ESSENTIAL FOUNDATIONS OF

ECONOMICS

8TH EDITION

Bade ▪ Parkin



Pearson

ESSENTIAL FOUNDATIONS OF ECONOMICS

delivers a complete, hands-on learning system designed around active learning.

A Learning-by-Doing Approach

The **Checklist** that begins each chapter highlights the key topics covered and the chapter is divided into sections that directly correlate to the Checklist.

The **Checkpoint** that ends each section provides a full page of practice problems to encourage students to review the material while it is fresh in their minds.

Each chapter opens with a question about a central issue that sets the stage for the material.



Why did the price of coffee rise in 2014?

4

Demand and Supply

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Distinguish between quantity demanded and demand, and explain what determines demand.
2. Distinguish between quantity supplied and supply, and explain what determines supply.
3. Explain how demand and supply determine price and quantity in a market, and explain the effects of changes in demand and supply.

MyEconLab Big Picture Video

CHECKPOINT 4.1

MyEconLab Study Plan 4.1
Key Terms Quiz
Solutions Video

Distinguish between quantity demanded and demand, and explain what determines demand.

Practice Problems

The following events occur one at a time in the market for smartphones:

- The price of a smartphone falls.
- Producers announce that the price of a smartphone will fall next month.
- The price of a call made from a smartphone falls.
- The price of a call made from a land-line phone increases.
- An increase in memory makes smartphones more popular.

1. Explain the effect of each event on the demand for smartphones.
2. Use a graph to illustrate the effect of each event.
3. Does any event (or events) illustrate the law of demand?

In the News

Airline profits soar yet no relief for passengers

EYE on the PRICE OF COFFEE

MyEconLab Critical Thinking Exercise

Why Did the Price of Coffee Rise in 2014?

When a fungus called coffee rust swept through Brazil and other countries of South America in 2014, world coffee production decreased and the price of coffee beans increased.

The table below provides some data on the quantity and price of coffee in 2013 and 2014. What does the data table tell us?

It tells us that the quantity of coffee

You can answer this question from the information provided. You know that an increase in demand brings a rise in the price and an increase in the quantity bought, while a decrease in supply brings a rise in the price and a decrease in the quantity bought.

Because the quantity of coffee decreased and the price increased, there must have been a decrease in the sup-

The figure illustrates the global market for coffee in 2013 and 2014. The demand curve D shows the demand for coffee, which we will assume was the same in both years.

In 2013, the supply curve was S_{2013}, the equilibrium price was $1.04 per pound and the equilibrium quantity traded was 19.4 billion pounds.

In 2014, decreased coffee produc-

Eye On boxes apply theory to important issues and problems that shape our global society and individual decisions.

Confidence-Building Graphs

use color to show the direction of shifts and detailed, numbered captions guide students step-by-step through the action.

100% of the figures are animated in MyEconLab, with step-by-step audio narration.

FIGURE 4.4

Change in Quantity Demanded Versus Change in Demand

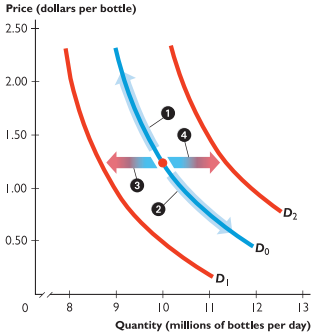
MyEconLab Animation

1 A decrease in the quantity demanded
The quantity demanded decreases and there is a movement up along the demand curve D_0 if the price of the good rises and other things remain the same.

3 A decrease in demand
Demand decreases and the demand curve shifts leftward (from D_0 to D_1) if

- The price of a substitute falls or the price of a complement rises.
- The price of the good is expected to fall.
- Income decreases.*
- Expected future income or credit decreases.
- The number of buyers decreases.

* Bottled water is a normal good.



2 An increase in the quantity demanded
The quantity demanded increases and there is a movement down along the demand curve D_0 if the price of the good falls and other things remain the same.

4 An increase in demand
Demand increases and the demand curve shifts rightward (from D_0 to D_2) if

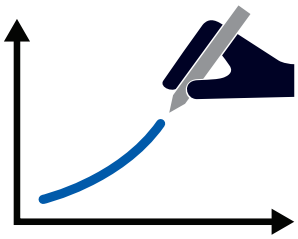
- The price of a substitute rises or the price of a complement falls.
- The price of the good is expected to rise.
- Income increases.
- Expected future income or credit increases.
- The number of buyers increases.

Practice, Engage, and Assess



- **Enhanced eText**—The Pearson eText gives students access to their textbook anytime, anywhere. In addition to note-taking, highlighting, and bookmarking, the Pearson eText offers interactive and sharing features. Students actively read and learn through auto-graded practice, real-time data-graphs, figure animations, author videos, and more. Instructors can share comments or highlights, and students can add their own, for a tight community of learners in any class.

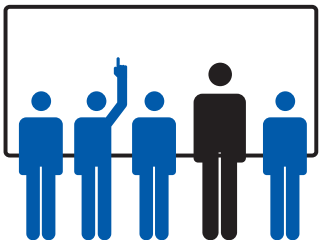
- **Practice**—Algorithmically generated homework and study plan exercises with instant feedback ensure varied and productive practice, helping students improve their understanding and prepare for quizzes and tests. Draw-graph exercises encourage students to practice the language of economics.





- **Learning Resources**—Personalized learning aids such as Help Me Solve This problem walkthroughs and Figure Animations provide on-demand help when students need it most.

- **Personalized Study Plan**—Assists students in monitoring their own progress by offering them a customized study plan based on Homework, Quiz, and Test results. Includes regenerated exercises with unlimited practice, as well as the opportunity to earn mastery points by completing quizzes on recommended learning objectives.





- **Dynamic Study Modules**—With a focus on key topics, these modules work by continuously assessing student performance and activity in real time and, using data and analytics, provide personalized content to reinforce concepts that target each student's particular strengths and weaknesses.

- **Digital Interactives**—Digital Interactives are engaging assessment activities that promote critical thinking and application of key economic principles. Each Digital Interactive has progressive levels where students can explore, apply, compare, and analyze economic principles. Many Digital Interactives include real time data from FRED® that displays, in graph and table form, up-to-the-minute data on key macro variables. Digital Interactives can be assigned and graded within MyEconLab, or used as a lecture tool to encourage engagement, classroom conversation, and group work.



with MyEconLab®

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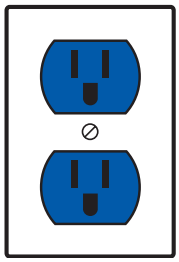




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Essential Foundations of ECONOMICS

Robin Bade

Michael Parkin

University of Western Ontario



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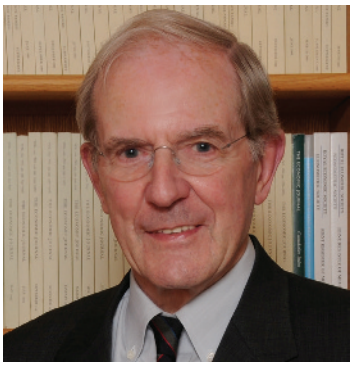
To Erin, Tessa, Jack, Abby, and Sophie

About the Authors



Robin Bade was an undergraduate at the University of Queensland, Australia, where she earned degrees in mathematics and economics. After a spell teaching high school math and physics, she enrolled in the Ph.D. program at the Australian National University, from which she graduated in 1970. She has held faculty appointments at the University of Edinburgh in Scotland, at Bond University in Australia, and at the Universities of Manitoba, Toronto, and Western Ontario in Canada. Her research on international capital flows appears in the *International Economic Review* and the *Economic Record*.

Robin first taught the principles of economics course in 1970 and has taught it (alongside intermediate macroeconomics and international trade and finance) most years since then. She developed many of the ideas found in this text while conducting tutorials with her students at the University of Western Ontario.



Michael Parkin studied economics in England and began his university teaching career immediately after graduating with a B.A. from the University of Leicester. He learned the subject on the job at the University of Essex, England's most exciting new university of the 1960s, and at the age of 30 became one of the youngest full professors. He is a past president of the Canadian Economics Association and has served on the editorial boards of the *American Economic Review* and the *Journal of Monetary Economics*. His research on macroeconomics, monetary economics, and international economics has resulted in more than 160 publications in journals and edited volumes, including the *American Economic Review*, the *Journal of Political Economy*, the *Review of Economic Studies*, the *Journal of Monetary Economics*, and the *Journal of Money, Credit, and Banking*. He is author of the best-selling textbook, *Economics* (Pearson), now in its Twelfth Edition.

Robin and Michael are a wife-and-husband team. Their most notable joint research created the Bade-Parkin Index of central bank independence and spawned a vast amount of research on that topic. They don't claim credit for the independence of the new European Central Bank, but its constitution and the movement toward greater independence of central banks around the world were aided by their pioneering work. Their joint textbooks include *Macroeconomics* (Prentice-Hall), *Modern Macroeconomics* (Pearson Education Canada), and *Economics: Canada in the Global Environment*, the Canadian adaptation of Parkin, *Economics* (Addison-Wesley). They are dedicated to the challenge of explaining economics ever more clearly to a growing body of students.

Music, the theater, art, walking on the beach, and five grandchildren provides their relaxation and fun.

ECONOMICS

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Preface



Students know that throughout their lives they will make economic decisions and be influenced by economic forces. They want to understand the economic principles that can help them navigate these forces and guide their decisions. *Essential Foundations of Economics* is our attempt to satisfy this want.

The response to our earlier editions from hundreds of colleagues across the United States and throughout the world tells us that most of you agree with our view that the principles course must do four things well. It must

- Motivate with compelling issues and questions
- Focus on core ideas
- Steer a path between an overload of detail and too much left unsaid
- Encourage and aid learning by doing

The Foundations icon with its four blocks (on the cover and throughout the book) symbolizes this four-point approach that has guided all our choices in writing this text and creating its comprehensive teaching and learning supplements.

WHAT'S NEW IN THE EIGHTH EDITION

New in this Eighth Edition revision are: A further fine-tuning of the content; an enhanced focus on outcome-driven teaching and learning; and a further large investment in enhanced digital features to bring economics to life and provide an exciting interactive experience for the student on all platforms and devices.

Fine-Tuning the Content

The content of this revision is driven by the drama of the extraordinary period of economic history in which we are living and its rich display of events and forces through which students can be motivated to discover the economic way of thinking. Persistent slow economic growth; increasing concentration of wealth; headwinds from Europe's stagnant economy and the UK decision to leave the economic union (Brexit); ongoing tensions arising from the loss of American jobs to offshore outsourcing and the political popularity of trade protection; a slowing pace of China's expansion; enhanced concern about carbon emission and climate change; relentless pressure on the federal budget from the demands of an aging

population and a sometimes dysfunctional Congress with its associated rising government debt; the dilemma posed by slow, almost decade-long recovery from the global financial crisis and recession and the related question of when and how fast to exit an era of extreme monetary stimulus. These are just a few of these interest-arousing events. All of them feature at the appropriate points in our new edition.

Every chapter contains many small changes, all designed to enhance clarity and currency, and the text and examples are all thoroughly updated to reflect the most recently available data and events.

Because the previous edition's revision was so extensive and well-received, we have limited our interventions and changes in this Eighth Edition to addressing the small number of issues raised by our reviewers and users, ensuring that we are thoroughly up-to-date, and focusing on the new digital tools that we've just described. Nonetheless, some changes that we now summarize are worth noting.

Notable Content Changes

In Chapter 1, Getting Started, we have added a new section, *Economics as a Life Skill*, which explains how economics is used as a decision tool, the scientific method the subject employs, and economics as an aid to critical thinking. A new *Eye on Your Life* looks at the BLS data on student time allocation (which contains some surprises).

In Chapter 3, The Economic Problem, we show explicitly how the outward-bowed production possibilities frontier arises from exploiting comparative advantage.

Chapter 7, Government Actions in Markets, has a new section on production quotas, which explains why producers like them and illustrates how a quota expands producer surplus.

In Chapter 9, Externalities: Pollution, Education, and Healthcare, we have expanded our discussion of carbon emissions and the global challenge of achieving an efficient use of energy resources. Our expanded coverage of healthcare describes why underproduction arises in healthcare markets and compares alternative solutions including Obamacare and the health systems of Canada and Europe.

Chapter 15, Jobs and Unemployment, is motivated by the question of whether we are back at full employment. In seeking an answer, the chapter adds to the standard list of job market indicators the new Z-Pop measure of the percentage of the population that is fully occupied.

Chapter 16, The CPI and the Cost of Living, explains and presents data on the new "Sticky Price CPI" and its related "Flexible Price CPI" as an attempt to measure the underlying inflation rate.

In Chapter 17, Potential GDP and Economic Growth, we have added an account of who gets the benefits of economic growth with a dramatic demonstration of the gains by the top one percent compared with the gains of the other 99 percent.

Chapter 18, Money and Inflation, closes with a new discussion of money, the price level, and inflation, which focuses on the long-run predictions of the quantity theory of money.

Chapter 20, Fiscal Policy and Monetary Policy, has a new and expanded explanation of the concepts of fiscal imbalance and generational imbalance and the magnitudes of these imbalances in the United States today.

Topical policy issues pervade the macro chapters. These include the the question of whether the United States is back at full employment, the Eurozone's extreme unemployment problem, and the falling U.S. labor force participation rate in Chapter 15; the ever-widening Lucas wedge and the persistence of U.S./E.U. productivity differences in Chapter 17; quantitative easing and the explosion of monetary base, the rise in bank reserves, and the collapse of the money multiplier in Chapter 18; the persistent federal budget deficit and rising debt to GDP ratio, the ongoing structural deficit, the ongoing near-zero federal funds rate, and an update of the contrast between monetary policy today and during the Great Depression, in Chapter 20.

Outcome-Driven Teaching and Learning

An overarching revision message is that this text, its customized MyEconLab, and classroom resources are built to support an outcome-driven teaching and learning program in which the principles of economics course strengthens

- Problem solving
- Critical thinking
- Decision making
- Citizenship

Problem solving is central to the *Foundations* story. A Checkpoint at the end of each topic, typically three per chapter, provides a pause and opportunity to check understanding with problems, one of which is driven by a recent news clip, and worked solutions. A series of MyEconLab Solutions Videos then give the student an alternative way of reviewing the solutions to these problems.

Critical thinking is encouraged and supported through a series of interactive exercises in MyEconLab. In each chapter, there is one exercise that is based on the question or issue that opens and motivates the chapter, and a second that builds from an *Economics in Your Life* feature.

Enhanced eText

The new Enhanced Pearson eText gives students access to their textbook anytime, anywhere. In addition to note-taking, highlighting, and bookmarking, the Pearson eText offers interactive and sharing features. Students actively read and learn through embedded and auto-graded practice, real-time data-graphs, animations, author videos, and more. Instructors can share comments or highlights, and students can add their own, for a tight community of learners in any class.

The new eText includes:

- A Big Picture Video that motivates and summarizes each chapter and provides an outline answer to the chapter's motivating question.
- A series of Concept Videos that illustrate and explain the key ideas in each section of a chapter. These videos also contain animations and explanations of each figure, which can be played separately.
- A series of Solutions Videos that walk the student through the solutions to the Practice Problems and In the News exercises in each Checkpoint.
- Interactive data graphs that display real-time data from the St. Louis Federal Reserve data base, FRED.

- Study Plan links that provide opportunities for more practice with problems similar to those in the text, some with real-time FRED data, that give targeted feedback to guide the student in answering the exercises.
- Key Terms Quiz links that provide opportunities for students to check their knowledge of the definitions and uses of the key terms.

THE FOUNDATIONS VISION

Focus on Core Concepts

Each chapter of *Foundations* concentrates on a manageable number of main ideas (most commonly three or four) and reinforces each idea several times throughout the chapter. This patient, confidence-building approach guides students through unfamiliar terrain and helps them to focus their efforts on the most important tools and concepts of our discipline.

Many Learning Tools for Many Learning Styles

Foundations' integrated print and electronic package builds on the basic fact that students have a variety of learning styles. Students have powerful tools at their fingertips: Within the eText, they can get an immediate sense of the content of a chapter by playing the Big Picture video; learn the key ideas by playing the Concept videos; and get a quick walkthrough of the Checkpoint Practice Problems and In the News exercises with the Solutions videos.

In MyEconLab, students can complete all Checkpoint problems and In the News exercises online and get instant feedback; work with interactive graphs and real-time data graphs; assess their skills by taking Practice Tests; receive a personalized Study Plan; and step-by-step help through the learning aid called "Help Me Solve This."

Diagrams That Tell the Whole Story

We developed the style of our diagrams with extensive feedback from faculty focus-group participants and student reviewers. All of our figures make consistent use of color to show the direction of shifts and contain detailed, numbered captions designed to direct students' attention step-by-step through the action.

Because beginning students of economics are often apprehensive about working with graphs, we have made a special effort to present material in as many as three ways—with graphs, words, and tables—in the same figure. In an innovation that seems necessary, but is to our knowledge unmatched, nearly all of the information supporting a figure appears on the same page as the figure itself. No more flipping pages back and forth!

Real-World Connections That Bring Theory to Life

Students learn best when they can see the purpose of what they are studying, apply it to illuminate the world around them, and use it in their lives.

Eye On boxes offer fresh new examples to help students see that economics is everywhere. Current and recent events appear in *Eye on the U.S. Economy* boxes; we place current U.S. economic events in global and historical perspectives in our *Eye on the Global Economy* and *Eye on the Past* boxes; and we show how students can use economics in day-to-day decisions in *Eye on Your Life* boxes.

Each chapter-opening question is answered in an Eye On box that helps students see the economics behind a key issue facing the world and highlights a major aspect of the chapter's story.

ORGANIZATION

We have organized the sequence of material and chapters in what we think is the most natural order in which to cover the material. But we recognize that there are alternative views on the best order. We have kept this fact and the need for flexibility firmly in mind throughout the text. Many alternative sequences work, and the Flexibility Chart on p. xxxii explains the alternative pathways through the chapters. In using the flexibility information, keep in mind that the best sequence is the one in which we present the material. And even chapters that the flexibility charts identify as strictly optional are better covered than omitted.

MYECONLAB

MyEconLab

MyEconLab has been designed and refined with a single purpose in mind: to create those moments of understanding that transform the difficult into the clear and obvious. With comprehensive homework, quiz, test, activity, and tutorial options, instructors can manage all their assessment needs in one program.

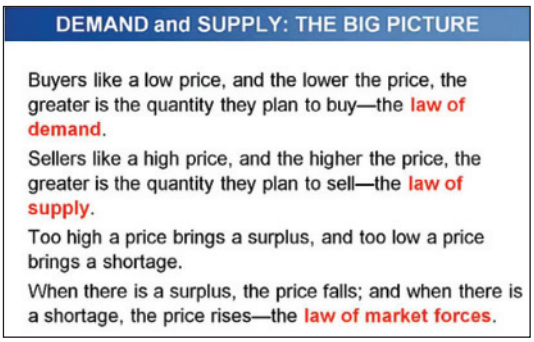
- All of the Checkpoint and Chapter Checkpoint Problems and Applications can be assigned and automatically graded in MyEconLab.
- Extra problems and applications, including algorithmic, draw-graph, and numerical exercises can be used for student practice or instructor assignment.
- Problems and applications that use real-time data continuously update directly from a feed to the Federal Reserve Bank of St. Louis.
- Test Item File questions can be assigned in quiz, test, or homework.
- The Custom Exercise Builder gives instructors the flexibility to create their own problems for assignment.
- The Gradebook records each student's performance and time spent on the Tests and Study Plan and generates reports by student or by chapter.

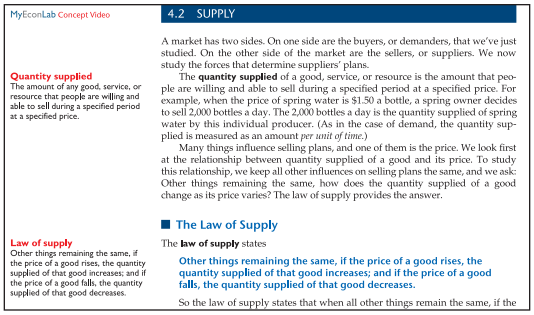
New for the Eighth Edition is an Enhanced Pearson eText, which includes embedded and auto-graded practice, real-time data graphs, animations, videos, and more. Instructors can share comments or highlights, and students can add their own, for a tight community of learners in any class.

With the Pearson eText 2.0 mobile app students can access the Enhanced eText and all its functionality from their computer, tablet, or cell phone. Because the student's progress is synced across all of their devices, they can stop what they're doing on one device and pick up again later on another one—without breaking their stride.

Features of the Enhanced eText

Big Picture Videos Big Picture videos, tied to the Chapter Checklist, set the stage for the main concept that will be introduced throughout the chapter. Students can use these videos to prepare for today's lecture or to help them focus on main chapter ideas.




MyEconLab Concept Video

4.2 SUPPLY

A market has two sides. On one side are the buyers, or demanders, that we've just studied. On the other side of the market are the sellers, or suppliers. We now study the forces that determine suppliers' plans.

The **quantity supplied** of a good, service, or resource is the amount that people are willing and able to sell during a specified period at a specified price. For example, when the price of spring water is $1.50 a bottle, a spring owner decides to sell 2,000 bottles a day. The 2,000 bottles a day is the quantity supplied of spring water by this individual producer. (As in the case of demand, the quantity supplied is measured as an amount *per unit of time*.)

Many things influence selling plans, and one of them is the price. We look first at the relationship between quantity supplied of a good and its price. To study this relationship, we keep all other influences on selling plans the same, and we ask: Other things remaining the same, how does the quantity supplied of a good change as its price varies? The law of supply provides the answer.

Quantity supplied
The amount of any good, service, or resource that people are willing and able to sell during a specified period at a specified price.

■ The Law of Supply

The **law of supply** states

Other things remaining the same, if the price of a good rises, the quantity supplied of that good increases; and if the price of a good falls, the quantity supplied of that good decreases.

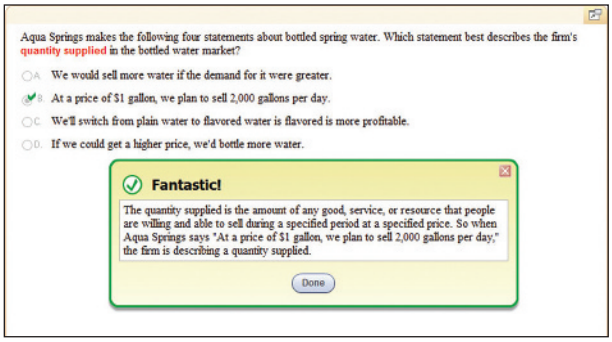
So the law of supply states that when all other things remain the same, if the

Law of supply
Other things remaining the same, if the price of a good rises, the quantity supplied of that good increases; and if the price of a good falls, the quantity supplied of that good decreases.

Concept Videos Concept videos accompany every major section of each chapter and are designed to briefly present the major concepts and graphical tools covered within key sections. Using text, audio, and animation, Concept videos enable students with different learning styles to efficiently study and review key concepts of the chapter.

Animations Every textbook figure includes a step-by-step animation, with audio, to help students learn the intuition behind reading and interpreting graphs. These animations may be used for review, or as an instructional aid in the classroom. Figures labeled *MyEconLab Real-Time Data* update using the most recent data available from the Federal Reserve Bank of St. Louis's FRED site.

Embedded MyEconLab Assessment Every Checkpoint Practice Problem, every In the News problem, and every Study Plan Problem and Application in the enhanced eText can be worked by the student directly from the eText page on which it occurs. These problems are auto-graded and feed into the MyEconLab's Study Plan, where students receive recommendations based upon their performance.


Aqua Springs makes the following four statements about bottled spring water. Which statement best describes the firm's **quantity supplied** in the bottled water market?

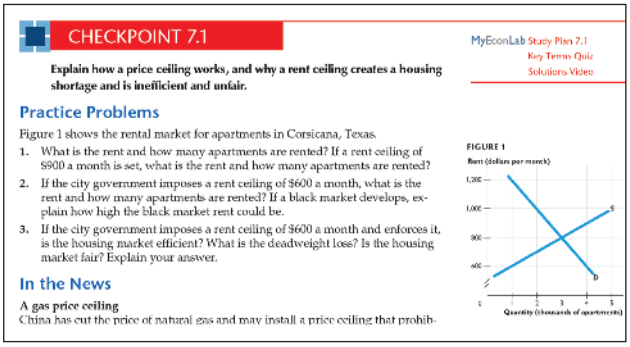
A. We would sell more water if the demand for it were greater.
B. At a price of $1 gallon, we plan to sell 2,000 gallons per day.
C. We'll switch from plain water to flavored water is flavored is more profitable.
D. If we could get a higher price, we'd bottle more water.

Fantastic!

The quantity supplied is the amount of any good, service, or resource that people are willing and able to sell during a specified period at a specified price. So when Aqua Springs says "At a price of $1 gallon, we plan to sell 2,000 gallons per day," the firm is describing a quantity supplied.

Done

Key Terms Quiz The Key Terms Quiz, accessible from each Checkpoint, allows students to check their understanding of key chapter concepts before moving onto the next section. The Interactive Glossary that supports the enhanced eText provides the key term definition, an example, and related terms.


CHECKPOINT 7.1

MyEconLab Study Plan 7.1
Key Terms Quiz
Solutions Video

Explain how a price ceiling works, and why a rent ceiling creates a housing shortage and is inefficient and unfair.

Practice Problems

Figure 1 shows the rental market for apartments in Corsicana, Texas.

1. What is the rent and how many apartments are rented? If a rent ceiling of $900 a month is set, what is the rent and how many apartments are rented?
2. If the city government imposes a rent ceiling of $600 a month, what is the rent and how many apartments are rented? If a black market develops, explain how high the black market rent could be.
3. If the city government imposes a rent ceiling of $600 a month and enforces it, is the housing market efficient? What is the deadweight loss? Is the housing market fair? Explain your answer.

FIGURE 1
Rent (dollars per month)
1,200
1,000
900
600
S
D
0
1
2
3
4
5
Quantity (thousands of apartments)

In the News

A gas price ceiling
China has cut the price of natural gas and may install a price ceiling that prohib-

Solutions Videos Every Checkpoint Practice problem and In the News problem is supported by a Solutions video that provides a step-by-step working of the problem, including graphical analysis. Text, audio, and animation ensure that a student understands how to set-up and solve each of the problems.

MyEconLab also includes:

Economics in the News Economics in the News is a turn-key solution to bringing current news into the classroom. Updated daily during the academic year, we upload two relevant articles (one micro, one macro) and provide questions that may be assigned for homework or for classroom discussion.

Current News Each week during the academic year, we upload multi-part microeconomic and macroeconomic exercises, with links to relevant articles, into the MyEconLab assignment manager. These enable instructors to bring current issues and events into the course with easy to assign and auto-graded exercises.

Real-Time Data Analysis Exercises (FRED) Easy to assign and automatically graded, Real-Time Data Analysis exercises use up-to-the-minute, real-time macroeconomic data. These exercises communicate directly with the Federal Reserve Bank of St. Louis's FRED site, so every time FRED posts new data, students see new data. As a result, Real-Time Data Analysis exercises offer a no-fuss solution for instructors who want to make the most recent data a central part of their macro course. End-of-chapter exercises accompanied by the Real-Time Data Analysis icon () include Real-Time Data versions in MyEconLab. Select in-text figures, labeled Real-time data, update in the eText using FRED data.

Digital Interactives: Economic principles are not static ideas, and learning them shouldn't be either! Digital Interactives are dynamic and engaging assessment activities that promote critical thinking and application of key economic principles.

Each Digital Interactive has 3 to 5 progressive levels and requires approximately 20 minutes to explore, apply, compare, and analyze each topic. Many Digital Interactives include real-time data from FRED™ allowing professors and students to display, in graph and table form, up-to-the-minute data on key macro variables.

Digital Interactives can be assigned and graded within MyEconLab, or used as a lecture tool to encourage engagement, classroom conversation, and group work.

Topics include:

Comparative Advantage
Opportunity Cost
Demand & Supply
Elasticity
GDP
Unemployment
Consumer Price Index/Inflation
Monetary Policy

Math Review Exercises in MyEconLab—MyEconLab now offers an array of assignable and auto-graded exercises that cover fundamental math concepts. Geared specifically toward principles economics students, these exercises aim to increase student confidence and success in these courses. Our new Math Review is accessible from the assignment manager and contains more than 150 exercises for homework, quiz, and test use.

Learning Catalytics Learning Catalytics helps you generate class discussion, customize your lecture, and promote peer-to-peer learning with real-time analytics. As a student response tool, Learning Catalytics uses students' smartphones, tablets, or laptops to engage them in more interactive tasks and thinking.

- NEW! Upload a full PowerPoint® deck for easy creation of slide questions.
- Help your students develop critical thinking skills.
- Monitor responses to find out where your students are struggling.
- Rely on real-time data to adjust your teaching strategy.
- Automatically group students for discussion, teamwork, and peer-to-peer learning.

Experiments in MyEconLab Experiments are a fun and engaging way to promote active learning and mastery of important economic concepts. Pearson's Experiments program is flexible and easy for instructors to assign and students to use.

- Single-player experiments, available to assign, allow your students to play against virtual players from anywhere at anytime so long as they have an internet connection.
- Multiplayer experiments allow you to assign and manage a real-time experiment with your class.
- Pre and post-questions for each experiment are available for assignment in MyEconLab.
- Experiments are auto-graded using algorithms that objectively evaluate a student's economic gain and performance during the experiment.

AACSB and Learning Outcomes All end-of-chapter and Test Item File questions are tagged in two ways: to AACSB standards and to discipline-specific Learning Outcomes. These two separate tagging systems allow professors to build assessments around desired departmental and course outcomes and track results in MyEconLab's gradebook.

Personalized Study Plan The Personalized Study Plan provides recommendations for each of your students based on his or her ability to master the learning objectives in your course. This allows students to focus their study time by pinpointing the precise areas they need to review and allowing them to use customized practice and learning aids—such as videos, eText, tutorials, and more—to get them back on track. The Study Plan also ensures that your students are mastering the concepts, not just guessing the answers.

Using the report available in the Gradebook, you can then tailor course lectures to prioritize the content where students need the most support—offering you better insight into classroom and individual performance.

Dynamic Study Modules Dynamic Study Modules help students study effectively on their own by continuously assessing their activity and performance in real time. Here's how it works: students complete a set of questions with a unique answer format that also asks them to indicate their confidence level. Questions repeat until the student can answer them all correctly and confidently. Once completed, Dynamic Study Modules explain the concept using materials from the text. These are available as graded assignments prior to class, and accessible on smartphones, tablets, and computers.

NEW! Instructors can now remove questions from Dynamic Study Modules to better fit their course.

SUPPORT MATERIALS FOR INSTRUCTORS AND STUDENTS

Essential Foundations of Economics is accompanied by the most comprehensive set of teaching and learning tools ever assembled. Each component of our package is organized by Checkpoint topic for a tight, seamless integration with both the textbook and the other components. In addition to authoring the MyEconLab Study Plan and Assignment problems, PowerPoint resources, and Video scripts, we have helped in the reviewing and revising of the Solutions Manual, Instructor's Manual, and Test Item Files to ensure that every element of the package achieves the consistency that students and teachers need.

PowerPoint Resources

We have created the PowerPoint resources based on our 24 years of experience using this tool in our own classrooms. We have created four sets of PowerPoint presentations for instructors. They are:

- Lecture notes with full-color, animated figures, and tables from the textbook
- Figures and tables from the textbook, animated with step-by-step walk-through for instructors to use in their own personal slides
- *Eye On* features
- Alternative micro lecture notes with full-color, animated figures and tables that use examples different from those in the textbook

A student version of the lecture notes is also available on MyEconLab.

Instructor's Manual

The Instructor's Manual, written by Luke Armstrong and reviewed by Mark Rush, contains chapter outlines and road maps, additional exercises with solutions, a comprehensive Chapter Lecture resource, and a virtual encyclopedia of suggestions on how to enrich class presentation and use class time efficiently. The Instructor's Manual has been updated to reflect changes in the main text as well as infused with a fresh and intuitive approach to teaching this course. The Instructor's Manual is available for download in Word and PDF formats.

Solutions Manual

The Solutions Manual, written by Mark Rush and checked for accuracy by Jeannie Gillmore, contains the solutions to all Chapter Checkpoint Study Plan Problems and Applications, Instructor Assignable Problems and Applications, and the Multiple Choice Quiz. The Solutions Manual is available for download in Word and PDF formats.

Three Test Item Files and TestGen

More than 6,000 multiple-choice, numerical, fill-in-the-blank, short answer, essay, and integrative questions make up the three Test Item Files that support *Essential Foundations of Economics.* Mark Rush reviewed and edited the updated and new questions from three dedicated principles instructors to form one of the most comprehensive testing systems on the market. Our microeconomics questions were written by Carol Dole (Jackson University); and our macroeconomics questions were written by Svitlana. Maksymenko (University of Pittsburgh) and David Black

(University of Toledo). The entire set of questions is available for download in Word, PDF, and TestGen formats.

All three Test Item Files are available in test generator software (TestGen with QuizMaster). TestGen's graphical interface enables instructors to view, edit, and add questions; transfer questions to tests; and print different forms of tests. Instructors also have the option to reformat tests with varying fonts and styles, margins, and headers and footers, as in any word-processing document. Search and sort features let the instructor quickly locate questions and arrange them in a preferred order. QuizMaster, working with your school's computer network, automatically grades the exams, stores the results on disk, and allows the instructor to view and print a variety of reports.

Instructor's Resource Center

This page on the Pearson Higher Education website (www.pearsonhighered.com/IRC) contains the Instructor's Manual, Solutions Manual, and Test Item Files in Word and PDF formats. It also contains the Computerized Test Item Files (with a TestGen program installer) and PowerPoint resources. It is compatible with both Windows and Macintosh operating systems.

For access or more information, contact your local Pearson representative or request access online at the Instructor Resource Center.

ACKNOWLEDGMENTS

Working on a project such as this one generates many debts that can never be repaid. But they can be acknowledged, and it is a special pleasure to be able to do so here and to express our heartfelt thanks to each and every one of the following long list, without whose contributions we could not have produced *Foundations.*

Mark Rush again coordinated, managed, and contributed to our Solutions Manual, Instructor's Manual, and Test Item Files. He assembled, polished, wrote, and rewrote these materials to ensure their close consistency with the text. He and we were in constant contact as all the elements of our text and package came together. Mark also made many valuable suggestions for improving the text and the Checkpoint Problems. His contribution went well beyond that of a reviewer, and his effervescent sense of humor kept us all in good spirits along the way.

Working closely with Mark, Luke Armstrong wrote content for the Instructor's Manual. Carol Dole, Svitlana Maksymenko and David Black authored new questions for the Test Item Files.

Luke Armstrong and Carol Dole recorded the narrations that accompany the Big Picture, Concept, and Solutions Videos in the eText. The engaging style and clarity of these outstanding teachers makes these videos a powerful learning tool.

Fred Bounds (Georgia Perimeter College) and Carol Dole provided outstanding reviews of the Study Plan and Assessment problems in MyEconLab that helped to make our exercises as effective as possible.

The ideas from which *Foundations* grew began to form over dinner at the Andover Inn in Andover, Massachusetts, with Denise Clinton and Sylvia Mallory. We gratefully acknowledge Sylvia's role not only at the birth of this project but also in managing its initial development team. Denise was an ongoing inspiration for 15 years, and we are privileged to have had the benefit of her enormous experience.

The success of *Foundations* owes much to its outstanding editors: Director of Portfolio Management, Adrienne D'Ambrosio, and Portfolio Manager, Ashley Bryan. Adrienne's acute intelligence and sensitive understanding of the market have helped sharpen our vision of this text and package over several editions, and Ashley has brought a fresh perspective to this Eight edition revision. The value-added of Adrienne and Ashley is huge. It has been, and we hope it will for many future editions remain, a joy to work with them.

Jonathan Boylan created the new impressive cover design and converted the raw ideas of our brainstorms into an outstandingly designed text.

Melissa Honig, Digital Studio Producer, and Noel Lotz, Digital Content Team Lead have set a new standard for online learning and teaching resources. They have been sources of high energy, good sense, and level-headed advice and quickly found creative solutions to all our technology problems.

Nancy Freihofer, our outstanding, ever calm, Content Producer, worked with a talented team at Integra, Project Editor, Heather Johnson, and designer, art coordinator, and typesetter. Our copy editor, Catherine Baum, gave our work a thorough review and helpful polish, and our proofreader ensured the most error-free text we have yet produced.

Our marketing team, comprised of Ramona Elmer, Tricia Murphy, and Brad Parkins, has been an integral part of this revision process. They have provided great knowledge and strategies to help continuously improve our suite of materials and keep them relevant and valuable in these ever-changing times.

Richard Parkin, our technical illustrator, created the figures in the text, the dynamic figures in the eText, the animated figures in the PowerPoint presentations, created the animations for and assembled the enhanced eText videos, and contributed many ideas to improving the clarity of our illustrations in all media.

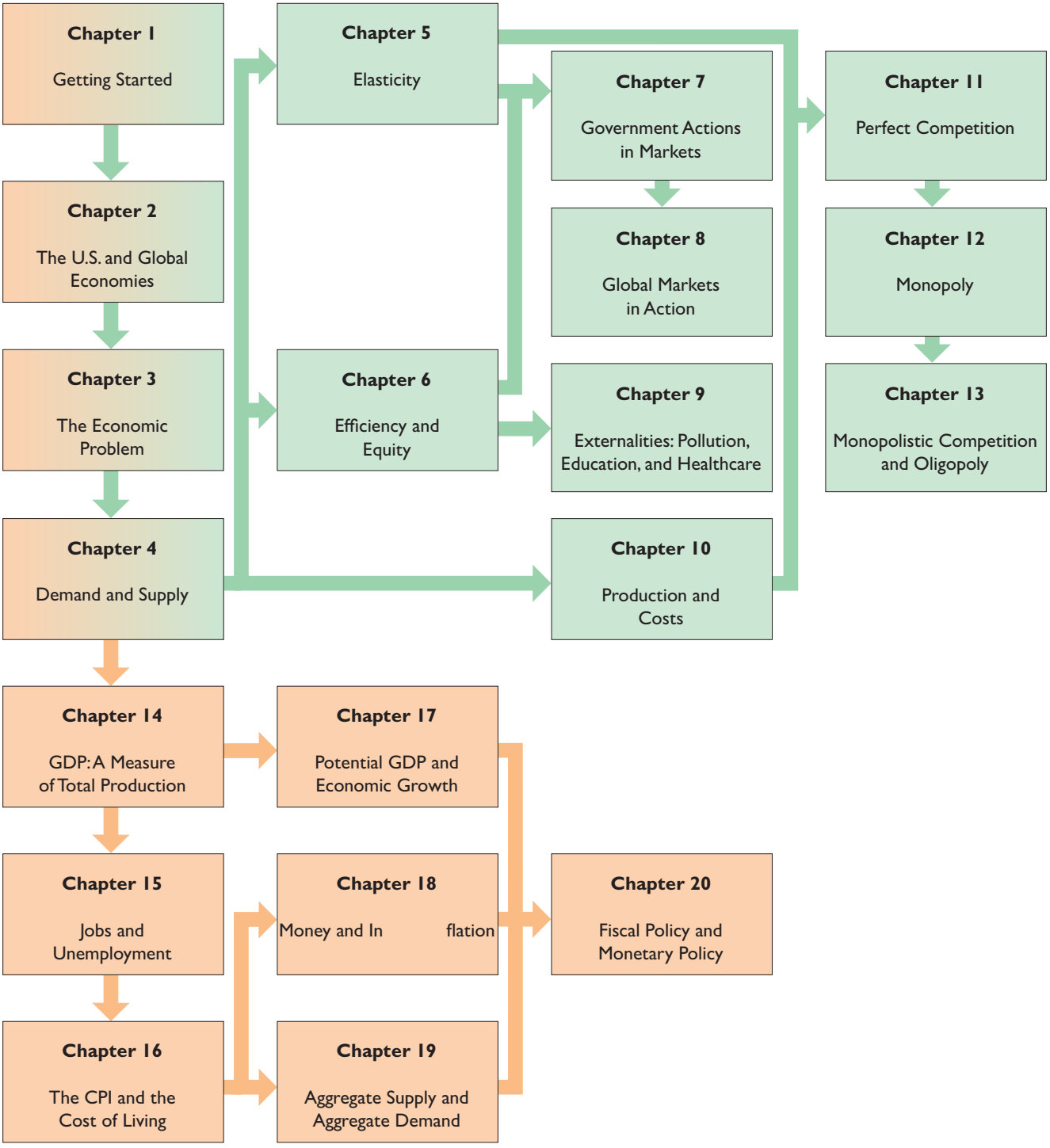
Jeannie Gillmore, our long-standing personal assistant, worked closely with us to create MyEconLab Study Plan and Assignment problems and to ensure the highest standards for our feedbacks and "help me solve this" question help.

Finally, our reviewers, whose names appear on the following pages, have made an enormous contribution to this text and MyEconLab resources. Once again we find ourselves using superlatives, but they are called for. In the many texts that we've written, we've not seen reviewing of the quality that we enjoyed on this revision. It has been a pleasure (if at times a challenge) to respond constructively to their many excellent suggestions.

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ESSENTIAL FOUNDATIONS OF ECONOMICS; FLEXIBILITY CHART

Flexibility



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You're in school!
Did you make the right decision?

Getting Started

1

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Define economics and explain the kinds of questions that economists try to answer.
2. Explain the ideas that define the economic way of thinking.
3. Explain how economics is useful as a life skill.

MyEconLab Big Picture Video

MyEconLab Concept Video

1.1 DEFINITION AND QUESTIONS

Well, did you make the right decision? Is being in school the best use of your time? You'll soon know how an economist answers this question—for it is an economic question. It arises from the fact that you want more than you can get. You want to be in school. But you also want the time to enjoy your favorite sports and movies, to travel, and to hang out with friends—time that right now you don't have because you've got classes to attend and assignments due. Your time is scarce.

Scarcity

Scarcity
The condition that arises because wants exceed the ability of resources to satisfy them.

Our inability to satisfy all our wants is called **scarcity**. The ability of each of us to satisfy our wants is limited by the time we have, the incomes we earn, and the prices we pay for the things we buy. These limits mean that everyone has unsatisfied wants. The ability of all of us as a society to satisfy our wants is limited by the productive resources that exist. These resources include the gifts of nature, our labor and ingenuity, and the tools and equipment that we have made.

Everyone, poor and rich alike, faces scarcity. A student wants Taylor Swift's latest album and a paperback but has only $10.00 in his pocket. He faces scarcity. Gwen Stefani wants to spend a week on the set of *The Voice* in L.A., but she also wants to devote time and energy to her successful clothing line. She faces scarcity. The U.S. government wants to increase spending on homeland security and cut taxes. It faces scarcity. An entire society wants improved healthcare, an Internet connection in every classroom, clean lakes and rivers, and so on. Society faces scarcity. Scarcity is everywhere: Even parrots face scarcity!



Not only do I want a cracker—we all want a cracker!

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Faced with scarcity, we must make choices. We must choose among the available alternatives. The student must choose the download or the paperback. Gwen Stefani must choose shooting episodes of *The Voice* or designing her next clothing collection. The government must choose greater security or tax cuts. And society must choose among healthcare, computers, the environment, and so on.

Economics Defined

Economics
The social science that studies the choices that individuals, businesses, governments, and entire societies make as they cope with *scarcity*, all the things that influence those choices, and the arrangements that coordinate them.

Economics is the social science that studies the choices that individuals, businesses, governments, and entire societies make as they cope with *scarcity*, all the things that influence those choices, and the arrangements that coordinate them.

The subject has two broad parts:

- Microeconomics, and
- Macroeconomics

Microeconomics

Microeconomics
The study of the choices that individuals and businesses make and the way these choices interact and are influenced by governments.

Microeconomics is the study of the choices that individuals and businesses make and the way these choices interact and are influenced by governments. Some examples of microeconomic questions are: Will you buy a 3-D TV or a standard one? Will Nintendo sell more units of Wii if it cuts the price? Will a cut in the income tax rate encourage people to work longer hours? Will a hike in the gas tax encourage more people to drive hybrid or smaller automobiles? Is music streaming killing song downloads?

Macroeconomics

Macroeconomics is the study of the aggregate (or total) effects on the national economy and the global economy of the choices that individuals, businesses, and governments make. Some examples of macroeconomic questions are: Why did production and jobs expand slowly in the United States during 2014 and 2015? Why are incomes growing much faster in China and India than in the United States? Why is unemployment in Europe so high? Why are Americans borrowing more than $1 billion a day from the rest of the world?

Macroeconomics
The study of the aggregate (or total) effects on the national economy and the global economy of the choices that individuals, businesses, and governments make.

Two big questions define the scope of economics:

- How do choices end up determining *what*, *how*, and *for whom* goods and services get produced?
- When do choices made in the pursuit of *self-interest* also promote the *social interest*?

What, How, and For Whom?

Goods and services are the objects and actions that people value and produce to satisfy human wants. Goods are *objects* that satisfy wants. Sports shoes and ketchup are examples. Services are *actions* that satisfy wants. Haircuts and rock concerts are examples. We produce a dazzling array of goods and services that range from necessities such as food, houses, and healthcare to leisure items such as Blu-ray players and roller coaster rides.

Goods and services
The objects (goods) and the actions (services) that people value and produce to satisfy human wants.

What?

What determines the quantities of corn we grow, homes we build, and healthcare services we produce? Sixty years ago, farm output was 5 percent of total U.S. production. Today, it is 1 percent. Over the same period, the output of mines, construction, and utilities slipped from 9 percent to 7 percent of total production and manufacturing fell from 28 percent to 12 percent. These decreases in output are matched by increases in the production of a wide range of services, up from 58 percent of total production 60 years ago to 80 percent today. How will these quantities change in the future as ongoing changes in technology make an ever-wider array of goods and services available to us?



How?

How are goods and services produced? In a vineyard in France, a hundred basket-carrying workers pick the annual grape crop by hand. In a vineyard in California, a huge machine and a few workers do the same job. Look around and you will see many examples of this phenomenon—the same job being done in different ways. In some stores, checkout clerks key in prices. In others, they use a laser scanner. One farmer keeps track of his livestock feeding schedules and inventories by using paper-and-pencil records, while another uses a computer. In some plants, GM hires workers to weld auto bodies and in others it uses robots to do the job.

Why do we use machines in some cases and people in others? Do mechanization and technological change destroy more jobs than they create? Do they make us better off or worse off?



In a California vineyard a machine and a few workers do the same job as a hundred grape pickers in France.

For Whom?



A doctor gets more of the goods and services produced than a nurse or a medical assistant gets.

For whom are goods and services produced? The answer depends on the incomes that people earn and the prices they pay for the goods and services they buy. At given prices, a person who has a high income is able to buy more goods and services than a person who has a low income. Doctors earn much higher incomes than do nurses and medical assistants, so doctors get more of the goods and services produced than nurses and medical assistants get.

You probably know about many other persistent differences in incomes. Men, on average, earn more than women. Whites, on average, earn more than minorities. College graduates, on average, earn more than high school graduates. Americans, on average, earn more than Europeans, who in turn earn more, on average, than Asians and Africans. But there are some significant exceptions. The people of Japan and Hong Kong now earn an average income similar to that of Americans. And there is a lot of income inequality throughout the world.

What determines the incomes we earn? Why do doctors earn larger incomes than nurses? Why do men earn more, on average, than women? Why do college graduates earn more, on average, than high school graduates? Why do Americans earn more, on average, than Africans?

Economics explains how the choices that individuals, businesses, and governments make and the interactions of those choices end up determining *what*, *how*, and *for whom* goods and services are produced. In answering these questions, we have a deeper agenda in mind. We're not interested in just knowing how many Blu-ray players are produced, how they are produced, and who gets to enjoy them. We ultimately want to know the answer to the second big economic question that we'll now explore.

Can the Pursuit of Self-Interest Be in the Social Interest?

Every day, you and 321 million other Americans, along with 7.2 billion people in the rest of the world, make economic choices that result in *"what," "how,"* and *"for whom"* goods and services are produced.

Are the goods and services produced, and the quantities in which they are produced, the right ones? Are the scarce resources used in the best possible way? Do the goods and services we produce go to those who benefit most from them?

Self-Interest and the Social Interest

Self-interest
The choices that are best for the individual who makes them.

Social interest
The choices that are best for society as a whole.

Choices that are the best for the individual who makes them are choices made in the pursuit of **self-interest**. Choices that are the best for society as a whole are said to be in the **social interest**. The social interest has two dimensions: *efficiency* and *equity*. We'll explore these concepts in later chapters. For now, think of efficiency as being achieved by baking the biggest possible pie, and think of equity as being achieved by sharing the pie in the fairest possible way.

You know that your own choices are the best ones for you—or at least you *think* they're the best at the time that you make them. You use your time and other resources in the way that you think is best. You might consider how your choices affect other people, but you order a home delivery pizza because you're hungry and want to eat, not because you're concerned that the delivery person or the cook needs an income. You make choices that are in your self-interest—choices that you think are best for you.

When you act on your economic decisions, you come into contact with thousands of other people who produce and deliver the goods and services that you decide to buy or who buy the things that you sell. These people have made their own decisions—what to produce and how to produce it, whom to hire or whom to work for, and so on. Like you, all these people make choices that they think are best for them. When the pizza delivery person shows up at your home, he's not doing you a favor. He's earning his income and hoping for a good tip.

Can it be possible that when each one of us makes choices that are in our own best interest—in our self-interest—it turns out that these choices are also the best choices for society as a whole—in the social interest?

Adam Smith, regarded as the founder of economic science, (see *Eye on the Past* on p. 18) said the answer is *yes*. He believed that when we pursue our self-interest, we are led by an *invisible hand* to promote the social interest.

Is Adam Smith correct? Can it really be possible that the pursuit of self-interest promotes the social interest? Much of the rest of this book helps you to learn what economists know about this question and its answer. To help you start thinking about the question, we're going to illustrate it with four topics that generate heated discussion in today's world. You're already at least a little bit familiar with each one of them. They are

- Globalization
- The information revolution
- Climate change
- Government budget deficit and debt

Globalization

Globalization—the expansion of international trade and the production of components and services by firms in other countries—has been going on for centuries. But in recent years, its pace has accelerated. Microchips, satellites, and fiber-optic cables have lowered the cost of communication and globalized production decisions. When Nike produces more sports shoes, people in Malaysia get more work. When Steven Spielberg makes a new movie, programmers in New Zealand write the code that makes magical animations. And when China Airlines wants a new airplane, Americans who work for Boeing build it.



Workers in Asia make our shoes.

Globalization is bringing rapid income growth, especially in Asia. But globalization is leaving some people behind. Jobs in manufacturing and routine services are shrinking in the United States, and some nations of Africa and South America are not sharing in the prosperity enjoyed in other parts of the world.

The owners of multinational firms benefit from lower production costs and consumers benefit from low-cost imported goods. But don't displaced American workers lose? And doesn't even the worker in Malaysia, who sews your new shoes for a few cents an hour, also lose? Is globalization in the social interest, or does globalization benefit just some at the expense of others?

The Information Revolution

We are living at a time of extraordinary economic change that has been called the *Information Revolution*. This name suggests a parallel with the *Industrial Revolution* of the 1800s and the *Agricultural Revolution* of 12,000 years ago.

The changes that have occurred during the last 35 years are based on one major technology: the microprocessor or computer chip. The spin-offs from faster



Robots fill orders at Amazon.

and cheaper computing have been widespread in telecommunications, music, and the automation of millions of tasks that previously required human decisions. You encounter some of these tasks when you check out at the grocery store or use an ATM. Less visible, but larger in scope, are the robots that assemble cars and move goods around warehouses. Over the next 20 years, more than one third of today's jobs will be done by a new generation of robots.

The computing and robot revolution resulted from people pursuing their self-interest. Gordon Moore, the chip maker who set up Intel, and Bill Gates, who quit Harvard to set up Microsoft, weren't thinking how much easier it would be for you to turn in your essay on time if you had a computer. Moore and Gates and thousands of other entrepreneurs were in pursuit of big rewards. Yet their actions made many other people better off. They advanced the social interest.

But are resources used in the best possible way? Or do Intel and Microsoft set their prices too high and put their products out of reach for too many people? And is it in the social interest for robots to take people's jobs?

Climate Change



Human activity is raising the Earth's surface temperature.

The Earth is getting hotter and the ice at the two poles is melting. Since the late nineteenth century, the Earth's surface temperature has increased about 1 degree Fahrenheit, and close to a half of that increase occurred over the past 25 years.

Most climate scientists believe that the current warming has come at least in part from human economic activity—from self-interested choices—and that, if left unchecked, the warming will bring large future economic costs.

Are the individual energy choices that each of us makes damaging the social interest? What needs to be done to make our choices serve the social interest? Would the United States joining with other nations to limit carbon emissions serve the social interest? What other measures might be introduced?

Government Budget Deficit and Debt



A government budget time bomb is ticking as spending grows faster than tax revenues.

Every year since 2000, the U.S. government has run a budget deficit. On average, the government has spent $2.3 billion a day more than it has received in taxes. The government's debt has increased each day by that amount. Over the 15 year period from 2000 to 2015, government debt increased by $12.5 trillion. Your personal share of this debt is $56,000.

This large deficit and debt is just the beginning of an even bigger problem. From about 2020 onwards, the retirement and healthcare benefits to which older Americans are entitled are going to cost increasingly more than current taxes can cover. With no changes in tax or benefit rates, the budget deficit will increase and the debt will swell ever higher.

Deficits and the debts they create cannot persist indefinitely, and debts must somehow be repaid. They will most likely be repaid by you, not by your parents. When we make our voter choices, we pursue our self-interest. Do our choices serve the social interest? Do the choices made by politicians and bureaucrats in Washington and the state capitals promote the social interest, or do they only serve their own self-interests?

The four issues we've just reviewed raise questions that are hard to answer. We'll return to each of them at various points throughout this text and explain when the social interest is served and when there remain problems to be solved.

CHECKPOINT 1.1

MyEconLab Study Plan 1.1
Key Terms Quiz
Solutions Video

Define economics and explain the kinds of questions that economists try to answer.

Practice Problems

1. Economics studies choices that arise from one fact. What is that fact?
2. Provide three examples of wants in the United States today that are especially pressing but not satisfied.
3. In the following three news items, find examples of the *what*, *how*, and *for whom* questions: "With more research, we will cure cancer"; "A good education is the right of every child"; "Congress raises taxes to curb the deficit."
4. How does a new Starbucks in Beijing, China, influence self-interest and the social interest?
5. How does Facebook influence self-interest and the social interest?

In the News

1. The Bureau of Labor Statistics (BLS) reports that high-paying jobs in healthcare and jobs in leisure, hospitality, and education will expand quickly over the next five years. How does the BLS expect *what* and *for whom* goods and services are produced to change in the next five years?
2. Hewlett-Packard will cut 30,000 jobs and lower its cost by $2.7 billion a year.
   Source: *Fortune*, October 1, 2015

   Explain how Hewlett-Packard's decision made in its self-interest might also be in the social interest.

Solutions to Practice Problems

1. The fact is scarcity—human wants exceed the resources available.
2. Examples would include security from terrorism, cleaner air in our cities, better public schools, and better public infrastructure. (Think of others.)
3. More research is a *how* question, and a cure for cancer is a *what* question. Good education is a *what* question, and every child is a *for whom* question. Raising taxes is a *for whom* question.
4. Decisions made by Starbucks are in Starbucks' self-interest but they also serve the self-interest of its customers and so contribute to the social interest.
5. Facebook serves the self-interest of its investors, users, and advertisers. It also serves the social interest by enabling people to share information.

Solutions to In the News

1. The BLS expects the quantities of goods and services produced by workers in healthcare, leisure, hospitality, and education to increase. For whom they are produced depends on how people's incomes and the prices of goods and services will change in the next five years. The BLS expects workers in these high-paying jobs and expanding industries will get more of them.
2. Hewlett-Packard's product prices might fall and benefit its customers. The laid-off workers will find new jobs, some of which might pay higher wages.

MyEconLab Concept Video

1.2 THE ECONOMIC WAY OF THINKING

The definition of economics and the kinds of questions that economists try to answer give you a flavor of the scope of economics. But they don't tell you how economists *think* about these questions and how they go about seeking answers to them. You're now going to see how economists approach their work.

We'll break this task into two parts. First, we'll explain the ideas that economists use to frame their view of the world. These ideas will soon have you thinking like an economist. Second, we'll look at economics both as a social science and as a policy tool that governments, businesses, and *you* can use.

Six ideas define the *economic way of thinking*:

- A choice is a *tradeoff*
- *Cost* is what you *must give up* to get something.
- *Benefit* is what you gain from something.
- People make *rational choices* by comparing benefits and costs.
- Most choices are "*how much*" choices made at the *margin.*
- Choices respond to *incentives.*

A Choice Is a Tradeoff

Tradeoff
An exchange—giving up one thing to get something else.

A **tradeoff** is an exchange—giving up one thing to get something else. Because we face scarcity, we must make choices. And when we make a choice, we select from the available alternatives. You can think about choices as tradeoffs. When you choose one thing, you give up something else that you could have chosen.

Think about what you will do on Saturday night. You can spend the night studying for your next economics test or having fun with your friends, but you can't do both of these activities at the same time. You must choose how much time to devote to each. Whatever choice you make, you could have chosen something else. When you choose how to spend your Saturday night, you face a tradeoff between studying and hanging out with your friends. To get more study time, you must give up some time with your friends.

Cost: What You *Must* Give Up

Opportunity cost
The opportunity cost of something is the best thing you must give up to get it.

The **opportunity cost** of something is the best thing you must give up to get it. You most likely think about the cost of something as the money you must spend to get it. But dig a bit deeper. If you spend $10 on a movie ticket, you can't spend it on a sandwich. The movie ticket really costs a sandwich. The *cost* of something is what must be given up to get it, not the money spent on it. Economists use the term *opportunity cost* to emphasize this view of cost.



The opportunity cost of being in school: things you can't buy and do.

The biggest opportunity cost you face is that of being in school. This opportunity cost has two components: things you can't afford to buy and things you can't do with your time.

Start with the things you can't afford to buy. You've spent all your income on tuition, residence fees, books, and a laptop. If you weren't in school, you would have spent this money on tickets to ball games and movies and all the other things that you enjoy. But that's only the start of the things you can't afford to buy because you're in school. You've also given up the opportunity to get a job and buy the things that you could afford with your higher income. Suppose that the

best job you could get if you weren't in school is working as a convenience store manager earning $24,000 a year. Another part of your opportunity cost of being in school is all the things that you would buy with that extra $24,000.

Now think about the time that being a student eats up. You spend many hours each week in class, doing homework assignments, preparing for tests, and so on. To do all these school activities, you must give up what would otherwise be time spent playing your favorite sport, time watching movies, and leisure time spent with your friends.

The opportunity cost of being in school is the best alternative things that you can't afford and that you don't have the time to enjoy. You might put a dollar value on this cost but the cost is the goods and services and time that you give up, not dollars.



The opportunity cost of being in school includes forgone earnings.

Benefit: What You Gain

The **benefit** from something is the gain or pleasure that it brings, measured by what you are *willing to give up* to get it. Benefit is determined by personal *preferences*—by what a person likes and dislikes and the intensity of those feelings. If you get a huge kick out of Madden NFL, that video game brings you a large benefit. And if you have little interest in listening to Yo Yo Ma playing a Vivaldi cello concerto, that activity brings you a small benefit.

Benefit
The benefit from something is the gain or pleasure that it brings, measured by what you are *willing to give up* to get it.

Some benefits are large and easy to identify, such as the benefit that you get from being in school. A big piece of that benefit is the goods and services that you will be able to enjoy with the boost to your earning power when you graduate. Some benefits are small, such as the benefit you receive from a slice of pizza.

Economists measure benefit as the most that a person is *willing to give up* to get something. You are willing to give up a lot for something that brings a large benefit. For example, because being in school brings a large benefit, you're *willing to give up* a lot of time and goods and services to get that benefit. But you're willing to give up very little for something that brings a small benefit. For example, you might be willing to give up one iTunes download to get a slice of pizza.

Rational Choice

A basic idea of economics is that in making choices, people act rationally. A **rational choice** is one that uses the available resources to best achieve the objective of the person making the choice.

Rational choice
A choice that uses the available resources to best achieve the objective of the person making the choice.

But how do people choose rationally? The answer is by comparing the *benefits* and *costs* of the alternative choices and choosing the alternative that makes *net benefit*—benefit minus cost—as large as possible.

You have chosen to be a student. If that choice is rational, as economists assume, your benefit from being in school exceeds the cost, so your net benefit is maximized by being in school. For an outstanding baseball player, a high earning potential makes the opportunity cost of school higher than the benefit from school, so for that person, net benefit is maximized by choosing full-time sport. (*Eye on the Benefit and Cost of School* on p. 12 explores these examples more closely.)

The benefit from a choice is determined by the preferences of the person making the choice, so two people can make different rational choices even if they face the same cost. For example, you might like chocolate ice cream more than vanilla ice cream, but your friend prefers vanilla. So it is rational for you to choose chocolate and for your friend to choose vanilla.

A rational choice might turn out not to have been the best choice after the fact. For example, a farmer might decide to plant wheat rather than soybeans. Then, when the crop comes to market, the price of soybeans might be much higher than the price of wheat. The farmer's choice was rational when it was made, but subsequent events made it less profitable than the alternative choice.

All the rational choices we've just considered (school or not, chocolate or vanilla ice cream, soybeans or wheat) involve choosing between two things. One or the other is chosen. We call such choices *all-or-nothing* choices. Many choices are of this type, but most choices involve *how much* of an activity to do.

How Much? Choosing at the Margin

You can allocate the next hour between studying and video chatting with your friends, but the choice is not all or nothing. You must decide how many minutes to allocate to each activity. To make this decision, you compare the benefit of a little bit more study time with its cost—you make your choice *at the margin*.

Margin
A choice on the margin is a choice that is made by comparing *all* the relevant alternatives systematically and incrementally.

Other words for "margin" are "border" or "edge." You can think of a choice at the margin as one that adjusts the border or edge of a plan to determine the best course of action. Making a choice at the **margin** means comparing the relevant alternatives systematically and incrementally.

Marginal Cost

Marginal cost
The opportunity cost that arises from a one-unit increase in an activity. The marginal cost of something is what you *must* give up to get *one additional* unit of it.

The opportunity cost of a one-unit increase in an activity is called **marginal cost**. The marginal cost of something is what you *must* give up to get *one additional* unit of it. Think about your marginal cost of going to the movies for a third time in a week. Your marginal cost of seeing the movie is what you must give up to see that one additional movie. It is *not* what you give up to see all three movies. The reason is that you've already given up something to see two movies, so you don't count that cost when making a decision to see the third movie.

The marginal cost of any activity increases as you do more of it. You know that going to the movies decreases your study time and lowers your grade. Suppose that seeing a second movie in a week lowers your grade by five percentage points. Seeing a third movie will lower your grade by more than five percentage points. Your marginal cost of moviegoing is increasing as you see more movies.

Marginal Benefit

Marginal benefit
The benefit that arises from a one-unit increase in an activity. The marginal benefit of something is *measured* by what you *are willing* to give up to get *one additional* unit of it.

The benefit of a one-unit increase in an activity is called **marginal benefit**. Marginal benefit is what you gain from having *one more* unit of something. But the marginal benefit from something is *measured* by what you *are willing* to give up to get that *one additional* unit of it.

A fundamental feature of marginal benefit is that it diminishes. Think about your marginal benefit from movies. If you've been studying hard and haven't seen a movie this week, your marginal benefit from seeing your next movie is large. But if you've been on a movie binge this week, you now want a break and your marginal benefit from seeing your next movie is small.

Because the marginal benefit from a movie decreases as you see more movies, you are willing to give up less to see one additional movie. For example, you know that going to the movies decreases your study time and lowers your grade. You pay for seeing a movie with a lower grade. You might be willing to give up ten percentage points to see your first movie in a week, but you won't be willing to take such a big hit on your grade to see a second movie in a week. Your willingness to pay to see a movie decreases as the number of movies increases.

Making a Rational Choice

So, will you go to the movies for that third time in a week? The answer is found by comparing marginal benefit and marginal cost.

If the marginal cost of the movie is less than the marginal benefit from it, seeing the third movie adds more to benefit than to cost. Your net benefit increases, so your rational choice is to see the third movie.

If the marginal cost of the movie exceeds the marginal benefit from it, seeing the third movie adds more to cost than to benefit. Your net benefit decreases, so your rational choice is to spend the evening studying.

When the marginal benefit from something equals its marginal cost, the choice is rational and it is not possible to make a better choice. Scarce resources are being used in the best possible way.

Choices Respond to Incentives

The choices we make depend on the incentives we face. An **incentive** is a reward or a penalty—a "carrot" or a "stick"—that encourages or discourages an action. We respond positively to "carrots" and negatively to "sticks." The carrots are marginal benefits; the sticks are marginal costs. A change in marginal benefit or a change in marginal cost changes the incentives that we face and leads us to change our actions.

Incentive
A reward or a penalty—a "carrot" or a "stick"—that encourages or discourages an action.

Most students believe that the payoff from studying just before a test is greater than the payoff from studying a month before a test. In other words, as a test date approaches, the marginal benefit from studying increases and the incentive to study becomes stronger. For this reason, we observe an increase in study time and a decrease in leisure pursuits during the last few days before a test. And the more important the test, the greater is this effect.

A change in marginal cost also changes incentives. For example, suppose that last week, you found your course work easy and you scored 100 percent on your practice quizzes. You figured that the marginal cost of taking an evening off to enjoy a movie was low and that your grade on the next test would not suffer, so you headed to the Cineplex. But this week the going has gotten tough. You're just not getting it, and your practice test scores are low. If you take off even one evening this week, your grade on the next test will suffer. The marginal cost of seeing a movie is now high, so you decide to give the movies a miss.

A central idea of economics is that by observing *changes in incentives*, we can predict how *choices change*.





Changes in marginal benefit and marginal cost change the incentive to study or to enjoy a movie.



MyEconLab Critical Thinking Exercise

EYE on the BENEFIT AND COST OF SCHOOL

Did You Make the Right Decision?

Your decision to be in school is an economic decision. You faced a tradeoff between school, a job, and leisure time. You compared benefits and costs, and you responded to incentives.

Did you make the right decision when you chose school over a full-time job? Or, if you have a full-time job and you're studying in what would be your leisure time, did you make the right choice? Does school provide a big enough benefit to justify its cost?

The Benefits of School

Being in school has many benefits for which people are willing to pay. They fall into two broad categories: present enjoyment and a higher future income.

You can easily make a list of all the fun things you do with your friends in school that would be harder to do if you didn't have these friends and opportunities for social interaction that school provides.

Putting a dollar value on the items in your list would be hard, but it is possible to put a dollar value, or rather an expected dollar value, on the other benefit—a higher future income.

A high-school graduate earns, on average, an annual income of $40,000 a year. A graduate with a bachelor's degree earns, on average, $76,000 a year.

So by being in school, you can expect (on average) to increase your annual earnings by $36,000 a year.

This number is likely to grow as the economy becomes more productive and prices and earnings rise.

The Costs of School

The opportunity cost of being in school is your best forgone alternative. It is all the things you would have been able to enjoy if you were not in school. An opportunity cost is goods and services and time that must be forgone. Putting a dollar value on opportunity cost for a full-time student includes

- Tuition
- Expenditure on books and other study aids
- Forgone earnings

For a student attending a state university in her or his home state, tuition is around $10,000 per year.

Books and other study aids cost around $1,000 per year.

Forgone earnings are the wage of a high-school graduate in a starter job, which is around $24,000 a year.

So the total cost of being in school is about $35,000 per year or $105,000 for a 3-year degree and $140,000 for a 4-year degree.

Net Benefit

The benefit of extra earnings alone brings in $36,000 a year or $360,000 in 10 years and $1,440,000 in a working life of 40 years.

But you are incurring the costs now while you won't enjoy the benefits until some time in the future. We need to lower the benefits to compare them properly with the costs. You'll learn how to do that later in your economics course. But even allowing for the fact that the costs are incurred now while the benefits are received in the future, the net benefit is big!

Is School Always Best?

At the age of 18, Clayton Kershaw was offered a baseball scholarship at Texas A & M. The scholarship wouldn't have covered all the costs of school, but it would have lowered them a long way below those that you face.

But Clayton had an alternative to school. He was considered the top high-schooler available entering the 2006 MLB Draft and he was offered a signing bonus by the Los Angeles Dodgers said to be $2.3 million.

Clayton turned down the baseball scholarship at Texas A & M and signed with the Dodgers.

As the starting pitcher, Clayton's value to the Dodgers is high and earned him a salary of $30 million in 2015.

Clayton Kershaw's opportunity cost of a college education vastly exceeded the benefit he could expect to get from it. So, like you, he made the right decision.



CHECKPOINT 1.2

MyEconLab Study Plan 1.2
Key Terms Quiz
Solutions Video

Explain the ideas that define the economic way of thinking.

Practice Problems

Every week, Kate plays tennis for two hours, and her grade on each math test is 70 percent. Last week, after playing for two hours, Kate considered playing for another hour. She decided to play for another hour and cut her study time by one hour. But last week, her math grade fell to 60 percent. Use this information to work Problems **1** to **4**.

1. What was Kate's opportunity cost of the third hour of tennis?
2. Given that Kate played the third hour, what can you conclude about her marginal benefit and marginal cost of the second hour of tennis?
3. Was Kate's decision to play the third hour of tennis rational?
4. Did Kate make her decision on the margin?

In the News

The *New York Times* reports that cruise lines have been slashing prices and cruise sales are up. It says this surge of interest tells us that despite the uncertain economic climate, people clearly need more fun in their lives and view their vacations as valuable and necessary.

1. In deciding whether to take a cruise, would you face a tradeoff?
2. How would you make a rational choice about taking a cruise?
3. What would be the marginal benefit from a cruise? What would be the marginal cost of a cruise?
4. Why would you expect a lower price to increase the number of people who decide to take a cruise?

Solutions to Practice Problems

1. Kate's opportunity cost of the third hour of tennis was the drop in her grade of ten percentage points.
2. The marginal benefit from the second hour of tennis must have exceeded the marginal cost of the second hour because Kate chose to play the third hour.
3. If marginal benefit exceeded marginal cost, Kate's decision was rational.
4. Kate made her decision on the margin because she compared the benefit and cost of one more hour (marginal benefit and marginal cost).

Solutions to In the News

1. You would face a tradeoff because you would have to forgo something else that you might otherwise do with your resources (time and budget).
2. You would make a rational choice by comparing the marginal benefit from a cruise and the marginal cost of taking one.
3. The marginal benefit from a cruise is the most you are willing to pay for one. The marginal cost is what you would have to pay to take a cruise.
4. With a lower price, more people will have a marginal benefit that exceeds the price and they will choose to take a cruise.

1.3 ECONOMICS AS A LIFE SKILL

Economics is a life skill. It is a decision-making toolkit and, as a social science, it is a platform on which you will build critical thinking skills that prepare you for your career and life.

Economics as a Decision Tool

Economics is useful. The economic way of thinking provides you with tools for making decisions in all aspects of your lives:

- Personal
- Business
- Government

Personal Decisions

Should you take a student loan? Should you get a weekend job? Should you rent an apartment or borrow and buy a condo? How should you allocate your time between study, working, volunteering, caring for others, and having fun?

Deciding the answers to these questions involves weighing a marginal benefit and a marginal cost. Although some of the numbers might be hard to pin down, you will make more solid decisions if you approach these questions with the tools of economics.

Business Decisions

Should Sony compete with Apple in the smartphone market? Should Texaco get more oil from the Gulf of Mexico or from Alaska? Should Marvel Studios produce Spider-Man 4, a sequel to Spider-Man 3?

Like personal economic questions, these business questions involve the evaluation of a marginal benefit and a marginal cost. So again, by approaching these questions with the tools of economics and by hiring economists as advisers, businesses can make better decisions.

Government Decisions

Should there be a special tax to penalize corporations that send jobs overseas? Should cheap foreign imports of furniture and textiles be limited? Should the farms that grow beets receive a subsidy?

These government policy questions call for decisions that involve the evaluation of a marginal benefit and a marginal cost and an investigation of the interactions of individuals and businesses. Yet again, by approaching these questions with the tools of economics, governments can make better decisions.

Economics as a Social Science

Economists try to understand and predict the effects of economic forces by using the *scientific method* first developed by physicists. The scientific method is a commonsense way of systematically checking what works and what doesn't work. It begins with a question about cause and effect arising from some observed facts. An economist might wonder why computers are getting cheaper and more computers are being used. Are computers getting cheaper because more people are buying them, or are more people buying computers because they are getting cheaper? Or is a third factor causing both the price fall and the quantity increase?

Economic Models

A scientist's second step is to build a model that provides a possible answer to the question of interest. All sciences use models. An **economic model** is a description of the economy or a part of the economy that includes only those features assumed necessary to explain the observed facts.

Economic model
A description of the economy or a part of the economy that includes only those features assumed necessary to explain the observed facts.

A model is like a map. If you want to know about valleys and mountains, you use a physical map; if you're studying nations, you use a political map; if you want to drive from *A* to *B* in an unfamiliar city, you use a street map; and if you're a city engineer, you use a map of the cables and conduit under the streets.

In economics, we use mathematical and graph-based models. The questions posed above about the price and quantity of computers bought are answered by a graph-based model called "demand and supply" that you will study in Chapter 4.

Check Predictions of Models Against Facts

A scientist's third step is to check the predictions of a proposed model against the facts. Physicists check whether their models correspond to the facts by doing experiments. For example, with a particle accelerator, a physicist can test a model of the structure of an atom.

Economists have a harder time than physicists, but they still approach the task in a scientific manner. To check predictions of a model against facts, economists use natural experiments, statistical investigations, and laboratory experiments.

A natural experiment is a situation that arises in the ordinary course of economic life in which the one factor of interest is different and other things are equal (or similar). For example, Canada has higher unemployment benefits than the United States, but the people in the two nations are similar. So to study the effect of unemployment benefits on the unemployment rate, economists might compare the United States with Canada.

A statistical investigation looks for a *correlation*—a tendency for the values of two variables to move together (either in the same direction or in opposite directions) in a predictable and related way. For example, cigarette smoking and lung cancer are correlated. Sometimes a correlation shows a causal influence of one variable on the other. Smoking causes lung cancer. But sometimes the direction of causation is hard to determine.

A laboratory experiment puts people (often students) in a decision-making situation and varies the influence of one factor at a time to discover how they respond to changed incentives. Some economists (neuroeconomists) are now studying what happens inside the brain of a decisionmaker.

Disagreement: Normative versus Positive

Economists sometimes disagree. Some disagreements can be settled by checking facts, but others cannot.

Disagreements that can't be settled by facts are *normative*—disagreements about what *should be.* These disagreements turn on subjective values and cannot be tested. The statement "We *should* burn less coal" is normative. You may agree or disagree with it, but you can't test it. It doesn't assert a fact that can be checked. Economists as social scientists try to steer clear of normative statements.

Disagreements that *can* be settled by facts are *positive*—disagreements about *what is*. These disagreements can be settled by careful observation of facts. "Burning coal raises the temperature of the planet" is a positive statement. It can be tested. Sometimes the facts are hard to get and sometimes they are hard to interpret, so disagreement persists. It is an ongoing feature of a healthy science.

Economics as an Aid to Critical Thinking

Throughout your career you will need to engage in *critical thinking*. And throughout your life, if you strive to approach personal and social issues as a critical thinker, you will make better decisions and be a better friend, neighbor, and citizen.

What is Critical Thinking?

Critical thinking is thinking that is logical and fact-based. It is thinking that

- begins with a question
- clarifies the question
- thinks with an open mind about how to answer the question
- identifies potential answers
- seeks the relevant facts to check the potential answers
- ends with a well-reasoned answer

Does this sequence of critical thinking activities seem familiar? It does if you have just read the previous page. You will recognize that critical thinking is just another name for approaching an issue like a scientist. Economic science begins with a question about some economic event or activity; uses the economic way of thinking to clarify the question, think about how to answer it, identify possible answers, and check them against the facts; and arrives at a well-reasoned answer.

As a student, you will have lots of opportunities to practice critical thinking. It will be a feature of almost all your courses, and it will be a major feature of your economics course. What you learn in this course and the critical thinking and economic thinking skills that you develop will enrich your career and your life.

Learning-by-Doing

A central theme of this textbook is that the best way to learn economics is to do it—*learning-by-doing*. The mantra is "work the problem" and "draw the graph." This same message applies to critical thinking. The best way to become skilled at critical thinking is to do it.

To get you started, look at the example of a critical thinking question in *Eye on Your Life* on p. 17. The question is a simple one about facts. It doesn't have a cause-and-effect dimension, but it illustrates the central role that facts play. Facts always trump guesses and beliefs. The question also suggests another valuable activity: cooperating and working with others. Teamwork enables data to be shared and brainstorming a question often triggers better ideas about other possible answers that should be checked.

Throughout this textbook, we present you with a wide variety of critical thinking opportunities. Some arise from your life experiences in *Eye on Your Life* boxes like the one in this chapter. Others arise from economic events and issues in the news. News clips and the critical thinking questions that they raise appear in every chapter.

Also, every chapter starts with a question that is answered with a critical thinking box later in the chapter. The question on the opening page of this chapter and the *Eye on the Benefit and Cost of School* box on p. 12 are examples. Studying these examples and using what you learn to answer the economic questions that arise in your life and in the news will strengthen your critical thinking. You will emerge from your economics course with not only the ability to think like an economist but also more generally to be a critical thinker.

EYE on YOUR LIFE

Your Time Allocation

MyEconLab Critical Thinking Exercise

Your time is a scarce resource and how you allocate it impacts the quality of your life. Your physical fitness depends on how much time you allocate to sports and exercise, and your grade depends on the amount of time you allocate to studying.

Sleeping, personal care, eating and drinking, and traveling take a large chunk of your time, but you have choices about how much time to allocate to each of these activities. You also have choices about how much time to spend working for an income, enjoying sports and other leisure activities, and on educational activities (attending class, doing assignments, and studying).

Do you know the number of hours per day that you allocate to sleeping, personal care, eating and drinking, traveling, working, sports and leisure, and educational activities?

Here is a critical thinking question for you: Who works harder, you or the average student?

This question is one of fact, but answering requires agreement on what we mean by "works harder" and requires some data (the facts).

Let's agree that we will measure how hard a person works as the average number of hours per weekday spent working and on educational activities.

Next, we need the facts about time allocation—data about your time use and the time use of an average student.

The table above has eight activities and two columns for data. Complete the first column based on your current best guess about your time use.

Now keep a calendar for a normal week, and calculate your actual average hours for each activity. At the end of the week, complete the second column of the table.

How do your actual numbers compare with your guesses? Are there any surprises?

Now we need to compare your time use with that of the average student. The Bureau of Labor Statistics has conducted a survey to get the facts and the figure below shows what it found.

So, what is the answer? Are there any more surprises? Who works more hours, you or the average student?

Does the answer make you want to change your time allocation?

Your Time Use

Activity	Guess	Actual average
	(hours per day)	
Sleeping		
Personal care		
Eating and drinking		
Traveling		
Working and related activities		
Leisure and sports		
Educational activities		
Other		
Total	**24.0**	**24.0**

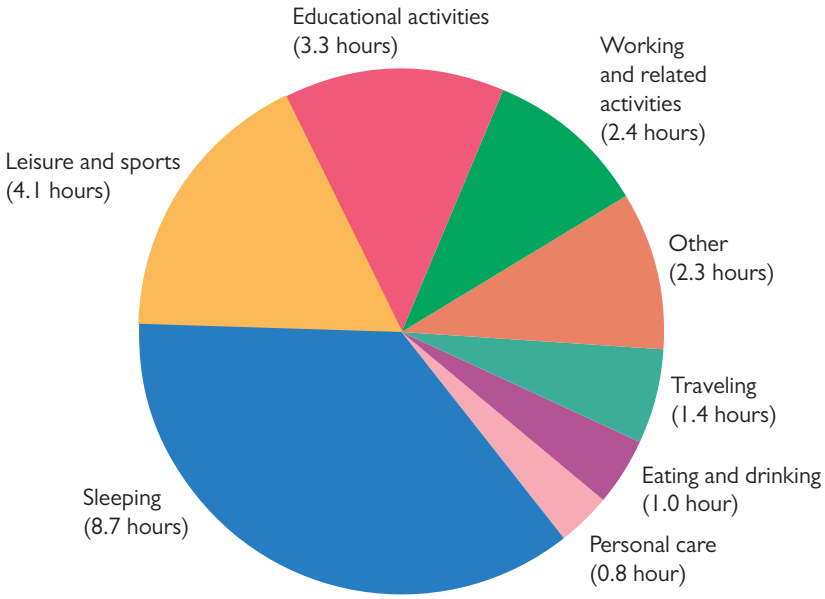


Figure 1 Time Use for Full-Time Students

SOURCE OF DATA: Bureau of Labor Statistics, American Time Use Survey, average on non-holiday weekdays for full-time university and college students 2010–2014.



EYE on the PAST

Adam Smith and the Birth of Economics as a Social Science

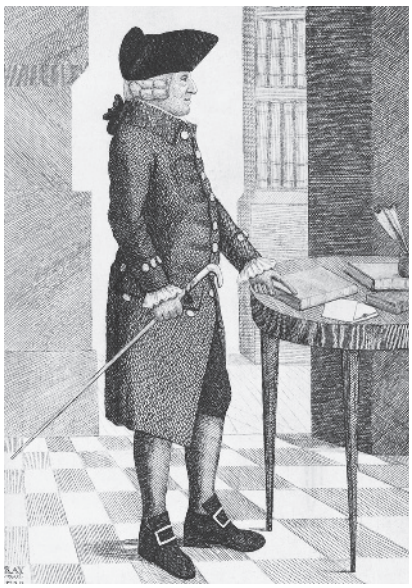
Many people had written about economics before Adam Smith did, but he made economics a social science.

Born in 1723 in Scotland, Smith became a full professor at 28 and published his masterpiece, *An Inquiry into the Nature and Causes of the Wealth of Nations,* in 1776.

Adam Smith asked: Why are some nations wealthy while others are poor? His answer: Through the division of labor and free markets, nations become wealthy. To illustrate his argument, he used the example of a pin factory. He guessed that one person, using the hand tools available in the 1770s, might make 20 pins a day. Yet, he observed, by using the same hand tools but breaking the process into a number of individually small tasks in which people specialize—by the division of labor—ten people could make a staggering 48,000 pins a day.

But a large market is needed to support the division of labor: One factory employing ten workers would need to sell more than 15 million pins a year to stay in business!

Smith saw free competitive markets as a source of wealth. The self-interested pursuit of profit, led by an invisible hand, resulted in resources being used in ways that created the greatest possible value and wealth.



MyEconLab Study Plan 1.3
Key Terms Quiz
Solutions Video

CHECKPOINT 1.3

Explain how economics is useful as a life skill.

Practice Problem

Distinguish between positive and normative statements and provide an example of each.

In the News

The *New York Times* reports that China will end its one-child policy. How would an economist study the effect of this policy change?

Solution to Practice Problem

A positive statement is a statement of fact that can be checked, such as "grocery prices are rising." A normative statement is an opinion that cannot be checked, such as "tuition should be based on family income."

Solution to In the News

As a social scientist, an economist would construct a population model. As a policy adviser, an economist would evaluate the benefits and costs of the change.

CHAPTER SUMMARY

Key Points

1. Define economics and explain the kinds of questions that economists try to answer.

- Economics is the social science that studies the choices that we make as we cope with scarcity and the incentives that influence and reconcile our choices.
- Microeconomics is the study of individual choices and interactions, and macroeconomics is the study of the national economy and global economy.
- The first big question of economics is: How do the choices that people make end up determining *what*, *how*, and *for whom* goods and services are produced?
- The second big question is: When do choices made in the pursuit of *self-interest* also promote the *social interest*?

2. Explain the ideas that define the economic way of thinking.

- Six ideas define the economic way of thinking:
  1. A choice is a *tradeoff*.
  2. *Cost* is what you *must* give up to get something.
  3. *Benefit* is what you gain when you get something (measured by what you *are willing to* give up to get it).
  4. People make *rational* choices by comparing benefits and costs.
  5. A "how much" choice is made on the *margin* by comparing *marginal benefit* and *marginal cost*.
  6. Choices respond to *incentives*.

3. Explain how economics is useful as a life skill.

- Economics is a tool for personal, business, and government decisions.
- Economists use the *scientific method* to try to understand how the economic world works. They create economic models and test them using natural experiments, statistical investigations, and laboratory experiments.
- Economics and the economic way of thinking are foundations on which to build critical thinking skills.

Key Terms

MyEconLab Key Terms Quiz

Benefit, 9
Economic model, 15
Economics, 2
Goods and services, 3
Incentive, 11
Macroeconomics, 3
Margin, 10
Marginal benefit, 10
Marginal cost, 10
Microeconomics, 2
Opportunity cost, 8
Rational choice, 9
Scarcity, 2
Self-interest, 4
Social interest, 4
Tradeoff, 8

MyEconLab Chapter 1 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. Provide three examples of scarcity that illustrate why even the 1,826 billionaires in the world face scarcity.

2. Label each entry in List 1 as dealing with a microeconomic topic or a macroeconomic topic. Explain your answer.

LIST 1

- Motor vehicle production in China is growing by 10 percent a year.
- Coffee prices skyrocket.
- Globalization has reduced African poverty.
- The government must cut its budget deficit.
- Apple sells 20 million iPhone 6 smartphones a month.

Use the following information to work Problems **3** to **6**.

Jurassic World had world-wide box office receipts of $1.66 billion. The movie's production budget was $150 million with additional marketing costs. A successful movie brings pleasure to millions, creates work for thousands, and makes a few people rich.

3. What contribution does a movie like *Jurassic World* make to coping with scarcity? When you buy a movie ticket, are you buying a good or a service?

4. Who decides whether a movie is going to be a blockbuster? How do you think the creation of a blockbuster movie influences *what*, *how*, and *for whom* goods and services are produced?

5. What are some of the components of marginal cost and marginal benefit that the producer of a movie faces?

6. Suppose that Chris Pratt had been offered a part in another movie and that to hire him for *Jurassic World*, the producer had to double Chris Pratt's pay. What incentives would have changed? How might the changed incentives have changed the choices that people made?

7. What is the social interest? Distinguish it from self-interest. In your answer give an example of self-interest and an example of social interest.

8. Pam, Pru, and Pat are deciding how they will celebrate the New Year. Pam prefers to take a cruise, is happy to go to Hawaii, but does not want to go skiing. Pru prefers to go skiing, is happy to go to Hawaii, but does not want to take a cruise. Pat prefers to go to Hawaii or to take a cruise but does not want to go skiing. Their decision is to go to Hawaii. Is this decision rational? What is the opportunity cost of the trip to Hawaii for each of them? What is the benefit that each gets?

9. Label each of the entries in List 2 as a positive or a normative statement.

LIST 2

- Low-income people pay too much for housing.
- The number of U.S. farms has decreased over the past 50 years.
- Toyota expands parts production in the United States.
- Imports from China are swamping U.S. department stores.
- The rural population in the United States is declining.

Use the following information to work Problems **10** to **12**.

REI is paying its employees to take Black Friday, Thanksgiving off
REI, the outdoor gear and apparel retailer, is paying employees to celebrate Thanksgiving 2015 by spending Black Friday outdoors with their families.

Source: *Sustainable Brands*, October 28, 2015

10. With Black Friday off with full pay, explain what is free and what is scarce.

11. What is REI's incentive to give its workers Black Friday off? Was REI's decision made in self-interest or in the social interest? Explain your answer.

12. Do you think that REI workers will shop or spend the day with family? Explain your answer.

13. Read *Eye on the Benefit and Cost of School* on p. 12 and explain why both you and Clayton Kershaw made the right decision.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. Which of the following items are components of the opportunity cost of being a full-time college student who lives at home? The things that the student would have bought with
   - A higher income
   - Expenditure on tuition
   - A subscription to the *Rolling Stone* magazine
   - The income the student will earn after graduating
2. Think about the following news items and label each as involving a *what*, *how*, or *for whom* question:
   - Today, most stores use computers to keep their inventory records, whereas 20 years ago most stores used paper records.
   - Healthcare professionals and drug companies recommend that Medicaid drug rebates be made available to everyone in need.
   - An increase in the gas tax pays for low-cost public transit.
3. The headlines in List 1 appeared in *The Wall Street Journal*. Classify each headline as a signal that the news article is about a microeconomic topic or a macroeconomic topic. Explain your answers.
4. Your school decides to increase the intake of new students next year. To make its decision, what economic concepts would it have considered? Would the school have used the "economic way of thinking" in reaching its decision? Would the school have made its decision on the margin?
5. Provide examples of (a) a monetary incentive and (b) a non-monetary incentive, a carrot and a stick of each, that governments use to influence behavior.
6. Think about each of the items in List 2 and explain how they affect incentives and might change the choices that people make.
7. Does the decision to make a blockbuster movie mean that some other more desirable activities get fewer resources than they deserve? Is your answer positive or normative? Explain your answer.
8. Provide two examples of economics being used as a tool by (a) a student, (b) a business, and (c) a government. Classify your examples as dealing with microeconomic topics and macroeconomic topics.

LIST 1

- Job Gains Calm Slump Worries
- Washington Post's Profit Falls
- Overcapacity, Fuel Costs Hit Shipping
- U.S. Budget Deficit Expands

LIST 2

- A hurricane hits Central Florida.
- The World Series begins tonight, but a storm warning is in effect for the area around the stadium.
- The price of a personal computer falls to $50.
- Unrest in the Middle East sends the price of gas to $5 a gallon.

Use the following news clip to work Problems **9** to **12**.

Obama unveils major climate change policy

Obama's Clean Power Plan, which will set federal limits on carbon emissions from coal-fired power plants, will cost $8.4 billion and reap benefits of more than $34 billion. Opponents of the plan say it will drive up the cost of electricity for millions of Americans.

Source: CNN, August 3, 2015

9. What are the more than $34 billion of benefits from using less coal to produce electricity? Who receives these benefits: the users of electricity or the owners of power plants, or both the users and the owners?
10. What are the $8.4 billion of costs arising from using less coal to produce electricity? Who bears these costs: the users of electricity or the owners of power plants, or both the users and the owners?
11. Explain why someone might oppose the Clean Power Plan when its benefits exceed its costs.
12. Explain whether the Clean Power Plan has an opportunity cost.

MyEconLab Chapter 1 Study Plan

Multiple Choice Quiz

1. Which of the following describes the reason why scarcity exists?

A. Governments make bad economic decisions.
B. The gap between the rich and the poor is too wide.
C. Wants exceed the resources available to satisfy them.
D. There is too much unemployment.

2. Which of the following defines economics?
Economics is the social science that studies _____.

A. the best way of eliminating scarcity
B. the choices made to cope with scarcity, how incentives influence those choices, and how the choices are coordinated
C. how money is created and used
D. the inevitable conflict between self-interest and the social interest

3. Of the three big questions, *what*, *how*, and *for whom*, which of the following is an example of a *how* question?

A. Why do doctors and lawyers earn high incomes?
B. Why don't we produce more small cars and fewer gas guzzlers?
C. Why do we use machines rather than migrant workers to pick grapes?
D. Why do college football coaches earn more than professors?

4. Which of the following is not a key idea in the economic way of thinking?

A. People make rational choices by comparing costs and benefits.
B. Poor people are discriminated against and should be treated more fairly.
C. A rational choice is made at the margin.
D. Choices respond to incentives.

5. A rational choice is _____.

A. the best thing you must forgo to get something
B. what you are willing to forgo to get something
C. made by comparing marginal benefit and marginal cost
D. the best for society

6. Which of the following best illustrates your marginal benefit from studying?

A. The knowledge you gain from studying two hours a night for a month
B. The best things forgone by studying two hours a night for a month
C. What you are willing to give up to study for one additional hour
D. What you must give up to be able to study for one additional hour

7. The scientific method uses models to _____.

A. clarify normative disagreements
B. avoid the need to study real questions
C. replicate all the features of the real world
D. focus on those features of reality assumed relevant for understanding a cause-and-effect relationship

8. Which of the following is a positive statement?

A. We should stop using corn to make ethanol because it is raising the cost of food.
B. You will get the most out of college life if you play a sport once a week.
C. Competition among wireless service providers across the borders of Canada, Mexico, and the United States has driven roaming rates down.
D. Bill Gates ought to spend more helping to eradicate malaria in Africa

APPENDIX: MAKING AND USING GRAPHS

When you have completed your study of this appendix, you will be able to

1. Interpret graphs that display data.
2. Interpret the graphs used in economic models.
3. Define and calculate slope.
4. Graph relationships among more than two variables.

Basic Idea

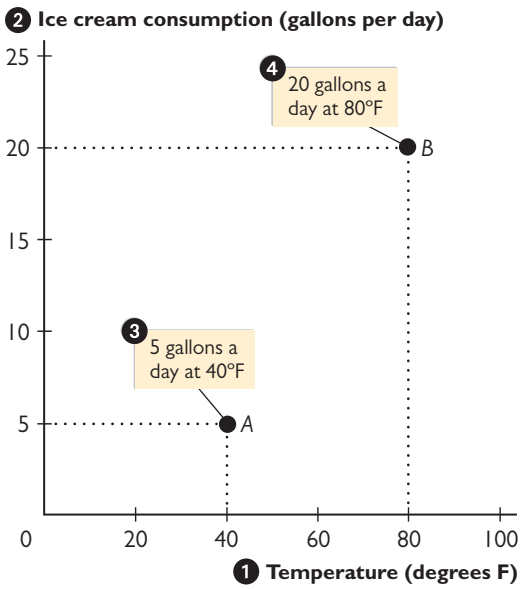
A graph represents a quantity as a distance and enables us to visualize the relationship between two variables. To make a graph, we set two lines called *axes* perpendicular to each other, like those in Figure A1.1. The vertical line is called the *y*-axis, and the horizontal line is called the *x*-axis. The common zero point is called the *origin.* In Figure A1.1, the *x*-axis measures temperature in degrees Fahrenheit. A movement to the right shows an increase in temperature, and a movement to the left shows a decrease in temperature. The *y*-axis represents ice cream consumption, measured in gallons per day.

To make a graph, we need a value of the variable on the *x*-axis and a corresponding value of the variable on the *y*-axis. For example, if the temperature is 40°F, ice cream consumption is 5 gallons a day at point *A* in Figure A1.1. If the temperature is 80°F, ice cream consumption is 20 gallons a day at point *B* in Figure A1.1. Graphs like that in Figure A1.1 can be used to show any type of quantitative data on two variables.

FIGURE A1.1

Making a Graph

MyEconLab Animation



All graphs have axes that measure quantities as distances.

1. The horizontal axis (*x*-axis) measures temperature in degrees Fahrenheit. A movement to the right shows an increase in temperature.
2. The vertical axis (*y*-axis) measures ice cream consumption in gallons per day. A movement upward shows an increase in ice cream consumption.
3. Point *A* shows that 5 gallons of ice cream are consumed on a day when the temperature is 40°F.
4. Point *B* shows that 20 gallons of ice cream are consumed on a day when the temperature is 80°F.

Interpreting Data Graphs

Scatter diagram
A graph of the value of one variable against the value of another variable.

A **scatter diagram** is a graph of the value of one variable against the value of another variable. It is used to reveal whether a relationship exists between two variables and to describe the relationship. Figure A1.2 shows two examples.

Figure A1.2(a) shows the relationship between expenditure and income. Each point shows expenditure per person and income per person in the United States in a given year from 2000 to 2015. The points are "scattered" within the graph. The label on each point shows its year. The point marked 10 shows that in 2010, income per person was $36,183 and expenditure per person was $32,758. This scatter diagram reveals that as income increases, expenditure also increases.

Figure A1.2(b) shows the relationship during the 1990s between the percentage of Americans who own a cell phone and the average monthly cell-phone bill. This scatter diagram reveals that as the cost of using a cell phone falls, the number of cell-phone subscribers increases.

Time-series graph
A graph that measures time on the *x*-axis and the variable or variables in which we are interested on the *y*-axis.

A **time-series graph** measures time (for example, months or years) on the *x*-axis and the variable or variables in which we are interested on the *y*-axis. Figure A1.2(c) shows an example. In this graph, time (on the *x*-axis) is measured in years, which run from 1980 to 2016. The variable that we are interested in is the price of coffee, and it is measured on the *y*-axis.

A time-series graph conveys an enormous amount of information quickly and easily, as this example illustrates. It shows when the value is

1. High or low. When the line is a long way from the *x*-axis, the price is high, as it was in 1986. When the line is close to the *x*-axis, the price is low, as it was in 2001.
2. Rising or falling. When the line slopes upward, as in 2006, the price is rising. When the line slopes downward, as in 1997, the price is falling.
3. Rising or falling quickly or slowly. If the line is steep, then the price is rising or falling quickly. If the line is not steep, the price is rising or falling slowly. For example, the price rose quickly in 2006 and slowly in 2014. The price fell quickly in 1987 and slowly in 1996.

Trend
A general tendency for the value of a variable to rise or fall over time.

A time-series graph also reveals whether the variable has a trend. A **trend** is a general tendency for the value of a variable to rise or fall over time. You can see that the price of coffee had a general tendency to fall from 1980 to late in 2000. That is, although the price rose and fell, it had a general tendency to fall.

With a time-series graph, we can compare different periods quickly. Figure A1.2(c) shows that the 2000s were different from the 1990s, which in turn were different from the 1980s. The price of coffee started the 1980s high and then fell for a number of years. During the 1990s, the price was on a roller coaster. And during the 2000s, the price rose steadily through 2014. This graph conveys a wealth of information about the price of coffee, and it does so in much less space than we have used to describe only some of its features.

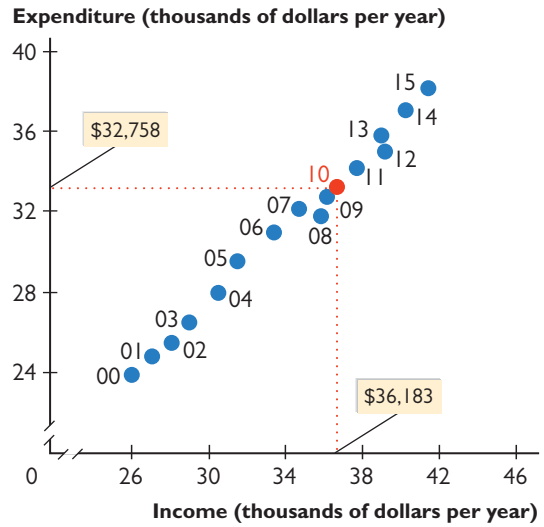
Cross-section graph
A graph that shows the values of an economic variable for different groups in a population at a point in time.

A **cross-section graph** shows the values of an economic variable for different groups in a population at a point in time. Figure A1.2(d) is an example of a cross-section graph. It shows the percentage of people who participate in selected sports activities in the United States. This graph uses bars rather than dots and lines, and the length of each bar indicates the participation rate. Figure A1.2(d) enables you to compare the participation rates in these ten sporting activities, and you can do so much more quickly and clearly than by looking at a list of numbers.

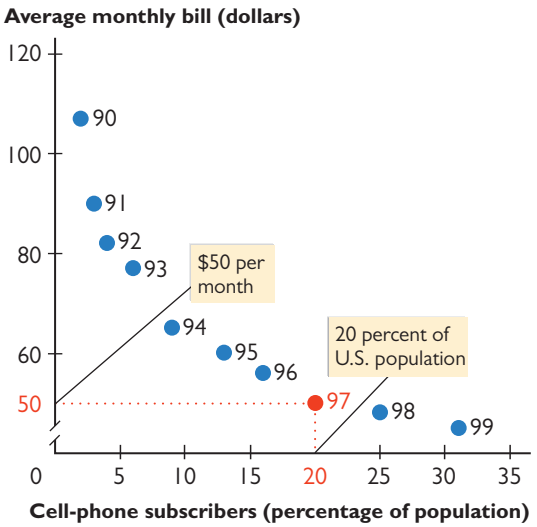
FIGURE A1.2

Data Graphs

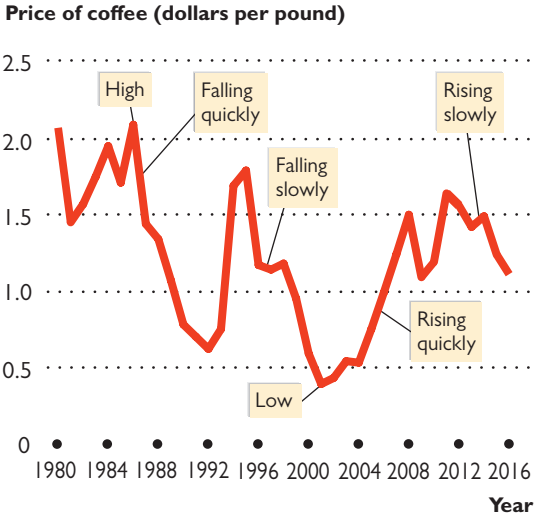
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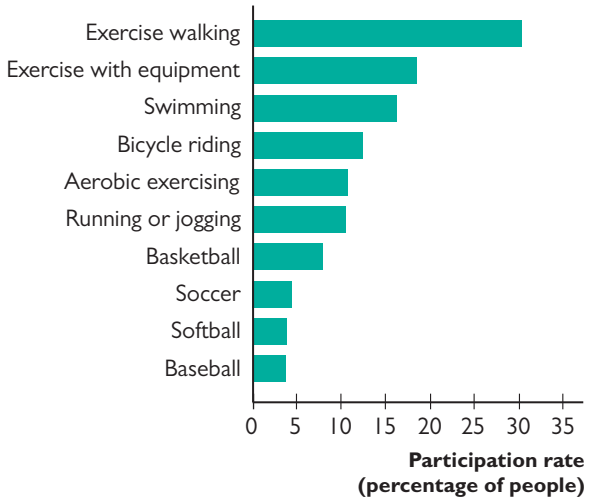
(a) Scatter Diagram: Expenditure and income



(b) Scatter Diagram: Subscribers and cost



(c) Time Series: The price of coffee



(d) Cross Section: Participation in selected sports activities

A scatter diagram reveals the relationship between two variables. In part (a), as income increases, expenditure almost always increases. In part (b), as the monthly cell-phone bill falls, the percentage of people who own a cell phone increases.

A time-series graph plots the value of a variable on the *y*-axis against time on the *x*-axis. Part (c) plots the price of coffee each year from 1980 to 2016. The graph shows when the price of coffee was high and low, when it increased and decreased, and when it changed quickly and changed slowly.

A cross-section graph shows the value of a variable across the members of a population. Part (d) shows the participation rate in the United States in each of ten sporting activities.

Interpreting Graphs Used in Economic Models

We use graphs to show the relationships among the variables in an economic model. An *economic model* is a simplified description of the economy or of a component of the economy such as a business or a household. It consists of statements about economic behavior that can be expressed as equations or as curves in a graph. Economists use models to explore the effects of different policies or other influences on the economy in ways similar to those used to test model airplanes in wind tunnels and models of the climate.

Positive relationship or **direct relationship**
A relationship between two variables that move in the same direction.

Linear relationship
A relationship that graphs as a straight line.

Figure A1.3 shows graphs of the relationships between two variables that move in the same direction. Such a relationship is called a **positive relationship** or **direct relationship**.

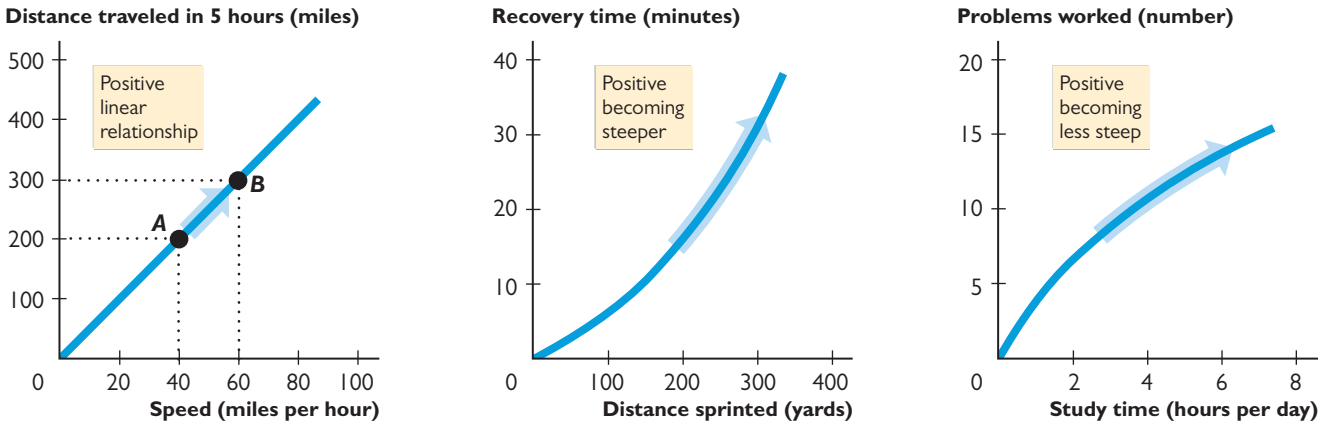
Part (a) shows a straight-line relationship, which is called a **linear relationship**. The distance traveled in 5 hours increases as the speed increases. For example, point *A* shows that 200 miles are traveled in 5 hours at a speed of 40 miles an hour. And point *B* shows that the distance traveled in 5 hours increases to 300 miles if the speed increases to 60 miles an hour.

Part (b) shows the relationship between distance sprinted and recovery time (the time it takes the heart rate to return to its normal resting rate). An upward-sloping curved line that starts out quite flat but then becomes steeper as we move along the curve away from the origin describes this relationship. The curve slopes upward and becomes steeper because the extra recovery time needed from sprinting another 100 yards increases. It takes 5 minutes to recover from sprinting 100 yards but 15 minutes to recover from sprinting 200 yards.

Part (c) shows the relationship between the number of problems worked by a student and the amount of study time. An upward-sloping curved line that starts out quite steep and becomes flatter as we move away from the origin shows this

FIGURE A1.3
Positive (Direct) Relationships

MyEconLab Animation



(a) Positive linear relationship

Part (a) shows that as speed increases, the distance traveled in a given number of hours increases along a straight line.

(b) Positive becoming steeper

Part (b) shows that as the distance sprinted increases, recovery time increases along a curve that becomes steeper.

(c) Positive becoming less steep

Part (c) shows that as study time increases, the number of problems worked increases along a curve that becomes less steep.

relationship. Study time becomes less effective as you increase the hours worked and become more tired.

Figure A1.4 shows relationships between two variables that move in opposite directions. Such a relationship is called a **negative relationship** or **inverse relationship**.

Negative relationship or **inverse relationship**
A relationship between two variables that move in opposite directions.

Part (a) shows the relationship between the number of hours spent playing squash and the number of hours spent playing tennis when the total number of hours available is five. One extra hour spent playing tennis means one hour less playing squash and vice versa. This relationship is negative and linear.

Part (b) shows the relationship between the cost per mile traveled and the length of a journey. The longer the journey, the lower is the cost per mile. But as the journey length increases, the fall in the cost per mile becomes smaller. This feature of the relationship is shown by the fact that the curve slopes downward, starting out steep at a short journey length and then becoming flatter as the journey length increases. This relationship arises because some of the costs, such as auto insurance, are fixed, and as the journey length increases, the fixed costs are spread over more miles.

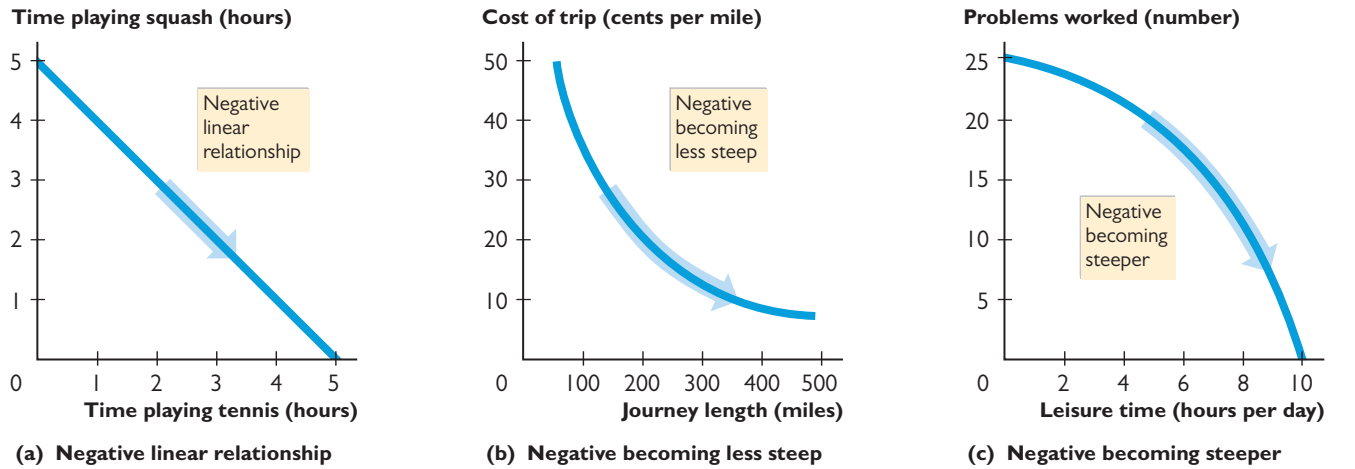
Part (c) shows the relationship between the amount of leisure time and the number of problems worked by a student. Increasing leisure time produces an increasingly large reduction in the number of problems worked. This relationship is a negative one that starts out with a gentle slope at a small number of leisure hours and becomes steeper as the number of leisure hours increases. This relationship is a different view of the idea shown in Figure A1.3(c).

Many relationships in economic models have a maximum or a minimum. For example, firms try to make the largest possible profit and to produce at the lowest possible cost. Figure A1.5 shows relationships that have a maximum or a minimum.

FIGURE A1.4

Negative (Inverse) Relationships

MyEconLab Animation



(a) Negative linear relationship

Part (a) shows that as the time playing tennis increases, the time playing squash decreases along a straight line.

(b) Negative becoming less steep

Part (b) shows that as the journey length increases, the cost of the trip falls along a curve that becomes less steep.

(c) Negative becoming steeper

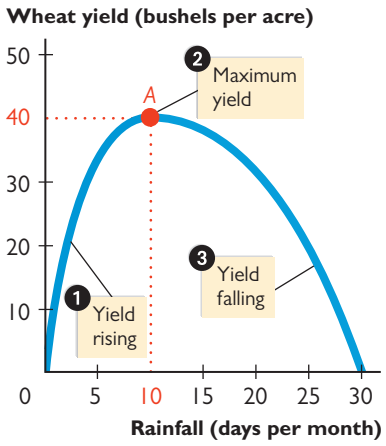
Part (c) shows that as leisure time increases, the number of problems worked decreases along a curve that becomes steeper.

FIGURE A1.5
Maximum and Minimum Points

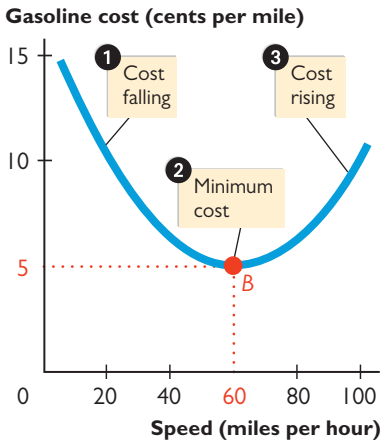
MyEconLab Animation

In part (a), as the rainfall increases, the curve ❶ slopes upward as the yield per acre rises, ❷ is flat at point *A*, the maximum yield, and then ❸ slopes downward as the yield per acre falls.

In part (b), as the speed increases, the curve ❶ slopes downward as the cost per mile falls, ❷ is flat at the minimum point *B*, and then ❸ slopes upward as the cost per mile rises.



(a) Relationship with a maximum



(b) Relationship with a minimum

Part (a) shows a relationship that starts out sloping upward, reaches a maximum, and then slopes downward. Part (b) shows a relationship that begins sloping downward, falls to a minimum, and then slopes upward.

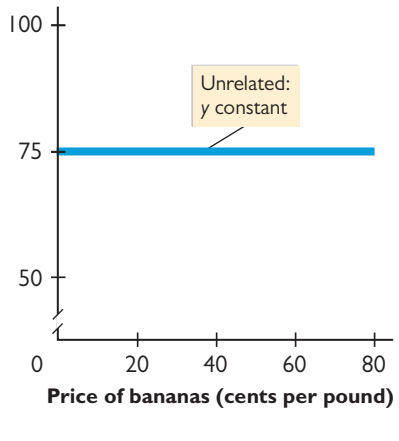
Finally, there are many situations in which, no matter what happens to the value of one variable, the other variable remains constant. Sometimes we want to show two variables that are unrelated in a graph. Figure A1.6 shows two graphs in which the variables are unrelated.

FIGURE A1.6
Variables That Are Unrelated

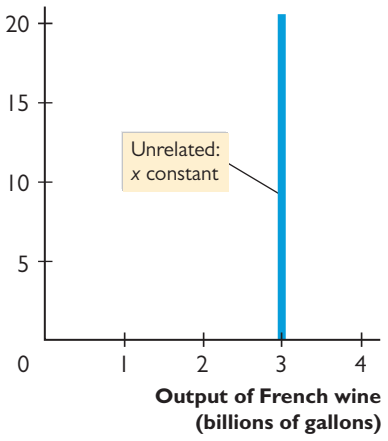
MyEconLab Animation

In part (a), as the price of bananas increases, the student's grade in economics remains at 75 percent. These variables are unrelated, and the curve is horizontal.

In part (b), the vineyards of France produce 3 billion gallons of wine no matter what the rainfall is in California. These variables are unrelated, and the curve is vertical.



(a) Unrelated: *y* constant



(b) Unrelated: *x* constant

The Slope of a Relationship

We can measure the influence of one variable on another by the slope of the relationship. The **slope** of a relationship is the change in the value of the variable measured on the *y*-axis divided by the change in the value of the variable measured on the *x*-axis. We use the Greek letter Δ (delta) to represent "change in." So Δy means the change in the value of y, and Δx means the change in the value of x. The slope of the relationship is

$$\Delta y \div \Delta x.$$

Slope
The change in the value of the variable measured on the *y*-axis divided by the change in the value of the variable measured on the *x*-axis.

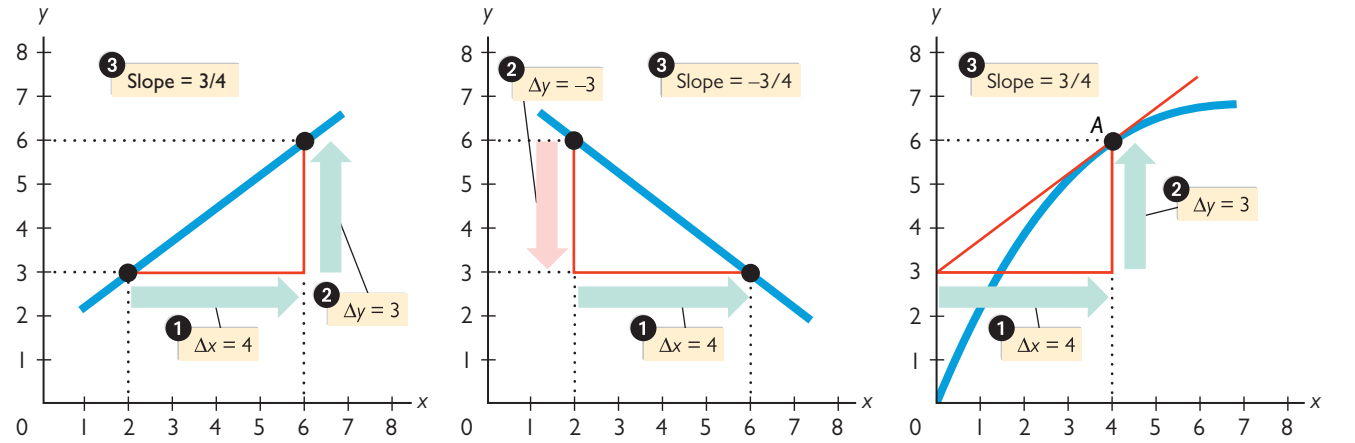
If a large change in y is associated with a small change in x, the slope is large and the curve is steep. If a small change in y is associated with a large change in x, the slope is small and the curve is flat.

Figure A1.7 shows you how to calculate slope. The slope of a straight line is the same regardless of where on the line you calculate it—the slope is constant. In part (a), when x increases from 2 to 6, y increases from 3 to 6. The change in x is 4—that is, Δx is 4. The change in y is 3—that is, Δy is 3. The slope of that line is 3/4. In part (b), when x increases from 2 to 6, y *decreases* from 6 to 3. The change in y is *minus* 3—that is, Δy is -3 The change in x is plus 4—that is, Δx is 4. The slope of the curve is $-3/4$.

In part (c), we calculate the slope at a point on a curve. To do so, place a ruler on the graph so that it touches point A and no other point on the curve, then draw a straight line along the edge of the ruler. The slope of this straight line is the slope of the curve at point A. This slope is 3/4.

FIGURE A1.7
Calculating Slope

MyEconLab Animation



(a) Positive slope

In part (a), ❶ when Δx is 4, ❷ Δy is 3, so ❸ the slope ($\Delta y \div \Delta x$) is 3/4.

(b) Negative slope

In part (b), ❶ when Δx is 4, ❷ Δy is -3, so ❸ the slope ($\Delta y \div \Delta x$) is $-3/4$.

(c) Slope at a point

In part (c), the slope of the curve at point A equals the slope of the red line. ❶ When Δx is 4, ❷ Δy is 3, so ❸ the slope ($\Delta y \div \Delta x$) is 3/4.

Relationships Among More Than Two Variables

All the graphs that you have studied so far plot the relationship between two variables as a point formed by the x and y values. But most of the relationships in economics involve relationships among many variables, not just two. For example, the amount of ice cream consumed depends on the price of ice cream and the temperature. If ice cream is expensive and the temperature is low, people eat much less ice cream than when ice cream is inexpensive and the temperature is high. For any given price of ice cream, the quantity consumed varies with the temperature; and for any given temperature, the quantity of ice cream consumed varies with its price.

Figure A1.8 shows a relationship among three variables. The table shows the number of gallons of ice cream consumed per day at various temperatures and ice cream prices. How can we graph these numbers?

To graph a relationship that involves more than two variables, we use the *ceteris paribus* assumption.

Ceteris Paribus

The Latin phrase *ceteris paribus* means "other things remaining the same." Every laboratory experiment is an attempt to create *ceteris paribus* and isolate the relationship of interest. We use the same method to make a graph.

Figure A1.8(a) shows an example. This graph shows what happens to the quantity of ice cream consumed when the price of ice cream varies while the temperature remains constant. The curve labeled 90°F shows the relationship between ice cream consumption and the price of ice cream if the temperature is 90°F. The numbers used to plot that curve are those in the first and fifth columns of the table in Figure A1.8. For example, if the temperature is 90°F, 10 gallons of ice cream are consumed when the price is $3.25 a scoop.

We can also show the relationship between ice cream consumption and temperature while the price of ice cream remains constant, as shown in Figure A1.8(b). The curve labeled $3.25 shows how the consumption of ice cream varies with the temperature when the price of ice cream is $3.25 a scoop. The numbers used to plot that curve are those in the sixth row of the table in Figure A1.8. For example, at $3.25 a scoop, 10 gallons of ice cream are consumed when the temperature is 90°F.

Figure A1.8(c) shows the effect of a change in temperature on the relationship between the quantity of ice cream consumed and the price of ice cream. The blue curve labeled 90°F is the same as the curve in Figure A1.8(a). It is the relationship between the price of ice cream and the quantity consumed on a hot day. The red curve labeled 70°F shows the relationship between the price of ice cream and the quantity consumed on a cooler day when the temperature is 70°F.

On each curve in Figure A1.8(c), "other things remain the same" as the price of ice cream and the quantity consumed change. When other things don't remain the same and the termperature changes, the relationship between the price of ice cream and the quantity consumed changes and the curve shifts. You will encounter this type of shifting relationship at many points in your economics course.

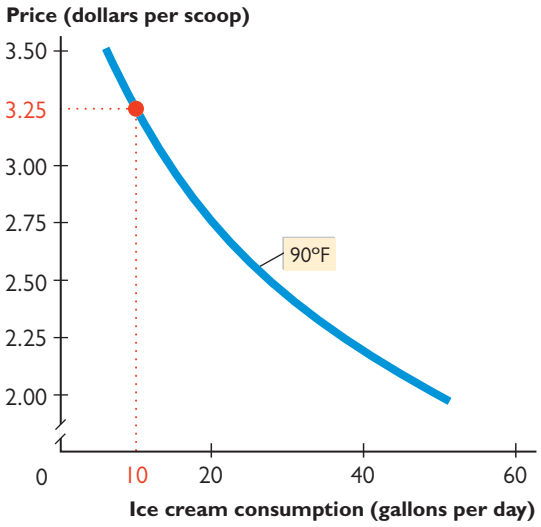
With what you've learned about graphs in this Appendix, you can move forward with your study of economics. There are no graphs in this textbook that are more complicated than the ones you've studied here.

FIGURE A1.8

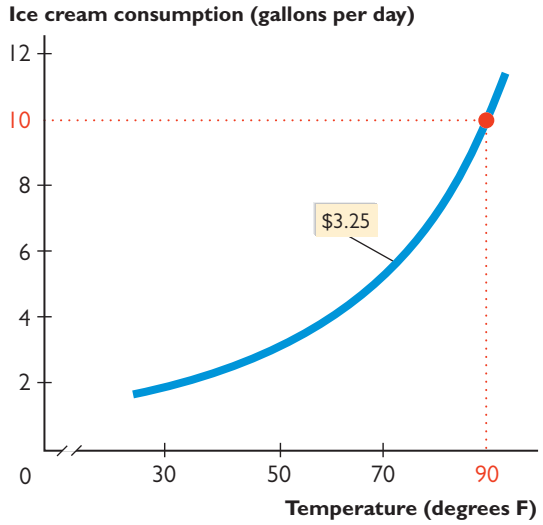
Graphing a Relationship Among Three Variables

MyEconLab Animation

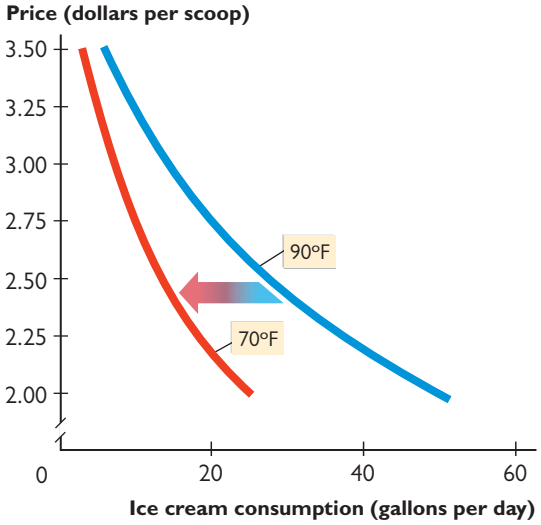
Price (dollars per scoop)	Ice cream consumption (gallons per day)			
	30°F	50°F	70°F	90°F
2.00	12	18	25	50
2.25	10	12	18	37
2.50	7	10	13	27
2.75	5	7	10	20
3.00	3	5	7	14
3.25	2	3	5	**10**
3.50	1	2	3	6



(a) Price and consumption at a given temperature



(b) Temperature and consumption of ice cream at a given price



(c) A change in temperature shifts the curve

The table shows the quantity of ice cream consumed at different prices and different temperatures. For example, if the price is $3.25 a scoop and the temperature is 90°F, 10 gallons of ice cream are consumed. This set of values is highlighted in the table and in parts (a) and (b).

Part (a) shows the relationship between the price and consumption when the temperature is 90°F. The negative slope means that a higher price brings lower consumption.

Part (b) shows the relationship between the temperature and consumption when price is $3.25 a scoop. The positive slope means that a higher temperature brings greater consumption

Part (c) shows the change in the relationship between price and consumption when the temperature falls from 90°F to 70°F.

MyEconLab Chapter 1 Study Plan

APPENDIX CHECKPOINT

Study Plan Problems

The spreadsheet in Table 1 provides data on the U.S. economy: Column A is the year; the other columns are quantities sold in millions per year of compact discs (column B), music videos (column C), and singles downloads (column D). Use this spreadsheet to work Problems **1** and **2**.

TABLE 1

	A	B	C	D
1	2004	767	33	139
2	2006	620	23	586
3	2008	385	13	1,033
4	2010	226	9	1,162
5	2012	211	11	1,392
6	2014	144	4	1,200

TABLE 2

x	0	1	2	3	4	5
y	32	31	28	23	16	7

TABLE 3

Price (dollars per ride)	Balloon rides (number per day)		
	50°F	70°F	90°F
5	32	50	40
10	27	40	32
15	18	32	27
20	10	27	18

1. Draw a scatter diagram to show the relationship between the quantities sold of compact discs and music videos. Describe the relationship.
2. Draw a time-series graph of the quantity of compact discs sold. Say in which year or years the quantity sold (a) was highest, (b) was lowest, (c) increased the most, and (d) decreased the most. If the data show a trend, describe it.
3. Is the relationship between x and y in Table 2 positive or negative? Calculate the slope of the relationship when x equals 2 and when x equals 4. How does the slope change as the value of x increases?
4. Table 3 provides data on the price of a balloon ride, the temperature, and the number of rides a day. Draw graphs to show the relationship between
   - The price and the number of rides, when the temperature is 70°F.
   - The number of rides and the temperature, when the price is $15 a ride.

Instructor Assignable Problems

MyEconLab Homework, Quiz, or Test if assigned by instructor

Use the information in Table 1 to work Problems **1** and **2**.

1. Draw a scatter diagram to show the relationship between quantities sold of music videos and singles downloads. Describe the relationship.
2. Draw a time-series graph of the quantity of music videos sold. Say in which year or years the quantity sold (a) was highest, (b) was lowest, (c) decreased the most, and (d) decreased the least. If the data show a trend, describe it.

TABLE 4

x	0	1	2	3	4	5
y	0	1	4	9	16	25

Use the information in Table 4 on the relationship between two variables x and y to work Problems **3** and **4**.

3. Is the relationship between x and y in Table 4 positive or negative? Explain.
4. Calculate the slope of the relationship when x equals 2 and when x equals 4. How does the slope change as the value of x increases?

TABLE 5

Price (dollars per cup)	Hot chocolate (cups per week)		
	50°F	70°F	90°F
2.00	40	30	20
2.50	30	20	10
3.00	20	10	0
3.50	10	0	0

5. Table 5 provides data on the price of hot chocolate, the temperature, and the cups of hot chocolate bought. Draw graphs to show the relationship between
   - The price and cups of hot chocolate bought, when the temperature is constant.
   - The temperature and cups of hot chocolate bought, when the price is constant.

Key Terms

MyEconLab Key Terms Quiz

Cross-section graph, 24
Direct relationship, 26
Inverse relationship, 27
Linear relationship, 26
Negative relationship, 27
Positive relationship, 26
Scatter diagram, 24
Slope, 29
Time-series graph, 24
Trend, 24



Who makes the Dreamliner?

The U.S. and Global Economies

2

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Describe what, how, and for whom goods and services are produced in the United States.
2. Describe what, how, and for whom goods and services are produced in the global economy.
3. Explain the circular flow model of the U.S. economy and of the global economy.

MyEconLab Big Picture Video

MyEconLab Concept Video

2.1 WHAT, HOW, AND FOR WHOM?

Who makes the Dreamliner? Boeing, right? Not exactly right. You'll see in this chapter that 400 firms around the world produce components of this airliner.

Airplanes are one of the many millions of different goods and services produced in the United States today. To see some more, walk around a shopping mall and go inside some of the shops and check the labels to see where things are made. Some are made in the United States but many, perhaps most, are made in other countries. We're going to look at what goods and services get produced and where; how they are produced, and who gets to enjoy them. We begin with *what* we produce in the United States..

What Do We Produce?

We place the goods and services produced into two large groups:

- Consumption goods and services
- Capital goods

Consumption Goods and Services

Consumption goods and services
Goods and services that individuals and governments buy and use in the current period.

Consumption goods and services are items that individuals and governments buy and use up in the current period. Consumption goods and services bought by households include items such as housing, automobiles, bottled water, ramen noodles, chocolate bars, Po' boy sandwiches, movies, downhill skiing lessons, and doctor and dental services. Consumption goods and services bought by governments include items such as police and fire services, garbage collection, and education.

Capital Goods

Capital goods
Goods bought by businesses and governments to increase productive resources and to use over future periods to produce other goods and services.

Capital goods are goods that businesses and governments buy to increase productive resources to use during future periods to produce other goods and services. Capital goods bought by businesses include items such as auto assembly lines, shopping malls, airplanes, and oil tankers. Capital goods bought by governments include missiles and weapons systems for national security, public schools and universities, and interstate highways.

Consumption goods and services represent 78.5 percent of U.S. production by value and that percentage doesn't fluctuate much. *Eye on the U.S. Economy* on p. 35 breaks the goods and services down into smaller categories.

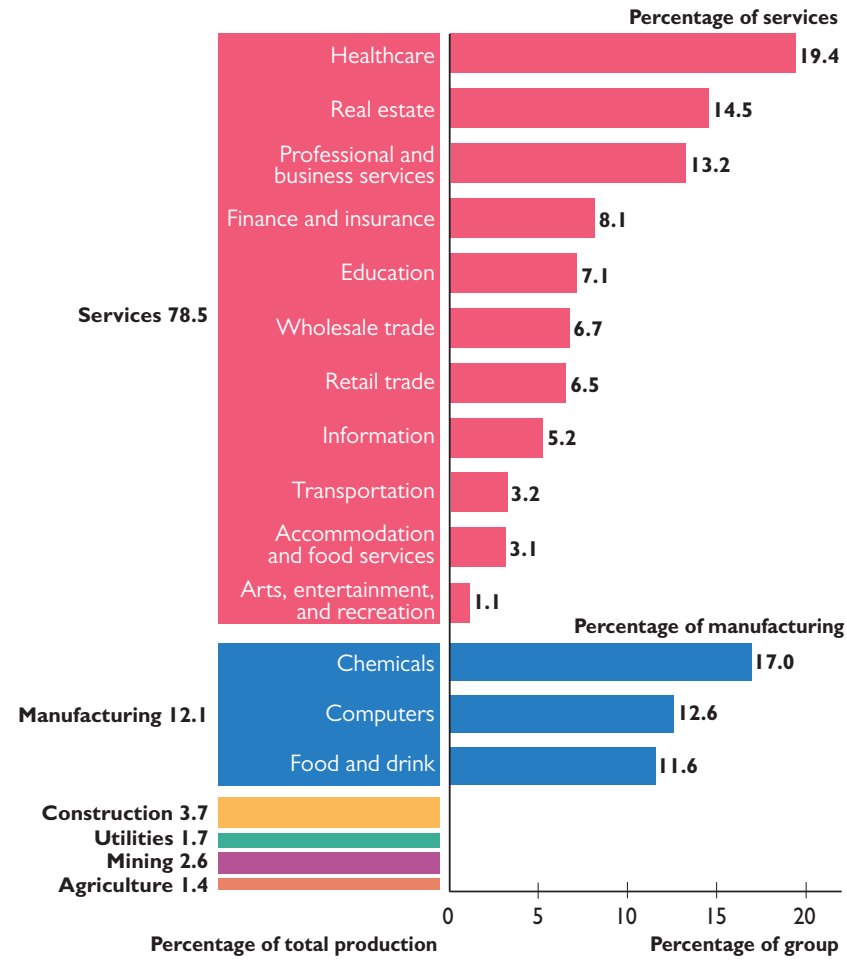
Health services is the largest category, with 19.4 percent of the value of total production. Real estate services come next at 14.5 percent. The main components of this item are the services of rental and owner-occupied housing. Professional and business services, which include the services of accountants and lawyers, are 13.2 percent of total production. Other large components of services are education and retail and wholesale trades.

The manufacture of goods represents only 12.1 percent of total production and the largest category of goods produced, chemicals, accounts for less than 2 percent of total production.

Construction accounts for 3.7 percent of production, and utilities, mining, and agriculture together make up only 5.7 percent. The nation's farms produce only a bit more than 1 percent of total production.

EYE on the U.S. ECONOMY

What We Produce



SOURCE OF DATA: Bureau of Economic Analysis.



Healthcare services, …



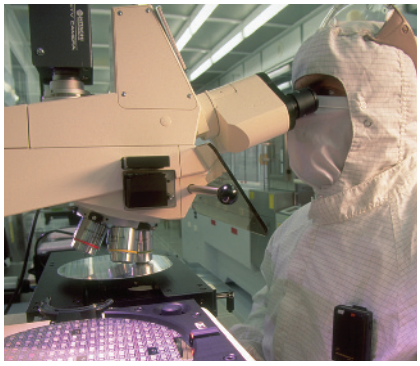
education services, …



and retail trades are among the largest categories of services produced.



Chemicals, ….



computer chips, …



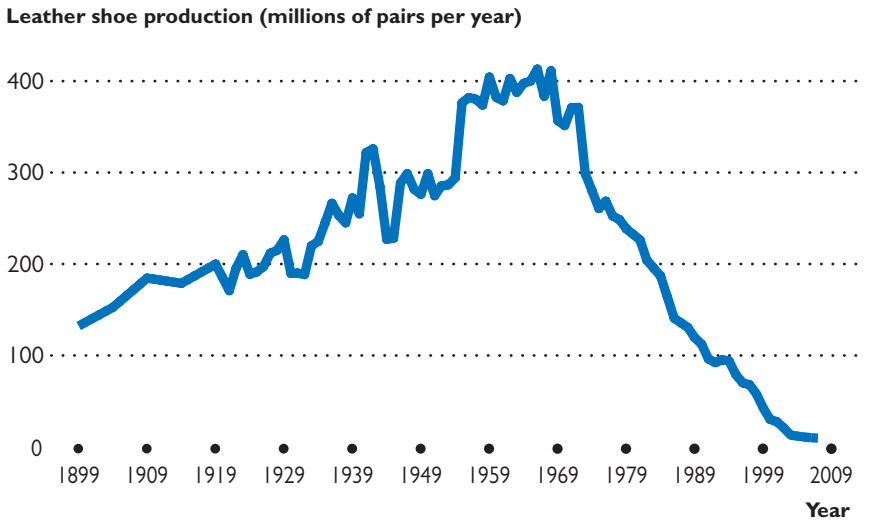
and food are the largest categories of goods produced in the United States.

EYE on the PAST

Changes in What We Produce

Freeport, Maine, became a shoemaking center in 1881 when the H.E. Davis Shoe Company opened its steam-powered factory in the town. Over the following years, many other shoemakers set up in Freeport and production steadily expanded. The town's shoe production peaked in 1968 after which it shrank rapidly. When the Freeport Shoe Company closed its factory in 1972, it became the fifteenth shoe factory to close in Freeport in four years. Today, the Freeport economy is based on shopping, not shoes.

Freeport's story of shoemaking was repeated across America and the figure tells this broader story. And as manufacturing has shrunk, retail and other services have expanded.



SOURCES OF DATA: *Historical Statistics of the United States Millennial Edition Online* and *Statistical Abstract of the United States*, 2012.

How Do We Produce?

Factors of production
The productive resources that are used to produce goods and services—land, labor, capital, and entrepreneurship.

Goods and services are produced by using productive resources. Economists call the productive resources **factors of production**. Factors of production are grouped into four categories:

- Land
- Labor
- Capital
- Entrepreneurship

Land

Land
The "gifts of nature," or *natural resources*, that we use to produce goods and services.

In economics, **land** includes all the "gifts of nature" that we use to produce goods and services. Land is what, in everyday language, we call *natural resources*. It includes land in the everyday sense, minerals, energy, water, air, and wild plants, animals, birds, and fish. Some of these resources are renewable, and some are nonrenewable. The U.S. Geological Survey maintains a national inventory of the quantity and quality of natural resources and monitors changes to that inventory.

The United States covers almost 2 billion acres. About 45 percent of the land is forest, lakes, and national parks. In 2009, almost 50 percent of the land was used for agriculture and 5 percent was urban, but urban land use is growing and agricultural land use is shrinking.

Our land surface and water resources are renewable, and some of our mineral resources can be recycled. But many mineral resources can be used only once. They are nonrenewable resources. Of these, the United States has vast known reserves of coal, oil, and natural gas.

Labor

Labor is the work time and work effort that people devote to producing goods and services. Labor includes the physical and mental efforts of all the people who work on farms and construction sites and in factories, shops, and offices. The Census Bureau and Bureau of Labor Statistics measure the quantity of labor at work every month.

Labor
The work time and work effort that people devote to producing goods and services.

In the United States in October 2015, 157 million people had jobs or were available for work. Some worked full time, some worked part time, and some were unemployed but looking for an acceptable vacant job. The total amount of time worked during 2015 was about 282 billion hours.

The quantity of labor increases as the adult population increases. The quantity of labor also increases if a larger percentage of the population takes jobs. During the past 50 years, a larger proportion of women have taken paid work and this trend has increased the quantity of labor. At the same time, a slightly smaller proportion of men have taken paid work and this trend has decreased the quantity of labor.

The *quality* of labor depends on how skilled people are. A laborer who can push a hand cart but can't drive a truck is much less productive than one who can drive. An office worker who can use a computer is much more productive than one who can't. Economists use a special name for human skill: human capital. **Human capital** is the knowledge and skill that people obtain from education, on-the-job training, and work experience.

Human capital
The knowledge and skill that people obtain from education, on-the-job training, and work experience.

You are building your own human capital right now as you work on your economics course and other subjects. Your human capital will continue to grow when you get a full-time job and become better at it. Human capital improves the *quality* of labor and increases the quantity of goods and services that labor can produce.

Capital

Capital consists of the tools, instruments, machines, buildings, and other items that have been produced in the past and that businesses now use to produce goods and services. Capital includes hammers and screwdrivers, computers, auto assembly lines, office towers and warehouses, dams and power plants, airplanes, cookie factories, and shopping malls.

Capital
Tools, instruments, machines, buildings, and other items that have been produced in the past and that businesses now use to produce goods and services.

Capital also includes inventories of unsold goods or of partly finished goods on a production line. And capital includes what is sometimes called *infrastructure capital*, such as highways and airports.

Capital, like human capital, makes labor more productive. A truck driver can produce vastly more transportation services than someone pushing a hand cart; the Interstate highway system enables us to produce vastly more transportation services than was possible on the old highway system that preceded it.

The Bureau of Economic Analysis in the U.S. Department of Commerce keeps track of the total value of capital in the United States and how it grows over time. Today, the value of capital in the U.S. economy is around $50 trillion.

Financial Capital Is Not Capital In everyday language, we talk about money, stocks, and bonds as being capital. These items are *financial capital*, and they are not productive resources. Stocks and bonds enable people to provide businesses with financial resources, but they are *not* used to produce goods and services. They are not capital.

EYE on the U.S. ECONOMY

Changes in How We Produce in the Information Economy

The information economy consists of the jobs and businesses that produce and use computers and equipment powered by computer chips. This information economy is highly visible in your daily life.

The pairs of images here illustrate two examples. In each pair, a new technology enables capital to replace labor.

The top pair of pictures illustrate the replacement of bank tellers (labor) with ATMs (capital). Although the ATM was invented almost 50 years ago, when it made its first appearance, it was located only inside banks and was not able to update customers' accounts. It is only in the last decade that ATMs have spread to corner stores and enable us to get cash and check our bank balance from almost anywhere in the world.

The bottom pair of pictures illustrate a more recent replacement of labor with capital: self-check-in. Air passengers today issue their own boarding pass, often at their own computer before leaving home. For international flights, some of these machines now even check passport details.





The number of bank teller and airport check-in clerk jobs is shrinking, but these new technologies are creating a whole range of new jobs for people who make, program, install, and repair the vast number of machines.





Entrepreneurship
The human resource that organizes labor, land, and capital to produce goods and services.

Entrepreneurship

Entrepreneurship is the human resource that organizes land, labor, and capital to produce goods and services. Entrepreneurs are creative and imaginative. They come up with new ideas about what and how to produce, make business decisions, and bear the risks that arise from these decisions. If their ideas work out, they earn a profit. If their ideas turn out to be wrong, they bear the loss.

The quantity of entrepreneurship is hard to describe or measure. During some periods, there appears to be a great deal of imaginative entrepreneurship around. People such as Sam Walton, who created Wal-Mart, one of the world's largest retailers; Bill Gates, who founded the Microsoft empire; and Mark Zuckerberg, who founded Facebook, are examples of extraordinary entrepreneurial talent. But these highly visible entrepreneurs are just the tip of an iceberg that consists of hundreds of thousands of people who run businesses, large and small.

For Whom Do We Produce?

Who gets the goods and services depends on the incomes that people earn. A large income enables a person to buy large quantities of goods and services. A small income leaves a person with a small quantity of goods and services.

People earn their incomes by selling the services of the factors of production they own. **Rent** is paid for the use of land, **wages** are paid for the services of labor, **interest** is paid for the use of capital, and entrepreneurs receive a **profit** (or incur a **loss**) for running their businesses. What are the shares of these four factor incomes in the United States? Which factor receives the largest share?

Figure 2.1(a) answers these questions. It shows that wages were 63 percent of total income in 2014 and rent, interest, and profit were 37 percent of total income. These percentages remain remarkably constant over time. We call the distribution of income among the factors of production the *functional distribution of income.*

Figure 2.1(b) shows the *personal distribution of income*—the distribution of income among households—in 2014. Some households, like that of Clayton Kershaw, earn many millions of dollars a year. These households are in the richest 20 percent who earn 50 percent of total income. Households at the other end of the scale, like those of fast-food servers, are in the poorest 20 percent who earn only 3 percent of total income. The distribution of income has been changing and becoming more unequal. The rich have become richer. But it isn't the case, on the whole, that the poor have become poorer. They just haven't become richer as fast as the rich have.

Rent
Income paid for the use of land.

Wages
Income paid for the services of labor.

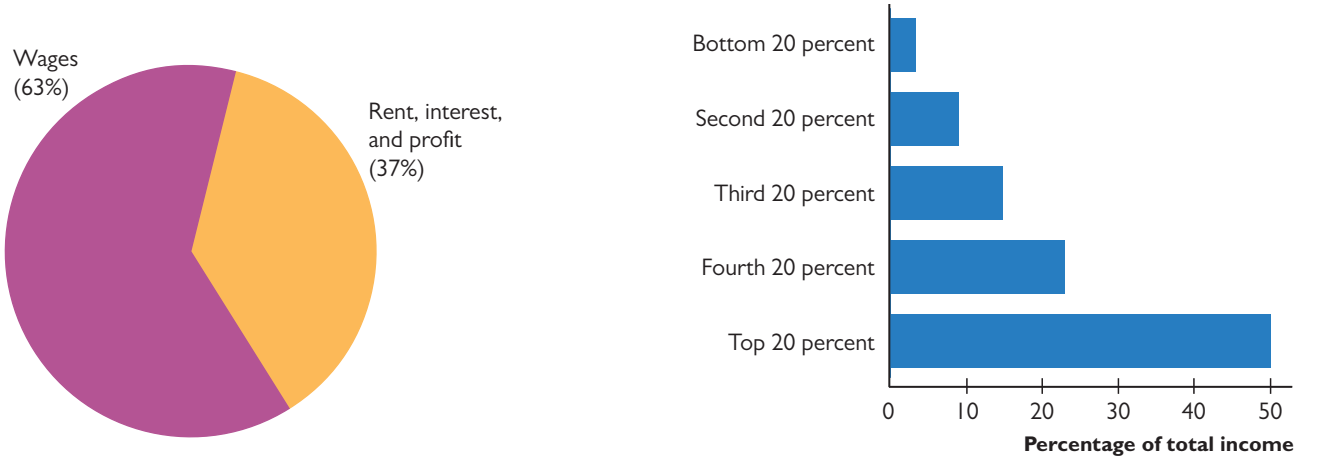
Interest
Income paid for the use of capital.

Profit (or loss)
Income earned by an entrepreneur for running a business.

FIGURE 2.1

For Whom in 2014

MyEconLab Animation



(a) Functional distribution of income

In 2014, wages (the income from labor) were 63 percent of total income. Rent, interest, and profit (the income from the services of land, capital, and entrepreneurship) totaled the remaining 37 percent.

(b) Personal distribution of income

In 2014, the 20 percent of the population with the highest incomes received 50 percent of total income. The 20 percent with the lowest incomes received only 3 percent of total income.

SOURCES OF DATA: Bureau of Economic Analysis, *National Income and Product Accounts*, Table 1.10 and U.S. Census Bureau, *Income and Poverty in the United States*: 2014, Current Population Reports P60-252, 2015.

MyEconLab Study Plan 2.1
Key Terms Quiz
Solutions Video

CHECKPOINT 2.1

Describe what, how, and for whom goods and services are produced in the United States.

Practice Problems

1. What are the types of goods and services produced? Give an example of each (different from those in the chapter) and distinguish between them.
2. Name the four factors of production and the incomes they earn.
3. Distinguish between the functional distribution of income and the personal distribution of income.
4. In the United States, which factor of production earned the largest share of income in 2014 and what percentage did it earn?

In the News

The frustration that drives people to become entrepreneurs
A study by researchers at Stanford and the University of Chicago discovered that most of the people who quit their jobs and start their own business do so not because they have a billion-dollar idea but because they are frustrated in their jobs.
Source: Chad Brooks, *Business News Daily*, September 16, 2014

Why do people become entrepreneurs? What do we call the income earned by entrepreneurs? Are most people entrepreneurs? What is the factor of production supplied by people who are not entrepreneurs? What is their income called? What percentage of total income does their income represent?

Solutions to Practice Problems

1. The goods and services produced fall into two types: consumption goods and services and capital goods. A hamburger is a consumption good and a haircut is a consumption service. An oil rig and auto assembly line are capital goods. A consumption good or service is an item that is bought by individuals or the government and is used up in the current period. A capital good is bought by businesses or the government and it is used over and over again to produce other goods and services.
2. The factors of production are land, labor, capital, and entrepreneurship. Land earns rent; labor earns wages; capital earns interest; and entrepreneurship earns profit or incurs a loss.
3. The functional distribution of income shows the percentage of total income received by each factor of production. The personal distribution of income shows how total income is shared among households.
4. Labor is the factor of production that earns the largest share of income. In 2014, labor in the United States earned 63 percent of total income.

Solution to In the News

People become entrepreneurs because they are frustrated in their jobs. The income earned by entrepreneurs is called profit. Most people are suppliers of labor, for which they earn a wage. The data in Figure 2.1 show that wage income of labor represents 63 percent of total income.

2.2 THE GLOBAL ECONOMY

MyEconLab Concept Video

We're now going to look at *what*, *how*, and *for whom* goods and services get produced in the global economy. We'll begin with a brief overview of the people and countries that form the global economy.

The People

Visit the Web site of the U.S. Census Bureau and go to the population clocks to find out how many people there are today in both the United States and the entire world. On the day these words were written, November 8, 2015, the U.S. clock recorded a population of 322,115,000. The world clock recorded a global population of 7,284,290,000. The U.S. clock ticks along showing a population increase of one person every 15 seconds. The world clock spins faster, adding 30 people in the same 15 seconds.

The Economies

The world's 7.3 billion (and rising) population lives in 176 economies, which the International Monetary Fund classifies into two broad groups:

- Advanced economies
- Emerging market and developing economies

Advanced Economies

Advanced economies are the richest 29 countries (or areas). The United States, Japan, Italy, Germany, France, the United Kingdom, and Canada belong to this group. So do four new industrial Asian economies: Hong Kong, South Korea, Singapore, and Taiwan. The other advanced economies include Australia, New Zealand, and most of the rest of Western Europe. Almost 1 billion people (15 percent of the world's population) live in the advanced economies.

Emerging Market and Developing Economies

Emerging market economies are 28 countries in Central and Eastern Europe and Asia. Almost 500 million people live in these countries—about half of the number in the advanced economies. These countries are important because they are emerging (hence the name) from a system of state-owned production, central economic planning, and heavily regulated markets moving toward a system of free enterprise and unregulated markets.

Developing economies are the 119 countries in Africa, Asia, the Middle East, Europe, and Central and South America. More than 5.5 billion people—almost four out of every five people—live in the developing economies.

Developing economies vary enormously in size, the level of average income, and the rate of growth of production and incomes. But in all the developing economies, average incomes are much lower than those in the advanced economies, and in some cases, they are extremely low.

Five emerging market and developing economies, representing 3 billion people or 42 percent of the world's population and known as BRICS (Brazil, Russia, India, China, and South Africa), hold regular meetings to advance the interests of these nations and draw attention to their development problems.

What in the Global Economy

First, let's look at the big picture. Imagine that each year the global economy produces an enormous pie. In 2015, the pie was worth about $113 trillion! To give this number some meaning, if the pie were shared equally among the world's 7.3 billion people, each of us would get a slice worth a bit less than $15,500.

Where Is the Global Pie Baked?

Figure 2.2 shows us where in the world the pie is baked. The advanced economies produce 43 percent—16 percent in the United States, 17 percent in the European Union, and 10 percent in the other advanced economies. This 43 percent of global output (by value) is produced by 15 percent of the world's population.

The BRICS economies, highlighted in the figure, together produce 31 percent of the world's output. China, with 17 percent of world production, dominates this group and South Africa, the group's smallest member, produces barely 1 percent of global output. This 31 percent of the global pie is baked by 42 percent of the world's population.

The remaining 26 percent of the global pie comes from other emerging market and developing economies and is baked by 43 percent of the world's people.

Unlike the slices of an apple pie, those of the global pie have different fillings. Some slices have more oil, some more food, some more clothing, some more housing services, some more autos, and so on. Let's look at some of these different fillings and at some similarities too.

FIGURE 2.2

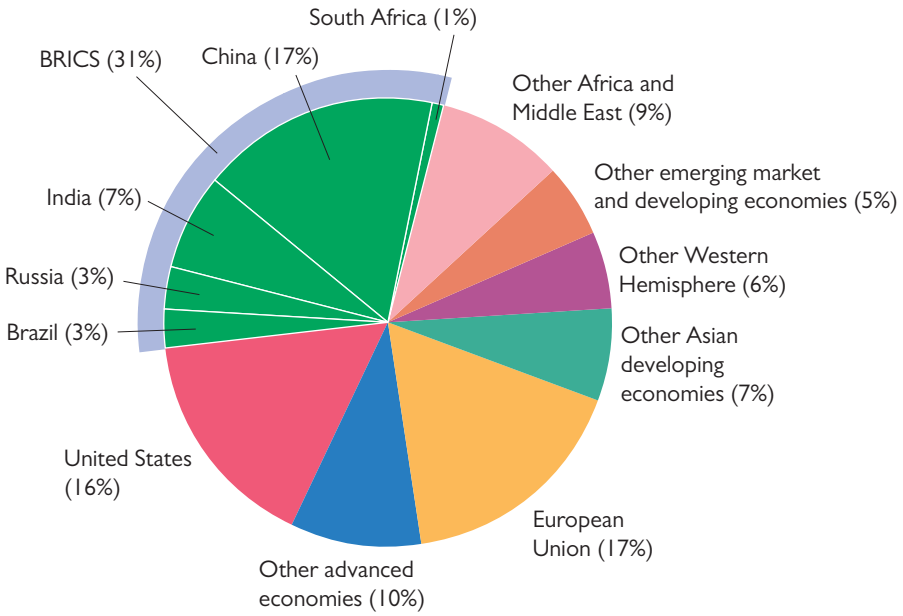
What in the Global Economy in 2015

MyEconLab Animation

If we show the value of production in the world economy as a pie, the United States produces a slice that is 16 percent of the total. The European Union produces 17 percent and other advanced economies 10 percent, so together, the advanced economies produce 43 percent of global output.

Another 31 percent of the global pie comes from the BRICS economies. China, which produces 17 percent of world output, dominates this group.

The remaining 26 percent of world output comes from other emerging market and developing economies in Africa, Asia, the Middle East, and the Western Hemisphere.



SOURCE OF DATA: International Monetary Fund, World Economic Outlook Database, April 2015.



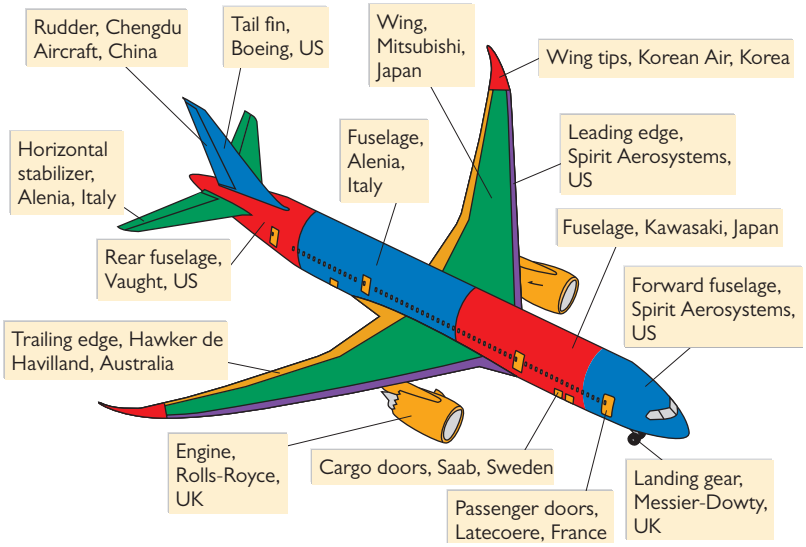
EYE on the DREAMLINER

MyEconLab Critical Thinking Exercise

Who Makes the Dreamliner?

Boeing designed, assembles, and markets the Dreamliner, but the airplane is made by more than 400 firms on four continents that employ thousands of workers and millions of dollars' worth of specialized capital equipment. The graphic identifies some of the firms and the components they make.

Boeing and these firms make decisions and pay their workers, investors, and raw material suppliers to influence *what*, *how*, and *for whom* goods and services are produced. All these decisions are made in self-interest, and produce an airplane at the lowest possible cost.



Some Differences in What Is Produced

What is produced in the developing economies contrasts sharply with that of the advanced economies. Manufacturing is the big story. Developing economies have large and growing industries, which produce textiles, footwear, sports gear, toys, electronic goods, furniture, steel, and even automobiles and airplanes.

Food production is a small part of the U.S. and other advanced economies and a large part of the developing economies such as Brazil, China, and India. But the advanced economies produce about one third of the world's food. How can this be? *Total* production is much larger in the advanced economies than in the developing economies, but a small percentage of a big number can be a *greater amount* than a large percentage of a small number!

Some Similarities in What Is Produced

If you were to visit a shopping mall in Canada, England, Australia, Japan, or any of the other advanced economies, you would wonder whether you had left the United States. You would see Starbucks, Burger King, Pizza Hut, Domino's Pizza, KFC, Kmart, Wal-Mart, Target, Gap, Tommy Hilfiger, Lululemon, Banana Republic, the upscale Louis Vuitton and Burberry, and a host of other familiar names. And, of course, you would see McDonald's golden arches. You would see them in any of the 119 countries in which one or more of McDonald's 30,000 restaurants are located.

The similarities among the advanced economies go beyond the view from main street and the shopping mall. The structure of *what* is produced is similar in these economies. As percentages of the total economy, agriculture and manufacturing are small and shrinking whereas services are large and expanding.



McDonald's in Shanghai.

How in the Global Economy

Goods and services are produced using land, labor, capital, and entrepreneurial resources, and the combinations of these resources used are chosen to produce at the lowest possible cost. Each country or region has its own blend of factors of production, but there are some interesting common patterns and crucial differences between the advanced and developing economies that we'll now examine.

Human Capital Differences

One of the biggest distinguishing features of an advanced economy from an emerging market or developing economy is its quantity of *human capital*. Advanced economies have much higher levels of human capital.

Education levels are the handiest measure of human capital. In an advanced economy such as the United States, almost everyone has completed high school. And 30 percent of the U.S. population has completed 4 years or more of college.

In contrast, in developing economies, the proportion of the population who has completed high school or has a college degree is small. In the poorest of the developing economies, many children even miss out on basic primary education—they just don't go to school at all.

On-the-job training and experience are also much less extensive in the developing economies than in the advanced economies.

Physical Capital Differences

Another major feature of an advanced economy that differentiates it from a developing economy is the amount of capital available for producing goods and services. The differences begin with the basic transportation systems. In the advanced economies, a well-developed highway system connects all the major cities and points of production. Open a map app on your phone. Contrast the U.S. interstate highway system in Texas with the sparse highways of Mexico. You would see a similar contrast if you swiped across the Atlantic Ocean and checked out the highway structures in Western Europe and Africa.

But it isn't the case that the developing economies have no highways and no modern trucks and cars. In fact, some of them have the newest and the best. But the new and best are usually inside and around the major cities—see *Eye on the Global Economy* on p. 45.

The contrasts in the transportation system are matched by those on farms and in factories. In general, the more advanced the economy, the greater are the amount and sophistication of the capital equipment used in production. But again, the contrast is not all or nothing. Some factories in India, China, and other parts of Asia use the very latest technologies. Furniture manufacturing is an example. To make furniture of a quality that Americans are willing to buy, firms in Asia use machines like those in the furniture factories of North Carolina.

The differences in human capital and physical capital between advanced and developing economies have a big effect on *who* gets the goods and services, which we'll now examine.

For Whom in the Global Economy

Who gets the world's goods and services depends on the incomes that people earn. We're now going to see how incomes are distributed within economies and across the world.

EYE on the GLOBAL ECONOMY

Differences in How We Produce

Big differences exist in how goods and services are produced and the images here illustrate three examples.

Laundry services (top), transportation services (center), and highway systems (bottom) can use a large amount of capital and almost no labor (left) or use almost no capital and a large amount of labor (right).

Capital-intensive automatic laundry equipment, big trucks, and multi-lane paved freeways are common in advanced economies but rare in poorer developing economies.

Riverside clothes washing, human pedal power, and unsealed dirt tracks are seen only in developing economies.

But we also see huge differences even within a developing economy. The bottom pictures contrast Beijing's capital-intensive highway system with the unpaved and sometimes hazardous roads of rural China.








Personal Distribution of Income

You saw earlier (on p. 39) that in the United States, the lowest-paid 20 percent of the population receives 3 percent of total income and the highest-paid 20 percent receives 50 percent of total income. The personal distribution of income in the world economy is much more unequal. According to World Bank data, the lowest-paid 20 percent of the world's population receives 2 percent of world income and the highest-paid 20 percent receives about 70 percent of world income.

International Distribution

Much of the greater inequality at the global level arises from differences in average incomes among countries. Figure 2.3 shows some of these differences. It shows the dollar value of what people can afford each day on average. You can see that in the United States, that number is $153 a day—an average person in the United States can buy goods and services that cost $153. This amount is around five times

the world average. The European Union has an average income of around two thirds that of the United States at $104 per day. Income levels fall off quickly as we move farther down the graph, with Russia at $65 a day, China $39 a day, India $17 a day, and Africa only $11 a day.

As people have lost well-paid manufacturing jobs and found lower-paid service jobs, inequality has increased in the United States and in most other advanced economies. Inequality is also increasing in the developing economies. People with skills enjoy rapidly rising incomes but the incomes of the unskilled are falling.

A Happy Paradox and a Huge Challenge

Despite the increase in inequality inside most countries, inequality across the entire world has decreased during the past 20 years. And most important, according to Xavier Sala-i-Martin, an economics professor at Columbia University, extreme poverty has declined. Professor Sala-i-Martin estimates that between 1976 and 1998, the number of people who earn $1 a day or less fell by 235 million and the number who earn $2 a day or less fell by 450 million. This positive situation arises because in China, the largest nation, incomes have increased rapidly and lifted millions from extreme poverty. Incomes are growing quickly in India too.

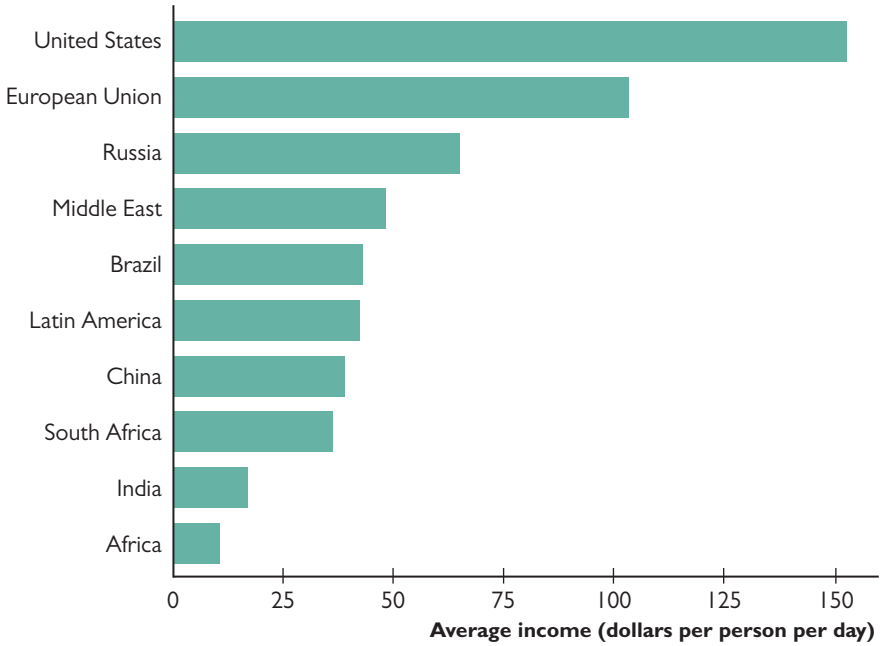
Lifting Africa from poverty is today's big challenge. In 1960, 11 percent of the world's poor lived in Africa, but in 1998, 66 percent did. Between 1976 and 1998, the number of people in Africa who earn $1 a day or less rose by 175 million, and the number who earn $2 a day or less rose by 227 million.

FIGURE 2.3

For Whom in the Global Economy in 2015

MyEconLab Animation

In 2015, the average income per person per day in the United States was $153. It was $104 in the European Union and $65 in Russia. The number falls to $39 in China, $17 in India, and $11 in Africa.



SOURCE OF DATA: International Monetary Fund, World Economic Outlook Database, October 2015.

EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

The U.S. and Global Economies in Your Life

You've encountered a lot of facts and trends about what, how, and for whom goods and services are produced in the U.S. economy and the global economy. How can you use this information? You can use it in two ways:

1. To inform your choice of career
2. To inform your stand on the politics of protecting U.S. jobs

Career Choices

As you think about your future career, you are now better informed about some of the key trends. You know that manufacturing is shrinking.

The U.S. economy is what is sometimes called a *post-industrial economy*. Industries that provided the backbone of the economy in previous generations have fallen to barely a fifth of the economy today, and the trend continues. It is possible that by the middle of the current century, manufacturing will be as small a source of jobs as agriculture is today.

So, a job in a manufacturing business is likely to lead to some tough situations and possibly the need for several job changes over a working life.

As manufacturing shrinks, so services expand, and this expansion will continue. The provision of healthcare, education, communication, wholesale and retail trades, and entertainment are all likely to expand in the future and be sources of increasing employment and rising wages. A job in a service-oriented business is more likely to lead to steady advances in income.

Political Stand on Job Protection

As you think about the stand you will take on the political question of protecting U.S. jobs, you are better informed about the basic facts and trends.

When you hear that manufacturing jobs are disappearing to China, you will be able to place that news in historical perspective. You might reasonably be concerned, especially if you or a member of your family has lost a job. But you know that trying to reverse or even halt this process is flying in the face of stubborn historical trends.

In later chapters, you will learn that there are good economic reasons to be skeptical about any form of protection and placing limits on competition.

CHECKPOINT 2.2

MyEconLab Study Plan 2.2
Solutions Video

Describe what, how, and for whom goods and services are produced in the global economy.

Practice Problems

1. Describe what, how, and for whom goods and services are produced in developing economies.
2. A Clinton Foundation success story is that it loaned $23,000 to Rwandan coffee growers to support improvements to coffee washing stations and provided technical support. What was the source of the success?

Solutions to Practice Problems

1. In developing countries, agriculture is the largest percentage, manufacturing is an increasing percentage, and services are a small percentage of total production. Most production does not use modern capital-intensive technologies, but some industries do. People who work in factories have rising incomes while those who work in rural industries are left behind.
2. The technical support allowed Rwandan coffee growers to improve their knowledge of coffee farming, which increased their human capital. The improvements to washing stations was a change in physical capital that allowed farmers to increase the quantity of washed coffee.

MyEconLab Concept Video

2.3 THE CIRCULAR FLOWS

Circular flow model
A model of the economy that shows the circular flow of expenditures and incomes that result from decision makers' choices and the way those choices interact to determine what, how, and for whom goods and services are produced.

We can organize the data you've just studied using the **circular flow model**—a model of the economy that shows the circular flow of expenditures and incomes that result from decision makers' choices and the way those choices interact to determine what, how, and for whom goods and services are produced. Figure 2.4 shows the circular flow model.

Households and Firms

Households
Individuals or groups of people living together.

Firms
The institutions that organize the production of goods and services.

Households are individuals or groups of people living together. The 124 million households in the United States own the factors of production—land, labor, capital, and entrepreneurship—and choose the quantities of these resources to provide to firms. Households also choose the quantities of goods and services to buy.

Firms are the institutions that organize the production of goods and services. The 28 million firms in the United States choose the quantities of the factors of production to hire and the quantities of goods and services to produce.

Markets

Market
Any arrangement that brings buyers and sellers together and enables them to get information and do business with each other.

Goods markets
Markets in which goods and services are bought and sold.

Factor markets
Markets in which the services of factors of production are bought and sold.

Households choose the quantities of the factors of production to provide to firms, and firms choose the quantities of the services of the factors of production to hire. Firms choose the quantities of goods and services to produce, and households choose the quantities of goods and services to buy. How are these choices coordinated and made compatible? The answer is: by markets.

A **market** is any arrangement that brings buyers and sellers together and enables them to get information and do business with each other. An example is the market in which oil is bought and sold—the world oil market. The world oil market is not a place. It is the network of oil producers, oil users, wholesalers, and brokers who buy and sell oil. In the world oil market, decision makers do not meet physically. They make deals by telephone, fax, and the Internet.

Figure 2.4 identifies two types of markets: goods markets and factor markets. Goods and services are bought and sold in **goods markets**; and the services of factors of production are bought and sold in **factor markets**.

Real Flows and Money Flows

When households choose the quantities of services of land, labor, capital, and entrepreneurship to offer in factor markets, they respond to the incomes they receive—rent for land, wages for labor, interest for capital, and profit for entrepreneurship. When firms choose the quantities of factor services to hire, they respond to the rent, wages, interest, and profits they must pay to households.

Similarly, when firms choose the quantities of goods and services to produce and offer for sale in goods markets, they respond to the amounts that they receive from the expenditures that households make. And when households choose the quantities of goods and services to buy, they respond to the amounts they must pay to firms.

Figure 2.4 shows the flows that result from these choices made by households and firms. The flows shown in orange are *real flows:* the flows of the factors of production that go from households through factor markets to firms and of the goods and services that go from firms through goods markets to households. The flows in the opposite direction are *money flows:* the flows of payments made in exchange

for the services of factors of production (shown in blue) and of expenditures on goods and services (shown in red).

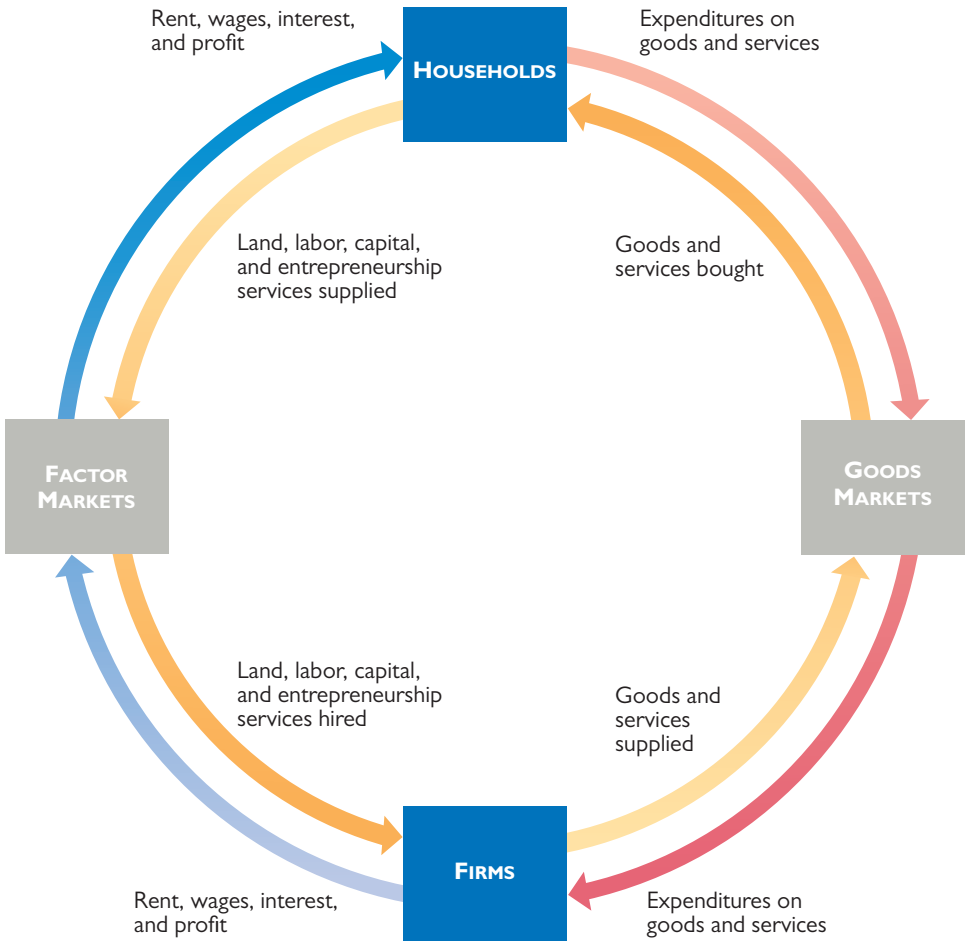
Lying behind these real flows and money flows are millions of individual choices about what to consume and what and how to produce. These choices result in buying plans by households and selling plans by firms in goods markets. And the choices result in selling plans by households and buying plans by firms in factor markets that interact to determine the prices that people pay and the incomes they earn, and so determine for whom goods and services are produced. You'll learn in Chapter 4 how markets coordinate the buying plans and selling plans of households and firms and make them compatible.

Firms produce most of the goods and services that we consume, but governments provide some of the services that we enjoy. Governments also play a big role in modifying for whom goods and services are produced by changing the personal distribution of income. We're now going to look at the role of governments in the U.S. economy and add them to the circular flow model.

FIGURE 2.4

The Circular Flow Model

MyEconLab Animation



The orange flows are the services of factors of production that go from households through factor markets to firms and the goods and services that go from firms through goods markets to households. These flows are *real* flows.

The blue flow is the income earned by the factors of production, and the red flow is the expenditures on goods and services. These flows are *money* flows.

The choices that generate these real and money flows determine *what*, *how*, and *for whom* goods and services are produced.

Governments

More than 86,000 organizations operate as governments in the United States. Some are tiny like the Yuma, Arizona, school district and some are enormous like the U.S. federal government. We divide governments into two levels:

- Federal government
- State and local government

Federal Government

The federal government's major expenditures provide

1. Goods and services
2. Social Security and welfare payments
3. Transfers to state and local governments

The goods and services provided by the federal government include the legal system, which protects property and enforces contracts, and national defense. Social Security and welfare benefits, which include income for retired people and programs such as Medicare and Medicaid, are transfers from the federal government to households. Federal government transfers to state and local governments are payments designed to provide more equality across the states and regions.

The federal government finances its expenditures by collecting a variety of taxes. The main taxes paid to the federal government are

1. Personal income taxes
2. Corporate (business) income taxes
3. Social Security taxes

In 2015, the federal government spent $4 trillion—about 23 percent of the total value of all the goods and services produced in the United States in that year. The taxes they raised were less than this amount—the government had a deficit.

State and Local Government

The state and local governments' major expenditures are to provide

1. Goods and services
2. Welfare benefits

The goods and services provided by state and local governments include the state courts and police, schools, roads, garbage collection and disposal, water supplies, and sewage management. Welfare benefits provided by state governments include unemployment benefits and other aid to low-income families.

State and local governments finance these expenditures by collecting taxes and receiving transfers from the federal government. The main taxes paid to state and local governments are

1. Sales taxes
2. Property taxes
3. State income taxes

In 2015, state and local governments spent $2.5 trillion or 14 percent of the total value of all the goods and services produced in the United States.

Governments in the Circular Flow

Figure 2.5 adds governments to the circular flow model. As you study this figure, first notice that the outer circle is the same as in Figure 2.4. In addition to these flows, governments buy goods and services from firms. The red arrows that run from governments through the goods markets to firms show this expenditure.

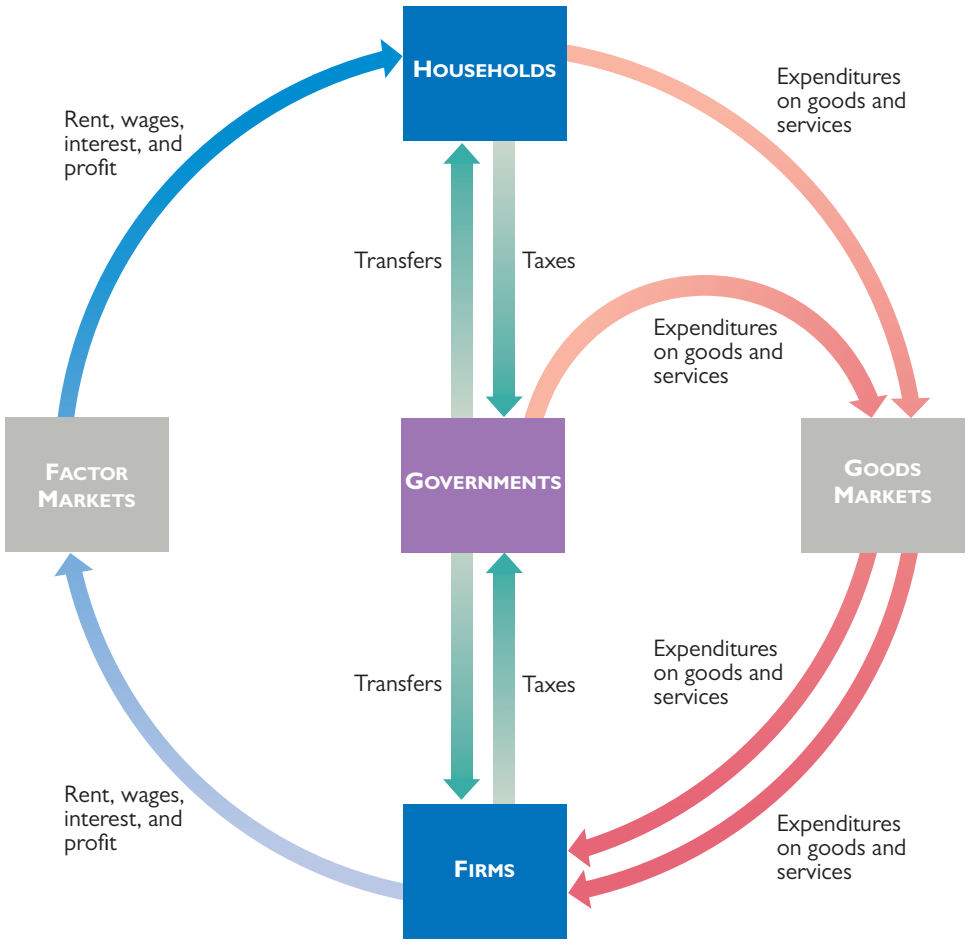
Households and firms pay taxes to governments. The green arrows running directly from households and firms to governments show these flows. Also, governments make money payments to households and firms. The green arrows running directly from governments to households and firms show these flows. Taxes and transfers are direct transactions with governments and do not go through the goods markets and factor markets.

Not part of the circular flow and not visible in Figure 2.5, governments provide the legal framework within which all transactions occur. For example, governments operate the courts and legal system that enable contracts to be written and enforced.

FIGURE 2.5

Governments in the Circular Flow

MyEconLab Animation



The green flows from households and firms to governments are taxes, and the green flows from governments to households and firms are money transfers.

The red flow from governments through the goods markets to firms is the expenditure on goods and services by governments.



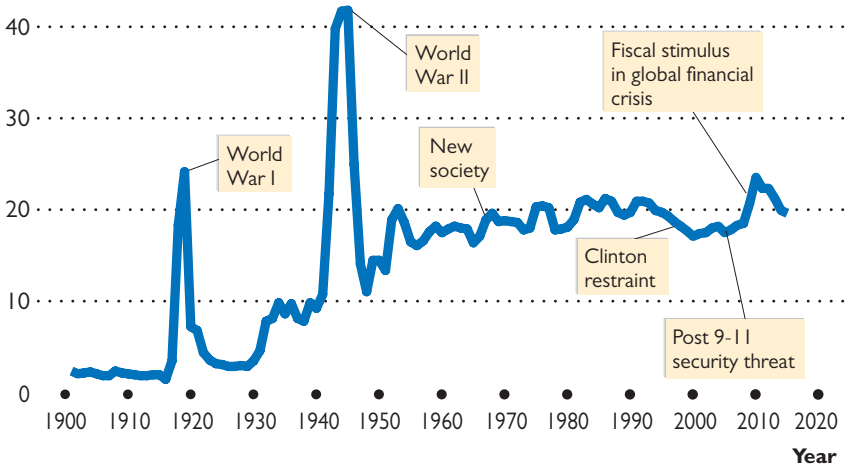
EYE on the PAST

Growing Government

One hundred years ago in 1915, the federal government spent 2 cents out of each dollar earned. Today, the federal government spends 20 cents. Government grew during the two world wars and during the 1960s and 1970s as social programs expanded.

Only during the 1980s and 1990s did big government begin to shrink in a process begun by Ronald Reagan and continued by Bill Clinton. But 9-11 saw the start of a new era of growing government. Fiscal stimulus and bail-outs to cope with the global financial crisis sent government spending soaring.

Federal expenditures (percentage of GDP)



SOURCE OF DATA: Budget of the United States Government, Historical Tables, Table 1.1.

Circular Flows in the Global Economy

Households and firms in the U.S. economy interact with households and firms in other economies in two main ways: They buy and sell goods and services and they borrow and lend. We call these two activities

- International trade
- International finance

International Trade

Many of the goods that you buy were not made in the United States. Your iPod, Wii games, Nike shoes, smartphone, T-shirt, and bike were made somewhere in Asia or possibly Europe or South or Central America. The goods and services that we buy from firms in other countries are U.S. *imports.*

Much of what is produced in the United States doesn't end up being bought by Americans. Boeing, for example, sells most of the airplanes it makes to foreign airlines. The banks of Wall Street sell banking services to Europeans and Asians. The goods and services that we sell to households and firms in other countries are U.S. *exports.*

International Finance

When firms or governments want to borrow, they look for the lowest interest rate available. Sometimes, that is outside the United States. Also, when the value of our imports exceeds the value of our exports, we must borrow from the rest of the world.

Firms and governments in the rest of the world behave in the same way. They look for the lowest interest rate at which to borrow and the highest at which to lend. They might borrow from or lend to Americans.

Figure 2.6 shows the flows through goods markets and financial markets in the global economy. Households and firms in the U.S. economy interact with those in the rest of the world (other economies) in goods markets and financial markets.

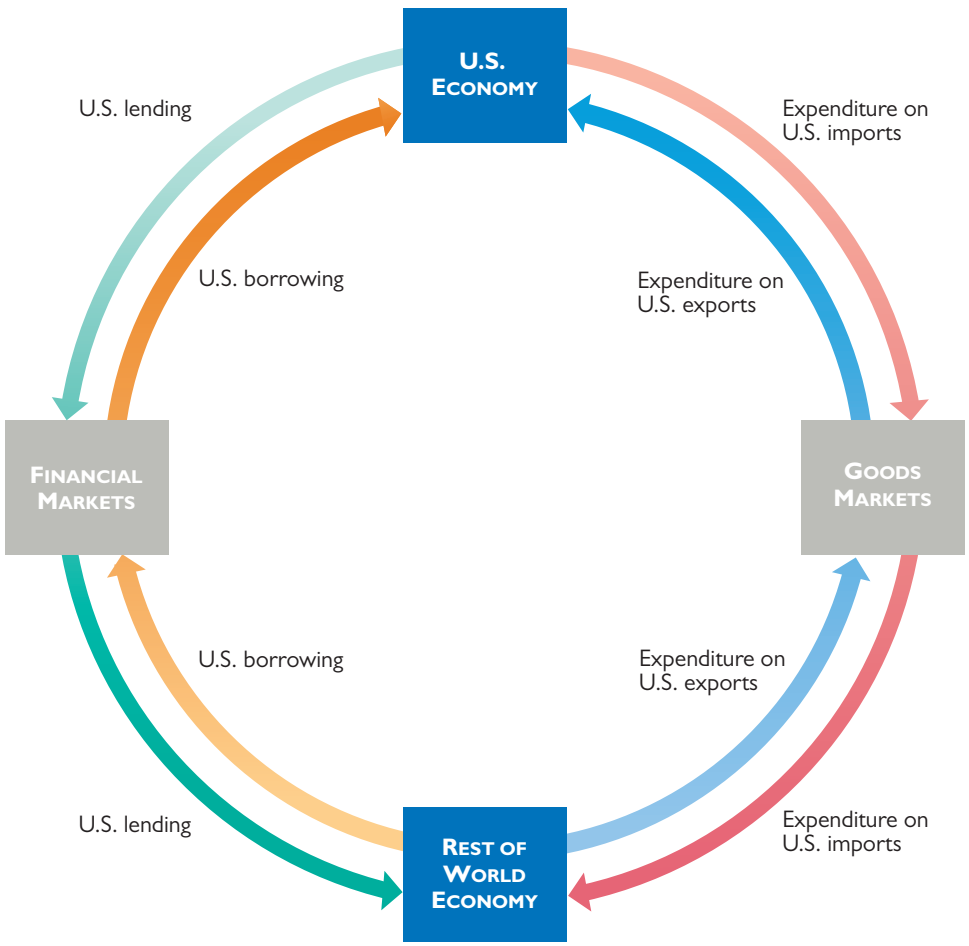
The red flow shows the expenditure by Americans on imports of goods and services, and the blue flow shows the expenditure by the rest of the world on U.S. exports (other countries' imports). The green flow shows U.S. lending to the rest of the world, and the orange flow shows U.S. borrowing from the rest of the world.

It is these international trade and international finance flows that tie nations together in the global economy and through which global booms and slumps are transmitted.

FIGURE 2.6

Circular Flows in the Global Economy

MyEconLab Animation



Households and firms in the U.S. economy interact with those in the rest of the world (other economies) in goods markets and financial markets.

The red flow shows the expenditure by Americans on imports of goods and services, and the blue flow shows the expenditure by the rest of the world on U.S. exports (other countries' imports).

The green flow shows U.S. lending to the rest of the world, and the orange flow shows U.S. borrowing from the rest of the world.

EYE on the GLOBAL ECONOMY

The Ups and Downs in International Trade

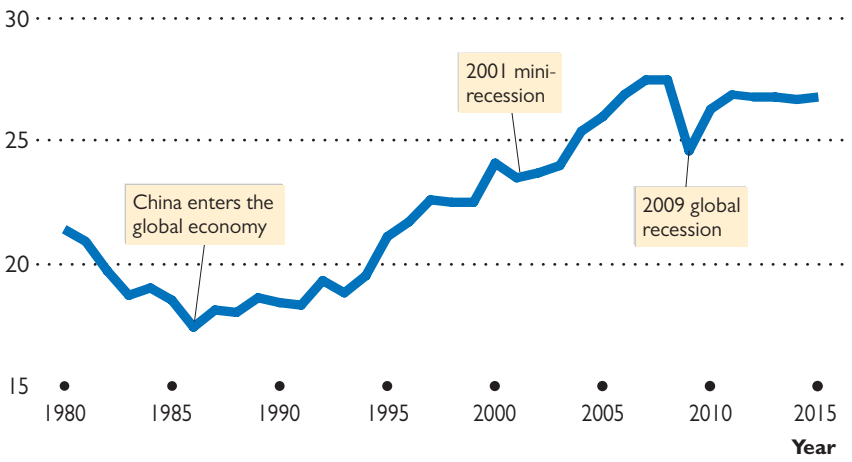
International trade expanded rapidly after China became a powerful player in the global economy.

At an average growth rate of close to 7 percent a year, world trade has doubled every decade and increased as a percentage of world production.

A mini-recession in 2001 slowed the growth in world trade to a crawl and the 2009 global recession reduced world trade.

After the recession of 2009, world trade bounced back to 27 percent of global production, where it remained in 2015.

Global international trade (percentage of world GDP)



SOURCE OF DATA: International Monetary Fund, World Economic Outlook Database, October 2015.

MyEconLab Study Plan 2.3
Key Terms Quiz
Solutions Video

CHECKPOINT 2.3

Explain the circular flow model of the U.S. economy and of the global economy.

Practice Problems

1. Describe the flows in the circular flow model in which expenditure on consumption goods and services, purchases of new national defense equipment, and payments for labor services appear. Through which market does each flow pass?
2. Of the flows that run between households, firms, and governments in the circular flow model, which ones are real flows and which are money flows?

Solutions to Practice Problems

1. Expenditure on consumption goods and services flows from households to firms through the goods market. Purchases of national defense flow from governments to firms through the goods market. Payments for labor services flow from firms to households through the factor market.
2. The flow of services of factors of production from households to firms through factor markets is a real flow, as are the flows of goods and services from firms to households and from firms to governments through goods markets. The money flows are the flows of factor incomes, household and government expenditures on goods and services, taxes, and transfers.

CHAPTER SUMMARY

Key Points

1. Describe what, how, and for whom goods and services are produced in the United States.

- Consumption goods and services represent 85 percent of total production; capital goods represent 15 percent.
- Goods and services are produced by using the four factors of production: land, labor, capital, and entrepreneurship.
- The incomes people earn (rent for land, wages for labor, interest for capital, and profit for entrepreneurship) determine who gets the goods and services produced.

2. Describe what, how, and for whom goods and services are produced in the global economy.

- Forty-three percent of the world's production (by value) comes from the advanced industrial countries and 57 percent comes from the emerging market and developing economies.
- Production in the advanced economies uses more capital (both machines and human), but some developing economies use the latest capital and technologies.
- The global distribution of income is more unequal than the U.S. distribution. Poverty has fallen in Asia, but it has increased in Africa.

3. Explain the circular flow model of the U.S. economy and of the global economy.

- The circular flow model of the U.S. economy shows the real flows of factors of production and goods and the corresponding money flows of incomes and expenditures.
- Governments in the circular flow receive taxes, make transfers, and buy goods and services.
- The circular flow model of the global economy shows the flows of U.S. exports and imports and the international financial flows that result from lending to and borrowing from other countries.

Key Terms

MyEconLab Key Terms Quiz

Capital, 37
Capital goods, 34
Circular flow model, 48
Consumption goods and services, 34
Entrepreneurship, 38
Factor markets, 48
Factors of production, 36
Firms, 48
Goods markets, 48
Households, 48
Human capital, 37
Interest, 39
Labor, 37
Land, 36
Market, 48
Profit (or loss), 39
Rent, 39
Wages, 39

MyEconLab Chapter 2 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. Which of the following items are *not* consumption goods and services? Explain why not.
- A chocolate bar
- A ski lift
- A golf ball

2. Which of the following items are *not* capital goods? Explain why not.
- An auto assembly line
- A shopping mall
- A golf ball

3. Which of the following items are *not* factors of production? Explain why not.
- Vans used by a baker to deliver bread
- 1,000 shares of Amazon.com stock
- Undiscovered oil in the Arctic Ocean

4. Which factor of production earns the highest percentage of total U.S. income? Define that factor of production. What is the income earned by this factor of production called?

5. With more job training and more scholarships to poor American students, which special factor of production is likely to grow faster than in the past?

6. Define the factor of production called capital. Give three examples of capital, different from those in the chapter. Distinguish between the factor of production capital and financial capital.

7. The pace at which new businesses are created in the U.S. economy and the percentage of U.S. jobs in young firms has fallen.

Ryan Decker and others, "The Role of Entrepreneurship in U.S. Job Creation and Economic Dynamism." *Journal of Economic Perspectives*, 2014.

Explain how you would expect these facts to influence *what*, *how*, and *for whom* goods and services are produced in the United States.

LIST 1
- You buy a coffee at Starbucks.
- The government buys some Dell computers.
- A student works at a FedEx office.
- Donald Trump rents a building to Marriott hotels.
- You pay your income tax.

8. In the circular flow model, explain the real flow and/or the money flow in which each item in List 1 belongs. Illustrate your answers on a circular flow diagram.

9. **Why you can get a free college education in Germany but not in California**
Even American students can get a free college degree in Germany, where high taxes pay for colleges. Despite college being free, fewer students in Germany earn college degrees than in the United States and more enter vocational apprenticeships.

Source: *Los Angeles Times*, October 29, 2015

If California adopted the German model of higher education, how would that change *for whom* goods and services are produced?

10. Read *Eye on the Dreamliner* on p. 43 and then answer the following questions:
- How many firms are involved in the production of the Dreamliner and how many are identified in the figure on p. 43?
- Is the Dreamliner a capital good or a consumption good? Explain why.
- State the factors of production that make the Dreamliner and provide an example of each.
- Explain how the production of the Dreamliner influences *what*, *how*, and *for whom* goods and services are produced.
- Use a diagram to show where in the circular flow model of the global economy the flows of the components listed on p. 43 appear and where the sales of Dreamliners appear.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. Boeing's Dreamliner has had a rocky start.
- Why doesn't Boeing manufacture all the components of the Dreamliner at its own factory in the United States?
- Describe some of the changes in *what*, *how*, and *for whom* that would occur if Boeing manufactured all the components of the Dreamliner at its own factories in the United States.
- State some of the tradeoffs that Boeing faces in making the Dreamliner.
- Why might Boeing's decisions in making the Dreamliner be in the social interest?

2. The global economy has seen a fall in the number of landlines and rapid growth in the number of smartphones. In the United States, 41 percent of households have no landline and 90 percent have a smartphone. In Africa, 33 percent have a smartphone. Describe the changes in *what*, *how*, and *for whom* telecommunication services are produced in the global economy.

3. Which of the entries in List 1 are consumption goods and services? Explain your choice.

4. Which of the entries in List 1 are capital goods? Explain your choice.

5. Which of the entries in List 1 are factors of production? Explain your choice.

6. In the African nation of Senegal, to enroll in school a child needs a birth certificate that costs $25. This price is several weeks' income for many families. Explain how this requirement is likely to affect the growth of human capital in Senegal.

7. **China's income gap widens**
The income gap has widened in China. In 2014, the pay of workers in the coastal regions increased by 9.7 percent while that of workers in the inland regions grew by 9 percent.

Source: *South China Morning Post*, May 28, 2015

Explain how the distribution of personal income in China can be getting more unequal even though the poorest are getting richer.

8. Compare the scale of agricultural production in the advanced and developing economies. In which is the percentage higher? In which is the total amount produced greater?

9. On a diagram of the circular flow model, indicate in which real or money flow each entry in List 2 belongs.

Use the following information to work Problems **10** and **11**.

Poor India makes millionaires at fastest pace
India, with the world's largest population of poor people, also paradoxically created millionaires at the fastest pace in the world. Millionaires increased by 22.7 percent to 123,000. In contrast, the number of Indians living on less than a dollar a day is 350 million and those living on less than $2 a day is 700 million. In other words, there are 7,000 very poor Indians for every millionaire.

Source: *The Times of India*, June 25, 2008

10. How is the personal distribution of income in India changing?

11. Why might incomes of $1 a day and $2 a day underestimate the value of the goods and services that these households actually consume?

LIST 1
- An interstate highway
- An airplane
- A school teacher
- A stealth bomber
- A garbage truck
- A pack of bubble gum
- President of the United States
- A strawberry field
- A movie
- An ATM

LIST 2
- General Motors pays its workers wages.
- IBM pays a dividend to its stockholders.
- You buy your groceries.
- Southwest rents some aircraft.
- Nike pays Serena Williams for promoting its sports shoes.

MyEconLab Chapter 2 Study Plan

Multiple Choice Quiz

1. Which of the following classifications is correct?
   A. City streets are consumption goods because they wear out with use.
   B. Stocks are capital goods because when people buy and sell them they make a profit.
   C. The coffee maker in the coffee shop at an airport is a consumption good because people buy the coffee it produces.
   D. White House security is a government service because it is paid for by the government.
2. Which of the following statements about U.S. production is correct?
   A. Construction accounts for a larger percentage of total production than does manufacturing.
   B. Real estate services account for 14.5 percent of the value of total production, larger than any other item of services or goods.
   C. Consumption goods and services represent 78.5 percent of U.S. production by value and that percentage doesn't fluctuate much.
   D. The manufacture of goods represents more than 50 percent of total production.
3. Which of the following items is *not* a factor of production?
   A. An oil rig in the Gulf of Mexico
   B. A ski jump in Utah
   C. A bank loan to a farmer
   D. An orange grove in Florida
4. What is human capital?
   A. A fruit picker
   B. Unskilled labor
   C. Your professor's knowledge of economics
   D. An auto assembly line robot
5. Which of the following statements is correct?
   A. Labor earns wages and entrepreneurship earns bonuses.
   B. Land earns interest and capital earns rent.
   C. Entrepreneurship earns interest and capital earns profit.
   D. Capital earns interest and labor earns wages.
6. How are goods and services produced in the global economy?
   A. Developing countries use less human capital but just as much physical capital as advanced economies.
   B. Emerging economies use more capital-intensive technology than do developing economies.
   C. Human capital in all economies is similar.
   D. Advanced economies use less capital than developing economies.
7. In the circular flow model, which of the following items is a real flow?
   A. The flow of government expenditures to firms for the goods bought
   B. The flow of income from firms to households for the services of the factors of production hired
   C. The flow of U.S. borrowing from the rest of the world
   D. The flow of labor services from households to firms



Is wind power free?

3

The Economic Problem

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain and illustrate the concepts of scarcity, production efficiency, and tradeoff using the production possibilities frontier.
2. Calculate opportunity cost.
3. Explain what makes production possibilities expand.
4. Explain how people gain from specialization and trade.

MyEconLab Big Picture Video

MyEconLab Concept Video

3.1 PRODUCTION POSSIBILITIES

The wind is free, but wind power is not: it must be produced. It is one of the vast array of goods and services produced in the nation's farms, factories, stores, offices, and construction sites. In 2015, 280 billion hours of labor equipped with $55 trillion worth of capital produced $18 trillion worth of goods and services.

Our production capability is enormous, but it is limited by our available resources and by technology. At any given time, we have fixed quantities of the factors of production and a fixed state of technology, so there is a limit to what we can produce. The economic problem is that our wants exceed what it is possible for our resources to produce.

Your task in this chapter is to study a model of the economic problem. We begin with a piece of the model that describes the limits to production, which is called the production possibilities frontier.

Production Possibilities Frontier

Production possibilities frontier
The boundary between the combinations of goods and services that can be produced and the combinations that cannot be produced, given the available factors of production and the state of technology.

The **production possibilities frontier** is the boundary between the combinations of goods and services that can be produced and the combinations that cannot be produced, given the available factors of production—land, labor, capital, and entrepreneurship—and the state of technology.

Although we produce millions of different goods and services, we can visualize the limits to production most easily if we look at a model economy that produces just two goods. Imagine an economy that produces only bikes and smartphones. All the land, labor, capital, and entrepreneurship available gets used to produce these two goods.

Land can be used for bike factories or smartphone factories. Labor can be trained to work as bike makers or as smartphone makers. Capital can be used for building bike or smartphone assembly lines. Entrepreneurs can put their talents to making bikes or running smartphone businesses. In every case, the more resources that are used to produce bikes, the fewer are left to produce smartphones.

Suppose that if no factors of production are allocated to producing smartphones, the maximum number of bikes that can be produced is 15 million a year. So one production possibility is no smartphones and 15 million bikes. Another possibility is to allocate sufficient resources to produce 1 million smartphones a year. But these resources must be taken from bike factories. Suppose that the economy can now produce only 14 million bikes a year. As resources are moved from producing bikes to producing smartphones, the economy produces more smartphones but fewer bikes.

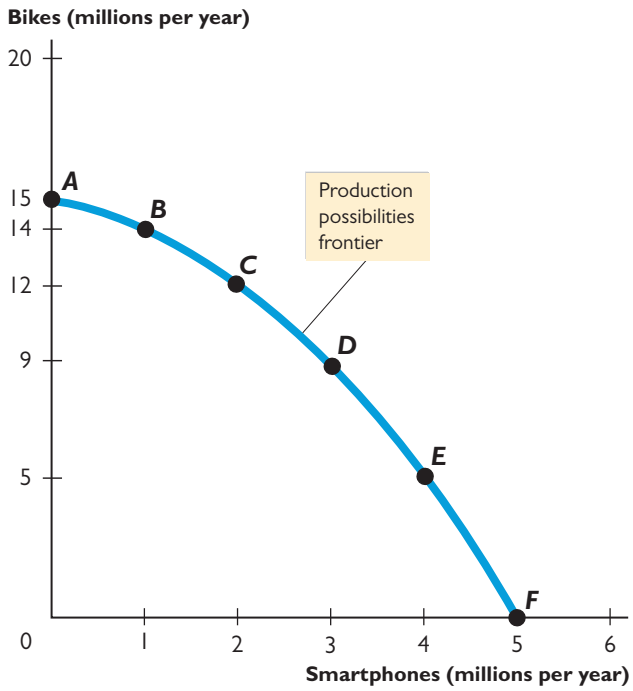
The table in Figure 3.1 illustrates these two combinations of smartphones and bikes as possibilities *A* and *B*. Suppose that *C*, *D*, *E*, and *F* are other combinations of the quantities of these two goods that the economy can produce. Possibility *F* uses all the resources to produce 5 million smartphones a year and allocates no resources to producing bikes. These six possibilities are alternative combinations of the quantities of the two goods that the economy can produce by *using all of its resources, given the technology.*

The graph in Figure 3.1 illustrates the production possibilities frontier, *PPF*, for smartphones and bikes. Each point on the graph labeled *A* through *F* represents the possibility in the table identified by the same letter. For example, point *B* represents the production of 1 million smartphones and 14 million bikes. These quantities also appear in the table as possibility *B*.

FIGURE 3.1

The Production Possibilities Frontier

MyEconLab Animation



Smartphones (millions)	0	1	2	3	4	5
Bikes (millions per year)	15	14	12	9	5	0
Possibility	*A*	*B*	*C*	*D*	*E*	*F*

The table and the graph show the production possibilities frontier for smartphones and bikes.

Point *A* tells us that if the economy produces no smartphones, the maximum quantity of bikes it can produce is 15 million a year.

Each point *A*, *B*, *C*, *D*, *E*, and *F* on the graph represents the possibility in the table identified by the same letter.

The line passing through these points is the production possibilities frontier.

The *PPF* shows the limits to production *with the available resources and technology*. If either resources or technology change, the *PPF* shifts. If more resources or better technology become available, the *PPF* shifts outward. If resources are lost, for example in a natural disaster, the *PPF* shifts inward.

The *PPF* is a valuable tool for illustrating the effects of scarcity and its consequences. Let's see how.

How the *PPF* Illustrates Scarcity and Its Consequences

The *PPF* illustrates scarcity and some of its consequences by putting three distinctions in sharp focus. They are the distinctions between

- Attainable and unattainable combinations
- Efficient and inefficient production
- Tradeoffs and free lunches

Attainable and Unattainable Combinations

Because the *PPF* shows the *limits* to production, it separates attainable combinations from unattainable ones. The economy can produce combinations of smartphones and bikes that are smaller than those on the *PPF*, and it can produce any of the combinations *on* the *PPF*. These combinations of smartphones and bikes are attainable. But it is impossible to produce combinations that are larger than those on the *PPF*. These combinations are unattainable.

Figure 3.2 emphasizes the attainable and unattainable combinations. Only the points on the *PPF* and inside it (in the orange area) are attainable. The combinations of smartphones and bikes beyond the *PPF* (in the white area), such as the combination at point *G*, are unattainable. These points illustrate combinations that cannot be produced with the current resources and technology. The *PPF* tells us that the economy can produce 4 million smartphones and 5 million bikes at point *E or* 2 million smartphones and 12 million bikes at point *C*. But the economy cannot produce 4 million smartphones and 12 million bikes at point *G*.

Efficient and Inefficient Production

Production efficiency
A situation in which the economy is getting all that it can from its resources and cannot produce more of one good or service without producing less of something else.

Production efficiency occurs when the economy is getting all that it can from its resources. When production is efficient it is not possible to produce more of one good or service without producing less of something else. For production to be efficient, there must be full employment—not just of labor but of all the available factors of production—and each resource must be assigned to the task that it performs comparatively better than other resources can.

FIGURE 3.2

Attainable and Unattainable Combinations

MyEconLab Animation

The production possibilities frontier, *PPF*, separates attainable combinations from unattainable ones. The economy can produce at any point *inside* the *PPF* (the orange area) or at any point *on* the frontier. Any point outside the production possibilities frontier, such as point *G*, is unattainable.

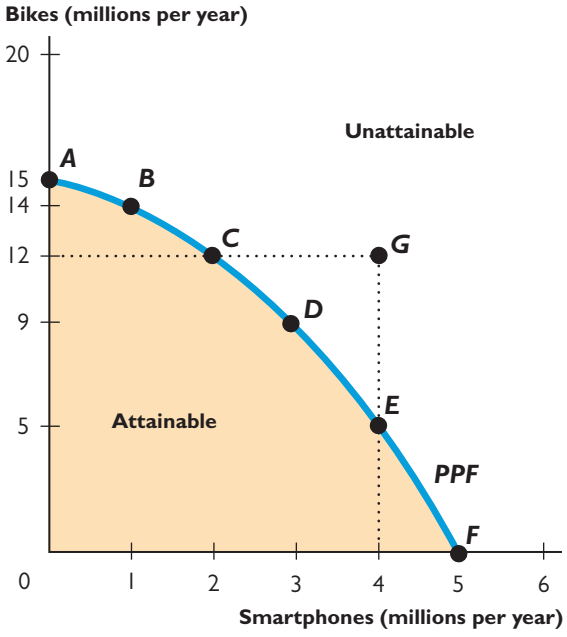


Figure 3.3 illustrates the distinction between efficient and inefficient production. With *inefficient* production, the economy might be producing 3 million smartphones and 5 million bikes at point *H*. With an *efficient* use of the economy's resources, it is possible to produce at a point on the *PPF* such as point *D* or *E*. At point *D*, there are more bikes and the same quantity of smartphones as at point *H*. And at point *E*, there are more smartphones and the same quantity of bikes as at point *H*. At points *D* and *E*, production is efficient.

Tradeoffs and Free Lunches

Tradeoff
An exchange—giving up one thing to get something else.

A **tradeoff** is an exchange—giving up one thing to get something else. You trade off income for a better grade when you decide to cut back on the hours you spend on your weekend job and allocate the time to extra study. The Ford Motor Company faces a tradeoff when it cuts the production of trucks and uses the resources saved to produce more hybrid SUVs. The federal government faces a tradeoff when it cuts NASA's space exploration program and allocates more resources to homeland security. As a society, we face a tradeoff when we decide to cut down a forest and destroy the habitat of the spotted owl.

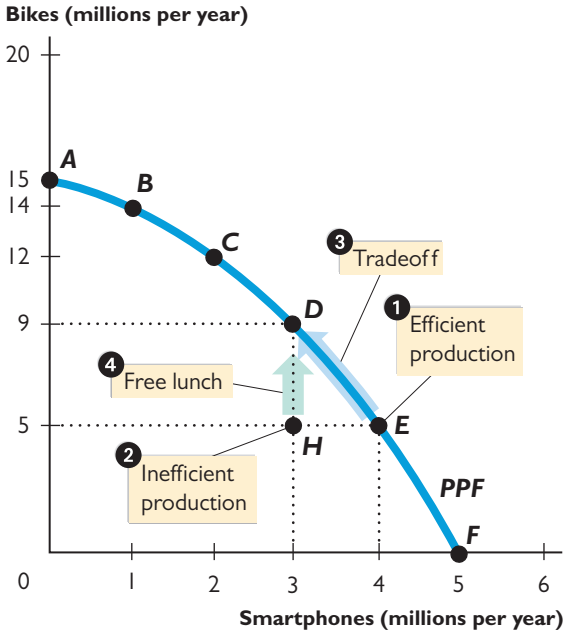
The production possibilities frontier illustrates the idea of a tradeoff. The *PPF* in Figure 3.3 shows how. If the economy produces at point *E* and people want to produce more bikes, they must forgo some smartphones. In the move from point *E* to point *D*, people trade off smartphones for bikes.

Economists often express the central idea of economics—that choices involve a tradeoff—with the saying "There is no such thing as a free lunch." A *free lunch* is a gift—getting something without giving up something else. What does the

FIGURE 3.3

Efficient and Inefficient Production, Tradeoffs, and Free Lunches

MyEconLab Animation



1. When production occurs at a point on the *PPF*, such as point *E*, resources are used efficiently.
2. When production occurs at a point inside the *PPF*, such as point *H*, resources are used inefficiently.
3. When production is efficient—on the *PPF*—the economy faces a tradeoff. To move from point *E* to point *D* requires that some smartphones be given up for more bikes.
4. When production is inefficient—inside the *PPF*—there is a free lunch. To move from point *H* inside the *PPF* to point *D* on the *PPF* does not involve a tradeoff.

famous saying mean? Suppose some resources are not being used or are not being used efficiently. Isn't it then possible to avoid a tradeoff and get a free lunch?

The answer is yes. You can see why in Figure 3.3. If production is taking place *inside* the *PPF* at point *H*, then it is possible to move to point *D* and increase the production of bikes by using currently unused resources or by using resources in their most productive way. Nothing is forgone to increase production—there is a free lunch.

When production is efficient—at a point on the *PPF*—choosing to produce more of one good involves a tradeoff. But if production is inefficient—at a point inside the *PPF*—there is a free lunch. More of some goods and services can be produced without producing less of any others.

So "there is no such thing as a free lunch" means that when resources are used efficiently, every choice involves a tradeoff. Because economists view people as making rational choices, they expect that resources will be used efficiently. That is why they emphasize the tradeoff idea and deny the existence of free lunches. We might *sometimes* get a free lunch, but we *almost always* face a tradeoff.

EYE on YOUR LIFE

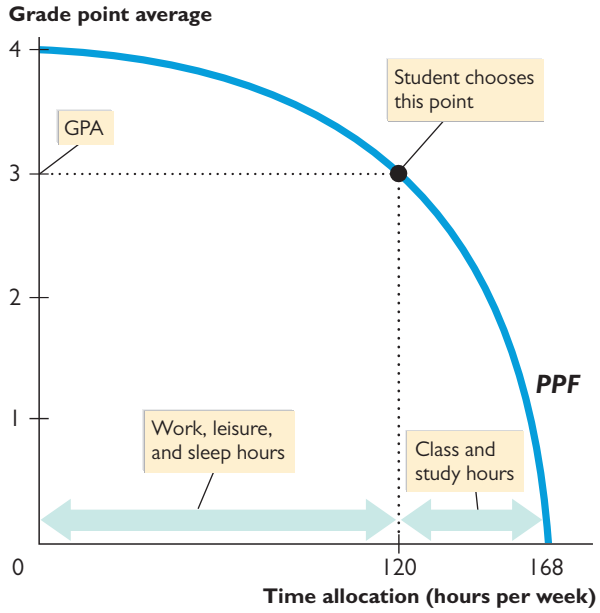
MyEconLab Critical Thinking Exercise

Your Production Possibilities Frontier

Two "goods" that concern you a great deal are your grade point average (GPA) and the amount of time you have available for leisure or earning an income. You face a tradeoff. To get a higher GPA you must give up leisure or income. Your forgone leisure or forgone income is the opportunity cost of a higher GPA. Similarly, to get more leisure or more income, you must accept a lower grade. A lower grade is the opportunity cost of increased leisure or increased income.

The figure illustrates a student's *PPF*. Any point on or inside the *PPF* is attainable and any point outside the *PPF* is unattainable. A student who wastes time ends up with a lower GPA than the highest attainable from the time spent studying. But a student who works efficiently achieves a point *on* the *PPF* and achieves production efficiency.

The student in the figure allocates the scarce 168 hours a week between studying (class and study hours) and other activities (work, leisure, and sleep hours). The student attends class and studies for 48 hours each week and works or has fun (and sleeps) for the other 120 hours. With this allocation of time, and studying efficiently, the student's GPA is 3.



CHECKPOINT 3.1

MyEconLab Study Plan 3.1
Key Terms Quiz
Solutions Video

Explain and illustrate the concepts of scarcity, production efficiency, and tradeoff using the production possibilities frontier.

Practice Problems

1. Table 1 sets out the production possibilities of a small Pacific island economy. Draw the economy's *PPF*.

Figure 1 shows an economy's *PPF* and identifies some production points. Use this figure to work Problems **2** to **4**.

2. Which points are attainable? Explain why.

3. Which points are efficient and which points are inefficient? Explain why.

4. Which points illustrate a tradeoff? Explain why.

TABLE 1

Possibility	Fish (pounds)		Berries (pounds)
A	0	and	20
B	1	and	18
C	2	and	15
D	3	and	11
E	4	and	6
F	5	and	0

In the News

Honeybee decline linked to killer virus
In 2007, the killer virus arrived in Hawaii, where almost all the queen bees used in the United States are bred. Bees are used to pollinate crops that are used in a third of the food we eat.

Source: *The Guardian*, June 8, 2012

Explain how a decline in bee population affects the U.S. *PPF*.

Solutions to Practice Problems

1. The *PPF* is the boundary between attainable and unattainable combinations of goods. Figure 2 shows the economy's *PPF*. The graph plots each row of the table as a point with the corresponding letter.

2. Attainable points: Any point on the *PPF* is attainable and any point inside the *PPF* is attainable. Points outside the *PPF* (*F* and *G*) are unattainable. In Figure 1, the attainable points are *A*, *B*, *C*, *D*, and *E*.

3. Efficient points: Production is efficient when it is not possible to produce more of one good without producing less of another good. To be efficient, a point must be attainable, so points *F* and *G* can't be efficient. Points inside the *PPF* can't be efficient because more goods can be produced, so *D* and *E* are not efficient. The only efficient points are those *on* the *PPF*—*A*, *B*, and *C*.

Inefficient points: Inefficiency occurs when resources are misallocated or unemployed. Such points are *inside* the *PPF*. These points are *D* and *E*.

4. Tradeoff: Begin by recalling that a tradeoff is an exchange—giving up something to get something else. A tradeoff occurs when moving along the *PPF* from one point to another point. So moving from any point *on* the *PPF*, point *A*, *B*, or *C*, to another point *on* the *PPF* illustrates a tradeoff.

FIGURE 1

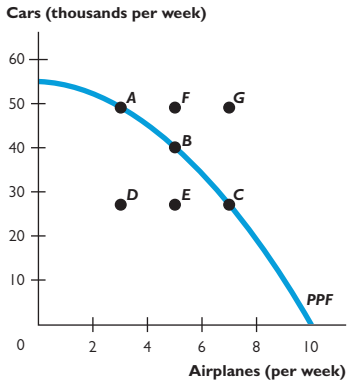
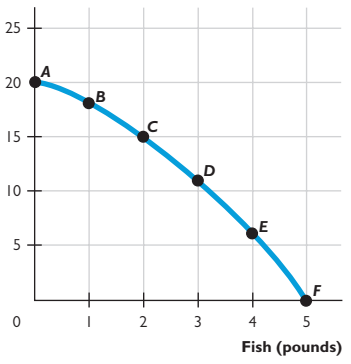


FIGURE 2



Solution to In the News

Honeybees are a resource used in the production of many food crops. Before 2007, the United States was at a point on its *PPF*. During the following years, with fewer queen bees, the number of honeybees declined and the quantity of food produced decreased. With no change in other resources and technology, and no change in the quantity of other goods and services produced, the U.S. *PPF* rotated inward.

MyEconLab Concept Video

3.2 OPPORTUNITY COST

You've seen that moving from one point to another on the *PPF* involves a trade-off. But what are the terms of the tradeoff? *How much* of one item must be forgone to obtain an additional unit of another item—a large amount or a small amount? The answer is given by opportunity cost—the best thing you must give up to get something (see p. 8). We can use the *PPF* to calculate opportunity cost.

The Opportunity Cost of a Smartphone

The opportunity cost of producing a smartphone is the number of bikes forgone to get an additional smartphone. It is calculated as the number of bikes forgone divided by the number of smartphones gained.

Figure 3.4 illustrates the calculation. At point *A*, the quantities produced are zero smartphones and 15 million bikes; and at point *B*, the quantities produced are 1 million smartphones and 14 million bikes. To gain 1 million smartphones by moving from point *A* to point *B*, 1 million bikes are forgone, so the opportunity cost of 1 smartphone is 1 bike.

At point *C*, the quantities produced are 2 million smartphones and 12 million bikes. To gain 1 million smartphones by moving from point *B* to point *C*, 2 million bikes are forgone. Now the opportunity cost of 1 smartphone is 2 bikes.

If you repeat these calculations, moving from *C* to *D*, *D* to *E*, and *E* to *F*, you will obtain the opportunity costs shown in the table and the graph.

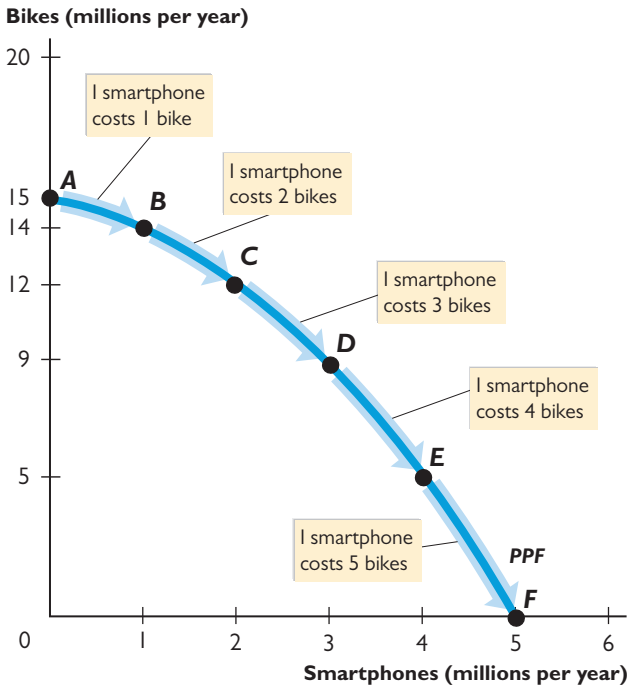
FIGURE 3.4

Calculating the Opportunity Cost of a Smartphone

MyEconLab Animation

Movement along *PPF*	Decrease in quantity of bikes	Increase in quantity of smartphones	Decrease in bikes divided by increase in smartphones
A to **B**	1 million	1 million	1 bike per phone
B to **C**	2 million	1 million	2 bikes per phone
C to **D**	3 million	1 million	3 bikes per phone
D to **E**	4 million	1 million	4 bikes per phone
E to **F**	5 million	1 million	5 bikes per phone

Along the *PPF* from *A* to *F*, the opportunity cost of a smartphone increases as the quantity of smartphones produced increases.



Opportunity Cost and the Slope of the *PPF*

Look at the numbers that we've just calculated for the opportunity cost of a smartphone and notice that they follow a striking pattern. The opportunity cost of a smartphone increases as the quantity of smartphones produced increases.

The magnitude of the *slope* of the *PPF* measures the opportunity cost. Because the *PPF* in Figure 3.4 is bowed outward, its slope changes and gets steeper as the quantity of smartphones produced increases.

When a small quantity of smartphones is produced—between points *A* and *B*—the *PPF* has a gentle slope and the opportunity cost of a smartphone is low. A given increase in the quantity of smartphones costs a small decrease in the quantity of bikes. When a large quantity of smartphones is produced—between points *E* and *F*—the *PPF* is steep and the opportunity cost of a smartphone is high. A given increase in the quantity of smartphones costs a large decrease in the quantity of bikes. Figure 3.5 shows the increasing opportunity cost of a smartphone.

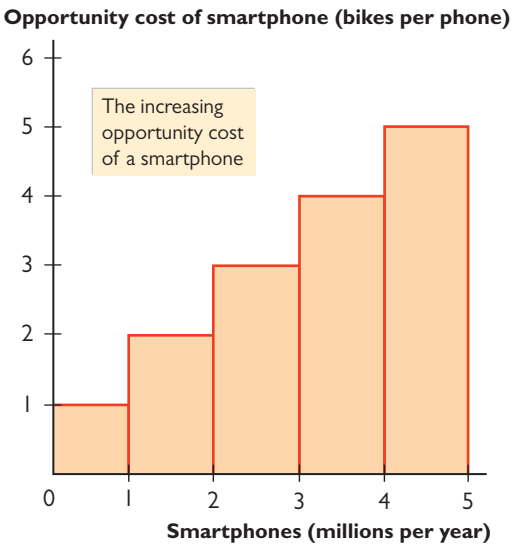
Opportunity Cost Is a Ratio

The opportunity cost of a smartphone is the *ratio* of bikes forgone to smartphones gained. Similarly, the opportunity cost of a bike is the *ratio* of smartphones forgone to bikes gained. So the opportunity cost of producing a bike is equal to the inverse of the opportunity cost of producing a smartphone. For example, moving along the *PPF* in Figure 3.4 from *C* to *D* the opportunity cost of a smartphone is 3 bikes. Moving along the *PPF* in the opposite direction, from *D* to *C*, the opportunity cost of a bike is 1/3 of a smartphone.

FIGURE 3.5

The Opportunity Cost of a Smartphone

MyEconLab Animation



Smartphones (millions)	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5
Opportunity cost (bikes per phone)	1	2	3	4	5

Because the *PPF* in Figure 3.4 is bowed outward, the opportunity cost of a smartphone increases as the quantity of smartphones produced increases.



EYE on the ENVIRONMENT

MyEconLab Critical Thinking Exercise

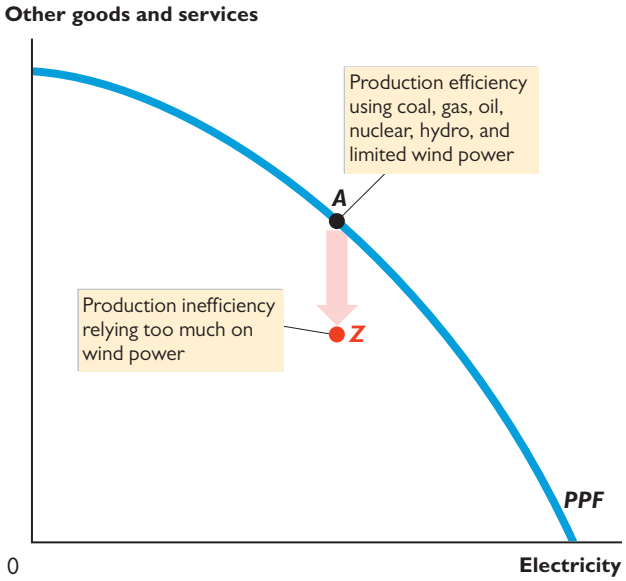
Is Wind Power Free?

Wind power is not free. To use it, we must give up other goods and services to build wind turbines and transmission lines.

Wind turbines can produce electricity only when the wind is strong enough, but advances in technology are enabling turbines to operate in lower wind conditions.

Some of the best wind farm locations are far from major population centers, so transmission lines can be long and power losses large.

If we produced most of our electricity using wind power, we would be operating inside the *PPF* at a point such as *Z*.



Increasing Opportunity Costs Are Everywhere

Just about every production activity that you can think of has increasing opportunity cost. We allocate the most skillful farmers and the most fertile land to producing food, and we allocate the best doctors and the least fertile land to producing healthcare services. Some resources are equally productive in both activities. If we shift these equally productive resources away from farming to hospitals, we get an increase in healthcare at a low opportunity cost. But if we keep increasing healthcare services, we must eventually build hospitals on the most fertile land and get the best farmers to become hospital porters. The production of food drops drastically and the increase in the production of healthcare services is small. The opportunity cost of a unit of healthcare services rises. Similarly, if we shift resources away from healthcare toward farming, we must eventually use more skilled doctors and nurses as farmers and more hospitals as hydroponic vegetable factories. The decrease in the production of healthcare services is large, but the increase in food production is small. The opportunity cost of producing a unit of food rises.

Your Increasing Opportunity Cost

Flip back to the *PPF* in *Eye on Your Life* on p. 64 and think about its implications for your opportunity cost of a higher grade.

What is the opportunity cost of spending time with your friends in terms of the grade you might receive on your exam? What is the opportunity cost of a higher grade in terms of the activities you give up to study? Do you face increasing opportunity costs in these activities?

CHECKPOINT 3.2

MyEconLab Study Plan 3.2
Solutions Video

Calculate opportunity cost.

Practice Problems

Table 1 shows Robinson Crusoe's production possibilities.

1. What is his opportunity cost of a pound of berries when Crusoe increases the quantity of berries from 21 pounds to 26 pounds and production is efficient? Does this opportunity cost increase as he produces more berries?

2. If Crusoe is producing 10 pounds of fish and 21 pounds of berries, what is his opportunity cost of an extra pound of berries? And what is his opportunity cost of an extra pound of fish? Explain your answers.

TABLE 1

Possibility	Fish (pounds)		Berries (pounds)
A	0	and	36
B	4.0	and	35
C	7.5	and	33
D	10.5	and	30
E	13.0	and	26
F	15.0	and	21
G	16.5	and	15
H	17.5	and	8
I	18.0	and	0

In the News

Cost of meeting 2021 vehicle emission standards

Carbon dioxide emissions from cars must be cut from 130 grams to 95 grams per kilometer. To meet this new standard, the price of a car will rise by $1,350.

Source: *International Business Times*, November 9, 2015

Calculate the opportunity cost of reducing the carbon emission level by 1 gram.

Solutions to Practice Problems

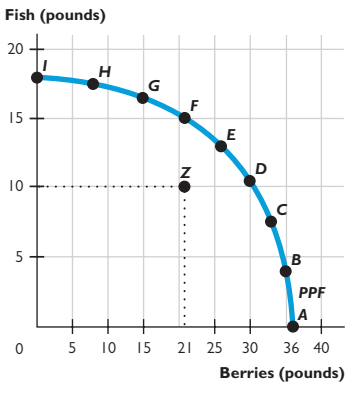
1. If Crusoe's production is efficient, he is producing at a point *on* his *PPF*. His opportunity cost of an extra pound of berries is the quantity of fish he must give up to get the berries. It is calculated as the decrease in the quantity of fish divided by the increase in the quantity of berries as he moves along his *PPF*.

To increase the quantity of berries from 21 pounds to 26 pounds (from row *F* to row *E* of Table 1), production of fish decreases from 15 pounds to 13 pounds. To gain 5 pounds of berries, Crusoe must forgo 2 pounds of fish. The opportunity cost of 1 pound of berries is the 2 pounds of fish forgone divided by 5 pounds of berries gained—2/5 of a pound of fish.

Crusoe's opportunity cost of berries increases as he produces more berries. To see why, move Crusoe from row *E* to row *D* in Table 1. His production of berries increases by 4 pounds and his production of fish falls by 2.5 pounds. His opportunity cost of 1 pound of berries increases to 5/8 of a pound of fish.

2. Figure 1 graphs the data in Table 1 and shows Crusoe's *PPF*. If Crusoe is producing 10 pounds of fish and 21 pounds of berries, he is producing at point *Z*. Point *Z* is a point *inside* Crusoe's *PPF*. When Crusoe produces 21 pounds of berries, he has enough time available to produce 15 pounds of fish at point *F* on his *PPF*. To produce more fish, Crusoe can move from *Z* toward *F* on his *PPF* and forgo no berries. His opportunity cost of a pound of fish is zero. Similiarly, his opportunity cost of a pound of berries is zero.

FIGURE 1



Solution to In the News

By spending $1,350 extra on a new car, you forgo $1,350 of other goods. With a new car, your emissions fall from 130 grams to 95 grams, a reduction of 35 grams. The opportunity cost of a 1-gram reduction in emissions is $1,350 of other goods divided by 35 grams, or $38.57 of other goods.

MyEconLab Concept Video

3.3 ECONOMIC GROWTH

Economic growth
The sustained expansion of production possibilities.

The *PPF* shows the limits to production with given resources and technology. But over time, resources and technology change and production possibilities expand. A process of sustained expansion of production possibilities is called **economic growth**. Our economy grows when we develop better technologies; improve the quality of labor by education, on-the-job training, and work experience; and acquire more machines (capital) to help us produce.

To study economic growth, we must look at the production possibilities for a consumption good—a smartphone—and a capital good—a smartphone factory. By using resources to produce smartphone factories, the economy can expand its future production possibilities. The greater the production of new capital—of new smartphone factories—the faster is the expansion of production possibilities.

Figure 3.6 shows how the *PPF* can expand. If no new factories are produced (at point *L*), production possibilities do not expand and the *PPF* stays at its original position. By producing fewer smartphones and using resources to produce 2 new smartphone factories (at point *K*), production possibilities expand once the new factories become operational. The *PPF* rotates outward to the new *PPF*.

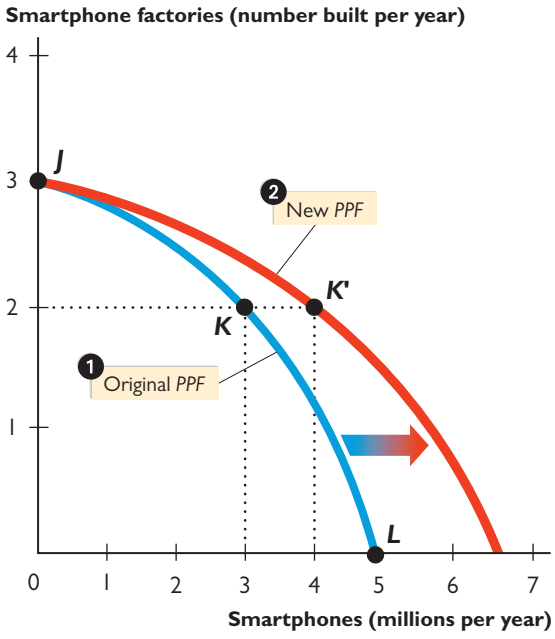
But economic growth is *not* free. To make it happen, current consumption must decrease. The move from *L* to *K* in Figure 3.6 means forgoing 2 million smartphones now. The opportunity cost of producing new smartphone factories is the decrease in the number of smartphones produced today.

Also, economic growth does not end scarcity. It rotates the *PPF* outward, but on the new *PPF* we continue to face opportunity costs. To keep producing new capital, current consumption must be less than its maximum possible level.

FIGURE 3.6
Expanding Production Possibilities

MyEconLab Animation

1. If firms allocate no resources to producing smartphone factories and produce 5 million smartphones a year at point *L*, the *PPF* doesn't change.
2. If firms decrease smartphone production to 3 million a year and produce 2 smartphone factories, at point *K*, production possibilities will expand. After a year, the *PPF* rotates outward to the new *PPF* and production can move to point *K'*.



EYE on the U.S. ECONOMY

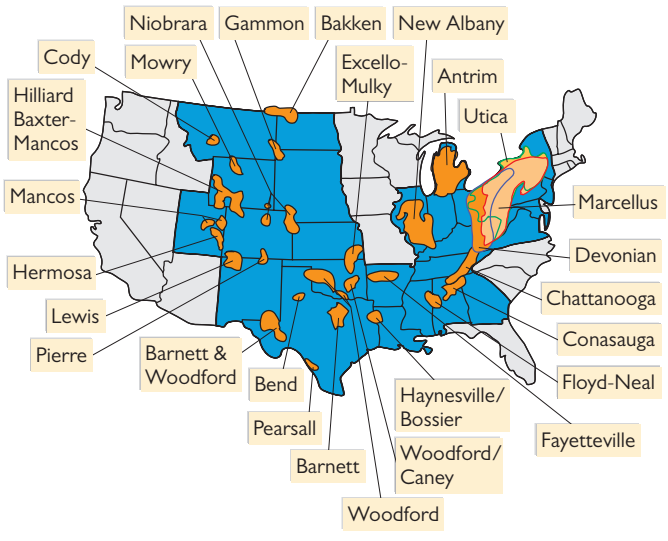
Expanding Our Production Possibilities

Horizontal drilling and hydraulic fracturing—fracking—combined with recent advances in remote sensing technology have made it possible to extract a large quantity of gas trapped in shale at low cost. The United States has an estimated 750 trillion cubic feet of this gas, enough for more than 90 years at today's extraction rate. The map below shows the locations of these gas deposits.

Figure 1 shows recent years of shale gas production. During 2010 and 2011, production doubled. The average growth rate since 2010 exceeds 30 percent per year.

Was this increase in gas production achieved by sliding along the *PPF* and producing less of other goods and servces? No! It was the result of advances in technology and the opening up of additional gas wells.

Figure 2 illustrates how these changes rotated the *PPF* outward from PPF_{10} in 2010 to PPF_{13} in 2013. Point *J* is the same on both curves because if we produced at that point (only other goods and services and no gas), we would not get the benefits of the technological advances in gas production. In 2010 we produced at point *K*, and in 2013 at point *K'*. Along PPF_{13} the opportunity cost of gas is lower than along PPF_{10}.



Natural Gas Shale Basins in the United States

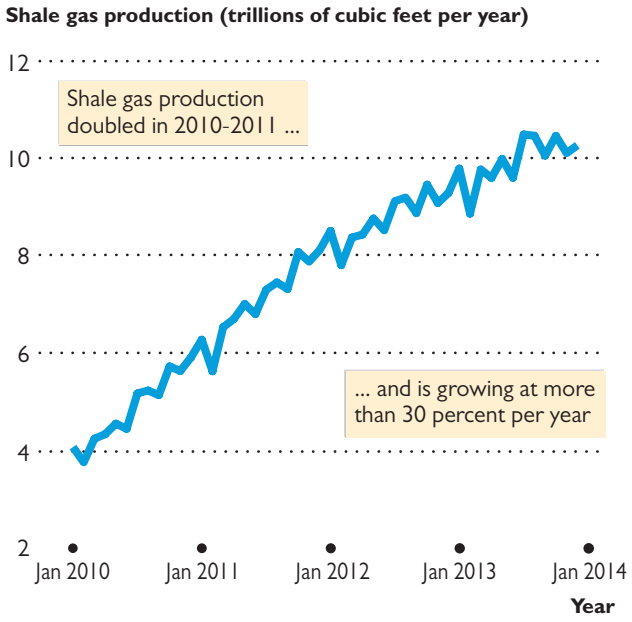


Figure 1 Shale Gas Production

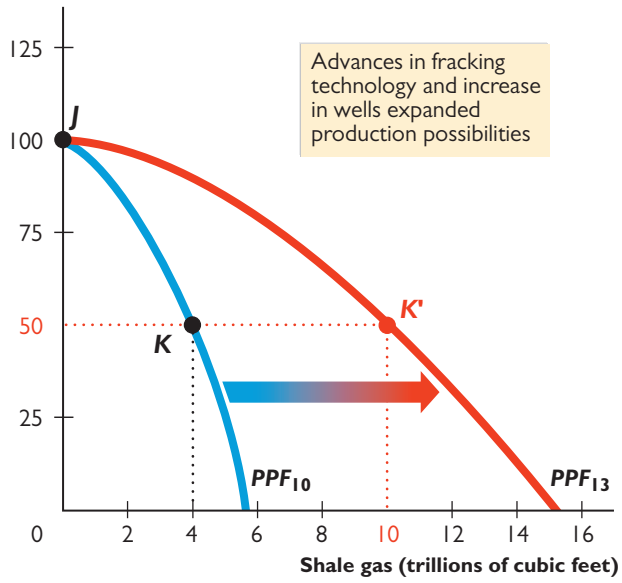


Figure 2 Shale Gas Versus Other Goods and Services

SOURCE OF DATA: Energy Information Administration.

EYE on the GLOBAL ECONOMY

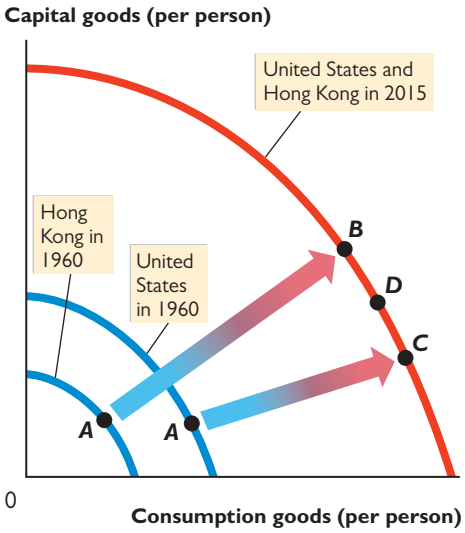
Hong Kong's Rapid Economic Growth

Hong Kong's production possibilities per person were 25 percent of those of the United States in 1960. By 2015, they had grown to become equal to U.S. production possibilities per person. Hong Kong grew faster than the United States because it allocated more of its resources to accumulating capital and less to consumption than did the United States.

In 1960, the United States and Hong Kong produced at point *A* on their respective *PPF*s. In 2015, Hong Kong was at point *B* and the United States was at point *C*.

If Hong Kong continues to produce at any point on its *PPF* above *C*, it will grow more rapidly than the United States and its *PPF* will eventually shift out beyond the *PPF* of the United States. But if Hong Kong produces at a point below *B*, the pace of expansion of its *PPF* will slow.





MyEconLab Study Plan 3.3
Key Terms Quiz
Solutions Video

TABLE 1

Possibility	Education services (graduates)	Consumption goods (units)
A	1,000	0
B	750	1,000
C	500	2,000
D	0	3,000

CHECKPOINT 3.3

Explain what makes production possibilities expand.

Practice Problems

1. Table 1 shows an economy that produces education services and consumption goods. If the economy currently produces 500 graduates a year and 2,000 units of consumption goods, what is the opportunity cost of one additional graduate?
2. How does an economy grow? Explain why economic growth is not free.

Solutions to Practice Problems

1. By increasing the number of graduates from 500 to 750, the quantity of consumption goods produced decreases from 2,000 to 1,000 units. The opportunity cost of a graduate is the decrease in consumption goods divided by the increase in the number of graduates. That is, the opportunity cost of a graduate is 1,000 units divided by 250, or 4 units of consumption goods.
2. An economy grows if it expands its production possibilities—if it develops better technologies; improves the quality of labor by education, on-the-job training, and work experience; and acquires more capital to use in production.

   Economic growth occurs when resources are used today to produce better technologies, higher-quality labor, or more machines. Those resources cannot be used to produce goods and services today, so the cost of economic growth is the goods and services forgone today. Economic growth is not free.

3.4 SPECIALIZATION AND TRADE

MyEconLab Concept Video

The next time you visit your favorite fast-food restaurant, watch what the workers are doing. You might see one person re-stocking the bread, salad materials, meat, sauces, boxes, and wrappers; another working the grill and another the fry maker; another assembling meals; and yet another taking orders and payments. Imagine how long you would wait for your burger if each worker performed all the tasks needed to fill each customer's not-so-fast-food order.

Specialization makes people more productive in two ways: It brings absolute advantage and comparative advantage.



Specialization boosts productivity in a fast-food kitchen

Absolute Advantage and Comparative Advantage

A person has an **absolute advantage** if that person is more productive than another. Being more productive means using fewer inputs or taking less time to produce a good or perform a production task. Being more productive also means being able to produce more with given inputs in a given amount of time.

The specialized workers at McDonald's have an *absolute advantage* over the same number of workers each performing all the tasks needed to make a burger.

A person has a **comparative advantage** in an activity if that person can perform the activity at a lower opportunity cost than anyone else. Recall that the opportunity cost of something is what you must give up to get it.

Notice the contrast between *absolute advantage* and *comparative advantage*. Absolute advantage is about *productivity*—how long does it take to produce a unit of a good. Comparative advantage is about *opportunity cost*—how much of some other good must be forgone to produce a unit of a good.

Absolute advantage
When one person (or nation) is more productive than another—needs fewer inputs or takes less time to produce a good or perform a production task.

Comparative advantage
The ability of a person to perform an activity or produce a good or service at a lower opportunity cost than anyone else.



EYE on the U.S. ECONOMY

No One Knows How to Make a Pencil



Not many products in today's world are as simple as a pencil. Yet the story of how the pencil in your hand got there illustrates the astonishing power of specialization and trade.

When you hold a pencil, you're holding cedar grown in Oregon, graphite mined in Sri Lanka, clay from Mississippi, wax from Mexico, rapeseed oil grown in the Dutch East Indies, pumice from Italy, copper from Arizona, and zinc from Alaska.

These materials were harvested and mined by thousands of workers equipped with hundreds of specialized tools, all of which were manufactured by thousands of other workers using hundreds more specialized tools. These tools were in turn made of steel, itself made from iron ore, and from other minerals and materials.

Rail, road, and ocean transportation systems moved all these things to custom-built factories that made graphite "leads," erasers, brass to hold the erasers, paint, and glue.

Finally, all these components were bought by a pencil factory which, with its millions of dollars' worth of custom machinery, put them all together.

Millions of people contributed to making that pencil, many of whom don't even know what a pencil is and *not one of whom knows how to make a pencil*. No one directed all these people. Each worker and business went about its self-interested specialized task trading with each other in markets.

Adapted from *I Pencil*, by Leonard Read, Foundation for Economic Education, 1958.

Comparative Advantage: A Model

We're going to explore the idea of comparative advantage and make it concrete by looking at a model economy with two smoothie bars: one operated by Liz and the other operated by Joe. You will see how we identify comparative advantage and how it creates an opportunity for Liz and Joe to gain from specialization and trade.



Liz's Smoothie Bar

Liz operates a high-tech bar. She can turn out *either* a smoothie *or* a salad every 2 minutes. If she spends all her time making smoothies, she produces 30 an hour. If she spends all her time making salads, she also produces 30 an hour (Table 3.1). If she splits her time equally between the two, she can produce 15 smoothies *and* 15 salads an hour. For each additional smoothie Liz produces, she must decrease her production of salads by one, and for each additional salad Liz produces, she must decrease her production of smoothies by one. So

Liz's opportunity cost of producing 1 smoothie is 1 salad,

and

Liz's opportunity cost of producing 1 salad is 1 smoothie.

Liz's customers buy smoothies and salads in equal quantities, so Liz splits her time equally between the items and produces 15 smoothies and 15 salads an hour.

TABLE 3.1 LIZ'S PRODUCTION POSSIBILITIES

Item	Minutes to produce 1	Quantity per hour
Smoothies	2	30
Salads	2	30



Joe's Smoothie Bar

Joe produces smoothies and salads in a smaller bar than Liz's, and he has only one blender—a slow, old machine. Even if Joe uses all his resources to produce smoothies, he can produce only 6 an hour. But Joe is pretty good in the salad department. If he uses all his resources to make salads, he can produce 30 an hour (Table 3.2). Joe's ability to make smoothies and salads is the same regardless of how he splits an hour between the two tasks. He can make a salad in 2 minutes or a smoothie in 10 minutes. For each additional smoothie Joe produces, he must decrease his production of salads by 5. And for each additional salad Joe produces, he must decrease his production of smoothies by 1/5 of a smoothie. So

Joe's opportunity cost of producing 1 smoothie is 5 salads,

and

Joe's opportunity cost of producing 1 salad is 1/5 of a smoothie.

Joe's customers, like Liz's, buy smoothies and salads in equal quantities. Joe spends 50 minutes of each hour making smoothies and 10 minutes of each hour making salads. With this division of his time, Joe produces 5 smoothies and 5 salads an hour.

TABLE 3.2 JOE'S PRODUCTION POSSIBILITIES

Item	Minutes to produce 1	Quantity per hour
Smoothies	10	6
Salads	2	30

Liz's and Joe's *PPFs*

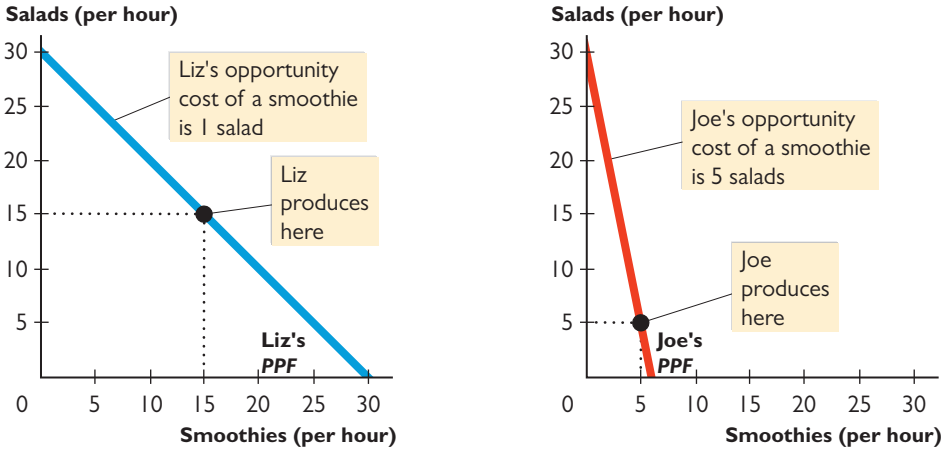
The *PPF*s in Figure 3.7 illustrate the situation we've just described. In part (a), Liz faces a *PPF* that enables her to produce 15 smoothies and 15 salads. In part (b), Joe faces a *PPF* that enables him to produce 5 smoothies and 5 salads. On Liz's *PPF*, 1 smoothie costs 1 salad. On Joe's *PPF*, 1 smoothie costs 5 salads.

The *PPF*s in Figure 3.7 contrast with the outward-bowed *PPF*s that you've seen earlier in this chapter, which capture the general rule that the opportunity cost of a good increases as we increase its rate of production. It is easier to identify

FIGURE 3.7

Production Possibilities Frontiers

MyEconLab Animation



(a) Liz's *PPF* and production

(b) Joe's *PPF* and production

Liz can produce 30 smoothies per hour or 30 salads per hour or any other combination along her *PPF* in part (a). Liz chooses to produce 15 smoothies and 15 salads per hour.

Joe can produce 6 smoothies per hour or 30 salads per hour or any other combination along his *PPF* in part (b). Joe chooses to produce 5 smoothies and 5 salads per hour.

comparative advantage and see the gains from trade when individuals have constant opportunity cost. And as you will soon see, the economy's *PPF* is outward-bowed even when individuals have constant opportunity cost and linear *PPF*s.

Liz's Greater Productivity

You can see from the production numbers that Liz is three times as productive as Joe—her 15 smoothies and 15 salads an hour are three times Joe's 5 smoothies and 5 salads. Liz is more productive than Joe in producing both smoothies and salads, but Liz has a comparative advantage in only one of the activities.

Liz's Comparative Advantage

In which of the two activities does Liz have a *comparative* advantage? Recall that comparative advantage is a situation in which one person's opportunity cost of producing a good is lower than another person's opportunity cost of producing that same good.

You've seen that Liz's opportunity cost of a smoothie is 1 salad, whereas Joe's opportunity cost of a smoothie is 5 salads. To produce 1 smoothie, Liz must forgo 1 salad while Joe must forgo 5 salads. So, because Liz forgoes fewer salads to make a smoothie, she has a comparative advantage in producing smoothies.

What about Joe? Doesn't he have a comparative advantage at anything? He does as you're about to see.

Joe's Comparative Advantage

Look at the opportunity costs of producing salads. For Liz, that opportunity cost is 1 smoothie. But for Joe, a salad costs only 1/5 of a smoothie. Because Joe's opportunity cost of a salad is less than Liz's, Joe has a comparative advantage in producing salads.

It is always true that if one person has a comparative advantage in producing a good, others have a comparative advantage in producing some other good.

Achieving Gains from Trade

Liz and Joe run into each other in a bar, where Liz tells Joe about her smoothie business. Her only problem, she says, is that she wants to produce more because customers leave when her lines get too long. Joe describes his own smaller business to Liz. When he explains how he divides his hour between making smoothies and salads, Liz's eyes pop. "Have I got a deal for you!" she exclaims.

Here's Liz's deal. Joe stops making smoothies and produces 30 salads per hour. Liz stops making salads and produces 30 smoothies per hour. That is, they both specialize in producing the good in which they have a comparative advantage—see Table 3.3(b). They then trade: Liz sells Joe 10 smoothies and Joe sells Liz 20 salads—the price of a smoothie is 2 salads—see Table 3.3(c).

Trade at a price of 2 salads per smoothie (1/2 a smoothie per salad) enables both Liz and Joe to gain. Liz gets salads for 1/2 a smoothie each, which is less than the 1 smoothie that it costs her to produce a salad. Joe gets smoothies for 2 salads each, which is less than the 5 salads it costs him to produce a smoothie.

After the trade, Joe has 10 salads (the 30 he produces minus the 20 he sells to Liz) and the 10 smoothies that he buys from Liz. So Joe doubles the quantities of smoothies and salads he can sell. Liz has 20 smoothies (the 30 she produces minus the 10 she sells to Joe) and the 20 salads she buys from Joe. See Table 3.3(d). From specialization and trade, each gains 5 smoothies and 5 salads—see Table 3.3(e).

Liz draws the graphs in Figure 3.8 to illustrate her idea. The blue *PPF* is Liz's and the red *PPF* is Joe's. They are each producing at the points marked *A*. Liz's proposal is that they each produce at the points marked *B*.

After trading, each moves to the point marked *C*. At these points, Liz has 20 smoothies and 20 salads, 5 more of each than she was producing only for herself. Joe has 10 smoothies and 10 salads, also 5 more of each than he was producing only for himself. Because of the gains from specialization and trade, total production increases by 10 smoothies and 10 salads.

Notice that the points *C* are *outside* Liz's and Joe's *PPF*s. Everyone gains and enjoys greater quantities of goods than they can produce on their own.

TABLE 3.3 LIZ AND JOE GAIN FROM TRADE

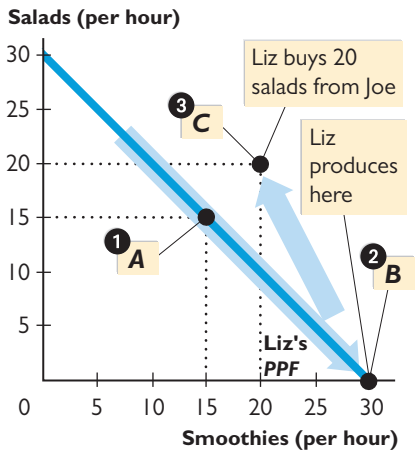
(a) Before Trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	**Liz**	**Joe**
Smoothies	30	0
Salads	0	30
(c) Trade		
Smoothies	sell 10	buy 10
Salads	buy 20	sell 20
(d) After Trade		
Smoothies	20	10
Salads	20	10
(e) Gains from Trade		
Smoothies	+5	+5
Salads	+5	+5

FIGURE 3.8

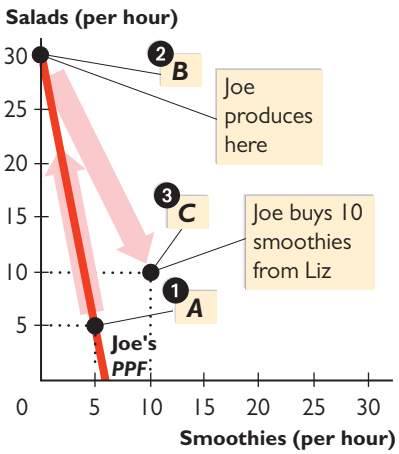
The Gains from Specialization and Trade

MyEconLab Animation

1. Before trade, Liz and Joe each produce at point *A* on their respective *PPF*s.
2. Liz specializes in smoothies and Joe specializes in salads, so they each move to point *B* on their respective *PPF*s.
3. They exchange smoothies for salads at a price of 2 salads per smoothie. After trade, each goes to point *C*—a point *outside* their individual *PPF*s. They each gain 5 salads and 5 smoothies—the quantities at point *C* minus the quantities at point *A*.



(a) Liz's gains from trade



(b) Joe's gains from trade

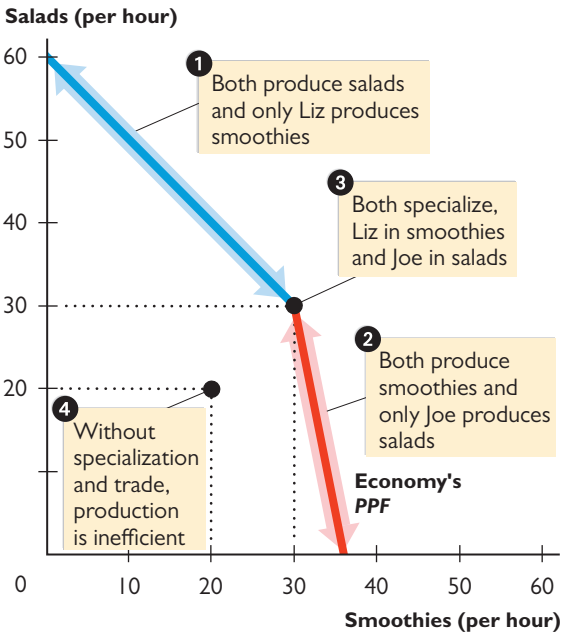
The Economy's Production Possibilities Frontier

With specialization and trade, Liz and Joe get outside their individual *PPF*s, but they produce *on* the economy's *PPF*. Also, despite Liz and Joe having constant opportunity costs, along the economy's *PPF* opportunity cost is increasing—the economy's *PPF* is bowed outward. Figure 3.9 illustrates. The first 30 smoothies produced (by Liz) cost 1 salad each, but the 31st smoothie produced (by Joe) costs 5 salads. Similarly, the first 30 salads produced (by Joe) cost 1/5 smoothie each, but the 31st salad produced (by Liz) costs 1 smoothie. When Liz and Joe specialize, they produce efficiently on the economy's *PPF*. Without specialization and trade, they produce at an inefficient point *inside* the economy's *PPF*.

FIGURE 3.9

The Economy's Production Possibilities

MyEconLab Animation



1. When the economy produces more than 30 salads per hour, both Liz and Joe produce salads but only Liz produces smoothies.
2. When the economy produces more than 30 smoothies per hour, both Liz and Joe produce smoothies but only Joe produces salads.
3. When Liz and Joe specialize in their comparative advantage, the economy produces 30 salads and 30 smoothies at an efficient point on the economy's *PPF*.
4. Without specialization and trade, Liz and Joe produce at an inefficient point inside the economy's *PPF*.



EYE on YOUR LIFE

Your Comparative Advantage

MyEconLab Critical Thinking Exercise

You are expanding your production possibilities by being in school and accumulating human capital.

By discovering your comparative advantage, you will be able to focus on producing the items that make you as well off as possible. Think hard about what you enjoy doing, and what you do comparatively better than others.

In today's world, it is a good idea to try to remain flexible so that you can switch jobs if you discover that your comparative advantage has changed.

Looking beyond your own self-interest, are you going to be a voice that supports or opposes offshore outsourcing?

You've learned in this chapter that regardless of whether outsourcing remains inside the United States, as it does with Liz and Joe at their smoothie bars, or is global like the outsourcing of jobs by U.S. producers to India, both parties gain from trade.

Americans pay less for goods and services and Indians earn higher incomes.

MyEconLab Study Plan 3.4
Key Terms Quiz
Solutions Video

TABLE 1 TONY'S PRODUCTION POSSIBILITIES

Snowboards (per week)		Skis (per week)
25	and	0
20	and	10
15	and	20
10	and	30
5	and	40
0	and	50

TABLE 2 PATTY'S PRODUCTION POSSIBILITIES

Snowboards (per week)		Skis (per week)
20	and	0
10	and	5
0	and	10

CHECKPOINT 3.4

Explain how people gain from specialization and trade.

Practice Problems

Tony and Patty produce skis and snowboards. Tables 1 and 2 show their production possibilities. Each week, Tony produces 5 snowboards and 40 skis and Patty produces 10 snowboards and 5 skis.

1. Who has a comparative advantage in producing snowboards? Who has a comparative advantage in producing skis?
2. If Tony and Patty specialize and trade, what are the gains from trade?

In the News

Sweet news after TPP sting
Trans-Pacific Partnership (TPP) trade deal has kept tight restrictions on Australia's sugar exports to the United States. In 2015, U.S. sugar producers received 22¢ per pound while Australian growers received the world price of 12¢ per pound.
Source: *The Land*, October 8, 2015

Which country has a comparative advantage in producing sugar? Explain why both the United States and Australia can gain from free trade in sugar.

Solutions to Practice Problems

1. The person with a comparative advantage in snowboards is the one who has the lower opportunity cost of producing a snowboard. Tony's production possibilities show that to produce 5 more snowboards he must produce 10 fewer skis. So Tony's opportunity cost of a snowboard is 2 skis.
   Patty's production possibilities show that to produce 10 more snowboards, she must produce 5 fewer skis. So Patty's opportunity cost of a snowboard is 1/2 a ski. Patty has a comparative advantage in snowboards because her opportunity cost of a snowboard is less than Tony's. Tony's comparative advantage is in skis. For each ski produced, Tony must forgo making 1/2 a snowboard, whereas Patty must forgo making 2 snowboards for a ski. So Tony's opportunity cost of a ski is lower than Patty's.
2. Patty has a comparative advantage in snowboards, so she specializes in snowboards. Tony has a comparative advantage in skis, so he specializes in skis. Patty makes 20 snowboards and Tony makes 50 skis. Before specializing, they made 15 snowboards and 45 skis. By specializing, total output increases by 5 snowboards and 5 skis. They share this gain by trading.

Solution to In the News

The cost of producing sugar is less in Australia than in the United States, so Australia has a comparative advantage in producing sugar. If Australia specializes in producing sugar and the United States specializes in producing other goods (for example, movies or airplanes) and the two countries engage in free trade, each country can gain and get to a point outside its own *PPF*.

CHAPTER SUMMARY

Key Points

1. Explain and illustrate the concepts of scarcity, production efficiency, and tradeoff using the production possibilities frontier.

- The production possibilities frontier, *PPF*, describes the limits to what can be produced by using all the available resources efficiently.
- Points inside and on the *PPF* are attainable. Points outside the *PPF* are unattainable.
- Production at any point on the *PPF* achieves production efficiency. Production at a point inside the *PPF* is inefficient.
- When production is efficient—on the *PPF*—people face a tradeoff. If production is at a point inside the *PPF*, there is a free lunch to be had.

2. Calculate opportunity cost.

- Along the *PPF*, the opportunity cost of *X* (the item measured on the *x*-axis) is the decrease in *Y* (the item measured on the *y*-axis) divided by the increase in *X*.
- The opportunity cost of *Y* is the inverse of the opportunity cost of *X*.
- The opportunity cost of producing a good increases as the quantity of the good produced increases.

3. Explain what makes production possibilities expand.

- Technological change and increases in capital and human capital expand production possibilities.
- The opportunity cost of economic growth is the decrease in current consumption.

4. Explain how people gain from specialization and trade.

- A person has a comparative advantage in an activity if he or she can perform that activity at a lower opportunity cost than someone else.
- People gain by increasing the production of the item in which they have a comparative advantage and trading.

Key Terms

MyEconLab Key Terms Quiz

Absolute advantage, 73
Comparative advantage, 73
Economic growth, 70
Production efficiency, 62
Production possibilities frontier, 60
Tradeoff, 63

MyEconLab Chapter 3 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

TABLE 1

Corn (bushels)		Beef (pounds)
250	and	0
200	and	300
100	and	500
0	and	600

TABLE 2

Labor (hours)	Entertainment (units)		Good food (units)
0	0	or	0
10	20	or	30
20	40	or	50
30	60	or	60
40	80	or	65
50	100	or	67

FIGURE 1

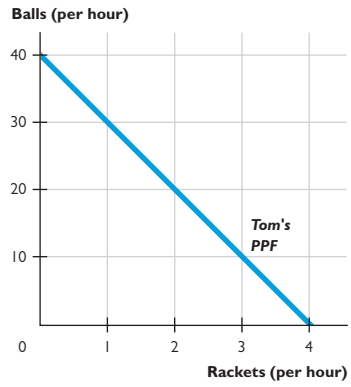
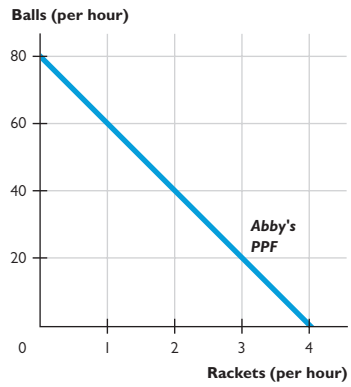


FIGURE 2



1. Table 1 shows the quantities of corn and beef that a farm can produce in a year. Draw a graph of the farm's *PPF*. Mark on the graph.

- An inefficient combination of corn and beef—label this point *A*.
- An unattainable combination of corn and beef—label this point *B*.
- An efficient combination of corn and beef—label this point *C*.

Use the following information to work Problems **2** and **3**.

The people of Leisure Island have 50 hours of labor a day that can be used to produce entertainment and good food. Table 2 shows the maximum quantity of *either* entertainment *or* good food that Leisure Island can produce with different quantities of labor.

2. Is an output of 50 units of entertainment and 50 units of good food attainable and efficient? With a production of 50 units of entertainment and 50 units of good food, do the people of Leisure Island face a tradeoff?

3. What is the opportunity cost of producing an additional unit of entertainment? Explain how the opportunity cost of producing a unit of entertainment changes as more entertainment is produced.

Use the following information to work Problems **4** and **5**.

Malaria can be controlled

The World Health Organization's malaria chief says that it is too costly to try to fully eradicate the disease. He says that by using nets, medicine, and DDT it is possible to eliminate 90 percent of malaria cases. But to eliminate 100 percent of cases would be extremely costly.

Source: *The New York Times*, March 4, 2008

4. Make a graph of the production possibilities frontier with malaria control on the *x*-axis and other goods and services on the *y*-axis.

5. Describe how the opportunity cost of controlling malaria changes as more resources are used to reduce the number of malaria cases.

6. Explain how the following events influence U.S. production possibilities:

- Some retail workers are re-employed building dams and wind farms.
- More people take early retirement.
- Drought devastates California's economy.

Use the following information to work Problems **7** and **8**.

Figures 1 and 2 show Tom's and Abby's production possibilities. Tom uses all his resources and produces 2 rackets and 20 balls an hour. Abby uses all her resources and produces 2 rackets and 40 balls an hour.

7. What is Tom's opportunity cost of producing a racket? What is Abby's opportunity cost of a racket? Who has a comparative advantage in producing rackets? Who has a comparative advantage in producing balls?

8. If Tom and Abby specialize and trade balls and rackets at the price of 15 balls per racket, what are Tom's and Abby's gains from trade?

9. Read *Eye on the Environment* on p. 68 and describe a tradeoff faced when deciding how to generate electricity and whether to use wind power.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

Use the following information to work Problems **1** to **4**.

Representatives Waxman of California and Markey of Massachusetts proposed a law to limit greenhouse gas emissions from electricity generation and require electricity producers to generate a minimum percentage of power using renewable fuels, with some emission rights to be auctioned. The Congressional Budget Office estimated that the government would receive $846 billion from auctions and would spend $821 billion on incentive programs and compensation for higher energy prices. Electricity producers would spend $208 million a year to comply with the new rules. (Think of these dollar amounts as dollars' worth of other goods and services.)

1. Would the Waxman-Markey law achieve production efficiency?

2. Is the $846 billion that electricity producers would pay for the right to emit greenhouse gasses part of the opportunity cost of producing electricity?

3. Is the $821 billion that the government would spend on incentive programs and compensation for higher energy prices part of the opportunity cost of producing electricity?

4. Is the $208 million that electricity producers will spend to comply with the new rules part of the opportunity cost of producing electricity?

5. The people of Foodland have 40 hours of labor a day to bake pizza and bread. Table 1 shows the maximum quantity of *either* pizza *or* bread that Foodland can bake with different quantities of labor. Can Foodland produce 30 pizzas and 30 loaves of bread a day? If it can, is this output efficient, do the people of Foodland face a tradeoff, and what is the opportunity cost of producing an additional pizza?

TABLE 1

Labor (hours)	Pizzas		Bread (loaves)
0	0	or	0
10	30	or	10
20	50	or	20
30	60	or	30
40	65	or	40

Use Table 2, which shows a farm's production possibilities, to work Problems **6** and **7**.

6. If the farm uses its resources efficiently, what is the opportunity cost of an increase in chicken production from 300 pounds to 500 pounds a year? Explain your answer.

7. If the farm adopted a new technology, which allows it to use fewer resources to fatten chickens, explain how the farm's production possibilities will change. Explain how the opportunity cost of producing a bushel of soybean will be affected.

TABLE 2

Soybean (bushels per year)		Chicken (pounds per year)
500	and	0
400	and	300
200	and	500
0	and	600

8. In an hour, Sue can produce 40 caps or 4 jackets and Tessa can produce 80 caps or 4 jackets. Who has a comparative advantage in producing caps? If Sue and Tessa specialize and trade, who will gain?

Use the following opinion to work Problems **9** to **11**.

Free Internet?

Everyone should have free Internet access to education, news, jobs, and more.

9. Explain how Internet access has changed the production possibilities and the opportunity cost of producing education and news.

10. Sketch a *PPF* curve with education and news on the *x*-axis and other goods and services on the *y*-axis before and after the Internet.

11. Explain why it is not possible for everyone to have free Internet access to education, news, jobs, and more.

MyEconLab Chapter 3 Study Plan

Multiple Choice Quiz

TABLE 1

Possibility	Fish (pounds)		Berries (pounds)
A	0	and	40
B	1	and	36
C	2	and	30
D	3	and	22
E	4	and	12
F	5	and	0

1. Table 1 shows the production possibilities of an island community. Choose the best statement.

A. This community has enough resources to produce 2 pounds of fish and 36 pounds of berries.
B. This community cannot produce 2 pounds of fish and 36 pounds of berries because this combination is inefficient.
C. This community will waste resources if it produces 2 pounds of fish and 22 pounds of berries.
D. This community can produce 2 pounds of fish and 30 pounds of berries but this combination is inefficient.

2. Table 1 shows the production possibilities of an island community. Choose the best statement.

A. Suppose that this community produces 3 pounds of fish and 20 pounds of berries. If it decides to gather more berries, it faces a tradeoff.
B. When this community produces 4 pounds of fish and 12 pounds of berries it faces a tradeoff, but it is inefficient.
C. Suppose that this community produces 5 pounds of fish and 0 pounds of berries. If it decides to gather some berries, it will get a free lunch.
D. If this community produces 3 pounds of fish and 22 pounds of berries, production is efficient but to produce more fish it faces a tradeoff.

3. Table 1 shows the production possibilities of an island community. This community's opportunity cost of producing 1 pound of fish _____.

A. is the increase in the quantity of berries gathered as the quantity of fish increases by 1 pound
B. increases as the quantity of berries gathered increases
C. is 10 pounds of berries if the quantity of fish increases from 2 to 3 pounds
D. increases as the quantity of fish caught increases

4. Table 1 shows the production possibilities of an island community. Choose the best statement.

A. When a drought hits the island, its *PPF* rotates outward.
B. When the islanders discover a better way of catching fish, the island's *PPF* rotates outward.
C. When islanders reduce the time they spend gathering berries, the *PPF* rotates inward.
D. If the islanders decide to spend more time gathering berries but continue to spend the same amount of time fishing, they face a tradeoff.

5. Mary makes 10 pies and 20 cakes a day and her opportunity cost of producing a cake is 2 pies. Tim makes 20 pies and 10 cakes a day and his opportunity cost of producing a cake is 4 pies. If Mary and Tim specialize in producing the good in which each has a comparative advantage, _____.

A. Mary produces only pies
B. Tim produces both pies and cakes
C. Mary produces only cakes while Tim produces only pies
D. Tim produces only cakes while Mary produces only pies



Why did the price of coffee rise in 2014?

4

Demand and Supply

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Distinguish between quantity demanded and demand, and explain what determines demand.
2. Distinguish between quantity supplied and supply, and explain what determines supply.
3. Explain how demand and supply determine price and quantity in a market, and explain the effects of changes in demand and supply.

MyEconLab Big Picture Video

COMPETITIVE MARKETS

When you want a latte you go to a coffee shop. When a coffee shop needs to restock with beans and milk, it calls its suppliers of those items. You, your favorite coffee shop, and the shop's suppliers are trading in *markets*.

You learned in Chapter 2 that a market is any arrangement that brings buyers and sellers together. A market has two sides: demand (buyers) and supply (sellers). There are markets for *goods* such as a latte and a bagel, running shoes, apples, and hiking boots; for *services* such as airplane trips, haircuts, and tennis lessons; for *resources* such as coffee beans, computer programmers, and tractors; and for *manufactured components* such as memory chips and auto parts. There are also markets for money such as Japanese yen and for financial securities such as Facebook stock. Only imagination limits what can be traded in markets.

Some markets are physical places where buyers and sellers meet and where an auctioneer or a broker helps to determine the prices. Examples of this type of market are the New York Stock Exchange; wholesale fish, meat, and produce markets; and used car auctions.

Some markets are virtual spaces where buyers and sellers never meet face-to-face but connect over telephone lines or the Internet. Examples include currency markets, e-commerce Web sites such as Amazon.com and iTunes, auction sites such as eBay, and travel Web sites.

But most markets are unorganized collections of buyers and sellers. You do most of your trading in this type of market. An example is the market for coffee and snacks. The buyers in this $75-billion-a-year market are the more than 100 million Americans who regularly drink coffee. The sellers are the 55,000 coffee shops and snack bars. Each buyer can visit several different sellers, and each seller knows that the buyer has a choice of many alternatives.

Markets vary in the intensity of competition that buyers and sellers face. In this chapter, we're going to study a *competitive market* that has so many buyers and so many sellers that no single buyer or seller can influence the price.



Markets for coffee and a bagel …



running shoes …



and airline travel.

4.1 DEMAND

MyEconLab Concept Video

First, we'll study the behavior of buyers in a competitive market. The **quantity demanded** of any good, service, or resource is the amount that people are willing and able to buy during a specified period at a specified price. For example, when spring water costs $1 a bottle, you decide to buy 2 bottles a day. The 2 bottles a day is your quantity demanded of spring water.

Quantity demanded
The amount of any good, service, or resource that people are willing and able to buy during a specified period at a specified price.

The quantity demanded is measured as an amount *per unit of time*. For example, your quantity demanded of water is 2 bottles *per day*. We could express this quantity as 14 bottles per week, or some other number per month or per year. A particular number of bottles without a time dimension has no meaning.

Many things influence buying plans, and one of them is price. We look first at the relationship between quantity demanded and price. To study this relationship, we keep all other influences on buying plans the same and we ask: How, other things remaining the same, does the quantity demanded of a good change as its price varies? The law of demand provides the answer.

The Law of Demand

The **law of demand** states

> **Other things remaining the same, if the price of a good rises, the quantity demanded of that good decreases; and if the price of a good falls, the quantity demanded of that good increases.**

Law of demand
Other things remaining the same, if the price of a good rises, the quantity demanded of that good decreases; and if the price of a good falls, the quantity demanded of that good increases.

So the law of demand states that when all other things remain the same, if the price of an iPhone falls, people will buy more iPhones; or if the price of a baseball ticket rises, people will buy fewer baseball tickets.

Why does the quantity demanded increase if the price falls, all other things remaining the same?

The answer is that, faced with a limited budget, people always have an incentive to find the best deals available. If the price of one item falls and the prices of all other items remain the same, the item with the lower price is a better deal than it was before, so some people buy more of this item. Suppose, for example, that the price of bottled water fell from $2 a bottle to $1.50 a bottle while the price of Gatorade remained at $2 a bottle. Wouldn't some people switch from Gatorade to water? By doing so, they save 50¢ a bottle, which they can spend on other things they previously couldn't afford.

Think about the things that you buy and ask yourself: Which of these items does *not* obey the law of demand? If the price of a new textbook were lower, other things remaining the same (including the price of a used textbook), would you buy more new textbooks? Then think about all the things that you do not buy but would if you could afford them. How cheap would a computer have to be for you to buy *both* a tablet and a laptop? There is a price that is low enough to entice you!

Demand Schedule and Demand Curve

Demand is the relationship between the quantity demanded and the price of a good when all other influences on buying plans remain the same. The quantity demanded is *one* quantity at *one* price. *Demand* is a *list of quantities at different prices* illustrated by a demand schedule and a demand curve.

Demand
The relationship between the quantity demanded and the price of a good when all other influences on buying plans remain the same.

Demand schedule
A list of the quantities demanded at each different price when all the other influences on buying plans remain the same.

Demand curve
A graph of the relationship between the quantity demanded of a good and its price when all the other influences on buying plans remain the same.

A **demand schedule** is a list of the quantities demanded at each different price when *all the other influences on buying plans remain the same.* The table in Figure 4.1 is one person's (Tina's) demand schedule for bottled water. This schedule tells us that if the price of water is $2.00 a bottle, Tina buys no water. Her quantity demanded is 0 bottles a day. If the price of water is $1.50 a bottle, her quantity demanded is 1 bottle a day. Tina's quantity demanded increases to 2 bottles a day at a price of $1.00 a bottle and to 3 bottles a day at a price of 50¢ a bottle.

A **demand curve** is a graph of the relationship between the quantity demanded of a good and its price when all the other influences on buying plans remain the same. The points on the demand curve labeled *A* through *D* represent the rows *A* through *D* of the demand schedule. For example, point *B* on the graph represents row *B* of the demand schedule and shows that the quantity demanded is 1 bottle a day when the price is $1.50 a bottle. Point *C* on the demand curve represents row *C* of the demand schedule and shows that the quantity demanded is 2 bottles a day when the price is $1.00 a bottle.

The downward slope of the demand curve illustrates the law of demand. Along the demand curve, when the price of the good *falls*, the quantity demanded *increases.* For example, in Figure 4.1, when the price of a bottle of water falls from $1.00 to 50 cents, the quantity demanded increases from 2 bottles a day to 3 bottles a day. Conversely, when the price *rises*, the quantity demanded *decreases.* For example, when the price rises from $1.00 to $1.50 a bottle, the quantity demanded decreases from 2 bottles a day to 1 bottle a day.

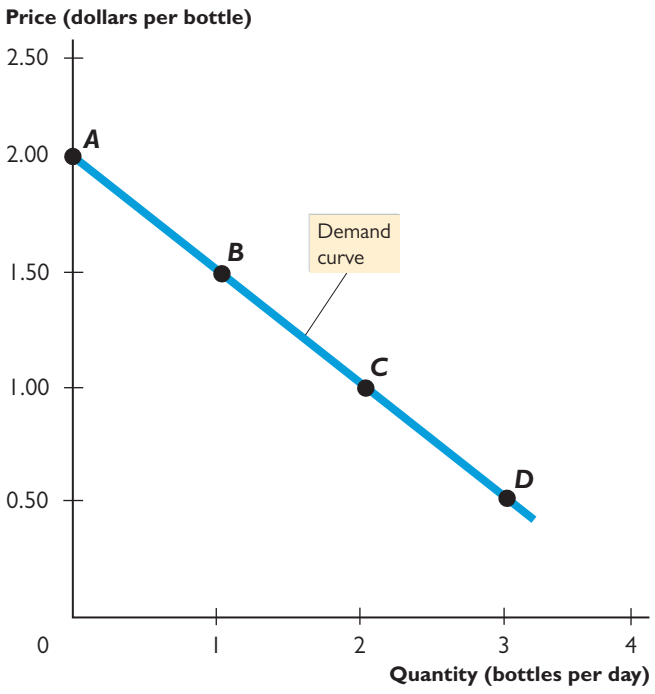
FIGURE 4.1
Demand Schedule and Demand Curve

MyEconLab Animation

The table shows Tina's demand schedule that lists the quantity of water demanded at each price if all other influences on buying plans remain the same. At a price of $1.50 a bottle, the quantity demanded is 1 bottle a day.

The demand curve shows the relationship between the quantity demanded and price, other things remaining the same. The downward-sloping demand curve illustrates the law of demand. When the price falls, the quantity demanded increases; and when the price rises, the quantity demanded decreases.

	Price (dollars per bottle)	Quantity demanded (bottles per day)
A	2.00	0
B	1.50	1
C	1.00	2
D	0.50	3



Individual Demand and Market Demand

The demand schedule and the demand curve that you've just studied are for one person. To study a market, we must determine the market demand.

Market demand is the sum of the demands of all the buyers in a market. To find the market demand, imagine a market in which there are only two buyers: Tina and Tim. The table in Figure 4.2 shows three demand schedules: Tina's, Tim's, and the market demand schedule. Tina's demand schedule is the same as before. It shows the quantity of water demanded by Tina at each different price. Tim's demand schedule tells us the quantity of water demanded by Tim at each price. To find the quantity of water demanded in the market, we sum the quantities demanded by Tina and Tim. For example, at a price of $1.00 a bottle, the quantity demanded by Tina is 2 bottles a day, the quantity demanded by Tim is 1 bottle a day, and so the quantity demanded in the market is 3 bottles a day.

Tina's demand curve in part (a) and Tim's demand curve in part (b) are graphs of the two individual demand schedules. The market demand curve in part (c) is a graph of the market demand schedule. At a given price, the quantity demanded on the market demand curve equals the horizontal sum of the quantities demanded on the individual demand curves.

FIGURE 4.2

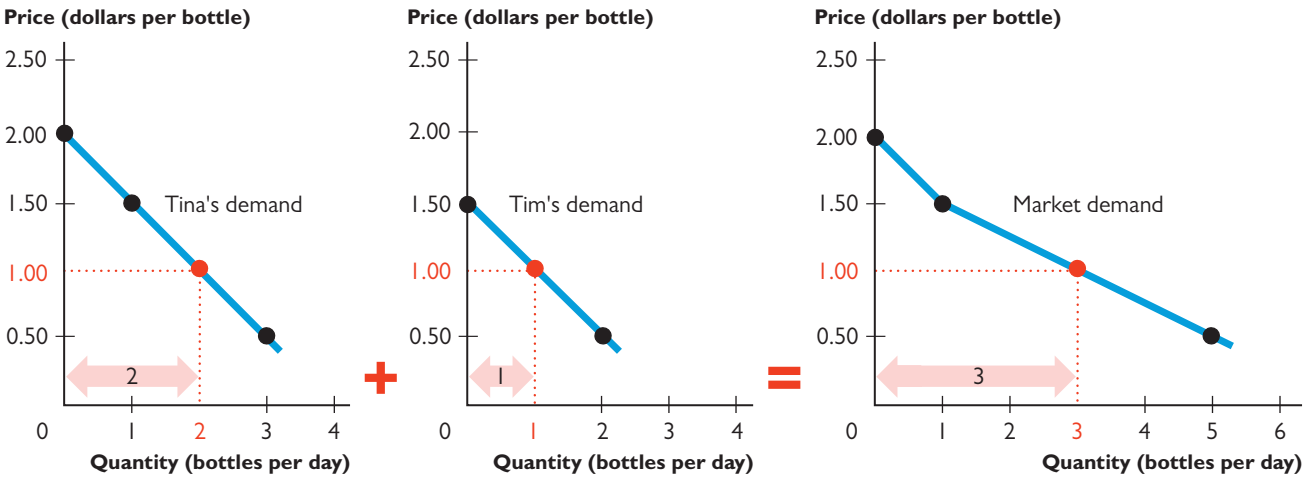
Individual Demand and Market Demand

MyEconLab Animation

Price (dollars per bottle)	Quantity demanded (bottles per day)				
	Tina		Tim		Market
2.00	0		0		0
1.50	1		0		1
1.00	2	+	1	=	3
0.50	3		2		5

The market demand schedule is the sum of the individual demand schedules, and the market demand curve is the horizontal sum of the individual demand curves.

At a price of $1 a bottle, the quantity demanded by Tina is 2 bottles a day and the quantity demanded by Tim is 1 bottle a day, so the total quantity demanded in the market is 3 bottles a day.



MyEconLab Concept Video

Changes in Demand

Change in demand
A change in the quantity that people plan to buy when any influence on buying plans other than the price of the good changes.

The demand curve shows how the quantity demanded changes when the price of the good changes but *all other influences on buying plans remain the same.* When any of these other influences on buying plans change, there is a **change in demand**, which means that there is a new demand schedule and new demand curve. *The demand curve shifts.*

Demand can either increase or decrease and Figure 4.3 illustrates the two cases. Initially, the demand curve is D_0. When demand decreases, the demand curve shifts leftward to D_1. On demand curve D_1, the quantity demanded at each price is smaller. When demand increases, the demand curve shifts rightward to D_2. On demand curve D_2, the quantity demanded at each price is greater.

The main influences on buying plans that change demand are

- Prices of related goods
- Expected future prices
- Income
- Expected future income and credit
- Number of buyers
- Preferences

Prices of Related Goods

Substitute
A good that can be consumed in place of another good.

Complement
A good that is consumed with another good.

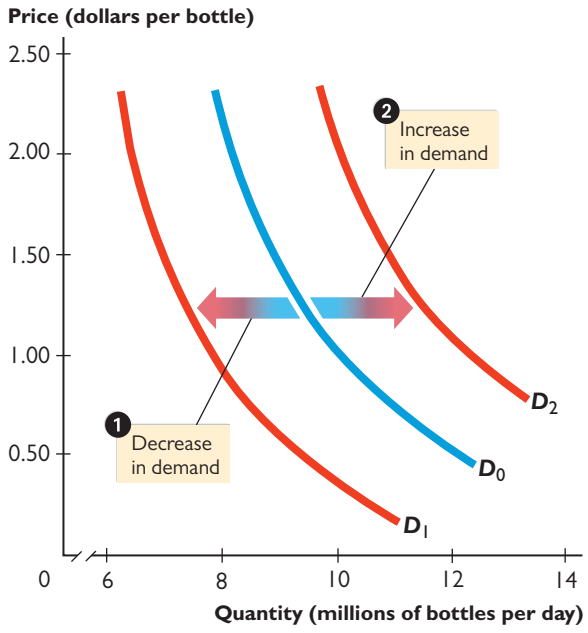
Goods have substitutes and complements. A **substitute** for a good is another good that can be consumed in its place. Chocolate cake is a substitute for cheesecake, and bottled water is a substitute for Gatorade. A **complement** of a good is another good that is consumed with it. A helmet is a complement of a bike, and bottled water is a complement of fitness center services.

FIGURE 4.3
Changes in Demand

MyEconLab Animation

A change in any influence on buying plans, other than a change in the price of the good itself, changes demand and shifts the demand curve.

1. When demand decreases, the demand curve shifts leftward from D_0 to D_1.
2. When demand increases, the demand curve shifts rightward from D_0 to D_2.



The demand for a good and the price of one of its substitutes move in the *same direction.* The demand for a good *increases* if the price of one of its substitutes *rises* and *decreases* if the price of one of its substitutes *falls.* For example, the demand for cheesecake increases when the price of chocolate cake rises.

The demand for a good and the price of one of its complements move in *opposite directions.* The demand for a good *decreases* if the price of one of its complements *rises* and *increases* if the price of one of its complements *falls.* For example, the demand for helmets decreases when the price of a bike rises.

Expected Future Prices

A rise in the expected *future* price of a good increases the *current* demand for that good and a fall in the expected *future* price decreases *current* demand. If you expect the price of noodles to rise next week, you buy a big enough stockpile to get you through the next few weeks. Your demand for noodles today has increased. If you expect the price of noodles to fall next week, you buy none now and plan to buy next week. Your demand for noodles today has decreased.

Income

A rise in income brings an increase in demand and a fall in income brings a decrease in demand for a **normal good**. A rise in income brings a *decrease* in demand and a fall in income brings an *increase* in demand for an **inferior good**. For example, if your income increases and you decide to buy more chicken and less pasta, for you, chicken is a normal good and pasta is an inferior good.

Normal good
A good for which demand increases when income increases and demand decreases when income decreases.

Inferior good
A good for which demand decreases when income increases and demand increases when income decreases.

Expected Future Income and Credit

When income is expected to increase in the future, or when credit is easy to get and the cost of borrowing is low, the demand for some goods increases. And when income is expected to decrease in the future, or when credit is hard to get and the cost of borrowing is high, the demand for some goods decreases.

Changes in expected future income and the availability and cost of credit have the greatest effect on the demand for big ticket items such as homes and automobiles. Modest changes in expected future income or credit availability bring large swings in the demand for these items.

Number of Buyers

The greater the number of buyers in a market, the larger is demand. For example, the demand for parking spaces, movies, bottled water, or just about anything is greater in New York City than it is in Boise, Idaho.

Preferences

Tastes or *preferences,* as economists call them, influence demand. When preferences change, the demand for one item increases and the demand for another item (or items) decreases. For example, preferences have changed as people have become better informed about the health hazards of tobacco. This change in preferences has decreased the demand for cigarettes and has increased the demand for nicotine patches. Preferences also change when new goods become available. For example, the development of smartphones has decreased the demand for landlines and has increased the demand for Internet service.

Change in Quantity Demanded Versus Change in Demand

Change in the quantity demanded
A change in the quantity of a good that people plan to buy that results from a change in the price of the good with all other influences on buying plans remaining the same.

The influences on buyers' plans that you've just seen bring a *change in demand.* These are all the influences on buying plans *except for the price of the good.* To avoid confusion, when *the price of the good changes* and all other influences on buying plans remain the same, we say there has been a **change in the quantity demanded**.

The distinction between a change in demand and a change in the quantity demanded is crucial for working out how a market responds to the forces that hit it. Figure 4.4 illustrates and summarizes the distinction:

- If the price of bottled water *rises* when other things remain the same, the quantity demanded of bottled water *decreases* and there is a *movement up* along the demand curve D_0. If the price *falls* when other things remain the same, the quantity demanded *increases* and there is a *movement down* along the demand curve D_0.
- If some influence on buyers' plans other than the price of bottled water changes, there is a change in demand. When the demand for bottled water *decreases*, the demand curve *shifts leftward* to D_1. When the demand for bottled water *increases*, the demand curve *shifts rightward* to D_2.

When you are thinking about the influences on demand, try to get into the habit of asking: Does this influence change the quantity demanded or does it change demand? The test is: Did the price of the good change or did some other influence change? If the price changed, then quantity demanded changed. If some other influence changed and the price remained constant, then demand changed.

FIGURE 4.4
Change in Quantity Demanded Versus Change in Demand

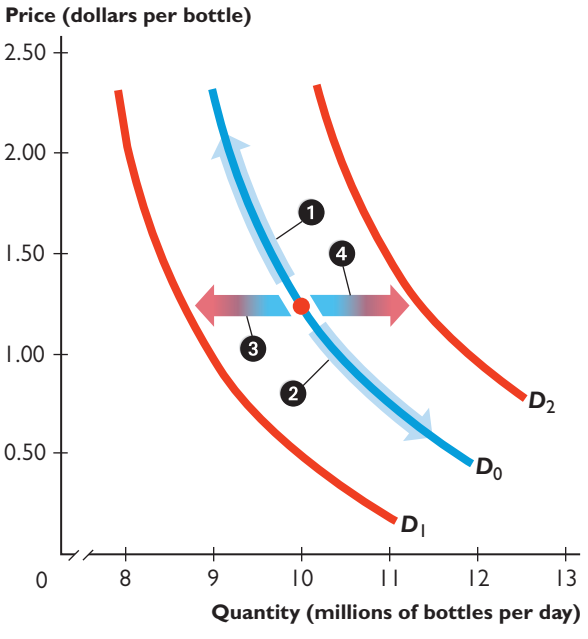
MyEconLab Animation

1 A decrease in the quantity demanded
The quantity demanded decreases and there is a movement up along the demand curve D_0 if the price of the good rises and other things remain the same.

3 A decrease in demand
Demand decreases and the demand curve shifts leftward (from D_0 to D_1) if

- The price of a substitute falls or the price of a complement rises.
- The price of the good is expected to fall.
- Income decreases.*
- Expected future income or credit decreases.
- The number of buyers decreases.

* Bottled water is a normal good.



2 An increase in the quantity demanded
The quantity demanded increases and there is a movement down along the demand curve D_0 if the price of the good falls and other things remain the same.

4 An increase in demand
Demand increases and the demand curve shifts rightward (from D_0 to D_2) if

- The price of a substitute rises or the price of a complement falls.
- The price of the good is expected to rise.
- Income increases.
- Expected future income or credit increases.
- The number of buyers increases.

CHECKPOINT 4.1

MyEconLab Study Plan 4.1
Key Terms Quiz
Solutions Video

Distinguish between quantity demanded and demand, and explain what determines demand.

Practice Problems

The following events occur one at a time in the market for smartphones:

- The price of a smartphone falls.
- Producers announce that the price of a smartphone will fall next month.
- The price of a call made from a smartphone falls.
- The price of a call made from a land-line phone increases.
- An increase in memory makes smartphones more popular.

1. Explain the effect of each event on the demand for smartphones.
2. Use a graph to illustrate the effect of each event.
3. Does any event (or events) illustrate the law of demand?

In the News

Airline profits soar yet no relief for passengers
Airplanes are more crowded than ever and fares are at a five-year high.
Source: *USA Today*, January 27, 2015

Does this news clip imply that the law of demand doesn't work in the real world? Explain why or why not.

Solutions to Practice Problems

1. A fall in the price of a smartphone increases the quantity of smartphones demanded but has no effect on the demand for smartphones.
   With the producers' announcement, the expected future price of a smartphone falls, which decreases the demand for smartphones today.
   A fall in the price of a call from a smartphone increases the demand for smartphones because a smartphone call and a smartphone are complements.
   A rise in the price of a call from a land-line phone increases the demand for smartphones because a land-line phone and a smartphone are substitutes.
   With smartphones more popular, the demand for smartphones increases.
2. Figure 1 illustrates the effect of a fall in the price of a smartphone as a movement along the demand curve *D*.
   Figure 2 illustrates the effect of an increase in the demand for smartphones as the shift of the demand curve from D_0 to D_1 and a decrease in the demand for smartphones as the shift of the demand curve from D_0 to D_2.
3. A fall in the price of a smartphone (other things remaining the same) illustrates the law of demand. Figure 1 illustrates the law of demand. The other events change demand and do not illustrate the law of demand.

FIGURE 1

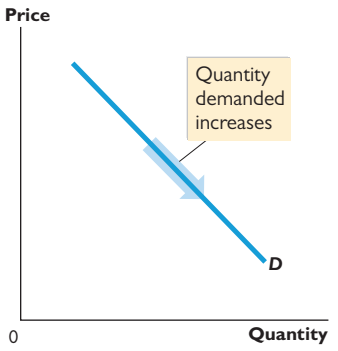
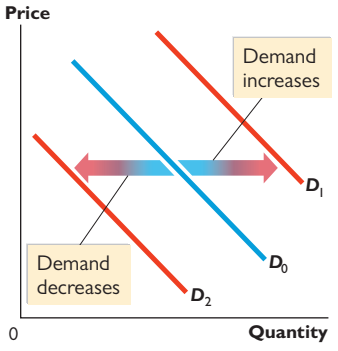


FIGURE 2



Solution to In the News

The law of demand states: If the price of an airline ticket rises, other things remaining the same, the quantity demanded of airline tickets will decrease. The demand curve for airline tickets slopes downward. The law of demand does work in the real world. Airlines can fill planes at high fares because "other things" have not remained the same. The demand for air travel has increased.

MyEconLab Concept Video

4.2 SUPPLY

A market has two sides. On one side are the buyers, or demanders, that we've just studied. On the other side of the market are the sellers, or suppliers. We now study the forces that determine suppliers' plans.

Quantity supplied
The amount of any good, service, or resource that people are willing and able to sell during a specified period at a specified price.

The **quantity supplied** of a good, service, or resource is the amount that people are willing and able to sell during a specified period at a specified price. For example, when the price of spring water is $1.50 a bottle, a spring owner decides to sell 2,000 bottles a day. The 2,000 bottles a day is the quantity supplied of spring water by this individual producer. (As in the case of demand, the quantity supplied is measured as an amount *per unit of time*.)

Many things influence selling plans, and one of them is the price. We look first at the relationship between quantity supplied of a good and its price. To study this relationship, we keep all other influences on selling plans the same, and we ask: Other things remaining the same, how does the quantity supplied of a good change as its price varies? The law of supply provides the answer.

The Law of Supply

Law of supply
Other things remaining the same, if the price of a good rises, the quantity supplied of that good increases; and if the price of a good falls, the quantity supplied of that good decreases.

The **law of supply** states

> **Other things remaining the same, if the price of a good rises, the quantity supplied of that good increases; and if the price of a good falls, the quantity supplied of that good decreases.**

So the law of supply states that when all other things remain the same, if the price of bottled water rises, spring owners will offer more water for sale; if the price of a flat-screen TV falls, Sony Corp. will offer fewer flat-screen TVs for sale.

Why, other things remaining the same, does the quantity supplied increase if the price rises and decrease if the price falls? Part of the answer lies in the principle of increasing opportunity cost (see p. 68). Because factors of production are not equally productive in all activities, as more of a good is produced, the opportunity cost of producing it increases. A higher price provides the incentive to bear the higher opportunity cost of increased production. Another part of the answer is that for a given cost, the higher price brings a larger profit, so sellers have greater incentive to increase production.

Think about the resources that you own and can offer for sale to others and ask yourself: Which of these items does *not* obey the law of supply? If the wage rate for summer jobs increased, would you have an incentive to work longer hours and bear the higher opportunity cost of forgone leisure? If the bank offered a higher interest rate on deposits, would you have an incentive to save more and bear the higher opportunity cost of forgone consumption? If the used book dealer offered a higher price for last year's textbooks, would you have an incentive to sell that handy math text and bear the higher opportunity cost of visiting the library (or finding a friend) whenever you needed the book?

Supply Schedule and Supply Curve

Supply
The relationship between the quantity supplied and the price of a good when all other influences on selling plans remain the same.

Supply is the relationship between the quantity supplied and the price of a good when all other influences on selling plans remain the same. The quantity supplied is *one* quantity at *one* price. *Supply* is a *list of quantities at different prices* illustrated by a supply schedule and a supply curve.

A **supply schedule** lists the quantities supplied at each different price when all the other influences on selling plans remain the same. The table in Figure 4.5 is one firm's (Agua's) supply schedule for bottled water. It tells us that if the price of water is 50¢ a bottle, Agua plans to sell no water. Its quantity supplied is 0 bottles a day. If the price of water is $1.00 a bottle, Agua's quantity supplied is 1,000 bottles a day. Agua's quantity supplied increases to 2,000 bottles a day at a price of $1.50 a bottle and to 3,000 bottles a day at a price of $2.00 a bottle.

Supply schedule
A list of the quantities supplied at each different price when all the other influences on selling plans remain the same.

A **supply curve** is a graph of the relationship between the quantity supplied of a good and its price when all the other influences on selling plans remain the same. The points on the supply curve labeled *A* through *D* represent the rows *A* through *D* of the supply schedule. For example, point *C* on the supply curve represents row *C* of the supply schedule and shows that the quantity supplied is 1,000 bottles a day when the price is $1.00 a bottle. Point *B* on the supply curve represents row *B* of the supply schedule and shows that the quantity supplied is 2,000 bottles a day when the price is $1.50 a bottle.

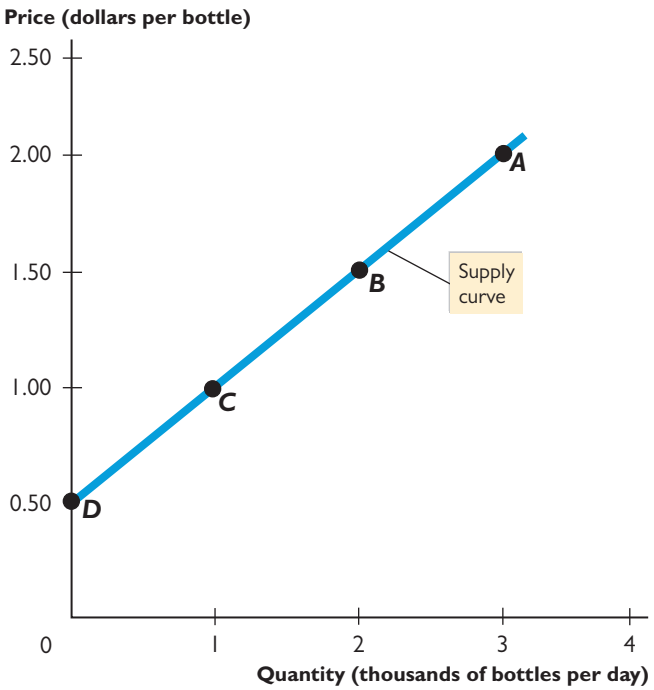
Supply curve
A graph of the relationship between the quantity supplied of a good and its price when all the other influences on selling plans remain the same.

The upward slope of the supply curve illustrates the law of supply. Along the supply curve, when the price of the good *rises*, the quantity supplied *increases*. For example, in Figure 4.5, when the price of a bottle of water rises from $1.50 to $2.00, the quantity supplied increases from 2,000 bottles a day to 3,000 bottles a day. And when the price *falls*, the quantity supplied *decreases*. For example, when the price falls from $1.50 to $1.00 a bottle, the quantity supplied decreases from 2,000 bottles a day to 1,000 bottles a day.

FIGURE 4.5
Supply Schedule and Supply Curve

MyEconLab Animation

	Price (dollars per bottle)	Quantity supplied (thousands of bottles per day)
A	2.00	3
B	1.50	2
C	1.00	1
D	0.50	0



The table shows a supply schedule that lists the quantity of water supplied at each price if all other influences on selling plans remain the same. At a price of $1.50 a bottle, the quantity supplied is 2,000 bottles a day.

The supply curve shows the relationship between the quantity supplied and price, other things remaining the same. The upward-sloping supply curve illustrates the law of supply. When the price rises, the quantity supplied increases; and when the price falls, the quantity supplied decreases.

Individual Supply and Market Supply

The supply schedule and the supply curve that you've just studied are for one seller. To study a market, we must determine the market supply.

Market supply is the sum of the supplies of all the sellers in the market. To find the market supply of water, imagine a market in which there are only two sellers: Agua and Prima. The table in Figure 4.6 shows three supply schedules: Agua's, Prima's, and the market supply schedule. Agua's supply schedule is the same as before. Prima's supply schedule tells us the quantity of water that Prima plans to sell at each price. To find the quantity of water supplied in the market, we sum the quantities supplied by Agua and Prima. For example, at a price of $1.00 a bottle, the quantity supplied by Agua is 1,000 bottles a day, the quantity supplied by Prima is 2,000 bottles a day, and the quantity supplied in the market is 3,000 bottles a day.

Agua's supply curve in part (a) and Prima's supply curve in part (b) are graphs of the two individual supply schedules. The market supply curve in part (c) is a graph of the market supply schedule. At a given price, the quantity supplied on the market supply curve equals the horizontal sum of the quantities supplied on the individual supply curves.

FIGURE 4.6

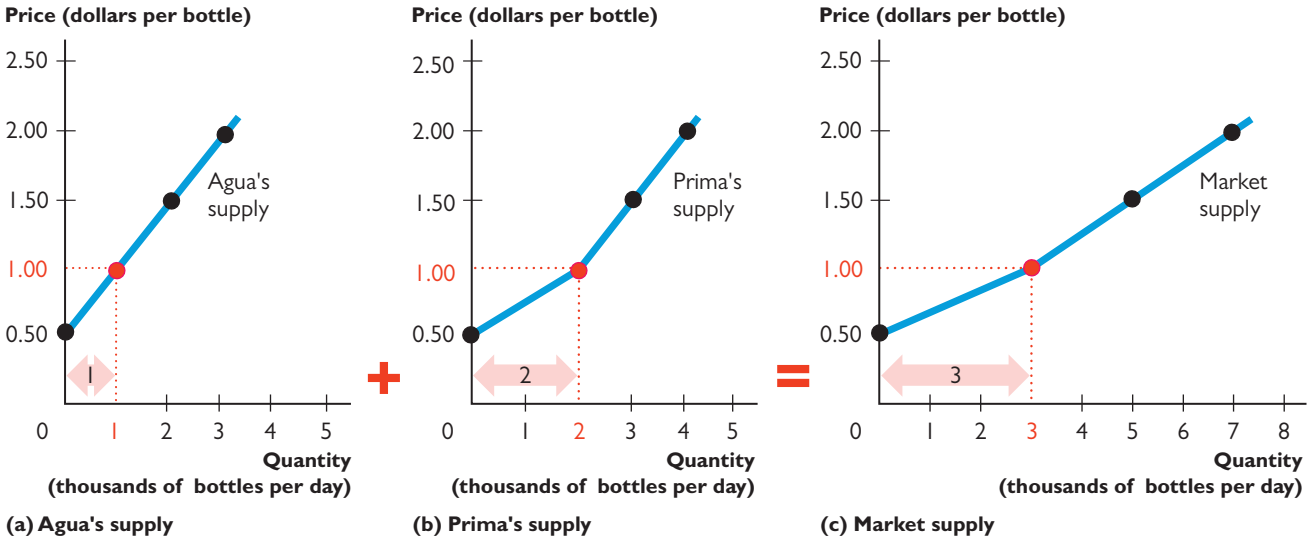
Individual Supply and Market Supply

MyEconLab Animation

Price (dollars per bottle)	Quantity supplied (thousands of bottles per day)				
	Agua		Prima		Market
2.00	3		4		7
1.50	2		3		5
1.00	1	+	2	=	3
0.50	0		0		0

The market supply schedule is the sum of the individual supply schedules, and the market supply curve is the horizontal sum of the individual supply curves.

At a price of $1 a bottle, the quantity supplied by Agua is 1,000 bottles a day and the quantity supplied by Prima is 2,000 bottles a day, so the total quantity supplied in the market is 3,000 bottles a day.



Changes in Supply

MyEconLab Concept Video

The supply curve shows how the quantity supplied changes when the price of the good changes but *all other influences on selling plans remain the same.* When any of these other influences on selling plans change, there is a **change in supply**, which means that there is a new supply schedule and new supply curve. *The supply curve shifts.*

Change in supply
A change in the quantity that suppliers plan to sell when any influence on selling plans other than the price of the good changes.

Supply can either increase or decrease, and Figure 4.7 illustrates the two cases. Initially, the supply curve is S_0. When supply decreases, the supply curve shifts leftward to S_1. On supply curve S_1, the quantity supplied at each price is smaller. When supply increases, the supply curve shifts rightward to S_2. On supply curve S_2, the quantity supplied at each price is greater.

The main influences on selling plans that change supply are

- Prices of related goods
- Prices of resources and other inputs
- Expected future prices
- Number of sellers
- Productivity

Prices of Related Goods

Related goods are either substitutes *in production* or complements *in production.* A **substitute in production** for a good is another good that can be produced in its place. Skinny jeans are substitutes in production for boot cut jeans in a clothing factory.

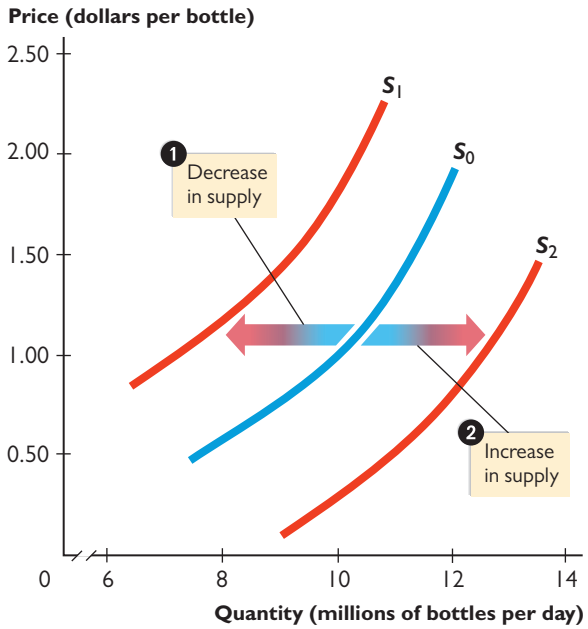
Substitute in production
A good that can be produced in place of another good.

A **complement in production** of one good is another good that is produced along with it. Cream is a complement in production of skim milk in a dairy.

Complement in production
A good that is produced along with another good.

FIGURE 4.7
Changes in Supply

MyEconLab Animation



A change in any influence on selling plans other than a change in the price of the good itself changes supply and shifts the supply curve.

1. When supply decreases, the supply curve shifts leftward from S_0 to S_1.
2. When supply increases, the supply curve shifts rightward from S_0 to S_2.

A Change in the Price of a Substitute in Production The supply of a good *decreases* if the price of one of its substitutes in production *rises;* and the supply of a good *increases* if the price of one of its substitutes in production *falls.* That is, the supply of a good and the price of one of its substitutes in production move in *opposite directions.* For example, a clothing factory can produce chinos or button-fly jeans, so these goods are substitutes in production. When the price of button-fly jeans rises, the clothing factory switches production from chinos to button-fly jeans, so the supply of chinos decreases.

A Change in the Price of a Complement in Production The supply of a good *increases* if the price of one of its complements in production *rises;* and the supply of a good *decreases* if the price of one of its complements in production *falls.* That is, the supply of a good and the price of one of its complements in production move in the *same direction.* For example, when a dairy produces skim milk, it also produces cream, so these goods are complements in production. When the price of skim milk rises, the dairy produces more skim milk, so the supply of cream increases.

Prices of Resources and Other Inputs

Supply changes when the price of a resource or other input used to produce the good changes. The reason is that resource and input prices influence the cost of production. The more it costs to produce a good, the smaller is the quantity supplied of that good at each price (other things remaining the same). For example, if the wage rate of bottling-plant workers rises, it costs more to produce a bottle of water, so the supply of bottled water decreases.

Expected Future Prices

Expectations about future prices influence supply. For example, a severe frost that wipes out Florida's citrus crop doesn't change the production of orange juice today, but it does decrease production later in the year when the current crop would normally have been harvested. Sellers of orange juice will expect the price to rise in the future. To get the higher future price, some sellers will increase their inventory of frozen juice, and this action decreases the supply of juice today.

Number of Sellers

The greater the number of sellers in a market, the larger is the supply. For example, many new sellers have developed springs and water-bottling plants in the United States, and the supply of bottled water has increased.

Productivity

Productivity is output per unit of input. An increase in productivity lowers the cost of producing the good and increases its supply. A decrease in productivity has the opposite effect and decreases supply.

Technological change and the increased use of capital increase productivity. For example, advances in electronic technology have lowered the cost of producing a computer and increased the supply of computers. Technological change brings new goods such as the iPhone 6, the supply of which was previously zero.

Natural events such as severe weather and earthquakes decrease productivity and decrease supply. For example, the four-year drought in California decreased the supply of agricultural products including nuts, fruits, and vegetables in 2015.

Change in Quantity Supplied Versus Change in Supply

The influences on sellers' plans that you've just considered bring a *change in supply*. These are all the influences on sellers' plans *except the price of the good.* To avoid confusion, when the *price of the good changes* and all other influences on selling plans remain the same, we say there has been a **change in the quantity supplied**.

Change in the quantity supplied
A change in the quantity of a good that suppliers plan to sell that results from a change in the price of the good.

The distinction between a change in supply and a change in the quantity supplied is crucial for figuring out how a market responds to the forces that hit it. Figure 4.8 illustrates and summarizes the distinction:

- If the price of bottled water *falls* when other things remain the same, the quantity supplied of bottled water *decreases* and there is a *movement down* along the supply curve S_0. If the price *rises* when other things remain the same, the quantity supplied *increases* and there is a *movement up* along the supply curve S_0.
- If any influence on water bottlers' plans other than the price of bottled water changes, there is a change in the supply of bottled water. When the supply of bottled water *decreases*, the supply curve *shifts leftward* to S_1. When the supply of bottled water *increases*, the supply curve *shifts rightward* to S_2.

When you are thinking about the influences on supply, get into the habit of asking: Does this influence change the quantity supplied or does it change supply? The test is: Did the price change or did some other influence change? If the price of the good changed, then quantity supplied changed. If some other influence changed and the price of the good remained constant, then supply changed.

FIGURE 4.8

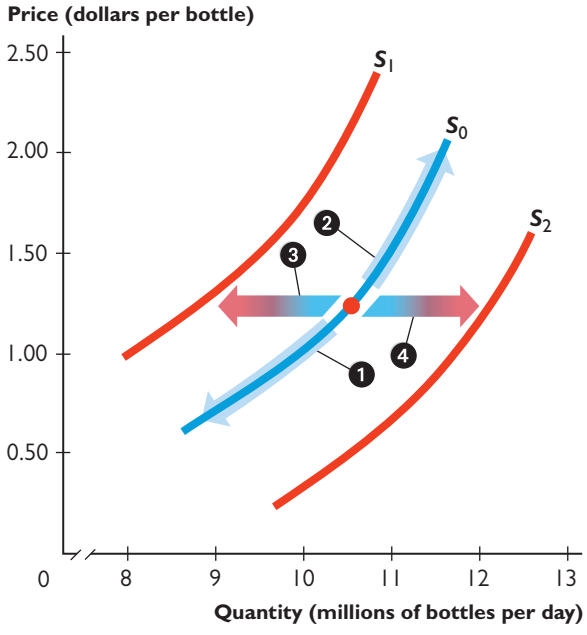
Change in Quantity Supplied Versus Change in Supply

MyEconLab Animation

1 A decrease in the quantity supplied
The quantity supplied decreases and there is a movement down along the supply curve S_0 if the price of the good falls and other things remain the same.

3 A decrease in supply
Supply decreases and the supply curve shifts leftward (from S_0 to S_1) if

- The price of a substitute in production rises.
- The price of a complement in production falls.
- A resource price or other input price rises.
- The price of the good is expected to rise.
- The number of sellers decreases.
- Productivity decreases.



2 An increase in the quantity supplied
The quantity supplied increases and there is a movement up along the supply curve S_0 if the price of the good rises and other things remain the same.

4 An increase in supply
Supply increases and the supply curve shifts rightward (from S_0 to S_2) if

- The price of a substitute in production falls.
- The price of a complement in production rises.
- A resource price or other input price falls.
- The price of the good is expected to fall.
- The number of sellers increases.
- Productivity increases.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Understanding and Using Demand and Supply

To truly understand the demand and supply model, it is a good idea to go beyond just memorizing the key terms and definitions and the lists of factors that change demand or change supply. Take ownership of the model by seeing how it explains your buying plans and your selling plans.

Your Buying Plans

Think about the things you buy: the quantities you buy and the prices you pay. These quantities and prices are points on your demand curves.

Now think about how some price changes would change your buying plans. How would your buying plans change if prices at the campus coffee shop increased? For which items would you change your quantity demanded? And for which items would you change your demand?

How would your buying plans change if you started a new job with a higher wage? What would you buy more of? What would you buy less of?

Suppose that you were just about to buy a new smartphone when Apple and Samsung announce plans to launch new phones next month. You figure that the prices of the older models will fall. How will this fall in the expected future price of a smartphone influence your buying plans?

For each thought experiment we've just described, think about whether you are sliding along a demand curve or shifting a demand curve.

Your Selling Plans

Most likely, you don't sell much stuff, but you own one precious resource that you might sell: your time.

If you have a job, think about the number of hours you work and the wage rate you earn. Are you working as many hours as you want to? If you are, you're at a point on the supply curve of your labor services.

How would you respond to a rise in the wage rate? Would you plan to work more hours or fewer hours?

Another thing you own is a pile of textbooks. Think about your selling plan for when your courses are over at the end of the semester. What is the lowest price at which you will sell this textbook? That price is a point on your supply curve of this book to the used book market.

You might also have a few old things that you'd like to sell on eBay. Again, think about your minimum supply-price—the point on your supply curve of these items.

By doing these thought experiments about your selling plans, you can make the idea of supply and the supply curve more concrete.

From Plans to Actions

Your demand and supply curves and the *market* demand and supply curves describe *plans.* They are statements about "what-if." They describe the buying plans and the selling plans at different possible prices. But when you act on your plan and buy something, someone else must have a plan to sell that item. Your buying plan must match someone else's selling plan.

Neither demand nor supply on its own tells us what actually happens in a market. To find buying plans and selling plans that match, we must look at demand and supply together. That's what you will do in the final section of this chapter. You will see how prices adjust to balance the opposing forces of demand and supply.

The Rest of Your Life

The demand and supply model is going to be a big part of the rest of your life! You will use it again and again during your economics course, so having a firm grasp of it will bring an immediate payoff.

But much more important, by understanding the laws of demand and supply and being aware of how prices adjust to balance these two opposing forces, you will have a much better appreciation of how your economic world works.

Every time you hear someone complaining about a price hike and blaming it on someone's greed, think about the market forces and how demand and supply determine that price.

As you shop for your favorite clothing, music, and food items, try to describe how supply and demand influence the prices of these goods.

CHECKPOINT 4.2

MyEconLab Study Plan 4.2
Key Terms Quiz
Solutions Video

Distinguish between quantity supplied and supply, and explain what determines supply.

Practice Problems

Lumber companies make timber beams from logs. In the process of making beams, the mill produces sawdust, which is made into pressed wood. In the market for timber beams, the following events occur one at a time:

- The wage rate of sawmill workers rises.
- The price of sawdust rises.
- The price of a timber beam rises.
- Next year's expected price of a timber beam rises.
- A new law reduces the amount of forest that can be cut for timber.
- A new technology lowers the cost of producing timber beams.

1. Explain the effect of each event on the supply of timber beams.
2. Use a graph to illustrate the effect of each event.
3. Does any event (or events) illustrate the law of supply?

In the News

Pump prices slide as crude oil falls to six-year low
The average price for regular gasoline at U.S. pumps fell almost 4¢ in March to $2.50 a gallon.The price of crude oil dropped to $43.46 per barrel on March 17, the lowest since March 2009.

Source: *Bloomberg Business,* March 23, 2015

Explain the effect of a lower crude oil price on the supply of gasoline.

Solutions to Practice Problems

1. A rise in workers' wage rates increases the cost of producing a timber beam and decreases the supply of timber beams. A rise in the price of sawdust increases the supply of timber beams because sawdust and timber beams are complements in production. A rise in the price of a timber beam increases the quantity of timber beams supplied but has no effect on the supply of timber beams. A rise in the expected price of a timber beam decreases the supply of timber beams today as producers hold back and wait for the higher price. The new law decreases the supply of timber beams. The new technology increases the supply of timber beams.
2. In Figure 1, an increase in the supply shifts the supply curve from S_0 to S_1, and a decrease in the supply shifts the supply curve from S_0 to S_2. In Figure 2, the rise in the price of a beam creates a movement along the supply curve.
3. A rise in the price of a beam, other things remaining the same, is the only event that illustrates the law of supply—see Figure 2.

Solution to In the News

Crude oil is refined to produce gasoline, so a fall in the price of crude oil lowers the cost of producing gasoline and increases the supply of gasoline.

FIGURE 1

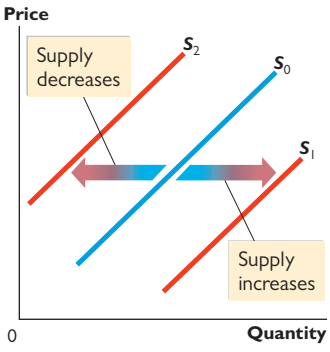
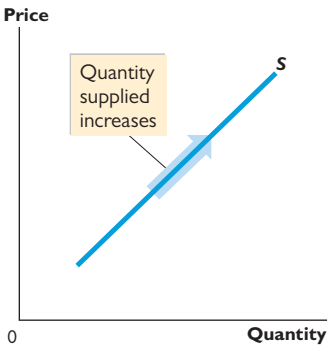


FIGURE 2



MyEconLab Concept Video

4.3 MARKET EQUILIBRIUM

Market equilibrium
When the quantity demanded equals the quantity supplied—buyers' and sellers' plans are in balance.

Equilibrium price
The price at which the quantity demanded equals the quantity supplied.

Equilibrium quantity
The quantity bought and sold at the equilibrium price.

In everyday language, "equilibrium" means "opposing forces are in balance." In a market, demand and supply are the opposing forces. **Market equilibrium** occurs when the quantity demanded equals the quantity supplied—when buyers' and sellers' plans are in balance. At the **equilibrium price**, the quantity demanded equals the quantity supplied. The **equilibrium quantity** is the quantity bought and sold at the equilibrium price.

In the market for bottled water in Figure 4.9, equilibrium occurs where the demand curve and the supply curve intersect. The equilibrium price is $1.00 a bottle, and the equilibrium quantity is 10 million bottles a day.

Price: A Market's Automatic Regulator

Law of market forces
When there is a surplus, the price falls; and when there is a shortage, the price rises.

When equilibrium is disturbed, market forces restore it. The **law of market forces** states

When there is a surplus, the price falls; and when there is a shortage, the price rises.

A *surplus* is the amount by which the quantity supplied exceeds the quantity demanded. If there is a surplus, suppliers must cut the price to sell more. Buyers are pleased to take the lower price, so the price falls. Because a surplus arises when the price is above the equilibrium price, a falling price is exactly what the market needs to restore equilibrium.

A *shortage* is the amount by which the quantity demanded exceeds the quantity supplied. If there is a shortage, buyers must pay a higher price to get more. Sellers are pleased to take the higher price, so the price rises. Because a shortage arises when the price is below the equilibrium price, a rising price is exactly what is needed to restore equilibrium.

FIGURE 4.9
Equilibrium Price and Equilibrium Quantity

MyEconLab Animation

1. Market equilibrium occurs at the intersection of the demand curve and the supply curve.
2. The equilibrium price is $1.00 a bottle.
3. At the equilibrium price, the quantity demanded and the quantity supplied are 10 million bottles a day, which is the equilibrium quantity.

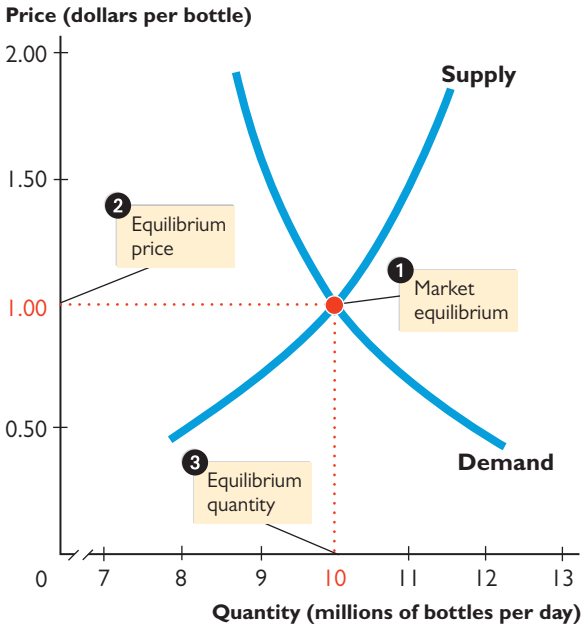
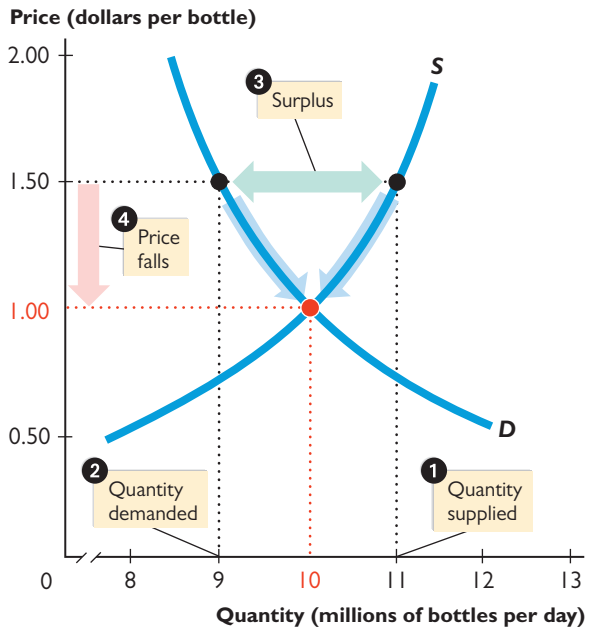


FIGURE 4.10

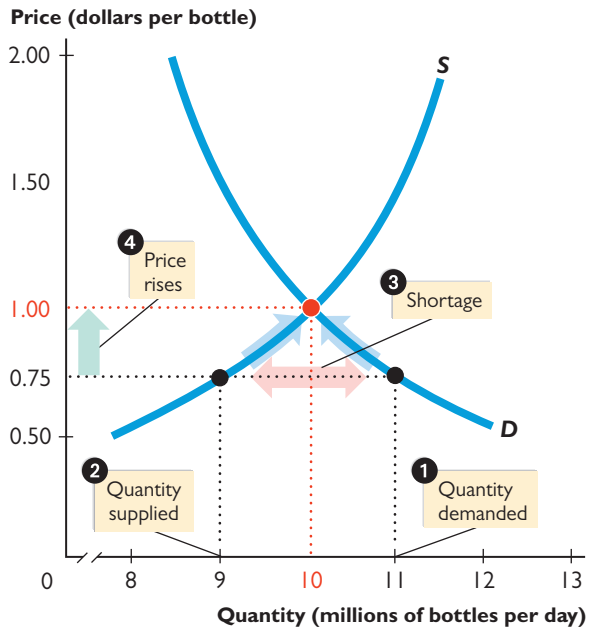
The Forces That Achieve Equilibrium

MyEconLab Animation



(a) Surplus and price falls

At $1.50 a bottle, ❶ the quantity supplied is 11 million bottles of water, ❷ the quantity demanded is 9 million bottles, ❸ the surplus is 2 million bottles, and ❹ the price falls.



(b) Shortage and price rises

At 75¢ a bottle, ❶ the quantity demanded is 11 million bottles of water, ❷ the quantity supplied is 9 million bottles, ❸ the shortage is 2 million bottles, and ❹ the price rises.

In Figure 4.10(a), at $1.50 a bottle, there is a surplus: The price falls, the quantity demanded increases, the quantity supplied decreases, and the surplus is eliminated at $1.00 a bottle.

In Figure 4.10(b), at 75¢ a bottle, there is a shortage of water: The price rises, the quantity demanded decreases, the quantity supplied increases, and the shortage is eliminated at $1.00 a bottle.

Predicting Price Changes: Three Questions

Because price adjustments eliminate shortages and surpluses, markets are normally in equilibrium. When an event disturbs an equilibrium, a new equilibrium soon emerges. To explain and predict changes in prices and quantities, we need to consider only changes in the *equilibrium* price and the *equilibrium* quantity. We can work out the effects of an event on a market by answering three questions:

1. Does the event influence demand or supply?
2. Does the event *increase* or *decrease* demand or supply—shift the demand curve or the supply curve *rightward* or *leftward*?
3. What are the new *equilibrium* price and *equilibrium* quantity and how have they changed?

MyEconLab Concept Video

Effects of Changes in Demand

Let's practice answering the three questions by working out the effects of an event in the market for bottled water: A new study says that tap water is unsafe.

1. With tap water unsafe, the demand for bottled water changes.
2. The demand for bottled water *increases*, and the demand curve *shifts rightward.* Figure 4.11(a) shows the shift from D_0 to D_1.
3. There is now a *shortage* at $1.00 a bottle. The *price rises* to $1.50 a bottle, and the quantity increases to 11 million bottles.

Note that there is *no change in supply*; the rise in price brings an *increase in the quantity supplied*—a movement along the supply curve.

Let's work out what happens if the price of a zero-calorie sports drink falls.

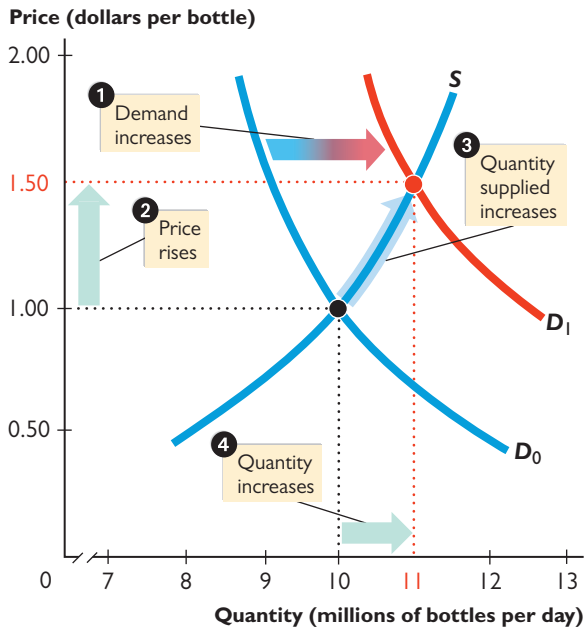
1. The sports drink is a substitute for bottled water, so when its price changes, the demand for bottled water changes.
2. The demand for bottled water *decreases*, and the demand curve *shifts leftward.* Figure 4.11(b) shows the shift from D_0 to D_2.
3. There is now a *surplus* at $1.00 a bottle. The price *falls* to 75¢ a bottle, and the quantity decreases to 9 million bottles.

Note again that there is *no change in supply;* the fall in price brings a *decrease in the quantity supplied*—a movement along the supply curve.

FIGURE 4.11

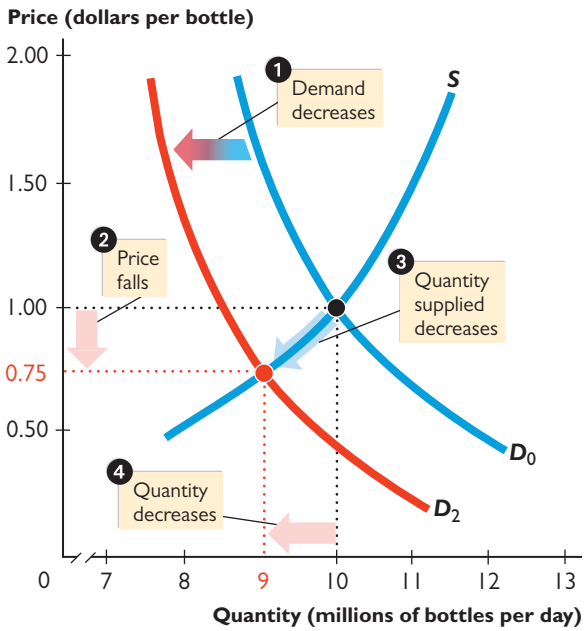
The Effects of a Change in Demand

MyEconLab Animation



(a) An increase in demand

❶ An increase in demand shifts the demand curve rightward to D_1 and creates a shortage of water. ❷ The price rises, ❸ the quantity supplied increases, and ❹ the equilibrium quantity increases.



(b) A decrease in demand

❶ A decrease in demand shifts the demand curve leftward to D_2 and creates a surplus of water. ❷ The price falls, ❸ the quantity supplied decreases, and ❹ the equilibrium quantity decreases.

EYE on the GLOBAL ECONOMY

The Markets for Cocoa and Chocolate

Fast-rising incomes in China and other developing economies and the sweet tooth of millions of newly rich middle classes are sending the consumption of chocolate soaring. With chocolate made from cocoa, the price of cocoa is soaring too.

Look at the data table below. It shows the quantities and prices of cocoa in 2010 and 2014, and it tells us that both the quantity of cocoa produced and the price of cocoa increased.

The quantity produced increased by 25 percent from 4 million tons in 2010 to 5 million tons in 2014.

The price of cocoa doubled from $1,500 to $3,000.

Why did the price of cocoa increase? Was it because demand increased or supply decreased?

You can answer this question with the information in the table. You know that an increase in demand brings a rise in the price and an increase in the quantity bought, while a decrease in supply brings a rise in the price and a decrease in the quantity bought.

Because when the price of cocoa increased, the quantity of cocoa produced and consumed also increased, the demand for cocoa must have increased.

An increase in demand is consistent with the facts about rising incomes in China and other developing economies.

Cocoa is a normal good, so an increase in income brings an increase in the demand for cocoa. The fast-rising incomes in China and other developing economies brought an increase in the demand for cocoa.

The figure illustrates the global market for cocoa in 2010 and 2014. The supply curve *S* shows the supply of cocoa, which we will assume didn't change between 2010 and 2014.

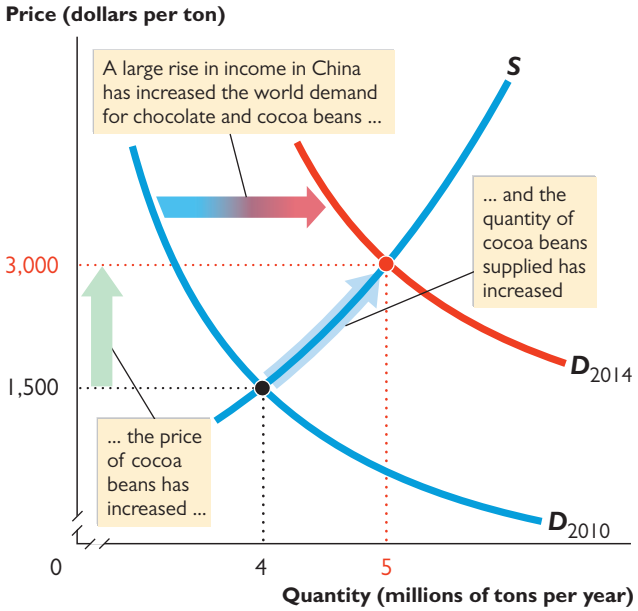
In 2010, the demand curve for cocoa was D_{2010}, the equilibrium price was $1,500 per ton and the equilibrium quantity of cocoa traded was 4 million tons.

By 2014, the higher incomes in China and other developing economies had increased the demand for cocoa to D_{2014}. The equilibrium price rose to $3,000 per ton and the equilibrium quantity traded increased to 5 million tons.

The higher price of cocoa brought an increase in the quantity of cocoa supplied, which is shown in the figure by the movement up along the supply curve of cocoa.

Year	Quantity of Cocoa (millions of tons per year)	Price of Cocoa (dollars per ton)
2010	4	1,500
2014	5	3,000





The Market for Cocoa Beans

MyEconLab Concept Video

Effects of Changes in Supply

You can get more practice working out the effects of another event in the market for bottled water: European water bottlers buy springs and open new plants in the United States.

1. With more suppliers of bottled water, the supply changes.
2. The supply of bottled water *increases*, and the supply curve *shifts rightward*. Figure 4.12(a) shows the shift from S_0 to S_1.
3. There is now a *surplus* at $1.00 a bottle. The *price falls* to 75¢ a bottle, and the quantity increases to 11 million bottles.

Note that there is *no change in demand*; the fall in price brings an *increase in the quantity demanded*—a movement along the demand curve.

What happens if a drought dries up some springs?

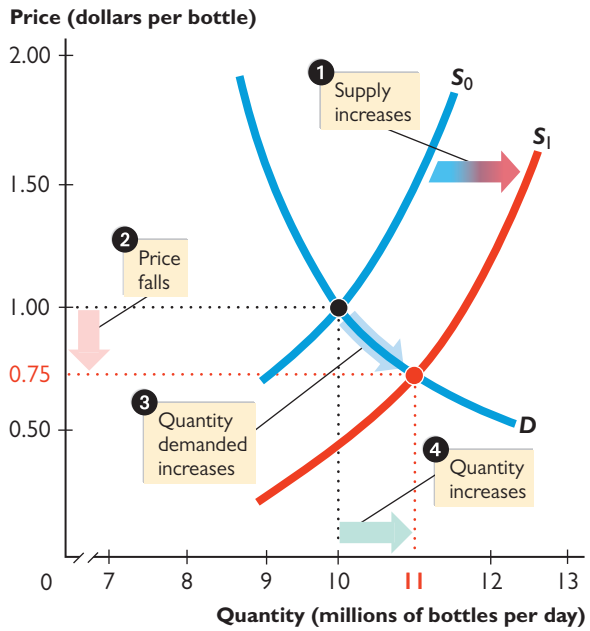
1. The drought is a change in productivity, so the supply of water changes.
2. With fewer springs, the supply of bottled water *decreases*, and the supply curve *shifts leftward*. Figure 4.12(b) shows the shift from S_0 to S_2.
3. There is now a *shortage* at $1.00 a bottle. The *price rises* to $1.50 a bottle, and the quantity decreases to 9 million bottles.

Again, there is *no change in demand*; the rise in price brings a *decrease in the quantity demanded*—a movement along the demand curve.

FIGURE 4.12

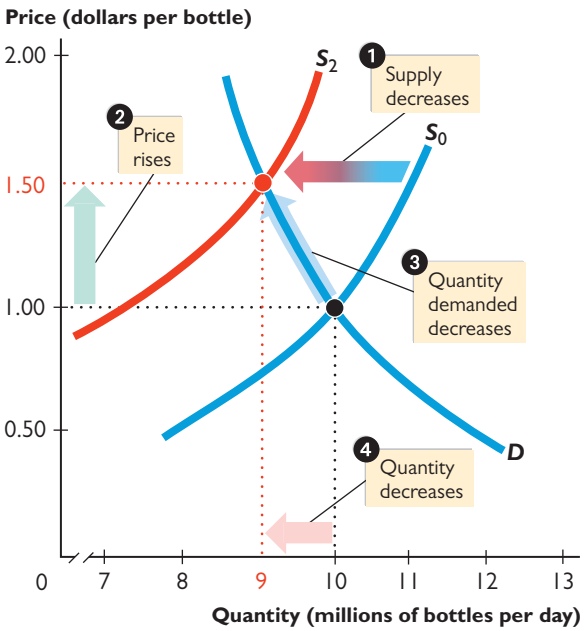
The Effects of a Change in Supply

MyEconLab Animation



(a) An increase in supply

❶ An increase in supply shifts the supply curve rightward to S_1 and creates a surplus of water. ❷ The price falls, ❸ the quantity demanded increases, and ❹ the equilibrium quantity increases.



(b) A decrease in supply

❶ A decrease in supply shifts the supply curve leftward to S_2 and creates a shortage of water. ❷ The price rises, ❸ the quantity demanded decreases, and ❹ the equilibrium quantity decreases.



EYE on the PRICE OF COFFEE

MyEconLab Critical Thinking Exercise

Why Did the Price of Coffee Rise in 2014?

When a fungus called coffee rust swept through Brazil and other countries of South America in 2014, world coffee production decreased and the price of coffee beans increased.

The table below provides some data on the quantity and price of coffee in 2013 and 2014. What does the data table tell us?

It tells us that the quantity of coffee produced decreased by 3.6 percent from 19.4 billion pounds in 2013 to 18.7 billion pounds in 2014, and the price of coffee rose by more than 30 percent from $1.04 per pound to $1.35 per pound.

Did the price of coffee rise because demand increased or because supply decreased?

You can answer this question from the information provided. You know that an increase in demand brings a rise in the price and an increase in the quantity bought, while a decrease in supply brings a rise in the price and a decrease in the quantity bought.

Because the quantity of coffee decreased and the price increased, there must have been a decrease in the supply of coffee.

The supply of coffee decreases if the crop yields decrease or if producers decrease their plantings.

The information that coffee rust swept through Brazil and other countries of South America in 2014 suggests that coffee crop yields decreased, which decreased the supply.

The figure illustrates the global market for coffee in 2013 and 2014. The demand curve *D* shows the demand for coffee, which we will assume was the same in both years.

In 2013, the supply curve was S_{2013}, the equilibrium price was $1.04 per pound and the equilibrium quantity traded was 19.4 billion pounds.

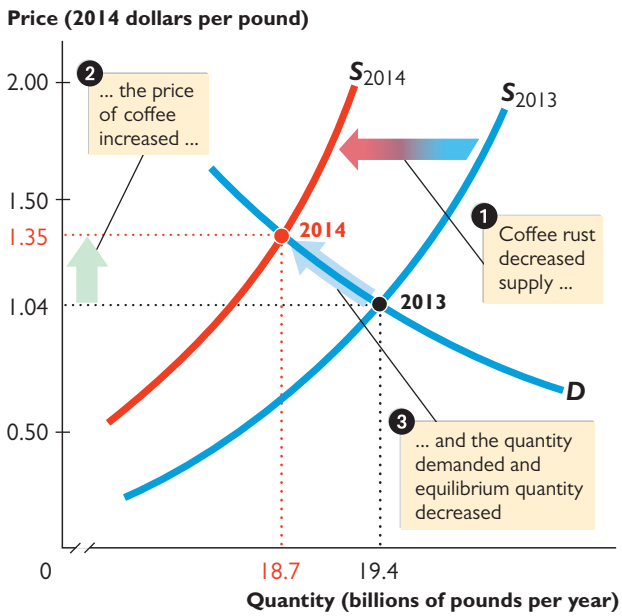
In 2014, decreased coffee production in Brazil and other countries decreased the supply of coffee to S_{2014}.

The equilibrium price rose to $1.35 per pound and the quantity traded decreased to 18.7 billion pounds.

The higher price brought a decrease in the quantity of coffee demanded, which is shown by the movement up along the demand curve.

Year	Quantity of Coffee (billions of pounds per year)	Price of Coffee (dollars per pound)
2013	19.4	1.04
2014	18.7	1.35





The Market for Coffee in 2013–2014

MyEconLab Concept Video

Effects of Changes in Both Demand and Supply

When events occur that change *both* demand and supply, you can find the resulting change in the equilibrium price and equilibrium quantity by combining the cases you've just studied.

Both Demand and Supply Change in the Same Direction

When demand and supply change in the same direction, the equilibrium quantity changes in that same direction, but we need to know the magnitudes of the changes in demand and supply to predict whether the price rises or falls. If demand increases by more than supply increases, the price rises. But if supply increases by more than demand increases, the price falls.

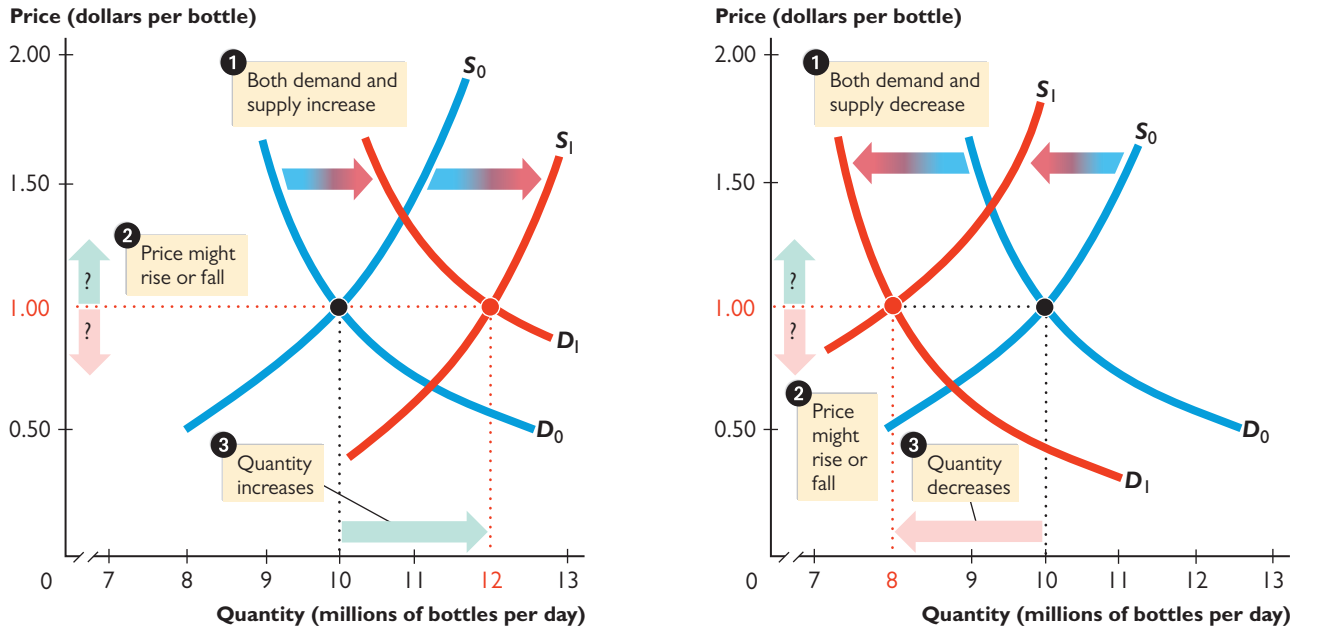
Figure 4.13(a) shows the case when both demand and supply increase and by the same amount. The equilibrium quantity increases. But because the increase in demand equals the increase in supply, neither a shortage nor a surplus arises so the price doesn't change. A bigger increase in demand would have created a shortage and a rise in the price; a bigger increase in supply would have created a surplus and a fall in the price.

Figure 4.13(b) shows the case when both demand and supply decrease by the same amount. Here the equilibrium quantity decreases and again the price might either rise or fall.

FIGURE 4.13

The Effects of Change in *Both* Demand and Supply in the *Same Direction*

MyEconLab Animation



(a) Increase in both demand and supply

❶ An increase in demand shifts the demand curve rightward to D_1 and an increase in supply shifts the supply curve rightward to S_1. ❷ The price might rise or fall, but ❸ the quantity increases.

(b) Decrease in both demand and supply

❶ A decrease in demand shifts the demand curve leftward to D_1 and a decrease in supply shifts the supply curve leftward to S_1. ❷ The price might rise or fall, but ❸ the quantity decreases.

Both Demand and Supply Change in Opposite Directions

When demand and supply change in opposite directions, we can predict how the price changes, but we need to know the magnitudes of the changes in demand and supply to say whether the equilibrium quantity increases or decreases. If demand changes by more than supply, the equilibrium quantity changes in the same direction as the change in demand. But if supply changes by more than demand, the equilibrium quantity changes in the same direction as the change in supply.

Figure 4.14(a) illustrates what happens when demand decreases and supply increases by the same amount. At the initial price, there is a surplus, so the price falls. A decrease in demand decreases the quantity and an increase in supply increases the quantity, so when these changes occur together, we can't say what happens to the quantity unless we know the magnitudes of the changes.

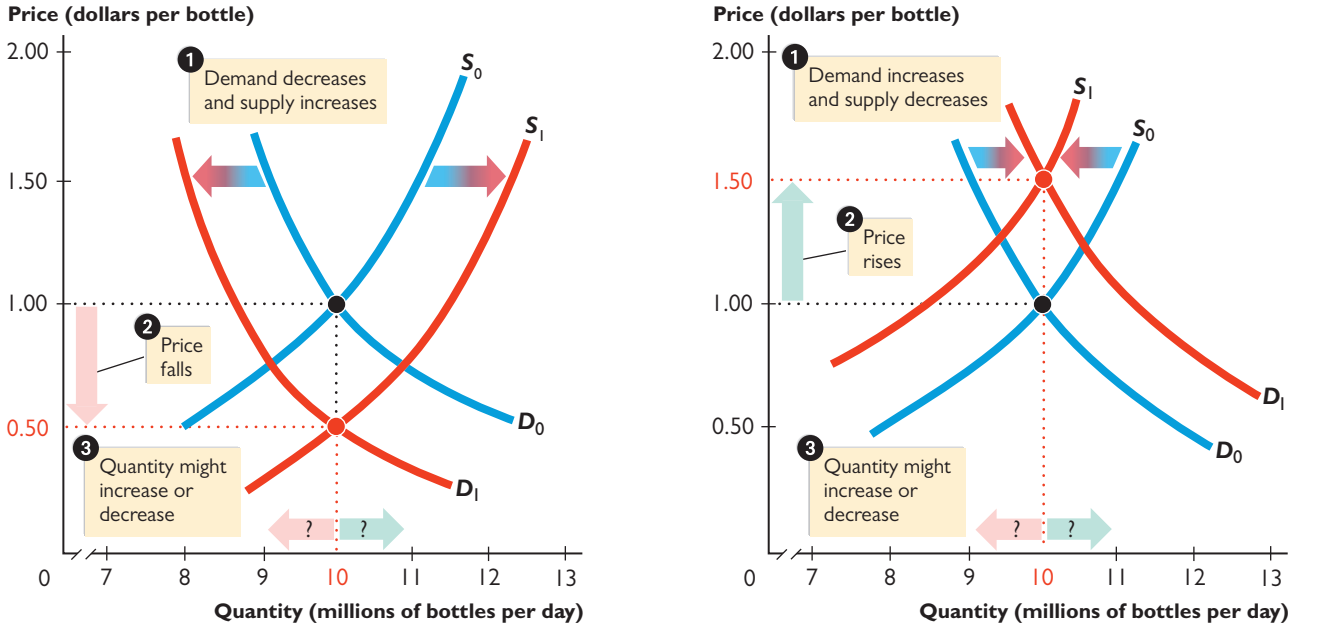
Figure 4.14(b) illustrates what happens when demand increases and supply decreases by the same amount. In this case, at the initial price, there is a shortage, so the price rises. An increase in demand increases the quantity and a decrease in supply decreases the quantity, so again, when these changes occur together, we can't say what happens to the quantity unless we know the magnitudes of the changes in demand and supply.

For all the cases in Figures 4.13 and 4.14 where you "can't say" what happens to price or quantity, draw some examples that go in each direction.

FIGURE 4.14

The Effects of Change in *Both* Demand and Supply in *Opposite Directions*

MyEconLab Animation



(a) Decrease in demand and increase in supply

❶ A decrease in demand shifts the demand curve leftward to D_1 and an increase in supply shifts the supply curve rightward to S_1. ❷ The price falls, but ❸ the quantity might increase or decrease.

(b) Increase in demand and decrease in supply

❶ An increase in demand shifts the demand curve rightward to D_1 and a decrease in supply shifts the supply curve leftward to S_1. ❷ The price rises, but ❸ the quantity might increase or decrease.

MyEconLab Study Plan 4.3
Key Terms Quiz
Solutions Video

CHECKPOINT 4.3

Explain how demand and supply determine price and quantity in a market, and explain the effects of changes in demand and supply.

Practice Problems

Table 1 sets out the demand and supply schedules for milk.

TABLE 1

Price (dollars per carton)	Quantity demanded (cartons per day)	Quantity supplied (cartons per day)
1.00	200	110
1.25	175	130
1.50	150	150
1.75	125	170
2.00	100	190

1. What is the equilibrium price and equilibrium quantity of milk?
2. Describe the situation in the milk market if the price were $1.75 a carton and explain how the market reaches equilibrium.
3. A drought decreases the quantity supplied by 45 cartons a day at each price. What is the new equilibrium and how does the market adjust to it?
4. If milk becomes more popular and better feeds increase milk production, describe how the equilibrium price and quantity of milk will change.

In the News

El Niño takes toll on U.S. rice farmers
Dry weather has delayed rice planting and harvests will be low. But wheat is enjoying a bumper crop.

Source: *The Guardian*, September 27, 2015

Using the demand and supply model, explain how the prices of rice and wheat will change and how the markets for rice and wheat will influence each other.

FIGURE 1

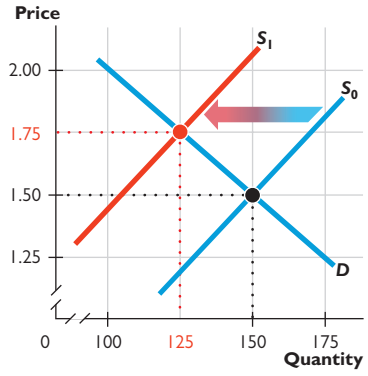
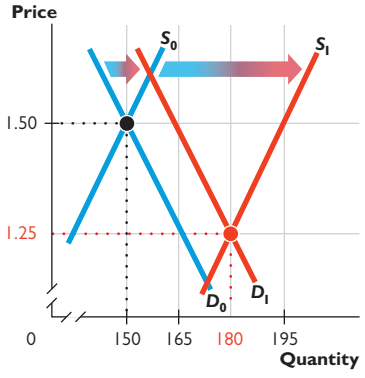


FIGURE 2



Solutions to Practice Problems

1. Equilibrium price is $1.50 a carton; equilibrium quantity is 150 cartons a day.
2. At $1.75 a carton, the quantity demanded (125 cartons) is less than the quantity supplied (170 cartons), so there is a surplus of 45 cartons a day. The price begins to fall, and as it does, the quantity demanded increases, the quantity supplied decreases, and the surplus decreases. The price will fall until the surplus is eliminated. The price falls to $1.50 a carton.
3. The supply decreases by 45 cartons a day so at $1.50 a carton there is a shortage of milk. The price begins to rise, and as it does, the quantity demanded decreases, the quantity supplied increases, and the shortage decreases. The price will rise until the shortage is eliminated. The new equilibrium occurs at $1.75 a carton and 125 cartons a day (Figure 1).
4. With milk more popular, demand increases. With better feeds, supply increases. If supply increases by more than demand, a surplus arises. The price falls, and the quantity increases (Figure 2). If demand increases by more than supply, a shortage arises. The price rises, and the quantity increases. If demand and supply increase by the same amount, there is no shortage or surplus, so the price does not change, but the quantity increases.

Solution to In the News

A fall in the rice harvest will decrease the supply of rice and raise its price. A bumper wheat harvest will increase the supply of wheat and lower its price. Wheat and rice are substitutes, so a higher price of rice will increase the demand for wheat and a lower price of wheat will decrease the demand for rice.

CHAPTER SUMMARY

Key Points

1. Distinguish between quantity demanded and demand, and explain what determines demand.

- Other things remaining the same, the quantity demanded increases as the price falls and decreases as the price rises—the law of demand.
- The demand for a good is influenced by the prices of related goods, expected future prices, income, expected future income and credit, the number of buyers, and preferences. A change in any of these influences changes the demand for the good.

2. Distinguish between quantity supplied and supply, and explain what determines supply.

- Other things remaining the same, the quantity supplied increases as the price rises and decreases as the price falls—the law of supply.
- The supply of a good is influenced by the prices of related goods, prices of resources and other inputs, expected future prices, the number of sellers, and productivity. A change in any of these influences changes the supply of the good.

3. Explain how demand and supply determine price and quantity in a market, and explain the effects of changes in demand and supply.

- The law of market forces brings market equilibrium—the equilibrium price and equilibrium quantity at which buyers and sellers trade.
- The price adjusts to maintain market equilibrium—to keep the quantity demanded equal to the quantity supplied. A surplus brings a fall in the price to restore market equilibrium; a shortage brings a rise in the price to restore market equilibrium.
- Market equilibrium responds to changes in demand and supply. An increase in demand increases both the price and the quantity; a decrease in demand decreases both the price and the quantity. An increase in supply increases the quantity but decreases the price; and a decrease in supply decreases the quantity but increases the price.

Key Terms

MyEconLab Key Terms Quiz

Change in demand, 88
Change in the quantity demanded, 90
Change in the quantity supplied, 97
Change in supply, 95
Complement, 88
Complement in production, 95
Demand, 85
Demand curve, 86
Demand schedule, 86
Equilibrium price, 100
Equilibrium quantity, 100
Inferior good, 89
Law of demand, 85
Law of market forces, 100
Law of supply, 92
Market equilibrium, 100
Normal good, 89
Quantity demanded, 85
Quantity supplied, 92
Substitute, 88
Substitute in production, 95
Supply, 92
Supply curve, 93
Supply schedule, 93

MyEconLab Chapter 4 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. Explain how each of the following events changes the demand for or supply of air travel.

- Airfares tumble, while long-distance bus fares don't change.
- The price of jet fuel rises.
- Airlines reduce the number of flights each day.
- People expect airfares to increase next summer.
- The price of train travel falls.
- The price of a pound of air cargo increases.

Use the laws of demand and supply to explain whether the statements in Problems **2** and **3** are true or false. In your explanation, distinguish between a change in demand and a change in the quantity demanded and between a change in supply and a change in the quantity supplied.

2. The United States does not allow oranges from Brazil (the world's largest producer of oranges) to enter the United States. If Brazilian oranges were sold in the United States, oranges and orange juice would be cheaper.

3. If the price of frozen yogurt falls, the quantity of ice cream consumed will decrease and the price of ice cream will rise.

4. Table 1 shows the demand and supply schedules for running shoes. What is the market equilibrium? If the price is $70 a pair, describe the situation in the market. Explain how market equilibrium is restored. If a rise in income increases the demand for running shoes by 100 pairs a day at each price, explain how the market adjusts to its new equilibrium.

TABLE 1

Price (dollars per pair)	Quantity demanded (pairs per day)	Quantity supplied (pairs per day)
60	1,000	400
70	900	500
80	800	600
90	700	700
100	600	800
110	500	900

5. "As more people buy fuel-efficient hybrid cars, the demand for gasoline will decrease and the price of gasoline will fall. The fall in the price of gasoline will decrease the supply of gasoline." Is this statement true? Explain.

6. **OPEC deadlocked on oil production hike**

Oil prices exceeded the $100-a-barrel mark Wednesday after OPEC said it could not reach an agreement about raising crude production.

Source: CNN Money, June 8, 2011

Suppose that OPEC members had agreed to increase production. Use a graph of the oil market to show the effect of this decision on the market equilibrium.

Use the following information to work Problems **7** and **8**.

Rain delays to U.S. planting lift corn and soybean prices

Heavy rain has delayed the planting of corn and soybean and soggy conditions have slowed the winter wheat harvest.

Source: *Financial Times*, June 25, 2015

7. Explain how heavy rain and soggy conditions will change the prices of corn, soybean, and wheat.

8. Use graphs to show how supply and demand will change in the markets for corn, soybean, and wheat.

9. Read *Eye on the Price of Coffee* on p. 105 and explain how we know that the price increased in 2014 because the supply of coffee decreased and not because the demand for coffee increased.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. Why can we be confident that the market for coffee is competitive and that a decrease in supply rather than the greed of coffee growers is the reason for the 2014 rise in price?
2. What is the effect on the equilibrium price and equilibrium quantity of orange juice if the price of apple juice decreases and the wage rate paid to orange grove workers increases?
3. What is the effect on the equilibrium in the orange juice market if orange juice becomes more popular and a cheaper robot is used to pick oranges?
4. **Concerns over winter wheat may boost price**
   Concerns about the U.S. winter wheat crop and dry conditions in other wheat-producing nations have increased the price of wheat.
   Source: Agweb.com, July 6, 2015
   Explain how an upcoming harvest influences today's price of wheat.

Table 1 shows the demand and supply schedules for boxes of chocolates in an average week. Use this information to work Problems **5** and **6**.

TABLE 1

Price (dollars per box)	Quantity demanded (boxes per day)	Quantity supplied (boxes per day)
13.00	1,600	
14.00	1,500	1,300
15.00	1,400	1,400
16.00	1,300	1,500
17.00	1,200	1,600
18.00	1,100	1,700

5. If the price of chocolates is $17.00 a box, describe the situation in the market. Explain how market equilibrium is restored.
6. During Valentine's week, more people buy chocolates and chocolatiers offer their chocolates in special red boxes, which cost more to produce than the everyday box. Set out the three-step process of analysis and show on a graph the adjustment process to the new equilibrium. Describe the changes in the equilibrium price and the equilibrium quantity.
7. After a severe bout of foreclosures and defaults on home loans, banks made it harder for people to borrow. How does this change influence
   - The demand for new homes?
   - The supply of new homes?
   - The price of new homes?

   Illustrate your answer with a graphical analysis.
8. **Bacon is 25 percent cheaper**
   Bacon is 25 percent cheaper now than a year ago and bacon sales are up 13 percent on the year. At the same time, the bird flu virus is killing millions of chickens, raising egg prices.
   Source: *CNN Money*, May 20, 2015
   Explain how this news clip illustrates: (a) the law of demand and why the price of bacon fell, and (b) how the markets for bacon and eggs influence each other. Draw a graph to illustrate your explanation.
9. "As more people buy smartphones, the demand for smartphone service increases and the price of smartphone service falls, which decreases the supply of smartphone service." Is this statement true or false? Explain.
10. **China slowdown could bring good news**
    China's economic slowdown could help reduce the cost of steel used by U.S. auto makers.
    Source: *The Wall Street Journal*, September 8, 2015
    Explain how an economic slowdown in China influences the global steel market. What happens to the equilibrium price of steel?

MyEconLab Chapter 4 Study Plan

Multiple Choice Quiz

1. Which of the following events illustrates the law of demand: Other things remaining the same, a rise in the price of a good will _____.

A. decrease the quantity demanded of that good
B. increase the demand for a substitute of that good
C. decrease the demand for the good
D. increase the demand for a complement of that good

2. In the market for jeans, which of the following events increases the demand for a pair of jeans?

A. The wage rate paid to garment workers rises.
B. The price of a denim skirt (a substitute for jeans) rises.
C. The price of denim cloth falls.
D. New technology reduces the time it takes to make a pair of jeans.

3. Other things remaining the same, a fall in the price of peanuts will _____.

A. increase the supply of peanuts
B. decrease the supply of peanut butter
C. decrease the quantity supplied of peanuts
D. decrease the supply of peanuts

4. In the market for smartphones, which of the following events increases the supply of smartphones?

A. New technology lowers the cost of making a smartphone
B. A rise in the price of an e-book reader (a substitute in production)
C. An increase in people's incomes
D. A rise in the wage rate paid to electronics workers

5. When floods wiped out the banana crop in Central America, the equilibrium price of bananas _____ and the equilibrium quantity of bananas _____.

A. rose; increased
B. rose; decreased
C. fell; increased
D. fell; decreased

6. A decrease in the demand for chocolate with no change in the supply of chocolate will create a _____ of chocolate at today's price, but gradually the price will _____.

A. surplus; fall
B. shortage; fall
C. surplus; rise
D. shortage; rise

7. Many Americans are selling their cars and buying new fuel-efficient hybrids. Other things remaining the same, in the market for used cars, _____ and in the market for hybrids _____.

A. supply increases and the price falls; demand increases and the price rises
B. demand decreases and the price rises; supply increases and the price falls
C. both demand and supply decrease and the price might rise, fall, or not change; demand increases and the price rises
D. demand decreases, supply increases, and the price falls; supply increases and the price falls



What do you do when Starbucks raises the price of a latte?

Elasticities of Demand and Supply

5

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Define and calculate the price elasticity of demand, and explain the factors that influence it.
2. Define and calculate the price elasticity of supply, and explain the factors that influence it.
3. Define the cross elasticity of demand and the income elasticity of demand, and explain the factors that influence them.

MyEconLab Big Picture Video

MyEconLab Concept Video

5.1 THE PRICE ELASTICITY OF DEMAND

Starbucks knows that if it raises the price of a latte and everything else remains the same, the quantity of lattes that it sells—the quantity demanded—will decrease. But by how much? To answer this question, Starbucks needs to know how responsive the quantity of latte demanded is to a change in its price. Elasticity provides this information.

Price elasticity of demand
A measure of the responsiveness of the quantity demanded of a good to a change in its price when all other influences on buyers' plans remain the same.

The **price elasticity of demand** is a measure of the responsiveness of the quantity demanded of a good to a change in its price when all other influences on buyers' plans remain the same.

To determine the price elasticity of demand, we compare the percentage change in the quantity demanded with the percentage change in price.

Percentage Change in Price

If Starbucks changes its price of a latte by $2, the percentage change in price depends on whether the price has gone up or down.

A Rise in Price

Suppose that Starbucks raises the price of a latte from $3 to $5. The percentage change is calculated as the change in price divided by the initial price, all multiplied by 100. The formula for the percentage change is

$$\text{Percentage change in price} = \left(\frac{\text{New price} - \text{Initial price}}{\text{Initial price}}\right) \times 100.$$

In this example, the initial price is $3 and the new price is $5, so

$$\text{Percentage change in price} = \left(\frac{\$5 - \$3}{\$3}\right) \times 100 = \left(\frac{\$2}{\$3}\right) \times 100 = 66.67 \text{ percent.}$$

A Fall in Price

Now suppose that Starbucks cuts the price of a latte from $5 to $3. The initial price is now $5 and the new price is $3, so the percentage change in price is

$$\text{Percentage change in price} = \left(\frac{\$3 - \$5}{\$5}\right) \times 100 = \left(\frac{-\$2}{\$5}\right) \times 100 = -40 \text{ percent.}$$

The same price change, $2, over the same interval, between $3 and $5, is a different absolute percentage change—66.67 percent if the price rises and 40 percent if the price falls.

Because elasticity compares the percentage change in the quantity demanded with the percentage change in price, we need a measure of percentage change that does not depend on the direction of the price change. The measure that economists use is called the *midpoint method*.

The Midpoint Method

To calculate the percentage change in price using the midpoint method, we divide the change in the price by the *average price*—the *average* of the new price and the initial price—and then multiply by 100. The average price is at the midpoint between the initial and the new price, hence the name *midpoint method*.

The formula for the percentage change using the midpoint method is

$$\text{Percentage change in price} = \left(\frac{\text{New price} - \text{Initial price}}{(\text{New price} + \text{Initial price}) \div 2}\right) \times 100.$$

In this formula, the numerator (New price − Initial price) is the same as before. The denominator, (New price + Initial price) ÷ 2, is the average of the new price and the initial price.

To calculate the percentage change in the price of a Starbucks latte using the midpoint method, put $5 for new price and $3 for initial price in the formula:

$$\begin{aligned}\text{Percentage change in price} &= \left(\frac{\$5 - \$3}{(\$5 + \$3) \div 2}\right) \times 100 = \left(\frac{\$2}{\$8 \div 2}\right) \times 100 \\ &= \left(\frac{\$2}{\$4}\right) \times 100 = 50 \text{ percent.}\end{aligned}$$

Because the average price is the same regardless of whether the price rises or falls, the percentage change in price calculated by the midpoint method is the same (magnitude) for a price rise and a price fall. In this example, it is 50 percent.

Percentage Change in Quantity Demanded

Suppose that when the price of a latte rises from $3 to $5, the quantity demanded decreases from 15 cups to 5 cups an hour. The percentage change in the quantity demanded using the midpoint method is

$$\begin{aligned}\text{Percentage change in quantity} &= \left(\frac{\text{New quantity} - \text{Initial quantity}}{(\text{New quantity} + \text{Initial quantity}) \div 2}\right) \times 100 \\ &= \left(\frac{5 - 15}{(5 + 15) \div 2}\right) \times 100 = \left(\frac{-10}{20 \div 2}\right) \times 100 \\ &= \left(\frac{-10}{10}\right) \times 100 = -100 \text{ percent.}\end{aligned}$$

When the price of a good *rises,* the quantity demanded of it *decreases*—a *positive* change in price brings a *negative* change in the quantity demanded. Similarly, when the price of a good *falls,* the quantity demanded of it *increases*—this time a *negative* change in price brings a *positive* change in the quantity demanded.

To compare the percentage changes in price and quantity demanded, we use the magnitudes of the percentage changes and we ignore the minus sign.

Comparing the Percentage Changes in Price and Quantity

To determine the responsiveness of the quantity of Starbucks lattes demanded to its price, we compare the two percentage changes we've just calculated. The percentage change in quantity demanded is 100 percent and the percentage change in price is 50 percent. In this case, the percentage change in the quantity of Starbucks lattes demanded is greater than the percentage change in its price. But it might have been equal or less. Let's see how we classify degrees of responsiveness.

MyEconLab Concept Video

Elastic and Inelastic Demand

If we collected data on the prices and quantities of Starbucks lattes and a number of other goods and services and we were careful to check that other things had remained the same, we could calculate lots of percentage changes in prices and quantities demanded. We could then classify the demands by their degree of responsiveness of quantity demanded to price.

Our calculations would fall into three groups: The percentage change in the quantity demanded might exceed the percentage change in price (as in the example of Starbucks lattes), be equal to the percentage change in price, or be less than the percentage change in price. Each of these three possibilities defines three ranges for the price elasticity of demand:

- When the percentage change in the quantity demanded exceeds the percentage change in price, demand is **elastic**.
- When the percentage change in the quantity demanded equals the percentage change in price, demand is **unit elastic**.
- When the percentage change in the quantity demanded is less than the percentage change in price, demand is **inelastic**.

Elastic demand
When the percentage change in the quantity demanded exceeds the percentage change in price.

Unit elastic demand
When the percentage change in the quantity demanded equals the percentage change in price.

Inelastic demand
When the percentage change in the quantity demanded is less than the percentage change in price.

Perfectly elastic demand
When the quantity demanded changes by a very large percentage in response to an almost zero percentage change in price.

Perfectly inelastic demand
When the percentage change in the quantity demanded is zero for any percentage change in the price.

Figure 5.1 shows the different types of demand curves that illustrate the range of possible price elasticities of demand. Part (a) shows an extreme case of an elastic demand called a **perfectly elastic demand**—an almost zero percentage change in the price brings a very large percentage change in the quantity demanded. Consumers are willing to buy any quantity of the good at a given price but none at a higher price. Part (b) shows an elastic demand—the percentage change in the quantity demanded exceeds the percentage change in price. Part (c) shows a unit elastic demand—the percentage change in the quantity demanded equals the percentage change in price. Part (d) shows an inelastic demand—the percentage change in the quantity demanded is less than the percentage change in price. Finally, part (e) shows an extreme case of an inelastic demand called a **perfectly inelastic demand**—the percentage change in the quantity demanded is zero for any percentage change in price.

Influences on the Price Elasticity of Demand

What makes the demand for some things elastic and the demand for others inelastic? The influences on the price elasticity of demand fall into two groups:

- Availability of substitutes
- Proportion of income spent

Availability of Substitutes

The demand for a good is elastic if a substitute for it is easy to find. Soft drink containers can be made of either aluminum or plastic and it doesn't matter which, so the demand for aluminum is elastic.

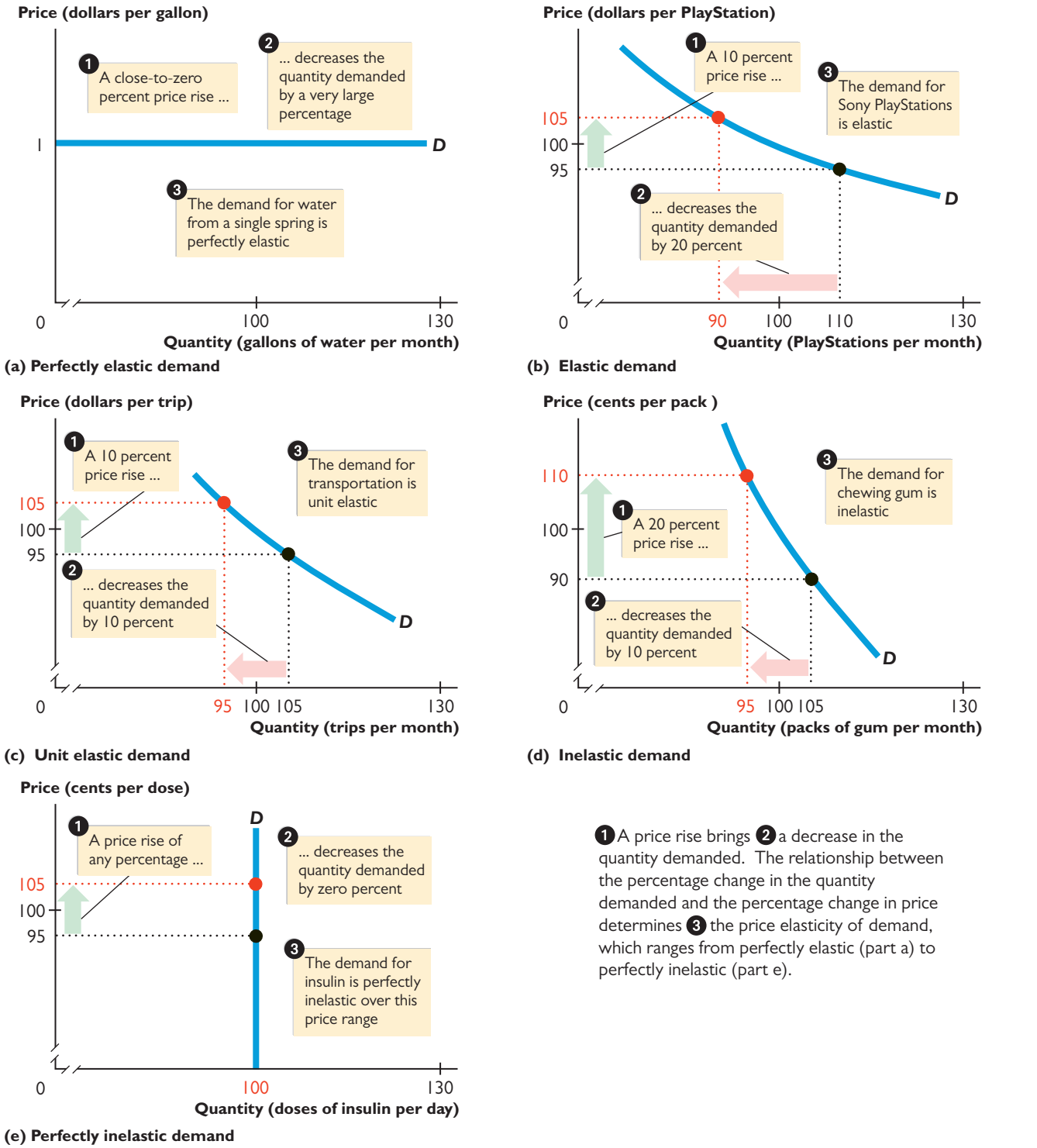
The demand for a good is inelastic if a substitute for it is hard to find. Oil has poor substitutes (imagine a coal-fueled car), so the demand for oil is inelastic.

Three main factors influence the ability to find a substitute for a good: whether the good is a luxury or a necessity, how narrowly the good is defined, and the amount of time available to find a substitute for it.

FIGURE 5.1

The Range of Price Elasticities of Demand

MyEconLab Animation



1 A price rise brings 2 a decrease in the quantity demanded. The relationship between the percentage change in the quantity demanded and the percentage change in price determines 3 the price elasticity of demand, which ranges from perfectly elastic (part a) to perfectly inelastic (part e).

Luxury Versus Necessity We call goods such as food and housing *necessities* and goods such as exotic vacations *luxuries.* A necessity has poor substitutes—you must eat—so the demand for a necessity is inelastic. A luxury has many substitutes—you don't absolutely have to go to the Galapagos Islands this summer—so the demand for a luxury is elastic.

Narrowness of Definition The demand for a narrowly defined good is elastic. For example, the demand for Starbucks lattes is elastic because a Panera latte is a good substitute for a Starbucks latte. The demand for a broadly defined good is inelastic. For example, the demand for coffee is inelastic because tea is a poor substitute for coffee.

Time Elapsed Since Price Change The longer the time that has elapsed since the price of a good changed, the more elastic is the demand for the good. For example, when the price of gasoline increased steeply during the 1970s and 1980s, the quantity of gasoline demanded didn't change much because many people owned gas-guzzling automobiles—the demand for gasoline was inelastic. But eventually, fuel-efficient cars replaced gas guzzlers and the quantity of gasoline demanded decreased—the demand for gasoline became more elastic.

Proportion of Income Spent

A price rise, like a decrease in income, means that people cannot afford to buy the same quantities of goods and services as before. The greater the proportion of income spent on a good, the greater is the impact of a rise in its price on the quantity of that good that people can afford to buy and the more elastic is the demand for the good. For example, toothpaste takes a tiny proportion of your budget and housing takes a large proportion. If the price of toothpaste doubles, you buy almost as much toothpaste as before. Your demand for toothpaste is inelastic. If your apartment rent doubles, you shriek and look for more roommates. Your demand for housing is more elastic than is your demand for toothpaste.

MyEconLab Concept Video

Computing the Price Elasticity of Demand

To determine whether the demand for a good is elastic, unit elastic, or inelastic, we compute a numerical value for the price elasticity of demand by using the following formula:

$$\text{Price elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}.$$

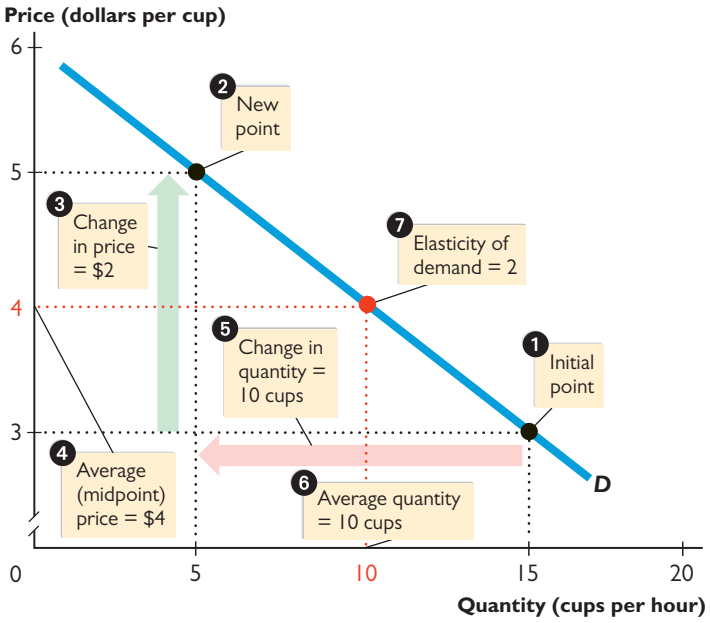
- If the price elasticity of demand is greater than 1, demand is elastic.
- If the price elasticity of demand equals 1, demand is unit elastic.
- If the price elasticity of demand is less than 1, demand is inelastic.

Figure 5.2 illustrates and summarizes the calculation for the Starbucks latte example. Initially, the price is $3 and 15 cups an hour are demanded—the initial point in the figure. Then the price rises to $5 and the quantity demanded decreases to 5 cups an hour—the new point in the figure. The price rises by $2 a cup and the average (midpoint) price is $4 a cup, so the percentage change in price is 50. The quantity demanded decreases by 10 cups an hour and the average (midpoint) quantity is 10 cups an hour, so the percentage change in quantity demanded is 100.

FIGURE 5.2

Price Elasticity of Demand Calculation

MyEconLab Animation



1. At the initial point, the price is $3 and the quantity demanded is 15 cups an hour.
2. At the new point, the price is $5 and the quantity demanded is 5 cups an hour.
3. The change in price is $2 and
4. the average price is $4, so the percentage change in price equals ($2 ÷ $4) × 100, which is 50 percent.
5. The change in the quantity demanded is 10 cups and
6. the average quantity demanded is 10 cups, so the percentage change in quantity demanded equals (10 ÷ 10) × 100, which is 100 percent.
7. The price elasticity of demand equals (100 percent ÷ 50 percent), which is 2.

Using the above formula, you can see that the price elasticity of demand for Starbucks lattes is

$$\text{Price elasticity of demand} = \frac{100 \text{ percent}}{50 \text{ percent}} = 2.$$

The price elasticity of demand is 2 at the midpoint between the initial price and the new price on the demand curve. Over this price range, the demand for Starbucks lattes is elastic.

Interpreting the Price Elasticity of Demand Number

The number we've just calculated for Starbucks lattes is only an example. We don't have real data on the price and quantity. But if we did have real data and we discovered that the price elasticity of demand for Starbucks lattes is 2, what does this number tell us?

It tells us three main things:

1. The demand for Starbucks lattes is elastic. Being elastic, the good has plenty of convenient substitutes (such as other brands of latte) and takes only a small proportion of buyers' incomes.
2. Starbucks must be careful not to charge too high a price for its latte. Pushing the price up brings in more revenue per cup but wipes out a lot of potential business.
3. The flip side of the second point: Even a slightly lower price could create a lot of potential business and end up bringing in more revenue.

MyEconLab Concept Video

Elasticity Along a Linear Demand Curve

Slope measures responsiveness. But elasticity is *not* the same as *slope*. You can see the distinction most clearly by looking at the price elasticity of demand along a linear (straight-line) demand curve. The slope is constant, but the elasticity varies. Figure 5.3 shows the same demand curve for Starbucks lattes as that in Figure 5.2 but with the axes extended to show lower prices and larger quantities demanded.

Let's calculate the elasticity of demand at point *A*. If the price rises from $3 to $5 a cup, the quantity demanded decreases from 15 to 5 cups an hour. The average price is $4 a cup, and the average quantity is 10 cups—point *A*. The elasticity of demand at point *A* is 2, and demand is elastic.

Let's calculate the elasticity of demand at point *C*. If the price falls from $3 to $1 a cup, the quantity demanded increases from 15 to 25 cups an hour. The average price is $2 a cup, and the average quantity is 20 cups—point *C*. The elasticity of demand at point *C* is 0.5, and demand is inelastic.

Finally, let's calculate the elasticity of demand at point *B*, which is the midpoint of the demand curve. If the price rises from $2 to $4 a cup, the quantity demanded decreases from 20 to 10 cups an hour. The average price is $3 a cup, and the average quantity is 15 cups—point *B*. The elasticity of demand at point *B* is 1, and demand is unit elastic.

Along a linear demand curve,

- Demand is unit elastic at the midpoint of the curve.
- Demand is elastic at all points above the midpoint of the curve.
- Demand is inelastic at all points below the midpoint of the curve.

FIGURE 5.3

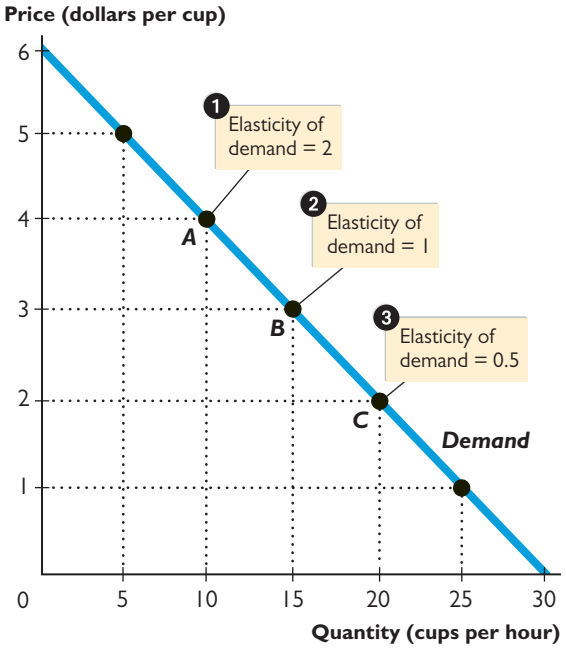
Elasticity Along a Linear Demand Curve

MyEconLab Animation

On a linear demand curve, the slope is constant, but the elasticity decreases as the price falls and the quantity demanded increases.

1. At point *A*, demand is elastic.
2. At point *B*, which is the midpoint of the demand curve, demand is unit elastic.
3. At point *C*, demand is inelastic.

Demand is elastic at all points above the midpoint of the demand curve and inelastic at all points below the midpoint of the demand curve.

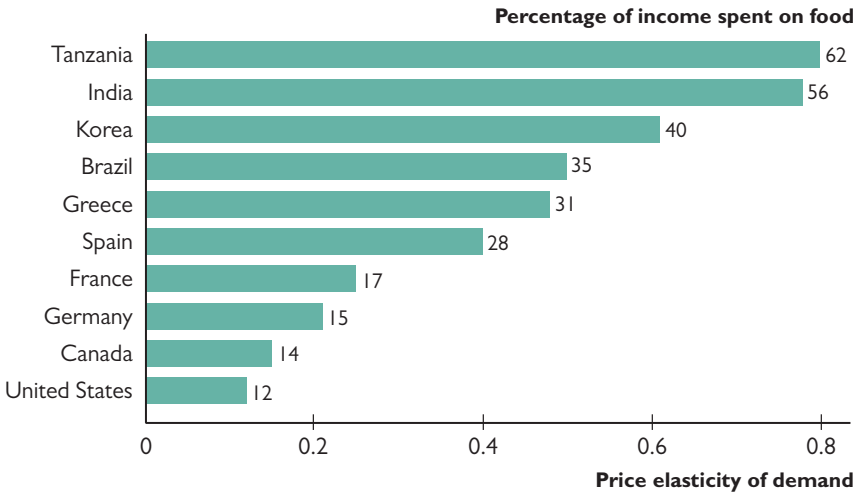


EYE on the GLOBAL ECONOMY

Price Elasticities of Demand

A wealthy American student is casual about her food. It costs only a few dollars a day, and she's going to have her burger, even at double the price. But a poor Tanzanian boy takes his food with deadly seriousness. He has a tough time getting, preparing, and even defending his food. A rise in the price of food means that he must cut back and eat even less.

The figure shows the percentage of income spent on food and the price elasticity of demand for food in ten countries. The larger the proportion of income spent on food, the larger is the price elasticity of demand for food.



As the low-income countries become richer, the proportion of income they spend on food will decrease and their demand for food will become more inelastic. Consequently, the world's demand for food will become more inelastic.

Harvests fluctuate and bring fluctuations in the price of food. As the world demand for food becomes more and more inelastic, the fluctuations in the prices of food items will become larger.

The table shows a few real-world price elasticities of demand. The numbers in the table range from 1.52 for metals to 0.12 for food. Metals have good substitutes, such as plastics, while food has virtually no substitutes. As we move down the list of items, they have fewer good substitutes and are more likely to be regarded as necessities.





Some Price Elasticities of Demand

Good or Service	Elasticity
Elastic Demand	
Metals	1.52
Electrical engineering products	1.39
Mechanical engineering products	1.30
Furniture	1.26
Motor vehicles	1.14
Instrument engineering products	1.10
Professional services	1.09
Transportation services	1.03
Inelastic Demand	
Gas, electricity, and water	0.92
Oil	0.91
Chemicals	0.89
Beverages (all types)	0.78
Clothing	0.64
Tobacco	0.61
Banking and insurance services	0.56
Housing services	0.55
Agricultural and fish products	0.42
Books, magazines, and newspapers	0.34
Food	0.12

SOURCES OF DATA: See p. C1.

Total Revenue and the Price Elasticity of Demand

Total revenue
The amount spent on a good and received by its seller and equals the price of the good multiplied by the quantity sold.

Total revenue is the amount spent on a good and received by its seller and equals the price of the good multiplied by the quantity of the good sold. For example, suppose that the price of a Starbucks latte is $3 and that 15 cups an hour are sold. Then total revenue is $3 a cup multiplied by 15 cups an hour, which equals $45 an hour.

We can use the demand curve for Starbucks lattes to illustrate total revenue. Figure 5.4(a) shows the total revenue from the sale of lattes when the price of a latte is $3 and the quantity of lattes demanded is 15 cups an hour. Total revenue is shown by the blue rectangle, the area of which equals $3, its height, multiplied by 15, its length, which equals $45.

When the price changes, total revenue can change in the same direction, the opposite direction, or remain constant. Which of these outcomes occurs depends on the price elasticity of demand. By observing the change in total revenue that results from a price change (with all other influences on the quantity remaining

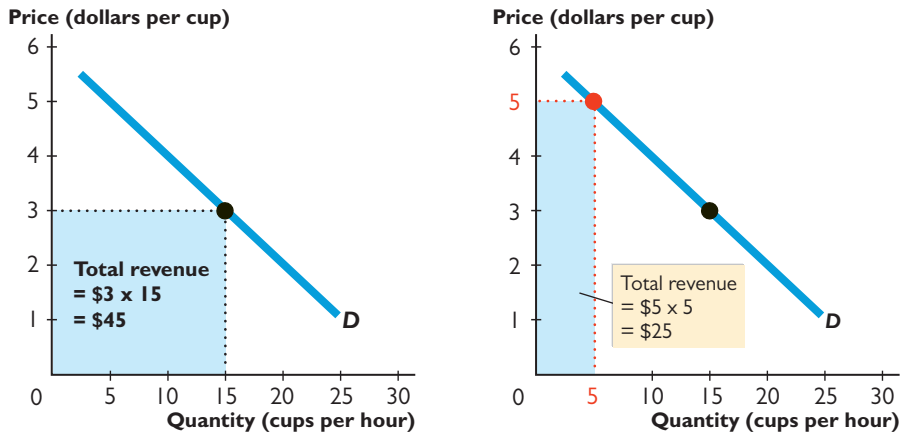
FIGURE 5.4
Total Revenue and the Price Elasticity of Demand
MyEconLab Animation

Part (a) show the demand for Starbucks lattes. Total revenue equals price multiplied by quantity. When the price of a latte is $3, the quantity demanded is 15 cups an hour and total revenue equals $45 an hour. But when the price rises to $5, the quantity demanded decreases to 5 cups an hour and total revenue decreases to $25 an hour.

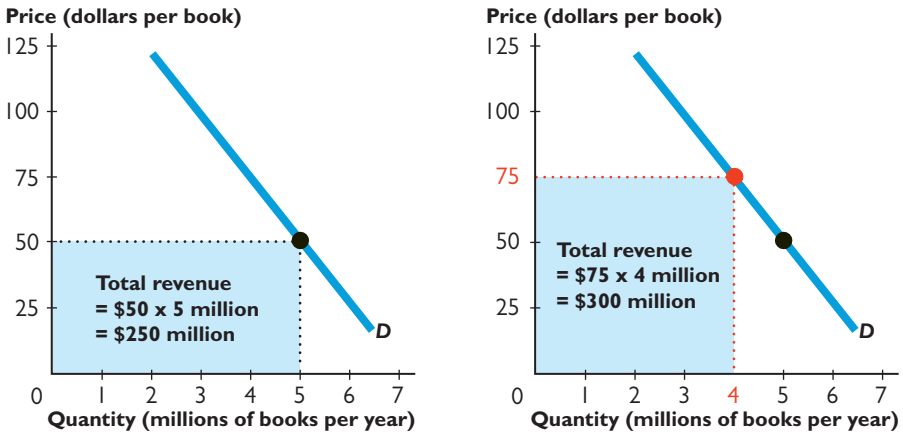
Starbucks' total revenue decreases when it raises its price because the demand for Starbucks lattes is elastic.

Part (b) shows the demand for textbooks. When the price is $50 a book, the quantity demanded is 5 million books a year and total revenue equals $250 million a year. When the price rises to $75 a book, the quantity demanded decreases to 4 million books a year and total revenue increases to $300 million a year.

When the textbook price rises, total revenue increases because the demand for textbooks is inelastic.



(a) Total revenue and elastic demand: Starbucks lattes



(b) Total revenue and inelastic demand: textbooks

unchanged), we can estimate the price elasticity of demand. This method of estimating the price elasticity of demand is called the **total revenue test**.

Total revenue test
A method of estimating the price elasticity of demand by observing the change in total revenue that results from a price change (with all other influences on the quantity sold remaining unchanged).

If demand is elastic, a given percentage rise in price brings a larger percentage decrease in the quantity demanded, so total revenue—price multiplied by quantity—decreases. Figure 5.4(a) shows this outcome. When the price of a latte is $3, the quantity demanded is 15 cups an hour, so total revenue ($3 × 15) equals $45. If the price of a latte rises to $5, the quantity demanded decreases to 5 cups an hour, so total revenue ($5 × 5) *decreases* to $25.

If demand is inelastic, a given percentage rise in price brings a smaller percentage decrease in the quantity demanded, so total revenue increases. Figure 5.4(b) shows this outcome. When the price of a textbook is $50, the quantity demanded is 5 million textbooks a year and total revenue ($50 × 5 million) is $250 million. If the price of a textbook rises to $75, the quantity demanded decreases to 4 million textbooks a year and total revenue ($75 × 4 million) *increases* to $300 million.

The relationship between the price elasticity of demand and total revenue is

- If price and total revenue change in opposite directions, demand is elastic.
- If a price change leaves total revenue unchanged, demand is unit elastic.
- If price and total revenue change in the same direction, demand is inelastic.



MyEconLab Critical Thinking Exercise

EYE on ELASTICITY AT THE COFFEE SHOP

What Do You Do When Starbucks Raises the Price of a Latte?

When Starbucks raises the price of a latte, the first thing to do is look at the price of lattes in other conveniently located coffee shops. Suppose they have not increased and you can get an acceptable latte for a lower price at Dunkin' Donuts. You decide to switch your allegiance and keep drinking the same quantity of latte.

Soon though, all the coffee shops in your neighborhood have raised their price. Your daily latte is more expensive, no matter how you satisfy your craving for it. You look at the dwindling change in your pocket and decide to return to Starbucks but trim your latte consumption by a cup a week.

Price Elasticity of Demand

We can translate this account of your possible response to a hike in Starbucks' price into some estimates of your price elasticity of demand for Starbucks latte and for latte in general.

Close Substitutes

When Starbucks alone has a higher price, you decrease the quantity of Starbucks latte to zero, so your price elasticity of demand for Starbucks latte is high—it is elastic.

A Starbucks latte and a Dunkin' Donuts latte are different, but for some people they are reasonably close substitutes. So when Starbucks alone raises its price of a latte, the quantity sold by Starbucks changes a lot—the demand for a Starbucks latte is elastic.

Poor Substitutes

Later, when all the coffee shops have raised the price of a latte, you return to Starbucks but cut back a bit on your consumption of latte. Your price elasticity of demand for latte of all types is low—it is inelastic.

Latte, tea, water, juice, and other drinks are poor substitutes. So when the price of a latte rises, the quantity of latte bought decreases but not by very much—the demand for lattes of all types is inelastic.

EYE on the U.S. ECONOMY

Two Applications of the Price Elasticity of Demand

Orange Prices and Total Revenue

Is a Florida frost that damages the orange crop bad news or good news for orange growers? Does the frost decrease or increase growers' total revenue? Knowledge of the price elasticity of demand for oranges enables us to answer these questions.

If supply changes and demand doesn't change, the percentage change in the equilibrium quantity equals the percentage change in the quantity demanded. And the magnitude of the change in the price and quantity depends on the elasticity of demand.

Economists have estimated that the demand for oranges is inelastic. So if a frost in Florida decreases the orange harvest and decreases the equilibrium quantity of oranges by 1 percent, the price of oranges will rise by more than 1 percent.

Because the price rises by a larger percentage than the percentage decrease in quantity, total revenue increases.



A Florida frost is bad news for buyers of orange juice and for growers who lose their crops, but good news for other orange growers.

So when a Florida frost strikes, the price of oranges rises by a larger percentage than the percentage decrease in the quantity of oranges and the total revenue of the orange growers increases.

A frost is bad news for consumers and growers who lose their crops, but good news for other growers.

Addiction and Elasticity

We can gain insights that might help to design potentially effective policies for dealing with addiction to drugs, whether legal (such as tobacco and alcohol) or illegal (such as meth or heroin).

Nonusers' demand for addictive substances is elastic. A moderately higher price leads to a substantially smaller number of people trying a drug and so exposing themselves to the possibility of becoming addicted. But the existing users' demand for addictive substances is inelastic. Even a substantial price rise brings only a modest decrease in the quantity demanded.

These facts about the price elasticity of demand mean that high taxes on cigarettes and alcohol limit the number of young people who become habitual users of these products, but high taxes have only a modest effect on the quantities consumed by established users.

Similarly, effective policing of imports of an illegal drug that limits its supply leads to a large price rise and a substantial decrease in the number of new users but only a small decrease in the quantity consumed by addicts. Expenditure on the drug by addicts increases. Further, because many drug addicts finance their purchases with crime, the amount of theft and burglary increases.

Because the price elasticity of demand for drugs is low for addicts, any successful policy to decrease drug use will be one that focuses on the demand for drugs and attempts to change preferences through rehabilitation programs.



Cracking down on imports of illegal drugs limits supply, which leads to a higher price. But it also increases the expenditure on drugs by addicts and increases the crime that finances addiction.

CHECKPOINT 5.1

MyEconLab Study Plan 5.1
Key Terms Quiz
Solutions Video

Define and calculate the price elasticity of demand, and explain the factors that influence it.

Practice Problems

When the price of a good increased by 10 percent, the quantity demanded of it decreased by 2 percent.

1. Is the demand for this good elastic, unit elastic, or inelastic?
2. Does this good have close substitutes or poor substitutes? Is this good more likely to be a necessity or a luxury and to be narrowly or broadly defined? Why?
3. Calculate the price elasticity of demand for this good; explain how the total revenue from the sale of the good has changed; and explain which of the following goods this good is most likely to be: orange juice, bread, toothpaste, theater tickets, clothing, blue jeans, or Super Bowl tickets.

In the News

Samsung and LG slash prices to take sales from Apple
Apple's new iPhone 6 sold out quickly in the United States and to avoid the same outcome in other national markets, Samsung and LG cut the prices of their Galaxy and V10 smartphones by over 10 percent.

Source: *International Business Times*, October 27, 2015

Will a price cut by Samsung and LG increase their total revenue? If Apple also cuts its prices, what will happen to the total revenue from all smartphone sales?

Solutions to Practice Problems

1. The demand for a good is *inelastic* if the percentage decrease in the quantity demanded is less than the percentage increase in its price. In this example, a 10 percent price rise brings a 2 percent decrease in the quantity demanded, so demand is inelastic.
2. Because the good has an inelastic demand, it most likely has poor substitutes, is a necessity rather than a luxury, and is broadly defined.
3. Price elasticity of demand equals the percentage change in the quantity demanded divided by the percentage change in price. In this example, the price elasticity of demand is 2 percent divided by 10 percent, or 0.2. An elasticity less than 1 means that demand is inelastic. When demand is inelastic, a price rise increases total revenue. This good is most likely a necessity (bread), or has poor substitutes (toothpaste), or is broadly defined (clothing).

Solution to In the News

The Apple 6s, Galaxy S6, and LG V10 offer similar features and functions, so they are close substitutes and the demand for any one of them alone is elastic. If the prices of only Samsung and LG fall by 10 percent, the quantity sold will increase by more than 10 percent and the two firms' total revenue will increase. But a smartphone has poor substitutes, so if Apple also cuts its prices, the total revenue of all three firms will decrease because the demand for smartphones is inelastic.

MyEconLab Concept Video

5.2 THE PRICE ELASTICITY OF SUPPLY

You know that when demand increases, the equilibrium price rises and the equilibrium quantity increases. But does the price rise by a large amount and the quantity increase by a little? Or does the price barely rise and the quantity increase by a large amount? To answer this question, we need to know the price elasticity of supply.

Price elasticity of supply
A measure of the responsiveness of the quantity supplied of a good to a change in its price when all other influences on sellers' plans remain the same.

The **price elasticity of supply** is a measure of the responsiveness of the quantity supplied of a good to a change in its price when all other influences on sellers' plans remain the same. We determine the price elasticity of supply by comparing the percentage change in the quantity supplied with the percentage change in price.

Elastic and Inelastic Supply

The supply of a good might be

- Elastic
- Unit elastic
- Inelastic

Perfectly elastic supply
When the quantity supplied changes by a very large percentage in response to an almost zero percentage change in price.

Elastic supply
When the percentage change in the quantity supplied exceeds the percentage change in price.

Unit elastic supply
When the percentage change in the quantity supplied equals the percentage change in price.

Inelastic supply
When the percentage change in the quantity supplied is less than the percentage change in price.

Perfectly inelastic supply
When the percentage change in the quantity supplied is zero for any percentage change in the price.

Figure 5.5 illustrates the range of supply elasticities. Figure 5.5(a) shows the extreme case of a **perfectly elastic supply**—an almost zero percentage change in price brings a very large percentage change in the quantity supplied. Figure 5.5(b) shows an **elastic supply**—the percentage change in the quantity supplied exceeds the percentage change in price. Figure 5.5(c) shows a **unit elastic supply**—the percentage change in the quantity supplied equals the percentage change in price. Figure 5.5(d) shows an **inelastic supply**—the percentage change in the quantity supplied is less than the percentage change in price. And Figure 5.5(e) shows the extreme case of a **perfectly inelastic supply**—the percentage change in the quantity supplied is zero when the price changes.

Influences on the Price Elasticity of Supply

What makes the supply of some things elastic and the supply of others inelastic? The two main influences on the price elasticity of supply are

- Production possibilities
- Storage possibilities

Production Possibilities

Some goods can be produced at a constant (or very gently rising) opportunity cost. These goods have an elastic supply. The silicon in your computer chips is an example of such a good. Silicon is extracted from sand at a tiny and almost constant opportunity cost, so the supply of silicon is perfectly elastic.

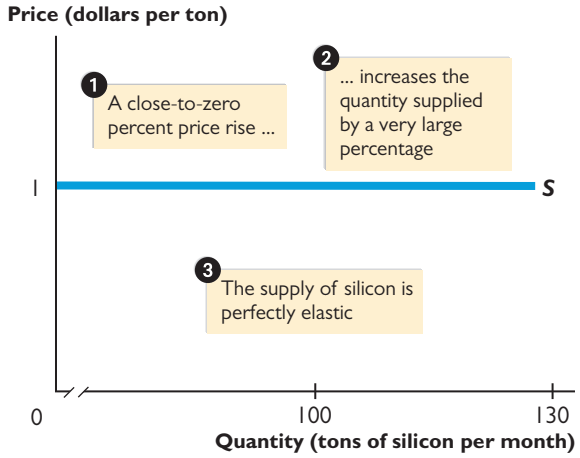
Some goods can be produced in only a fixed quantity. These goods have a perfectly inelastic supply. A beachfront home in Malibu can be built only on a unique beachfront lot, so the supply of these homes is perfectly inelastic.

Hotel rooms in New York City can't easily be used as office accommodation and office space cannot easily be converted into hotel rooms, so the supply of hotel rooms in New York City is inelastic. Paper and printing presses can be used to produce textbooks or magazines, and the supplies of these goods are elastic.

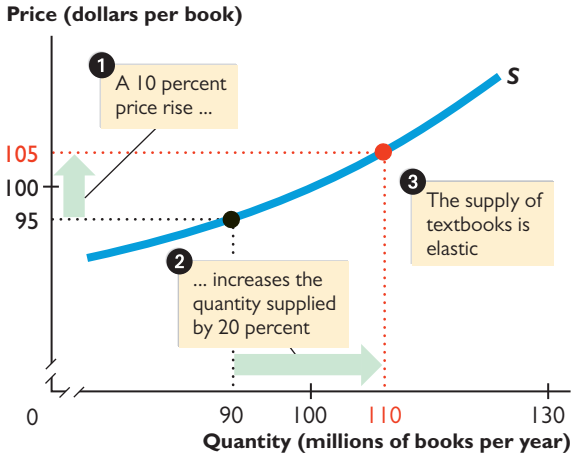
FIGURE 5.5

The Range of Price Elasticities of Supply

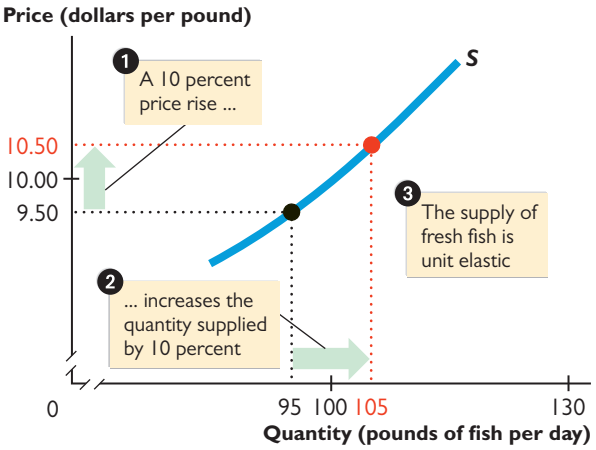
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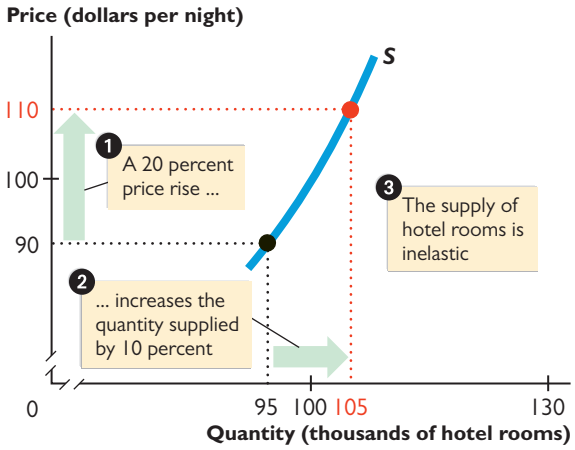
(a) Perfectly elastic supply



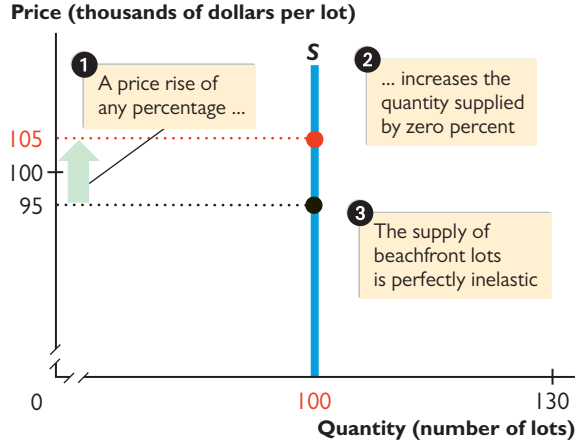
(b) Elastic supply



(c) Unit elastic supply



(d) Inelastic supply



(e) Perfectly inelastic supply

1 A price rise brings 2 an increase in the quantity supplied. The relationship between the percentage change in the quantity supplied and the percentage change in price determines 3 the price elasticity of supply, which ranges from perfectly elastic (part a) to perfectly inelastic (part e).

Time Elapsed Since Price Change As time passes after a price change, it becomes easier to change production plans and supply becomes more elastic. For some items—fruits and vegetables are examples—it is difficult or perhaps impossible to change the quantity supplied immediately after a price change. These goods have a perfectly inelastic supply on the day of a price change. The quantities supplied depend on crop-planting decisions that were made earlier. In the case of oranges, for example, planting decisions have to be made many years in advance of the crop being available.

Many manufactured goods also have an inelastic supply if production plans have had only a short period in which to change. For example, before it launched the Wii in November 2006, Nintendo made a forecast of demand, set a price, and drew up a production plan to supply the United States with the quantity that it believed people would be willing to buy. It turned out that demand outstripped Nintendo's earlier forecast. The price of the Wii increased on eBay, an Internet auction market, to bring market equilibrium. At the high price that emerged, Nintendo would have liked to ship more units of Wii, but it could do nothing to increase the quantity supplied in the near term. The supply of Wii was inelastic.

As time passes, the elasticity of supply increases. After all the technologically possible ways of adjusting production have been exploited, supply is extremely elastic—perhaps perfectly elastic—for most manufactured items. In 2007, Nintendo was able to step up the production rate of Wii units and the price on eBay began to fall. The supply of Wii had become more elastic as production continued to expand.

Storage Possibilities



Fresh strawberries must be sold before they deteriorate, so their supply is inelastic.

The elasticity of supply of a good that cannot be stored (for example, a perishable item such as fresh strawberries) depends only on production possibilities. But the elasticity of supply of a good that can be stored depends on the decision to keep the good in storage or to offer it for sale. A small price change can make a big difference to this decision, so the supply of a storable good is highly elastic. The cost of storage is the main influence on the elasticity of supply of a storable good. For example, rose growers in Colombia, anticipating a surge in demand on Valentine's Day in February, hold back supplies in late January and early February and increase their inventories of roses. They then release roses from inventory for Valentine's Day.

Computing the Price Elasticity of Supply

To determine whether the supply of a good is elastic, unit elastic, or inelastic, we compute a numerical value for the price elasticity of supply in a way similar to that used to calculate the price elasticity of demand. We use the formula:

$$\text{Price elasticity of supply} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}.$$

- If the price elasticity of supply is greater than 1, supply is elastic.
- If the price elasticity of supply equals 1, supply is unit elastic.
- If the price elasticity of supply is less than 1, supply is inelastic.

Let's calculate the price elasticity of the supply of roses. Suppose that in a normal month, the price of roses is $40 a bouquet and 6 million bouquets are supplied. And suppose that in February, the price rises to $80 a bouquet and the quantity supplied increases to 24 million bouquets. Figure 5.6 illustrates the supply of roses and summarizes the calculation. The figure shows the initial point at $40 a bouquet and the new point at $80 a bouquet. The price increases by $40 a bouquet and the average, or midpoint, price is $60 a bouquet, so the percentage change in the price is 66.67 percent. The quantity supplied increases by 18 million bouquets. and the average, or midpoint, quantity is 15 million bouquets, so the percentage change in the quantity supplied is 120 percent.

Using the above formula, you can see that the price elasticity of supply of roses is

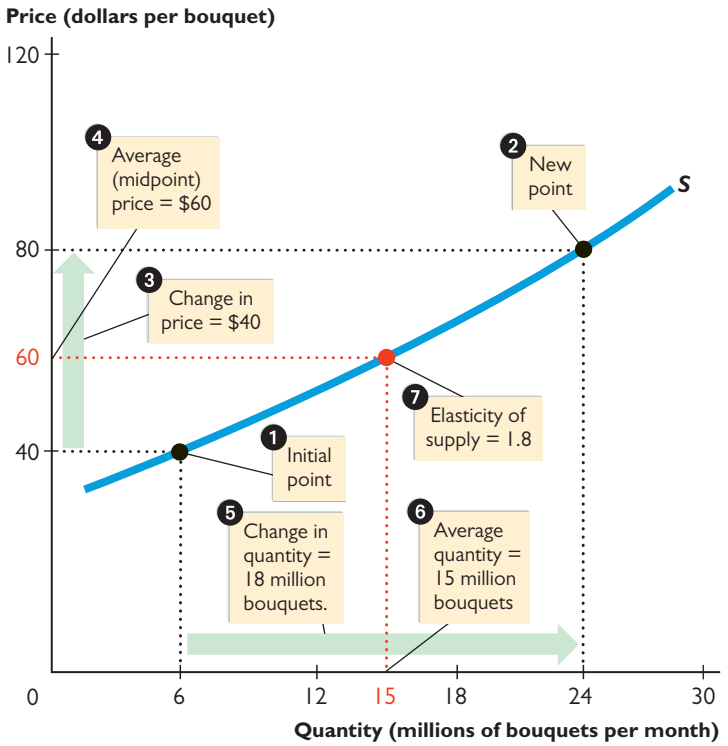
$$\text{Price elasticity of supply} = \frac{120 \text{ percent}}{66.67 \text{ percent}} = 1.8.$$

The price elasticity of supply is 1.8 at the midpoint between the initial point and the new point on the supply curve. In this example, over this price range, the supply of roses is elastic.

FIGURE 5.6

Price Elasticity of Supply Calculation

MyEconLab Animation



1. At the initial point, the price is $40 a bouquet and the quantity supplied is 6 million bouquets a month.
2. At the new point, the price is $80 a bouquet and the quantity supplied is 24 million bouquets a month.
3. The change in price is $40, and
4. the average price is $60, so the percentage change in the price equals ($40 ÷ $60) × 100, which is 66.67 percent.
5. The change in the quantity supplied is 18 million bouquets and
6. the average quantity supplied is 15 million bouquets, so the percentage change in quantity supplied is (18 million ÷ 15 million) × 100, which is 120 percent.
7. The price elasticity of supply is 120 percent ÷ 66.67 percent, which equals 1.8.

MyEconLab Study Plan 5.2
Key Terms Quiz
Solutions Video

CHECKPOINT 5.2

Define and calculate the price elasticity of supply, and explain the factors that influence it.

Practice Problems

A 10 percent increase in the price of a good increased the quantity supplied of the good by 1 percent after one month and by 25 percent after one year.

1. Is the supply of this good elastic, unit elastic, or inelastic? Is this good likely to be produced using factors of production that are easily obtained? What is the price elasticity of supply of this good?
2. What is the price elasticity of supply after one year? Has the supply of this good become more elastic or less elastic? Why?

In the News

Tuition and enrollment data
Enrollment increased from 15,539,000 in 2000 to 20,618,000 in 2013. The net cost of college (average for all types) increased from $12,357 to $14,860.
Source: trends.collegeboard.org, 2015

Calculate the price elasticity of supply of college. Is the supply of college elastic or inelastic?

Solutions to Practice Problems

1. The supply of a good is *inelastic* if the percentage increase in the quantity supplied is less than the percentage increase in price. In this example, a 10 percent price rise brings a 1 percent increase in the quantity supplied, so supply is inelastic. Because the quantity supplied increases by such a small percentage after one month, the factors of production that are used to produce this good are more likely to be difficult to obtain.
   The price elasticity of supply equals Percentage change in the quantity supplied divided by Percentage change in the price. In this example, the price elasticity of supply equals 1 percent divided by 10 percent, or 0.1.
2. The price elasticity of supply equals Percentage change in the quantity supplied divided by Percentage change in the price. After one year, the price elasticity of supply is 25 percent divided by 10 percent, or 2.5. The supply of the good has become more elastic over the year since the price rise. Possibly other producers have gradually started producing the good and with the passage of time more factors of production can be reallocated.

Solution to In the News

The demand for college increased, so we can use these data to calculate the price elasticity of supply of college. The price elasticity of supply equals the percentage change in the quantity supplied divided by the percentage change in the price. Using the midpoint method (see the calculations in the margin), the quantity supplied increased by 28.1 percent and the price increased by 18.4 percent. The elasticity of supply is 28.1 percent divided by 18.4 percent, which is 1.53. Because the elasticity of supply is greater than 1, the supply of college is elastic.

Calculations:
The change in price is $2,503, the average price is $13,609, so the percentage change in the price equals ($2,503 ÷ $13,609) × 100, which is 18.4 percent.
The change in the quantity supplied is 5,079,000, the average quantity supplied is 18,078,500, so the percentage change in quantity supplied is (5,079,000 ÷ 18,078,500) × 100, which is 28.1 percent.

5.3 CROSS ELASTICITY AND INCOME ELASTICITY

MyEconLab Concept Video

Domino's Pizza in Chula Vista has a problem. Burger King has just cut its prices. Domino's manager, Pat, knows that pizzas and burgers are substitutes. He also knows that when the price of a substitute for pizza falls, the demand for pizza decreases. But by how much will the quantity of pizza bought decrease if Pat maintains his current price?

Pat also knows that pizza and soda are complements. He knows that if the price of a complement of pizza falls, the demand for pizza increases. So he wonders whether he might keep his customers by cutting the price he charges for soda. But he wants to know by how much he must cut the price of soda to keep selling the same quantity of pizza with cheaper burgers all around him.

To answer these questions, Pat needs to calculate the cross elasticity of demand. Let's examine this elasticity measure.

Cross Elasticity of Demand

The **cross elasticity of demand** is a measure of the responsiveness of the demand for a good to a change in the price of a substitute or complement when other things remain the same. It is calculated by using the formula:

Cross elasticity of demand
A measure of the responsiveness of the demand for a good to a change in the price of a substitute or complement when other things remain the same.

$$\text{Cross elasticity of demand} = \frac{\text{Percentage change in quantity demanded of a good}}{\text{Percentage change in price of one of its substitutes or complements}}.$$

Suppose that when the price of a burger falls by 10 percent, the quantity of pizza demanded decreases by 5 percent.* The cross elasticity of demand for pizza with respect to the price of a burger is

$$\text{Cross elasticity of demand} = \frac{-5 \text{ percent}}{-10 \text{ percent}} = 0.5.$$

The cross elasticity of demand for a substitute is positive. A *fall* in the price of a substitute brings a *decrease* in the quantity demanded of the good. The quantity demanded of a good and the price of one of its substitutes change in the *same* direction.

Suppose that when the price of soda falls by 10 percent, the quantity of pizza demanded increases by 2 percent. The cross elasticity of demand for pizza with respect to the price of soda is

$$\text{Cross elasticity of demand} = \frac{+2 \text{ percent}}{-10 \text{ percent}} = -0.2.$$

The cross elasticity of demand for a complement is negative. A *fall* in the price of a complement brings an *increase* in the quantity demanded of the good. The quantity demanded of a good and the price of one of its complements change in *opposite* directions.

*As before, these percentage changes are calculated by using the midpoint method.

FIGURE 5.7

Cross Elasticity of Demand

MyEconLab Animation

❶ A burger is a *substitute* for pizza. When the price of a burger falls, the demand curve for pizza shifts leftward from D_0 to D_1. At the price of $10 a pizza, people plan to buy fewer pizzas. The cross elasticity of the demand for pizza with respect to the price of a burger is *positive*.

❷ Soda is a *complement* of pizza. When the price of soda falls, the demand for pizza increases and the demand curve for pizza shifts rightward from D_0 to D_2. At the price of $10 a pizza, people plan to buy more pizzas. The cross elasticity of the demand for pizza with respect to the price of soda is *negative*.

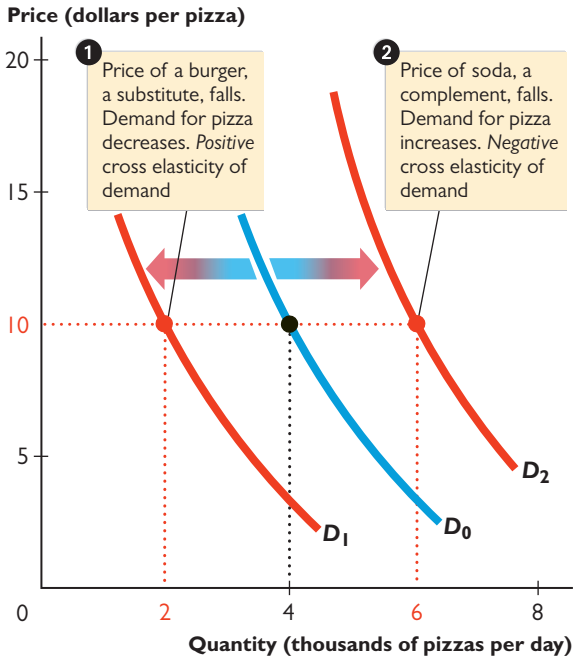


Figure 5.7 illustrates these two cross elasticities of demand for pizza. With the price of a pizza constant at $10, when the price of a burger falls, the demand for pizza decreases and the demand curve for pizza shifts leftward from D_0 to D_1. When the price of soda falls, the demand for pizza increases and the demand curve for pizza shifts rightward from D_0 to D_2. The magnitude of the cross elasticity determines how far the demand curve shifts.

Income Elasticity of Demand

The U.S. and global economies are expanding, and people are enjoying rising incomes. This increasing prosperity brings an increasing demand for most types of goods. But by how much will the demand for different items increase? Will the demand for some items increase so rapidly that we spend an increasing percentage of our incomes on them? And will the demand for some items decrease?

Income elasticity of demand
A measure of the responsiveness of the demand for a good to a change in income when other things remain the same.

The answer depends on the income elasticity of demand. The **income elasticity of demand** is a measure of the responsiveness of the demand for a good to a change in income when other things remain the same. It is calculated by using the following formula:

$$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}.$$

The income elasticity of demand falls into three ranges:

- Greater than 1 (normal good, income elastic)
- Between zero and 1 (normal good, income inelastic)
- Less than zero (inferior good)

As our incomes increase: items that have

- An income elastic demand take an increasing share of income
- An income inelastic demand take a decreasing share of income
- A negative income elasticity of demand take an absolutely smaller amount of income.

You can make some strong predictions about how the world will change over the coming years by knowing the income elasticities of demand of different goods and services. Table 5.1 provides a sampling of numbers.

These estimated income elasticities of demand tell us that we can expect air travel—both domestic and international—to become hugely more important; an increasing share of our incomes will be spent on watching movies, eating out in restaurants, using public transportation, and getting haircuts. Two other prominent items not shown in the table, items for which demand is income elastic, are healthcare and education. As our incomes grow, we can expect education and healthcare to take increasing shares of our incomes.

As our incomes grow, we'll spend a decreasing percentage on clothing, phone calls, and food. The income elasticity of demand for food is less than one, even for the poorest people. So we can predict a continuation of the trends of the past—shrinking agriculture and manufacturing, and expanding services.

TABLE 5.1

Some Income Elasticities of Demand

Good or Service	Elasticity
Income Elastic	
Airline travel	5.82
Movies	3.41
Foreign travel	3.08
Electricity	1.94
Restaurant meals	1.61
Local buses and trains	1.38
Haircuts	1.36
Income Inelastic	
Tobacco	0.86
Alcoholic beverages	0.62
Clothing	0.51
Newspapers	0.38
Telephone	0.32
Food	0.14

SOURCES OF DATA: See p. C1.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Your Price Elasticities of Demand

Pay close attention the next time the price of something that you buy rises. Did you spend more, the same, or less on this item?

Your expenditure on a good is equal to the price of the good multiplied by the quantity that you buy.

But recall that a seller's total revenue is equal to the price of the good multiplied by the quantity sold.

Because your expenditure on a good is equal to the seller's total revenue, the total revenue test that the seller uses to estimate price elasticity of demand can also be used to estimate your price elasticity of demand.

You can determine whether your demand for a good is elastic, unit elastic, or inelastic by noting how your total expenditure on a good changes when its price changes.

When the price of a good rises, your demand for that good is

- *Elastic* if your expenditure on it decreases.
- *Unit elastic* if your expenditure on it remains constant.
- *Inelastic* if your expenditure on it increases.

Think about why your demand for a good might be elastic, unit elastic, or inelastic by checking back to the list of influences on the price elasticity of demand on p. 116.

Most likely, as we noted in the *Eye on Elasticity at the Coffee Shop* on p. 123, when the price of a latte rises, you drink almost as many lattes as you did at the lower price. A latte has poor substitutes and your demand for latte is inelastic.

What do you do if the price of smartphone service falls? Do you spend less on smartphone service, as you would if your demand for smartphone service is inelastic? Or do you spend more on smartphone service, which would indicate an elastic demand for smartphone service?

What about your iTunes and Hulu or Netflix? Is your demand for these items elastic or inelastic? Is your demand for textbooks elastic or inelastic? You can estimate all these elasticities.

MyEconLab Study Plan 5.3
Key Terms Quiz
Solutions Video

CHECKPOINT 5.3

Define the cross elasticity of demand and the income elasticity of demand, and explain the factors that influence them.

Practice Problems

1. The quantity demanded of good *A* increases by 5 percent when the price of good *B* rises by 10 percent and other things remain the same. Calculate the cross elasticity of demand. Are goods *A* and *B* complements or substitutes? Describe how the demand for good *A* changes.
2. When income rises by 5 percent and other things remain the same, the quantity demanded of good *C* increases by 1 percent. Calculate the income elasticity of demand for good *C*. Is good *C* a normal good or an inferior good? Describe how the demand for good *C* changes.

In the News

China is the world's fastest-growing market for "vanity" spending
China's market for the consumption of goods aimed at enhancing one's appearance or status grew an average of 15.6 percent a year for the past five years.
Source: qz.com, April 23, 2015

Given the information that incomes grew at about 7 percent a year, is the demand for "vanity" goods in China income elastic or income inelastic? Explain.

FIGURE 1



FIGURE 2



Solutions to Practice Problems

1. Cross elasticity of demand = Percentage change in the quantity demanded of good *A* ÷ Percentage increase in the price of good *B*.
   Cross elasticity of demand = 5 ÷ 10, or 0.5.
   Goods *A* and *B* are substitutes because the cross elasticity of demand is positive. When the price of good *B* rises, the quantity demanded of good *A* increases and people switch from good *B* to good *A*. The demand for good *A* increases (Figure 1).
2. Income elasticity of demand = Percentage change in the quantity demanded of good *C* ÷ Percentage increase in income.
   Income elasticity of demand = 1 ÷ 5, or 0.2.
   Income elasticity of demand is positive, so good *C* is a normal good.
   As income rises, the quantity demanded of good *C* increases. The demand for good *C* increases (Figure 2).

Solution to In the News

To know whether the demand for a good is income elastic, we need to calculate the income elasticity of demand. A good with an income elastic demand is one that has an income elasticity of demand greater than 1. If spending on "vanity" goods increased by 15.6 percent per year when incomes grew by 7 percent per year, the income elasticity of demand for "vanity" goods is 15.6 divided by 7, which equals 2.2. The income elasticity of demand for "vanity" goods is greater than 1, so the demand for "vanity" goods is income elastic.

CHAPTER SUMMARY

Key Points

1. Define and calculate the price elasticity of demand, and explain the factors that influence it.

- The demand for a good is elastic if, when its price changes, the percentage change in the quantity demanded exceeds the percentage change in price.
- The demand for a good is inelastic if, when its price changes, the percentage change in the quantity demanded is less than the percentage change in price.
- The price elasticity of demand for a good depends on how easy it is to find substitutes for the good and on the proportion of income spent on it.
- Price elasticity of demand equals the percentage change in the quantity demanded divided by the percentage change in price.
- If demand is elastic, a rise in price leads to a decrease in total revenue. If demand is unit elastic, a rise in price leaves total revenue unchanged. And if demand is inelastic, a rise in price leads to an increase in total revenue.

2. Define and calculate the price elasticity of supply, and explain the factors that influence it.

- The supply of a good is elastic if, when its price changes, the percentage change in the quantity supplied exceeds the percentage change in price.
- The supply of a good is inelastic if, when its price changes, the percentage change in the quantity supplied is less than the percentage change in price.
- The main influences on the price elasticity of supply are the flexibility of production possibilities and storage possibilities.

3. Define the cross elasticity of demand and the income elasticity of demand, and explain the factors that influence them.

- Cross elasticity of demand shows how the demand for a good changes when the price of one of its substitutes or complements changes.
- Cross elasticity is positive for substitutes and negative for complements.
- Income elasticity of demand shows how the demand for a good changes when income changes. For a normal good, the income elasticity of demand is positive. For an inferior good, the income elasticity of demand is negative.

Key Terms

MyEconLab Key Terms Quiz

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MyEconLab Chapter 5 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

When the price of home heating oil increased by 20 percent, the quantity demanded decreased by 2 percent and the quantity of wool sweaters demanded increased by 10 percent. Use this information to work Problems **1** and **2**.

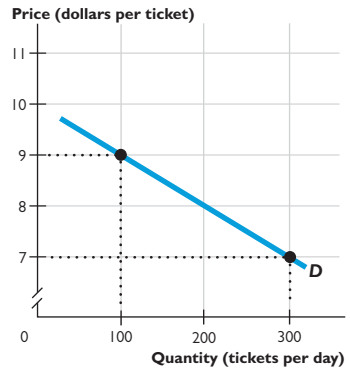
1. Use the total revenue test to determine whether the demand for home heating oil is elastic or inelastic.

2. If the price of a wool sweater did not change, calculate the cross elasticity of demand for wool sweaters with respect to the price of home heating oil. Are home heating oil and wool sweaters substitutes or complements? Why?

3. Figure 1 shows the demand for movie tickets. Is the demand for movie tickets elastic or inelastic over the price range $7 to $9 a ticket? If the price falls from $9 to $7 a ticket, explain how the total revenue from the sale of movie tickets will change. Calculate the price elasticity of demand for movie tickets when the price is $8 a ticket.

4. The price elasticity of demand for Pete's chocolate chip cookies is 1.5. Pete wants to increase his total revenue. Would you recommend that Pete raise or lower his price of cookies? Explain your answer.

FIGURE 1



Use the following information to work Problems **5** and **6**.

The price of a plane ride rises by 10 percent. The price elasticity of demand for plane rides is 0.5 and the price elasticity of demand for train rides is 0.2. The cross elasticity of demand for train rides with respect to the price of a plane ride is 0.4.

5. Calculate the percentage changes in the quantity demanded of plane rides and train rides.

6. Given the rise in the price of a plane ride, what percentage change in the price of a train ride will leave the quantity demanded of train rides unchanged?

7. A survey found that when incomes increased by 10 percent, the following changes in quantities demanded occurred: spring water up by 5 percent; sports drinks down by 2 percent; cruises up by 15 percent. For which good is demand income elastic? For which good is demand income inelastic? Which goods are normal goods?

8. **Did Starbucks start a pumpkin boom?**
Ever since Starbucks introduced its famed pumpkin spice latte about a decade ago, pumpkin sales have skyrocketed.

Source: CNNMoney, October 1, 2014

The price of pumpkin increased from $286 per ton in 2000 to $732 per ton in 2014 (both prices in 2014 dollars) and the quantity produced increased from 423,000 tons in 2000 to 657,150 in 2014. Calculate the U.S. price elasticity of supply of pumpkin: Is its supply elastic?

9. Read *Eye on Elasticity at the Coffee Shop* on p. 123 and then explain why the demand for latte is inelastic while the demand for a Starbucks latte is elastic. Which demand is likely to be more inelastic: the demand for latte or the demand for coffee?

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

Use the following data to work Problems **1** and **2**.

When Elle's Espresso Bar increased its prices by 10 percent, the quantity of coffee that Elle sold decreased by 40 percent. When Elle and all her competitors cut their prices by 10 percent, the quantity of coffee sold by Elle increased by only 4 percent.

1. Calculate the price elasticity of demand for Elle's Espresso Bar coffee and the price elasticity of demand for coffee.

2. Explain the difference between the responses to Elle's price hike and price cut. Why did the price increase bring a large response in the quantity sold while the price cut had only a small effect?

3. When rain ruined the banana crop in Central America, the price of bananas rose from $1 to $2 a pound. Growers sold fewer bananas, but their total revenue was unchanged. By what percentage did the quantity demanded of bananas change? Is the demand for bananas elastic, unit elastic, or inelastic?

4. The income elasticity of demand for haircuts is 1.5, and the income elasticity of demand for food is 0.14. You take a weekend job, and the income you have available to spend on food and haircuts doubles. If the prices of food and haircuts remain the same, will you double your expenditure on haircuts and double your expenditure on food? Explain why or why not.

5. Drought cuts the quantity of wheat grown by 2 percent. If the price elasticity of demand for wheat is 0.5, by how much will the price of wheat rise?

If pasta makers estimate that this change in the price of wheat will increase the price of pasta by 25 percent and decrease the quantity demanded of pasta by 8 percent, what is the pasta makers' estimate of the price elasticity of demand for pasta?

If pasta sauce makers estimate that, with the change in the price of pasta, the quantity of pasta sauce demanded will decrease by 5 percent, what is the pasta sauce makers' estimate of the cross elasticity of demand for pasta sauce with respect to the price of pasta?

6. "In a market in which demand is price inelastic, producers can gouge consumers and the government should set high standards of conduct for producers to ensure that consumers get a fair deal." Which parts of this statement are positive and which are normative? Explain how you might go about testing the positive part.

Use the following information to work Problems **7** and **8**.

Valentine roses

On Valentine's Day 2015, 257 million roses were sold for about double the normal price. On a normal day, 3 million roses are sold.

Source: aboutflowers.com, 2015

7. Does the information about the market for roses enable us to estimate an elasticity, and if so, which one: the price elasticity of demand, the price elasticity of supply, an income elasticity, or a cross elasticity? Explain your answer.

8. What is the magnitude of the elasticity that you can estimate using the information provided? Explain your answer.

MyEconLab Chapter 5 Study Plan

Multiple Choice Quiz

1. When the price of ice cream rises from $3 to $5 a scoop, the quantity of ice cream bought decreases by 10 percent. The price elasticity of demand for ice cream is _____.

A. 5
B. 0.2
C. 50
D. 2.5

2. In Pioneer Ville, the price elasticity of demand for bus rides is 0.5. When the price of a bus ticket rises by 5 percent, _____.

A. the demand for bus rides increases by 10 percent
B. the quantity of bus rides demanded increases by 2.5 percent
C. the demand for bus rides decreases by 2.5 percent
D. the quantity of bus rides demanded decreases by 2.5 percent

3. The price elasticity of demand for a good is 0.2. A 10 percent rise in the price will _____ the total revenue from sales of the good.

A. decrease
B. increase
C. decrease the quantity sold with no change in
D. not change

4. If the price of a good falls and expenditure on the good rises, the demand for the good is _____.

A. elastic
B. perfectly elastic
C. inelastic
D. unit elastic

5. When the price of a good rises from $5 to $7 a unit, the quantity supplied increases from 110 to 130 units a day. The price elasticity of supply is _____. The supply of the good is _____.

A. 60; elastic
B. 10; elastic
C. 0.5; inelastic
D. 2; inelastic

6. The cross elasticity of demand for good *A* with respect to good *B* is 0.2. A 10 percent change in the price of good *B* will lead to a _____ percent change in the quantity of good *A* demanded. Goods *A* and *B* are _____.

A. 2; substitutes
B. 0.5; complements
C. −2; complements
D. −0.5; substitutes

7. A 2 percent increase in income increases the quantity demanded of a good by 1 percent. The income elasticity of demand for this good is _____. The good is a _____ good.

A. 2; normal
B. −2; inferior
C. 1/2; normal
D. 2; inferior



Should price gouging be illegal?

Efficiency and Fairness of Markets

6

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Describe the alternative methods of allocating scarce resources, and define and explain the features of an efficient allocation.
2. Distinguish between value and price, and define consumer surplus.
3. Distinguish between cost and price, and define producer surplus.
4. Evaluate the efficiency of the alternative methods of allocating resources.
5. Explain the main ideas about fairness, and evaluate the fairness of the alternative methods of allocating scarce resources.

MyEconLab Big Picture Video

MyEconLab Concept Video

6.1 ALLOCATION METHODS AND EFFICIENCY

Because resources are scarce, they must be allocated among their competing uses. Doing nothing and leaving resource use to chance is one method of allocation. *Price gouging*—charging an unusually high price for an essential item following a natural disaster—is another. The goal of this chapter is to evaluate the ability of a market price to allocate resources efficiently and fairly.

But market price is only one of several methods of allocating resources. To know whether the market does a good job, we need to compare it with its alternatives. We also need to know what is meant by an efficient and fair allocation.

Economists have much more to say about efficiency than about fairness, so efficiency is the main focus of this chapter. We leave the difficult issue of fairness until the final section. We begin by describing the alternative ways in which resources might be allocated. Then we explain the characteristics of an efficient allocation.

Resource Allocation Methods

Resources might be allocated by using any one or some combination of the following methods:

- Market price
- Command
- Majority rule
- Contest
- First-come, first-served
- Sharing equally
- Lottery
- Personal characteristics
- Force

Let's see how each method works and look at an example of each.



Market price allocates resources to those who are willing and able to pay.

Market Price

When a market price allocates a scarce resource, the people who get the resource are those who are willing and able to pay the market price. People who don't value the resource as highly as the market price leave it for others to buy and use.

Most of the scarce resources that you supply get allocated by market price. For example, you sell your labor services in a market. And almost everything that you consume gets bought in a market.

Two kinds of people decide not to buy at the market price: those who can afford to buy but choose not to, and those who are too poor and can't afford to buy.

For many goods and services, distinguishing between those who choose not to buy and those who can't afford to buy doesn't matter. For a few items, that distinction does matter. For example, some poor people can't afford to pay school fees and doctor's fees. The inability of poor people to buy items that most people consider to be essential is not handled well by the market price method and is usually dealt with by one of the other allocation methods.

But for most goods and services, the market turns out to do a good job. We'll examine just how good a job it does later in this chapter.

Command

A **command system** allocates resources by the order (command) of someone in authority. Many resources get allocated by command. In the U.S. economy, the command system is used extensively inside firms and government bureaus. For example, if you have a job, it is most likely that someone tells you what to do. Your labor time is allocated to specific tasks by a command.

Sometimes, a command system allocates the resources of an entire economy. The former Soviet Union is an example. North Korea and Cuba are the only remaining command economies.

A command system works well in organizations in which the lines of authority and responsibility are clear and it is easy to monitor the activities being performed. But a command system works badly when applied to an entire economy. The range of activities to be monitored is just too large, and it is easy for people to fool those in authority. The system works so badly in North Korea that it fails even to deliver an adequate supply of food.

Command system
A system that allocates resources by the order of someone in authority.



A command allocates resources by the order of someone in authority.

Majority Rule

Majority rule allocates resources in the way that a majority of voters choose. Societies use majority rule for some of their biggest decisions. For example, majority rule decides the tax rates that end up allocating scarce resources between private use and public use. And majority rule decides how tax dollars are allocated among competing uses such as national defense and healthcare for the aged.

Having 200 million people vote on every line in a nation's budget would be extremely costly, so instead of direct majority rule, the United States (and most other countries) use the system of representative government. Majority rule determines who will represent the people, and majority rule among the representatives decides the detailed allocation of scarce resources.

Majority rule works well when the decisions being made affect large numbers of people and self-interest must be suppressed to use resources most effectively.



Voting allocates resources in the way that the majority wants.

Contest

A contest allocates resources to a winner (or a group of winners). The most obvious contests are sporting events. Serena Williams and Sloane Stephens do battle on a tennis court, and the winner gets twice as much in prize money as the loser.

But contests are much more general than those in a sports arena, though we don't call them contests in ordinary speech. For example, Bill Gates won a big contest to provide the world's personal computer operating system, and Jennifer Lawrence won a type of contest to rise to the top of the movie-acting business.

Contests do a good job when the efforts of the "players" are hard to monitor and reward directly. By dangling the opportunity to win a big prize, people are motivated to work hard and try to be the "winner." Even though only a few people end up with a big prize, many people work harder in the process of trying to win and so total production is much greater than it would be without the contest.



A contest allocates resources to the winner, in sport and business.

First-Come, First-Served

A first-come, first-served method allocates resources to those who are first in line. Most national parks allocate campsites in this way. Airlines use first-come, first-served to allocate standby seats at the departure gate. A freeway is an everyday example of first-come, first-served. This scarce transportation resource gets allocated



First-come, first-served allocates resources to the first in line.

to the first to arrive at the on-ramp. If too many vehicles enter the freeway, the speed slows and people, in effect, wait in line for a bit of the "freeway" to become free!

First-come, first-served works best when, as in the above examples, a scarce resource can serve just one user at a time in a sequence. By serving the user who arrives first, this method minimizes the time spent waiting in line for the resource to become free.



Sharing allocates resources by mutual agreement.

Sharing Equally

When a resource is shared equally, everyone gets the same amount of it. You perhaps use this method to share dessert at a restaurant. People sometimes jointly own a vacation apartment and share its use equally.

To make equal shares work, people must agree on how to use the resource and must make an arrangement to implement the agreement. Sharing equally can work for small groups who share a set of common goals and ideals.



A lottery allocates resources to the one who draws the winning number.

Lottery

Lotteries allocate resources to those who pick the winning number, draw the lucky cards, or come up lucky on some other gaming system. State lotteries and casinos reallocate millions of dollars' worth of goods and services every year.

But lotteries are far more widespread than state jackpots and roulette wheels in casinos. They are used in a variety of situations to allocate scarce resources. For example, the Lawn Tennis Association operates ballots and draws to allocate Wimbledon tickets and some airports use them to allocate landing slots to airlines.

Lotteries work well when there is no effective way to distinguish among potential users of a scarce resource.



Personal characteristics allocate resources based on whom we like.

Personal Characteristics

When resources are allocated on the basis of personal characteristics, people with the "right" characteristics get the resources. Some of the resources that matter most to you are allocated in this way. The people you like are the ones you spend the most time with. You try to avoid having to spend time with people you don't like. People choose marriage partners on the basis of personal characteristics. The use of personal characteristics to allocate resources is regarded as completely natural and acceptable.

But this method also gets used in unacceptable ways. Allocating the best jobs to white, Anglo-Saxon males and discriminating against minorities and women is an example.



Force protects the rule of law and facilitates economic activity.

Force

Force plays a crucial role, for both good and ill, in allocating scarce resources. Let's start with the ill.

War, the use of military force by one nation against another, has played an enormous role historically in allocating resources. The economic supremacy of European settlers in the Americas and Australia owes much to the use of this method.

Theft, the taking of the property of others without their consent, also plays a large role. Both large-scale organized crime and small-scale petty crime collectively allocate billions of dollars' worth of resources annually. A large amount of

theft today is conducted by using sophisticated electronic methods that move resources from banks and also from thousands of innocent people.

But force plays a crucial positive role in allocating resources. It provides an effective method for the government to transfer wealth from the rich to the poor and is the legal framework in which voluntary exchange in markets takes place.

Most income and wealth redistribution in modern societies occurs through a taxation and benefits system that is enforced by the power of the state. We vote for taxes and benefits—a majority vote allocation—but we use the power of the state to ensure that everyone complies with the rules and pays their allotted share.

A legal system is the foundation on which our market economy functions. Without courts to enforce contracts, it would be difficult to do business. But the courts could not enforce contracts without the ability to apply force if necessary. The state provides the ultimate force that enables the courts to do their work.

More broadly, the force of the state is essential to uphold the principle of the *rule of law.* This principle is the bedrock of civilized economic (and social and political) life. With the rule of law upheld, people can go about their daily economic lives with the assurance that their property will be protected—that they can sue for violations of their property (and be sued if they violate the property of others).

Free from the burden of protecting their property and confident in the knowledge that those with whom they trade will honor their agreements, people can get on with focusing on the activity at which they have a comparative advantage and trading for mutual gain.

In the next sections of this chapter, we're going to see how a market achieves an efficient use of resources, examine obstacles to efficiency, and see how sometimes, an alternative method might improve on the market. But first we need to be clear about the meaning of efficiency. What are the characteristics of an efficient allocation of resources?

Using Resources Efficiently

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In everyday language, *efficiency* means getting the most out of something. An efficient automobile is one that gets the best possible gas mileage; an efficient furnace is one that uses as little fuel as possible to deliver its heat. In economics, efficiency means getting the most out of the entire economy.

Efficiency and the *PPF*

The *production possibilities frontier* (*PPF*) is the boundary between the combinations of goods and services that can be produced and those that cannot be produced given the available factors of production and state of technology (p. 60). Production is efficient when the economy is *on* its *PPF* (Chapter 3, pp. 62–63). Production at a point *inside* the *PPF* is *inefficient.*

Allocative efficiency is achieved when the quantities of goods and services produced are those that people *value most highly*. To put it another way, resources are allocated efficiently when we cannot produce more of one thing without giving up something else *that people value more highly.* If we can give up some units of one good to get more of something that is *valued more highly*, we haven't achieved the most valued point on the *PPF*.

Allocative efficiency
A situation in which the quantities of goods and services produced are those that people *value most highly*—it is not possible to produce more of a good or service without giving up some of another good that people *value more highly*.

The *PPF* tells us what it is *possible* to produce but it doesn't tell us about the *value* of what we produce. To find the *highest-valued* point on the *PPF*, we need some information about value. *Marginal benefit* provides that information.

Marginal Benefit

Marginal benefit is the benefit that people receive from consuming *one more unit* of a good or service. People's *preferences* determine marginal benefit and we can measure the marginal benefit from a good or service by what people *are willing to* give up to get *one more* unit of it.

The more we have of any good or service, the smaller is our marginal benefit from it—*the principle of decreasing marginal benefit*. Think about your own marginal benefit from pizza. You really enjoy the first slice. A second slice is fine, too, but not quite as satisfying as the first one. But eat three, four, five, six, and more slices, and each additional slice is less enjoyable than the previous one. You get diminishing marginal benefit from pizza. The more pizza you have, the less of some other good or service you are willing to give up to get one more slice.

Figure 6.1 illustrates the economy's marginal benefit schedule and marginal benefit curve for pizza. The schedule and curve show the same information. In the schedule and on the curve, the quantity of other goods that people *are willing to give up* to get one more pizza *decreases* as the quantity of pizza available *increases*.

Marginal Cost

To achieve allocative efficiency, we must compare the marginal benefit from pizza with its marginal cost. *Marginal cost* is the opportunity cost of producing one more unit of a good or service (see p. 10) and is measured by the slope of the production possibilities frontier (see pp. 66–67). The marginal cost of a good increases as the quantity produced of that good increases.

FIGURE 6.1

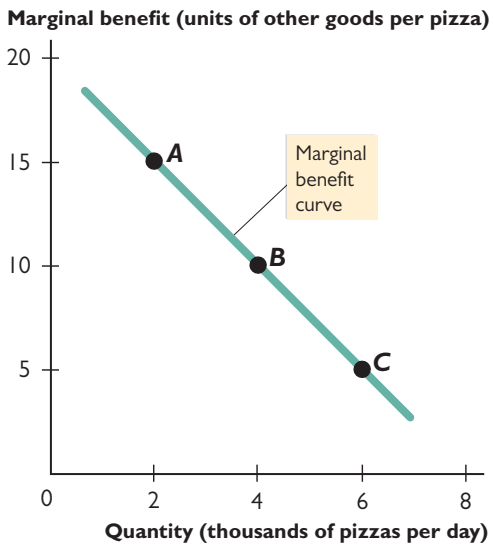
Marginal Benefit from Pizza

MyEconLab Animation

The table and the graph show the marginal benefit from pizza.

Possibility *A* and point *A* tell us that if 2,000 pizzas a day are produced, people are willing to give up 15 units of other goods for a pizza. Each point *A*, *B*, and *C* on the graph represents the possibility in the table identified by the same letter.

The line passing through these points is the marginal benefit curve. The marginal benefit from pizza decreases as the quantity of pizza available increases.



Quantity (thousands of pizzas per day)	2	4	6
Willingness to give up (units of other goods per pizza)	15	10	5
Possibility	*A*	*B*	*C*

Figure 6.2 illustrates the economy's marginal cost schedule and marginal cost curve. In the schedule and along the curve, which show the same information, the quantity of other goods that people *must give up* to get one more pizza *increases* as the quantity of pizza produced *increases*.

We can now use the concepts of marginal benefit and marginal cost to discover the efficient quantity of pizza to produce.

Efficient Allocation

The efficient allocation is the highest-valued allocation. To find this allocation, we compare marginal benefit and marginal cost.

If the marginal benefit from pizza exceeds its marginal cost, we're producing too little pizza (and too many units of other goods). If we increase the quantity of pizza produced, we incur a cost but receive a larger benefit from the additional pizza. Our allocation of resources becomes more efficient.

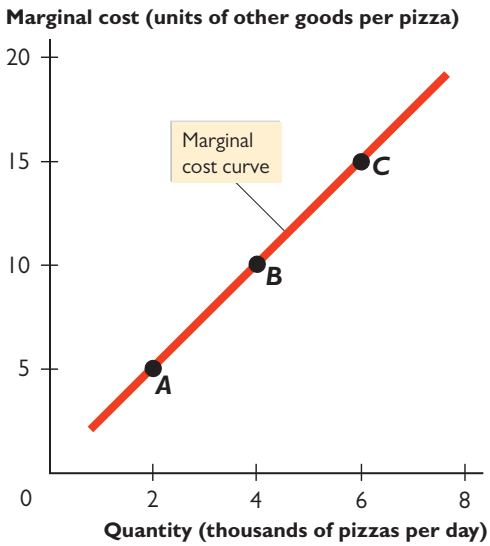
If the marginal cost of pizza exceeds its marginal benefit, we're producing too much pizza (and too little of other goods). Now if we decrease the quantity of pizza produced, we receive a smaller benefit from pizza but save an even greater cost of pizza. Again, our allocation of resources becomes more efficient.

Only when the marginal benefit and marginal cost of pizza are equal are we allocating resources efficiently. Figure 6.3 on the next page illustrates this efficient allocation and provides a graphical summary of the above description of allocative efficiency.

FIGURE 6.2

Marginal Cost of Pizza

MyEconLab Animation



Quantity (thousands of pizzas per day)	2	4	6
Must give up (units of other goods per pizza)	5	10	15
Possibility	*A*	*B*	*C*

The table and the graph show the marginal cost of a pizza. Marginal cost is the opportunity cost of producing one more unit. It is derived from the *PPF* and is measured by the slope of the *PPF*.

Points *A*, *B*, and *C* on the graph represent the possibilities in the table. The marginal cost curve shows that the marginal cost of a pizza increases as the quantity of pizza produced increases.

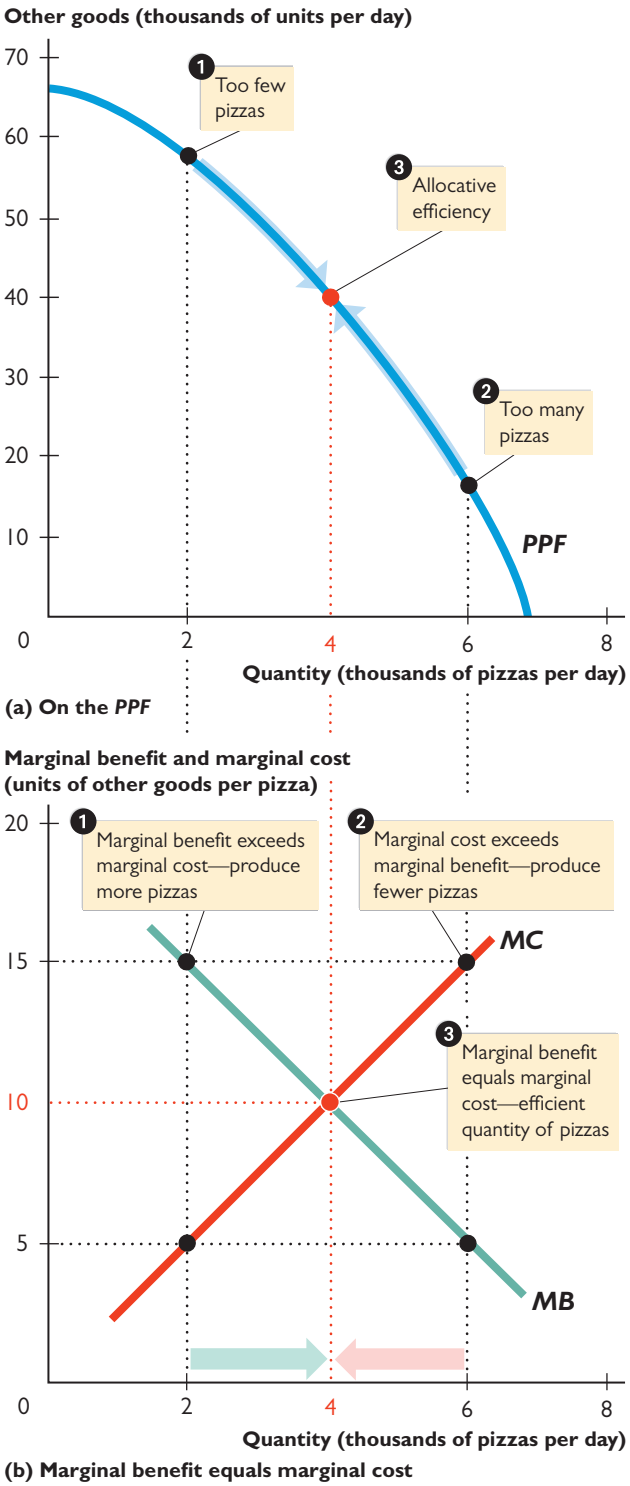
FIGURE 6.3

The Efficient Quantity of Pizza

MyEconLab Animation

Production efficiency occurs at all points on the *PPF*, but *allocative efficiency* occurs at only one point on the *PPF*.

1. When 2,000 pizzas are produced in part (a), the marginal benefit from pizza exceeds its marginal cost in part (b). Too few pizzas are being produced. If more pizzas and fewer other goods are produced, the value of production increases and resources are used more efficiently.
2. When 6,000 pizzas are produced in part (a), the marginal cost of a pizza exceeds its marginal benefit in part (b). Too many pizzas are being produced. If fewer pizzas and more other goods are produced, the value of production increases and resources are used more efficiently.
3. When 4,000 pizzas a day are produced in part (a), the marginal cost of a pizza equals its marginal benefit in part (b). The efficient quantity of pizzas is being produced. It is not possible to get greater value from the economy's scarce resources. If one less pizza and more other goods are produced, the value of the lost pizza exceeds the value of the additional other goods, so total value falls. And if one more pizza and fewer other goods are produced, the value of the gained pizza is less than the value of the lost other goods, so again total value falls.



CHECKPOINT 6.1

Describe the alternative methods of allocating scarce resources, and define and explain the features of an efficient allocation.

MyEconLab Study Plan 6.1
Key Terms Quiz
Solutions Video

Practice Problems

1. Which method is used to allocate the following scarce resources?
   - Campus parking space between student areas and faculty areas
   - A spot in a restricted student parking area
   - Textbooks
   - Host city for the Olympic Games

Use Figure 1, which shows a nation's *PPF*, and Table 1, which shows its marginal benefit and marginal cost schedules, to work Problems **2** and **3**.

2. What is the marginal benefit from bananas when 1 pound of bananas is grown? What is the marginal cost of growing 1 pound of bananas?
3. On Figure 1, mark two points: Point *A* at which production is efficient but too much coffee is produced for allocative efficiency; and point *B*, the point of allocative efficiency.

FIGURE 1

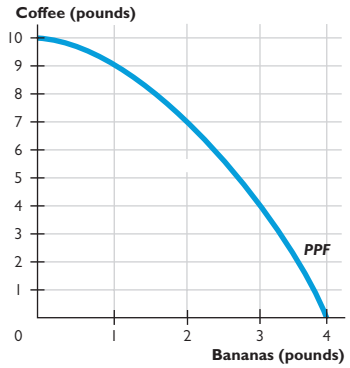


TABLE 1 MARGINAL BENEFIT AND MARGINAL COST

Bananas (pounds)	Willing to give up (pounds of coffee per pound of bananas)	Must give up (pounds of coffee per pound of bananas)
1	3	1
2	2	2
3	1	3

In the News

Jack White announces short run of shows—our best guesses as to where
Fresh off his scorching performance at Coachella Saturday night, rocker Jack White announced he'll do shows unannounced until day-of-show, with tickets priced at $3 and limited to one ticket per person, to be purchased only at the venue on a first-come, first-served basis.

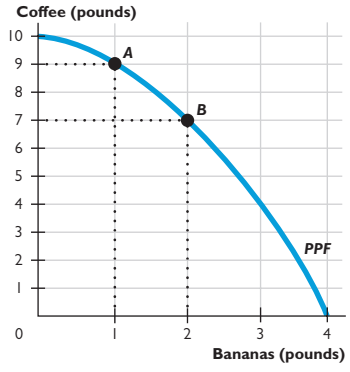
Source: *Billboard Magazine*, April 14, 2015

What method was used to allocate Jack White concert tickets? Was it efficient?

Solutions to Practice Problems

1. Campus parking is allocated by command. The spot in a restricted student parking area is allocated by first-come, first-served. Textbooks are allocated by market price. The Olympic Games' host city is allocated by contest.
2. The marginal benefit from 1 pound of bananas is 3 pounds of coffee. Marginal benefit is the amount of coffee that the nation is *willing to give up* to get *one additional* pound of bananas. The marginal cost of growing 1 pound of bananas is 1 pound of coffee. Marginal cost is the amount of coffee that the nation *must give up* to get *one additional* pound of bananas.
3. Point *A* on Figure 2 shows production efficiency (on the *PPF*) but not allocative efficiency because from Table 1 marginal benefit from bananas exceeds the marginal cost—too few bananas are produced. Point *B* is the point of allocative efficiency: It is on the *PPF* and marginal benefit equals marginal cost.

FIGURE 2



Solution to In the News

The initial allocation used was first-come, first-served at the venue. But a person who gets a ticket can either use it or sell it at the going market price to someone in the ticket line at the venue. Only if the market price equals the organizer's marginal cost is the allocation of tickets efficient.

MyEconLab Concept Video

6.2 VALUE, PRICE, AND CONSUMER SURPLUS

To investigate whether a market is efficient, we need to understand the connection between demand and marginal benefit and between supply and marginal cost.

Demand and Marginal Benefit

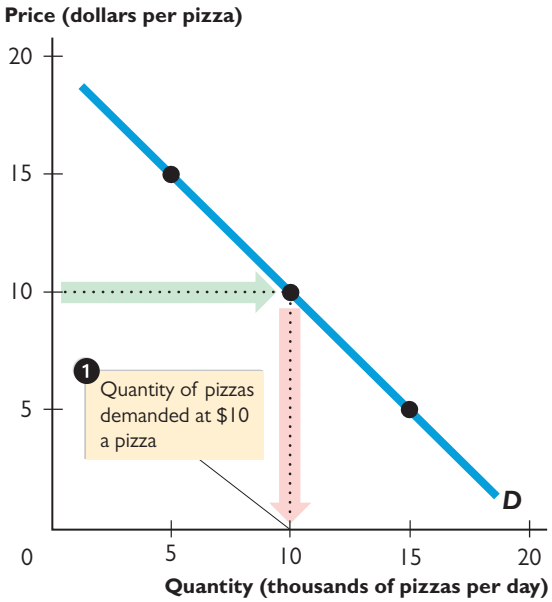
In everyday life, when we talk about "getting value for money," we're distinguishing between *value* and *price*. Value is what we get, and price is what we pay. In economics, the everyday idea of value is *marginal benefit*, which we measure as the maximum price that people are willing to pay for another unit of the good or service. The demand curve tells us this price. In Figure 6.4(a), the demand curve shows the quantity demanded at a given price—when the price is $10 a pizza, the quantity demanded is 10,000 pizzas a day. In Figure 6.4(b), the demand curve shows the maximum price that people are willing to pay when there is a given quantity—when 10,000 pizzas a day are available, the most that people are willing to pay for the 10,000th pizza is $10. The marginal benefit from the 10,000th pizza is $10. So:

A demand curve is a marginal benefit curve. The demand curve for pizza tells us the dollars' worth of other goods and services that people are willing to forgo to consume one more pizza.

FIGURE 6.4

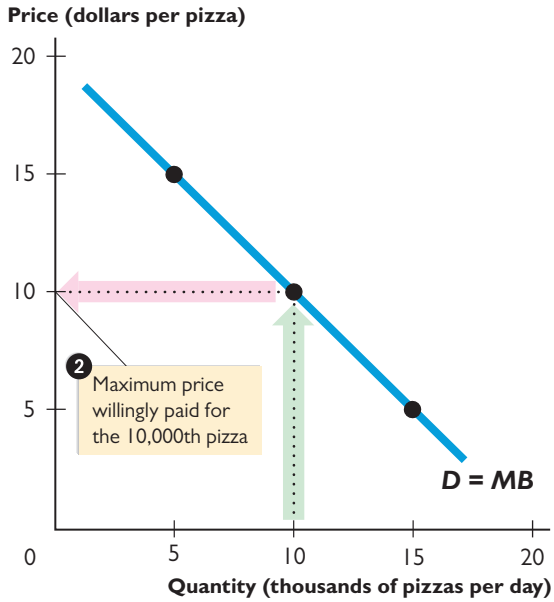
Demand, Willingness to Pay, and Marginal Benefit

MyEconLab Animation



(a) Price determines quantity demanded

❶ The demand curve for pizza, *D*, shows the quantity of pizza demanded at each price, other things remaining the same. At $10 a pizza, the quantity demanded is 10,000 pizzas a day.



(b) Quantity determines willingness to pay

❷ The demand curve shows the maximum price willingly paid (marginal benefit) for a given quantity. If 10,000 pizzas are available, the maximum price willingly paid for the 10,000th pizza is $10. The demand curve is also the marginal benefit curve *MB*.

Consumer Surplus

We don't always have to pay as much as we're willing to pay. When people buy something for less than it is worth to them, they receive a consumer surplus. **Consumer surplus** is the excess of marginal benefit from a good over the price paid for it, summed over the quantity consumed.

Consumer surplus
The marginal benefit from a good or service in excess of the price paid for it, summed over the quantity consumed.

Figure 6.5 illustrates consumer surplus. The demand curve for pizza tells us the quantity of pizza that people plan to buy at each price and the marginal benefit from pizza at each quantity. If the price of a pizza is $10, people buy 10,000 pizzas a day. Expenditure on pizza is $100,000, which is shown by the area of the blue rectangle.

To calculate consumer surplus, we must find the consumer surplus on each pizza and add these consumer surpluses together. For the 10,000th pizza, marginal benefit equals $10 and people pay $10, so the consumer surplus on this pizza is zero. For the 5,000th pizza (highlighted in the figure), marginal benefit is $15. So on this pizza, consumer surplus is $15 minus $10, which is $5. For the first pizza, marginal benefit is almost $20, so on this pizza, consumer surplus is almost $10.

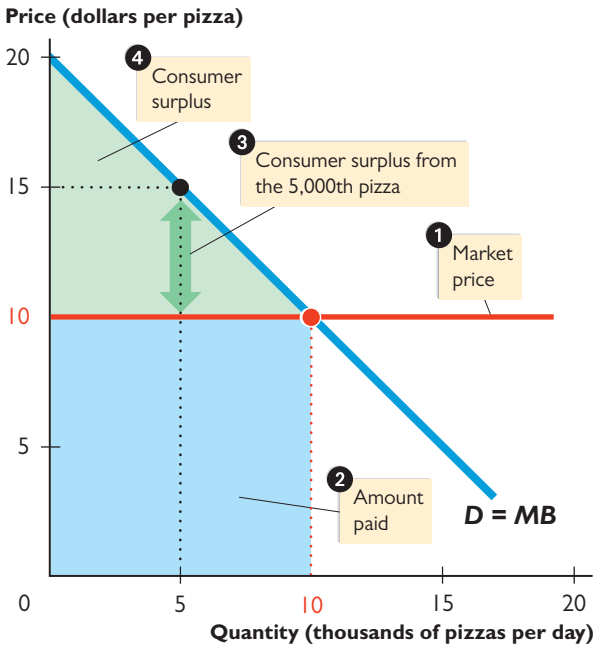
Consumer surplus—the sum of the consumer surpluses on the 10,000 pizzas that people buy—is $50,000 a day, which is shown by the area of the green triangle. (The base of the triangle is 10,000 pizzas a day and its height is $10, so its area is ($10 × 10,000) ÷ 2 = $50,000.)

The total benefit is the amount paid, $100,000 (the area of the blue rectangle), plus consumer surplus, $50,000 (the area of the green triangle), and is $150,000. Consumer surplus is the total benefit minus the amount paid, or net benefit to consumers.

FIGURE 6.5

Demand and Consumer Surplus

MyEconLab Animation



1. The market price of a pizza is $10.
2. At the market price, people buy 10,000 pizzas a day and spend $100,000 on pizza—the area of the blue rectangle.
3. The demand curve tells us that people are willing to pay $15 for the 5,000th pizza, so consumer surplus on the 5,000th pizza is $5.
4. Consumer surplus from the 10,000 pizzas that people buy is $50,000—the area of the green triangle.

The total benefit from pizza is the $100,000 that people pay plus the $50,000 consumer surplus they receive, or $150,000.

MyEconLab Study Plan 6.2
Key Terms Quiz
Solutions Video

CHECKPOINT 6.2

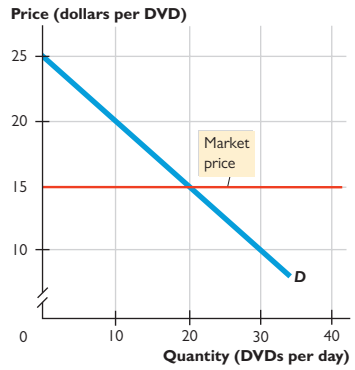
Distinguish between value and price, and define consumer surplus.

Practice Problems

Figure 1 shows the demand curve for DVDs and the market price of a DVD.

1. What is the willingness to pay for the 20th DVD? Calculate the value of the 10th DVD and the consumer surplus on the 10th DVD.
2. What is the quantity of DVDs bought? Calculate the consumer surplus, the amount spent on DVDs, and the total benefit from the DVDs bought.
3. If the price of a DVD rises to $20, what is the change in consumer surplus?

FIGURE 1



In the News

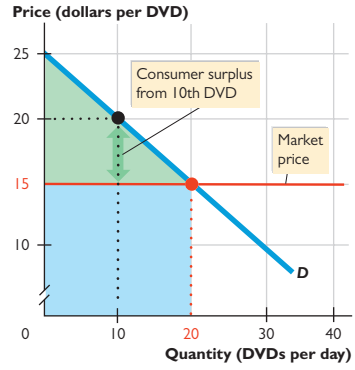
Airfares stacked against consumers

The airlines change prices from day to day. For example, the fare on one Delta flight from New York to Los Angeles jumped from $755 to $1,143 from a Friday to Saturday in April, then fell to $718 on Sunday.

Source: boston.com, June 22, 2011

Jodi planned a trip from New York to Los Angeles and was equally happy to travel on Friday, Saturday, or Sunday. The Saturday price was the most she was willing to pay. On which day do you predict she travelled and how much consumer surplus did she receive?

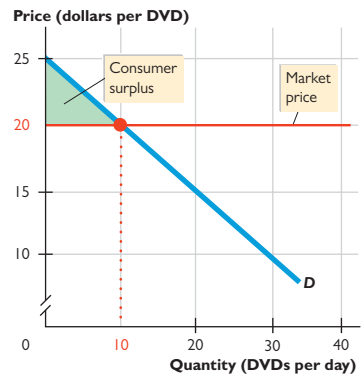
FIGURE 2



Solutions to Practice Problems

1. The willingness to pay for the 20th DVD is the price on the demand curve at 20 DVDs, which is $15 (Figure 2). The value of the 10th DVD is its marginal benefit, which is also the maximum price that someone is willing to pay for it. In Figure 2, the value of the 10th DVD is $20. The consumer surplus on the 10th DVD is its marginal benefit minus the price paid for the DVD, which is $20 − $15 (the length of the green arrow in Figure 2).
2. The quantity of DVDs bought is 20 a day. The consumer surplus from DVDs is ($25 − $15) × 20 ÷ 2 = $100 (the area of the green triangle in Figure 2). The amount spent on DVDs is the price multiplied by the quantity bought, which equals $15 × 20 = $300 (the area of the blue rectangle in Figure 2). The total benefit from DVDs is the amount spent on DVDs plus the consumer surplus from DVDs, which equals $300 + $100 = $400.
3. If the price of a DVD rises to $20, the quantity bought decreases to 10 a day. Consumer surplus decreases to ($25 − $20) × 10 ÷ 2 = $25 (the area of the green triangle in Figure 3). Consumer surplus decreases by $75 (from $100 in Figure 2 to $25 in Figure 3).

FIGURE 3



Solution to In the News

Being equally happy to travel on any of the three days means that Jodi's marginal benefit from the trip was the same on each day. Because Saturday's price of $1,143 was the most she was willing to pay, that is her marginal benefit. Being rational, Jodi would travel on the day with the lowest price, Sunday, and pay a fare of $718. Her consumer surplus would be her marginal benefit of $1,143 minus the price she paid, $718, which equals $425.

6.3 COST, PRICE, AND PRODUCER SURPLUS

MyEconLab Concept Video

You are now going to learn about cost, price, and producer surplus, which parallels what you've learned about value, price, and consumer surplus.

Supply and Marginal Cost

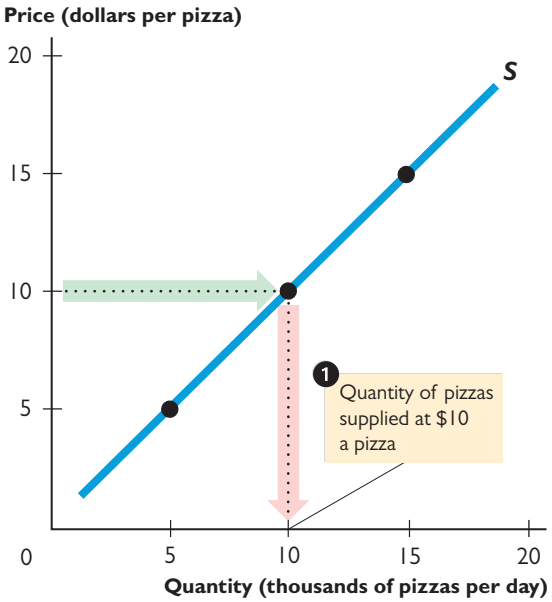
Just as buyers distinguish between *value* and *price,* so sellers distinguish between *cost* and *price.* Cost is what a seller must give up to produce the good, and price is what a seller receives when the good is sold. The cost of producing one more unit of a good or service is its *marginal cost.* It is just worth producing one more unit of a good or service if the price for which it can be sold equals marginal cost. The supply curve tells us this price. In Figure 6.6(a), the supply curve shows the quantity supplied at a given price—when the price of a pizza is $10, the quantity supplied is 10,000 pizzas a day. In Figure 6.6(b), the supply curve shows the minimum price that producers must receive to supply a given quantity—to supply 10,000 pizzas a day, producers must be able to get at least $10 for the 10,000th pizza. The marginal cost of the 10,000th pizza is $10. So:

A supply curve is a marginal cost curve. The supply curve of pizza tells us the dollars' worth of other goods and services that people must forgo if firms produce one more pizza.

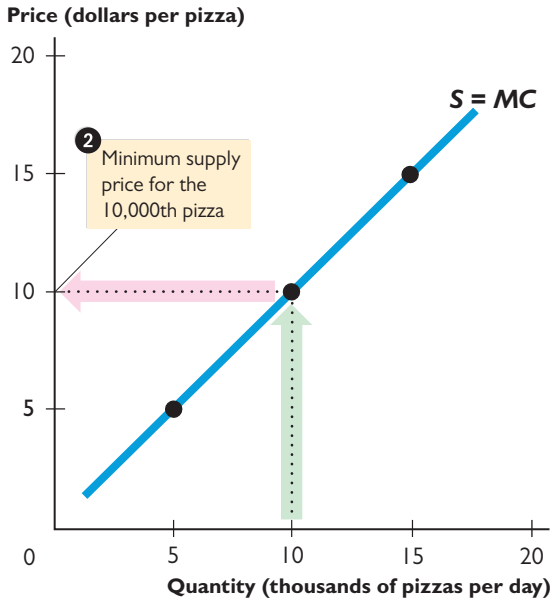
FIGURE 6.6

Supply, Minimum Supply Price, and Marginal Cost

MyEconLab Animation



(a) Price determines quantity supplied



(b) Quantity determines minimum supply price

❶ The supply curve of pizza, *S*, shows the quantity of pizza supplied at each price, other things remaining the same. At $10 a pizza, the quantity supplied is 10,000 pizzas a day.

❷ The supply curve shows the minimum price that firms must be offered to supply a given quantity. The minimum supply price equals marginal cost, which for the 10,000th pizza is $10. The supply curve is also the marginal cost curve *MC*.

Producer Surplus

Producer surplus
The price of a good in excess of the marginal cost of producing it, summed over the quantity produced.

When the price exceeds marginal cost, the firm obtains a producer surplus. **Producer surplus** is the excess of the price of a good over the marginal cost of producing it, summed over the quantity produced.

Figure 6.7 illustrates the producer surplus for pizza producers. The supply curve of pizza tells us the quantity of pizza that producers plan to sell at each price. The supply curve also tells us the marginal cost of pizza at each quantity produced. If the price of a pizza is $10, producers plan to sell 10,000 pizzas a day. The total revenue from pizza is $100,000 per day.

To calculate producer surplus, we must find the producer surplus on each pizza and add these surpluses together. For the 10,000th pizza, marginal cost equals $10 and producers receive $10, so the producer surplus on this pizza is zero. For the 5,000th pizza (highlighted in the figure), marginal cost is $6. So on this pizza, producer surplus is $10 minus $6, which is $4. For the first pizza, marginal cost is $2, so on this pizza, producer surplus is $10 minus $2, which is $8.

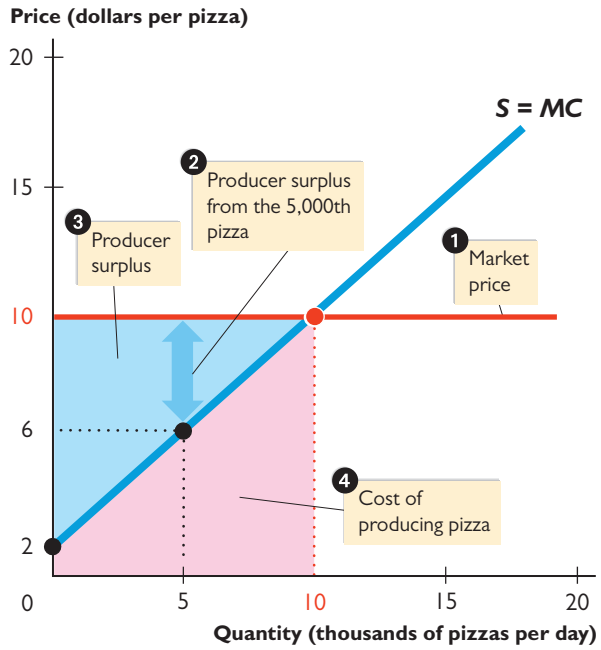
Producer surplus—the sum of the producer surpluses on the 10,000 pizzas that firms produce—is $40,000 a day, which is shown by the area of the blue triangle. The base of the triangle is 10,000 pizzas a day and its height is $8, so its area is (10,000 × $8) ÷ 2 = $40,000.

The total cost of producing pizza is the amount received from selling it, $100,000, minus the producer surplus, $40,000 (the area of the blue triangle), and is $60,000 (the red area beneath the *MC* curve). Producer surplus is the total amount received minus the total cost, or net benefit to producers.

FIGURE 6.7
Supply and Producer Surplus

MyEconLab Animation

1. The market price of a pizza is $10. At this price, producers plan to sell 10,000 pizzas a day and receive a total revenue of $100,000 a day.
2. The supply curve shows that the marginal cost of the 5,000th pizza a day is $6, so producers receive a producer surplus of $4 on the 5,000th pizza.
3. Producer surplus from the 10,000 pizzas sold is $40,000 a day—the area of the blue triangle.
4. The cost of producing 10,000 pizzas a day is the red area beneath the marginal cost curve. It equals total revenue of $100,000 minus producer surplus of $40,000 and is $60,000 a day.



CHECKPOINT 6.3

MyEconLab Study Plan 6.3
Key Terms Quiz
Solutions Video

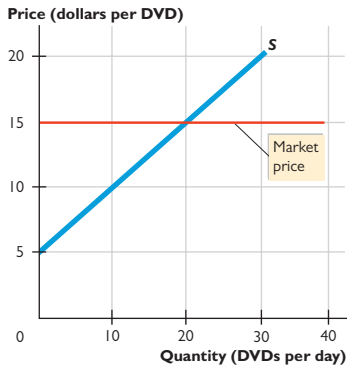
Distinguish between cost and price, and define producer surplus.

Practice Problems

Figure 1 shows the supply curve of DVDs and the market price of a DVD.

1. What is the minimum supply price of the 20th DVD? Calculate the marginal cost of the 10th DVD and the producer surplus on the 10th DVD.
2. What is the quantity of DVDs sold? Calculate the producer surplus, the total revenue from the DVDs sold, and the cost of producing the DVDs sold.
3. If the price of a DVD falls to $10, what is the change in producer surplus?

FIGURE 1



In the News

BlackBerry looks for reboot with Android
BlackBerry, the pioneer of smartphones, has almost vanished as Android and Apple phones have dominated the market. BlackBerry is now betting its future on using the Android operating system.

Source: *Financial Times*, November 6, 2015

As people have switched from BlackBerry to Android and Apple smartphones, how has BlackBerry's producer surplus changed? How has the producer surplus of Apple and the Android smartphone makers such as Samsung and LG changed?

Solutions to Practice Problems

1. The minimum supply price of the 20th DVD is the marginal cost of the 20th DVD, which is $15 (Figure 2). The marginal cost of the 10th DVD is equal to the minimum supply price for the 10th DVD, which is $10. The producer surplus on the 10th DVD is its market price minus the marginal cost of producing it, which is $15 − $10 = $5 (the blue arrow in Figure 2).
2. The quantity sold is 20 a day. Producer surplus equals ($15 − $5) × 20 ÷ 2, which is $100 (the area of the blue triangle in Figure 2). The total revenue is price multiplied by quantity sold, which equals $15 × 20 = $300. The cost of producing DVDs equals total revenue minus producer surplus, which is $300 − $100 = $200 (the red area in Figure 2).
3. If the price falls to $10, the quantity sold decreases to 10 a day. The producer surplus decreases to ($10 − $5) × 10 ÷ 2 = $25 (the area of the blue triangle in Figure 3). The change in producer surplus is a decrease of $75 (from $100 down to $25).

FIGURE 2

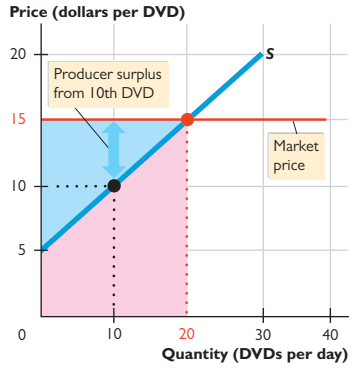
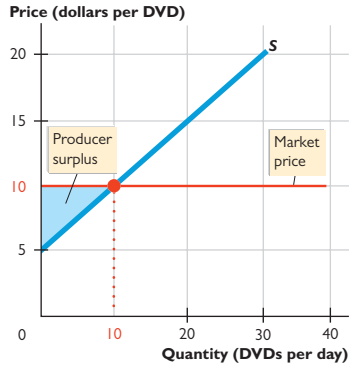


FIGURE 3



Solution to In the News

Producer surplus is the excess of the price of a good over the marginal cost of producing it, summed over the quantity produced.

For BlackBerry, the demand for its phones decreased, the price fell, and quantity sold decreased. BlackBerry's producer surplus decreased.

For Apple and the Android smartphone makers, demand increased, the quantity sold increased, and their producer surplus increased.

MyEconLab Concept Video

6.4 ARE MARKETS EFFICIENT?

You've seen (pp. 145–146) that an efficient allocation of resources is the highest-valued allocation, and it occurs when marginal benefit equals marginal cost. Continuing with the pizza example, the efficient quantity of pizza is the quantity that people value most highly, the quantity at which the marginal benefit of pizza equals its marginal cost.

The market forces that you studied in Chapter 4 (pp. 100–101) determine the equilibrium quantity and equilibrium price and coordinate the plans of buyers and sellers. Figure 6.8 shows the market for pizza in equilibrium. The demand curve is *D*, the supply curve is *S*, the equilibrium price is $10 a pizza, and the equilibrium quantity is 10,000 pizzas a day.

Does this competitive equilibrium deliver the efficient quantity of pizza?

Marginal Benefit Equals Marginal Cost

To check whether the equilibrium in Figure 6.8 is efficient, recall the interpretation of the demand curve as a marginal benefit curve and the supply curve as a marginal cost curve. The demand curve tells us the marginal benefit from pizza. The supply curve tells us the marginal cost of pizza. Where the demand curve and the supply curve intersect, marginal benefit equals marginal cost.

FIGURE 6.8

An Efficient Market for Pizza

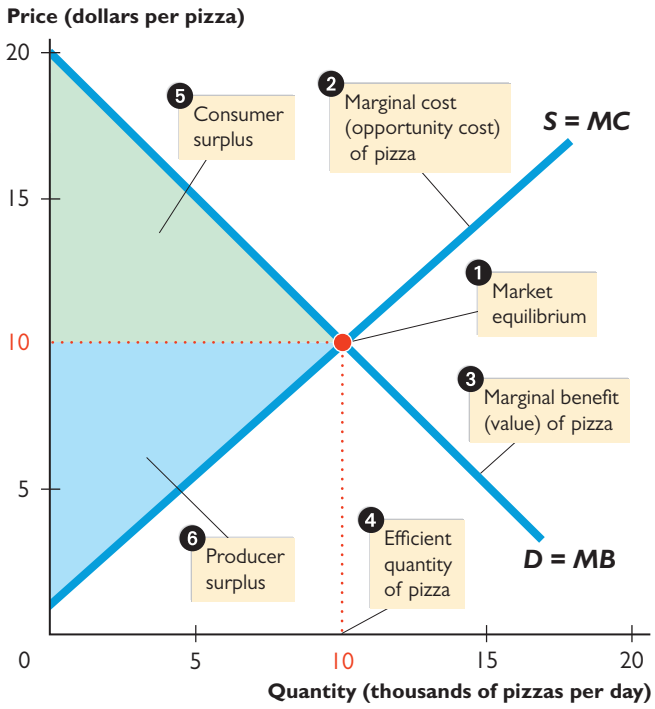
MyEconLab Animation

❶ Market equilibrium occurs at a price of $10 a pizza and a quantity of 10,000 pizzas a day.

❷ The supply curve is also the marginal cost curve.

❸ The demand curve is also the marginal benefit curve.

Because at the market equilibrium, marginal benefit equals marginal cost, ❹ the efficient quantity of pizza is produced. The sum of the ❺ consumer surplus and ❻ producer surplus is maximized.



This condition—marginal benefit equals marginal cost—is the condition that delivers an efficient use of resources. Because a competitive equilibrium allocates resources to the activities that create the greatest possible value, it is efficient.

Total Surplus Is Maximized

Another way of checking that the equilibrium is efficient is to look at the total surplus that it generates. **Total surplus** is the sum of producer surplus and consumer surplus. A price above the equilibrium might increase producer surplus, but it would decrease consumer surplus by more. And a price below the equilibrium price might increase consumer surplus, but it would decrease producer surplus by more. The competitive equilibrium price maximizes total surplus.

Total surplus
The sum of producer surplus and consumer surplus.

In Figure 6.8, if production is less than 10,000 pizzas a day, someone is willing to buy a pizza for more than it costs to produce. Buyers and sellers will gain if production increases. If production exceeds 10,000 pizzas a day, it costs more to produce a pizza than anyone is willing to pay for it. Buyers and sellers will gain if production decreases. Only when 10,000 pizzas a day are produced is there no unexploited gain from changing the quantity of pizza produced, and total surplus is maximized.

Buyers and sellers each attempt to do the best they can for themselves—they pursue their self-interest. No one plans for an efficient outcome for society as a whole. No one worries about the social interest. Buyers seek the lowest possible price, and sellers seek the highest possible price. But as buyers and sellers pursue their self-interest, this astonishing outcome occurs: The social interest is served.

The Invisible Hand

Writing in his *Wealth of Nations* in 1776, Adam Smith was the first to suggest that competitive markets send resources to the uses in which they have the highest value. Smith believed that each participant in a competitive market is "led by an invisible hand to promote an end [the efficient use of resources] which was no part of his intention."

You can see the effects of the invisible hand at work every day. Your campus bookstore is stuffed with texts at the start of each term. It has the quantities that it predicts students will buy. The coffee shop has the variety and quantities of drinks and snacks that people plan to buy. Your local clothing store has the sweatpants and socks and other items that you plan to buy. Truckloads of textbooks, coffee and cookies, and sweatpants and socks roll along our highways and bring these items to where you and your friends want to buy them. Firms that don't know you anticipate your wants and work hard to help you satisfy them.

No government organizes all this production, and no government auditor monitors producers to ensure that they serve the social interest. The allocation of scarce resources is not planned. It happens because prices adjust to make buying plans and selling plans compatible, and it happens in a way that sends resources to the uses in which they have the highest value.

Adam Smith explained why all this amazing activity occurs. "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner," he wrote, "but from their regard to their own interest."

Publishing companies, coffee growers, garment manufacturers, and a host of other producers are led by their regard for *their* own interest to serve *your* interest.

EYE on the U.S. ECONOMY

The Invisible Hand and e-Commerce

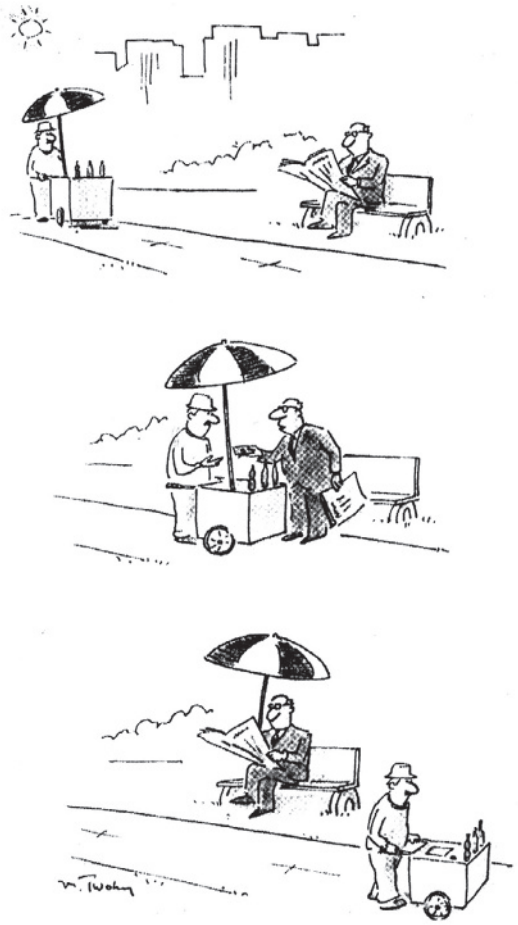
You can see Adam Smith's invisible hand idea in the cartoon.

On a hot sunny day, a cold-drinks vendor approaches a man sitting in a park reading a newspaper (the top frame). The vendor has both cold drinks and shade and an opportunity cost and a minimum supply-price of each item. The park bench reader has a marginal benefit from a cold drink and from shade.

A transaction occurs and the invisible hand does its work (the middle frame). The park bench reader buys the vendor's sun shade. This transaction tells us that the reader's marginal benefit from shade exceeds the vendor's marginal cost of shade.

After the transaction (bottom frame), the vendor obtains a producer surplus from selling the shade for more than its opportunity cost, and the reader obtains a consumer surplus from buying the shade for less than its marginal benefit. Both the buyer of shade and the seller are better off.

The umbrella has moved to its highest-valued use and the resource is being used efficiently.



© The New Yorker Collection 1985
Mike Twohy from cartoonbank.com. All Rights Reserved.



The market economy performs activity similar to that illustrated in the cartoon to achieve an efficient allocation of resources. New technologies have cut the cost of using the Internet and during the past few years, hundreds of Web sites have been established that are dedicated to facilitating trade in all types of goods, services, and factors of production.

The electronic auction site eBay (http://www.ebay.com/) has brought a huge increase in consumer surplus and producer surplus, and helps to achieve ever-greater allocative efficiency.

Market Failure

You've seen that a competitive market in equilibrium delivers an efficient outcome. But not all markets are competitive and sometimes a competitive market is prevented from achieving an equilibrium. We call a situation in which a market delivers an inefficient outcome a **market failure**. Either too little of an item is produced—*underproduction*—or too much—*overproduction*.

Market failure
An inefficient market outcome.

Underproduction and Overproduction

When underproduction occurs, marginal benefit exceeds marginal cost. Items *not* produced are worth more than they cost. When overproduction occurs, marginal cost exceeds marginal benefit. Items produced cost more than they are worth.

Figure 6.9(a) illustrates underproduction at 5,000 pizzas a day. Every pizza between 5,000 and 9,999 is worth more than it costs to make but it is not produced. Figure 6.9(b) illustrates overproduction at 15,000 pizzas a day. Every pizza produced between 10,001 and 15,000 costs more to make than it is worth.

Deadweight Loss

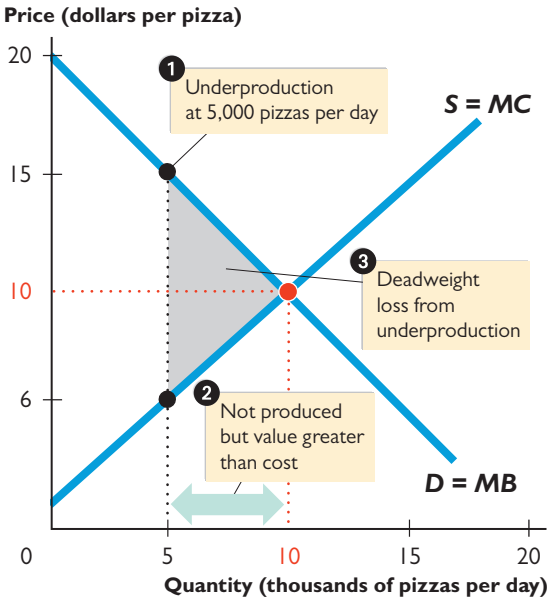
A **deadweight loss** is the decrease in total surplus that results from inefficient underproduction or overproduction. It is a *social* loss.

Deadweight loss
The decrease in total surplus that results from an inefficient underproduction or overproduction.

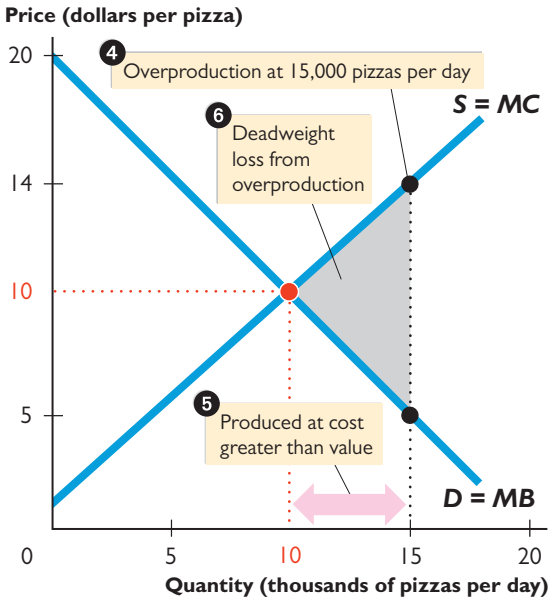
The deadweight loss from underproduction equals the area of the gray triangle in Figure 6.9(a). That area is \$22,500 [(\$15 − \$6) × 5,000 ÷ 2 = \$22,500]. Can you calculate the deadweight loss from overproduction in Figure 6.9(b)?

FIGURE 6.9
Inefficient Outcomes

MyEconLab Animation



(a) Underproduction



(b) Overproduction

❶ If production is 5,000 pizzas a day, ❷ pizzas not produced are worth more than they cost to make—there is inefficient underproduction. ❸ The gray triangle shows the deadweight loss that arises.

❹ If production is 15,000 pizzas a day, ❺ pizzas produced cost more to make than they are worth—there is inefficient overproduction. ❻ The gray triangle shows the deadweight loss that arises.

Sources of Market Failure

Obstacles to efficiency that bring market failure and create deadweight losses are

- Price and quantity regulations
- Taxes and subsidies
- Externalities
- Public goods and common resources
- Monopoly
- High transactions costs

Price and Quantity Regulations

Price regulations that put a cap on the rent a landlord is permitted to charge and laws that require employers to pay a minimum wage sometimes block the price adjustments that balance the quantity demanded and the quantity supplied and lead to underproduction. *Quantity regulations* that limit the amount that a farm is permitted to produce also lead to underproduction.

Taxes and Subsidies

Taxes increase the prices paid by buyers and lower the prices received by sellers. So taxes decrease the quantity produced and lead to underproduction. *Subsidies,* which are payments by the government to producers, decrease the prices paid by buyers and increase the prices received by sellers. So subsidies increase the quantity produced and lead to overproduction.

Externalities

An *externality* is a cost or a benefit that affects someone other than the seller and the buyer of a good. An electric utility creates an *external cost* by burning coal that brings acid rain and crop damage. The utility doesn't consider the cost of pollution when it decides how much power to produce. The result is overproduction.

A condominium owner would provide an *external benefit* if she installed a smoke detector. But she doesn't consider her neighbor's marginal benefit and decides not to install a smoke detector. The result is underproduction.

Public Goods and Common Resources

A *public good* benefits everyone and no one can be excluded from its benefits. National defense is an example. It is in everyone's self-interest to avoid paying for a public good (called the *free-rider problem*), which leads to its underproduction.

A *common resource* is owned by no one but used by everyone. Atlantic salmon is an example. It is in everyone's self-interest to ignore the costs that fall on others as a result of their own use of a common resource (called the *tragedy of the commons*), which leads to overproduction.

Monopoly

A *monopoly* is a firm that is the sole provider of a good or service. Local water supply and cable television are supplied by firms that are monopolies.

The self-interest of a monopoly is to maximize its profit. Because the monopoly has no competitors, it can set the price to achieve its self-interested goal. To achieve its goal, a monopoly produces too little and charges too high a price, which leads to underproduction.

High Transactions Costs

Stroll around a shopping mall and observe the retail markets in which you participate. You'll see that these markets employ enormous quantities of scarce labor and capital resources. It is costly to operate any market. Economists call the opportunity costs of making trades in a market **transactions costs**.

Transactions costs
The opportunity costs of making trades in a market.

To use market prices as the allocators of scarce resources, it must be worth bearing the opportunity cost of establishing a market. Some markets are just too costly to operate. For example, when you want to play tennis on your local "free" court, you don't pay a market price for your slot on the court. You hang around until the court becomes vacant, and you "pay" with your waiting time.

When transactions costs are high, the market might underproduce.

Alternatives to the Market

When a market is inefficient, can one of the alternative non-market methods that we described at the beginning of this chapter do a better job? Sometimes it can.

Table 6.1 summarizes the sources of market failure and the possible remedies. Often, majority rule might be used, but majority rule has its own shortcomings. A group that pursues the self-interest of its members can become the majority. For example, price and quantity regulations that create deadweight loss are almost always the result of a self-interested group becoming the majority and imposing costs on the minority. Also, with majority rule, votes must be translated into actions by bureaucrats who have their own agendas.

Managers in firms issue commands and avoid the transactions costs that they would incur if they went to a market every time they needed a job done. First-come, first-served saves a lot of hassle in waiting lines. These lines could have markets in which people trade their place in the line—but someone would have to enforce the agreements. Can you imagine the hassle at a busy Starbucks if you had to buy your spot at the head of the line?

There is no one mechanism for allocating resources efficiently. But markets bypassed by command systems inside firms and supplemented by majority rule and first-come, first-served do an amazingly good job.

TABLE 6.1

Market Failure and Some Possible Remedies

Reason for market failure	Possible remedy
1. Price and quantity regulations	Remove regulation by majority rule
2. Taxes and subsidies	Minimize deadweight loss by majority rule
3. Externalities	Minimize deadweight loss by majority rule
4. Public goods	Allocate by majority rule
5. Common resources	Allocate by majority rule
6. Monopoly	Regulate by majority rule
7. High transactions costs	Command or first-come, first-served

MyEconLab Study Plan 6.4
Key Terms Quiz
Solutions Video

CHECKPOINT 6.4

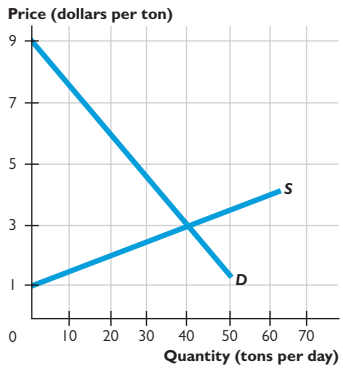
Evaluate the efficiency of the alternative methods of allocating resources.

Practice Problems

Figure 1 shows the market for paper.

1. At the market equilibrium, what are consumer surplus, producer surplus, and total surplus? Is the market for paper efficient? Why or why not?
2. Lobbyists for a group of news magazines persuade the government to pass a law that requires producers to sell 50 tons of paper a day. Is the market for paper efficient? Explain your answer and illustrate it on the figure.
3. An environmental lobbying group persuades the government to pass a law that limits the quantity of paper that producers sell to 20 tons a day. Is the market for paper efficient? If not, what is the deadweight loss?

FIGURE 1



In the News

Milking taxpayers

American corn and soybean farmers receive subsidies of about $20 billion a year.
Source: *The Economist*, February 14, 2015

Because they receive subsidies, the price they receive for their crops exceeds the market price. Describe the efficiency of the markets for corn and soybean with subsidies in place. If the subsidies (and the taxes that pay them) were decreased, explain how the efficiency of the markets for corn and soybean would change.

FIGURE 2

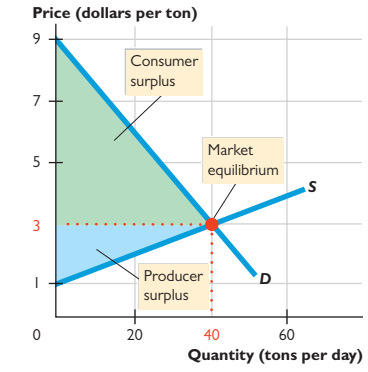
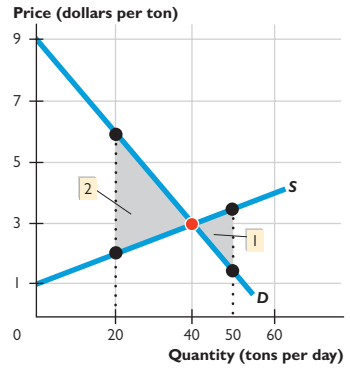


FIGURE 3



Solutions to Practice Problems

1. Market equilibrium is 40 tons a day at a price of $3 a ton (Figure 2). Consumer surplus is ($9 − $3) × 40 ÷ 2, which equals $120 (the area of the green triangle in Figure 2). Producer surplus is ($3 − $1) × 40 ÷ 2, which equals $40 (the area of the blue triangle in Figure 2). Total surplus is the sum of consumer surplus and producer surplus, which is $160.
   The market is efficient because marginal benefit (on the demand curve) equals marginal cost (on the supply curve) and total surplus (consumer surplus plus producer surplus) is maximized.
2. With producers required to sell 50 tons of paper a day, the market is inefficient because marginal cost exceeds marginal benefit. Deadweight loss equals the area of the gray triangle 1 in Figure 3.
3. With production limited to 20 tons a day, the market is inefficient because marginal benefit exceeds marginal cost. The deadweight loss equals the area of the gray triangle 2 in Figure 3.

Solution to In the News

Subsidies to producers induce overproduction and increase the supply of the good. With no change in demand, the market price falls. The price received by producers equals the market price plus the subsidy. Market failure occurs and the market is inefficient. A deadweight loss arises. By decreasing the subsidies (and taxes), overproduction would decrease, the markets for corn and soybean would become more efficient, and the deadweight loss would decrease.

6.5 ARE MARKETS FAIR?

MyEconLab Concept Video

Following a severe winter storm or hurricane, the prices of many essential items jump. Is it fair that disaster victims should be hit with higher prices? Many low-skilled people work for a wage that is below what most would regard as a living wage. Is that fair? How do we decide whether something is fair or unfair?

Economists have a clear definition of efficiency but they do not have a similarly clear definition of fairness. Also, ideas about fairness are not exclusively economic ideas. They involve the study of ethics.

To study ideas about fairness, think of economic life as a game—a serious game—that has *rules* and a *result*. Two broad and generally conflicting approaches to fairness are

- It's not fair if the *rules* aren't fair.
- It's not fair if the *result* isn't fair.

It's Not Fair If the *Rules* Aren't Fair

Harvard philosopher Robert Nozick argued for the fair-rules view in a book entitled *Anarchy, State, and Utopia*, published in 1974. Nozick argued that fairness requires two rules:

- The state must establish and protect private property rights.
- Goods and services and the services of factors of production may be transferred from one person to another only by voluntary exchange with everyone free to engage in such exchange.

The first rule says that everything that is valuable—all scarce resources and goods—must be owned by individuals and that the state must protect private property rights. The second rule says that the only way a person can acquire something is to buy it in voluntary trade.

If these rules are followed, says Nozick, the outcome is fair. It doesn't matter how unequally the economic pie is shared provided that the people who bake it supply their services voluntarily in exchange for the share of the pie offered in compensation. Opportunity is equal but the result might be unequal. This fair-rules approach is consistent with allocative efficiency.

It's Not Fair If the *Result* Isn't Fair

Most people think that the fair-rules approach leads to too much inequality—to an unfair result: For example, it is unfair for a bank president to earn millions of dollars a year while a bank teller earns only thousands of dollars a year.

But what is "too unequal"? Is it fair for some people to receive twice as much as others but not ten times as much or a hundred times as much? Or is all that matters that the poorest people shouldn't be "too poor"?

There is no easy answer to these questions. Generally, greater equality is regarded as good but there is no measure of the most desirable shares.

The fair-result approach conflicts with allocative efficiency and leads to what is called the **big tradeoff**—a tradeoff between efficiency and fairness that recognizes the cost of making income transfers.

Big tradeoff
A tradeoff between efficiency and fairness that recognizes the cost of making income transfers.

The big tradeoff is based on the fact that income can be transferred to people with low incomes only by taxing people with high incomes. But taxing people's



EYE on PRICE GOUGING

MyEconLab Critical Thinking Exercise

Should Price Gouging Be Illegal?

Price gouging is the practice of selling an essential item for a much higher price than normal, and usually occurs following a natural disaster. In Florida and Texas, where hurricanes happen all too often, price gouging is illegal.

Whether price gouging *should* be illegal depends on the view of fairness employed and on the facts about whether the buyers or the sellers are the poorer group.

The standard view of economists is that price gouging should *not* be illegal and that it is the expected and *efficient* response to a change in demand.

After a hurricane, the demand for items such as generators, pumps, lamps, gasoline, and camp stoves increases and the prices of these items rise in a natural response to the change in demand.

The figure illustrates the market for camp stoves. The supply of stoves is the curve *S*, and in normal times, the demand for stoves is D_0. The price is $20 per stove and the equilibrium quantity is 5 stoves per day.

Following a hurricane that results in a lengthy power outage, the demand for camp stoves increases to D_1. Provided there is no price-gouging law, the equilibrium price of a stove jumps to $40 and the equilibrium quantity increases to 7 stoves per day.

This outcome is efficient because the marginal cost of a stove (on the supply curve) equals the marginal benefit from a stove (on the demand curve).

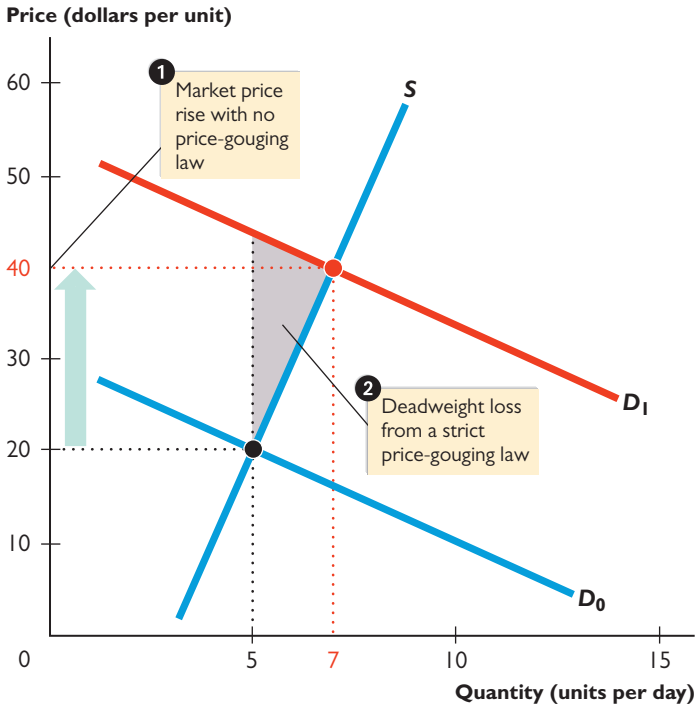
If a strict price-gouging law requires the price after the hurricane to be the *same* as the price before the hurricane, the price of a stove is stuck at $20.

At this price, the quantity of stoves supplied remains at 5 per day and a deadweight loss shown by the gray triangle arises. The price-gouging law is inefficient, and the price rise is efficient.

Whether a doubling of the price is *fair* depends on the idea of fairness used. On the *fair-rules* view, the price rise is fair. Trade is voluntary and both the buyer and the seller are better off. On the *fair-result* view, the price rise might be considered unfair if the buyers are poor and the sellers are rich. But if the buyers are rich and the sellers are poor, the price rise would be considered fair even on the fair-result view.

After Hurricane Katrina, John Shepperson bought 19 generators, loaded them into a rented U-Haul vehicle, and drove the 600 miles from his home in Kentucky to a place in Mississippi that had no power. He offered his generators to eager buyers for twice the price he had paid for them. But before he could complete a sale, the Mississippi police swooped in and arrested him. They confiscated his generators and put him in jail for four days. His crime: price gouging.

Was it efficient to stop Mr. Shepperson from selling his generators? Was it fair either to him or his deprived customers?





EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Allocation Methods, Efficiency, and Fairness

You live in the national economy, your state economy, your regional economy, and your own household economy. The many decisions you must make affect efficiency and fairness at all these levels. Think about your household economy.

Make a spreadsheet and on it identify all the factors of production that your household owns. Count all the person-hours available and any capital. Show how these resources are allocated.

By what methods are your household's scarce resources allocated? Identify those allocated by market price; by command; by first-come, first-served; and by equal shares. Are any resources allocated by majority vote?

Now the tough part: Are these resources allocated efficiently—is the value of your household's resources maximized? Think about how you can check whether marginal benefit equals marginal cost for each of your household's activities.

And now an even tougher question: Are your household's resources allocated fairly? Think about the two ideas of fairness and how they apply in your household.

income from employment discourages work. It results in the quantity of labor being less than the efficient quantity. Taxing the income people earn from capital discourages saving and results in the quantity of capital being less than the efficient quantity. With smaller quantities of both labor and capital, the quantity of goods and services produced is less than the efficient quantity. The economic pie shrinks.

Income redistribution creates a tradeoff between the size of the economic pie and the equality with which it is shared. The greater the scale of income redistribution through income taxes, the greater is the inefficiency—the smaller is the pie.

There is a second source of inefficiency: A dollar taken from a rich person does not end up as a dollar in the hands of a poorer person. Some of the dollar is spent on administration of the tax and transfer system, which includes the cost of accountants, auditors, and lawyers. These activities use skilled labor and capital resources that could otherwise be used to produce other goods and services that people value.

You can see that when all these costs are taken into account, transferring a dollar from a rich person does not give a dollar to a poor person. It is even possible that those with low incomes end up being worse off. For example, if a highly taxed entrepreneur decides to work less hard and shut down a business, low-income workers get fired and must seek other, perhaps even lower-paid, work.

Compromise

Most people, and probably most economists, have sympathy with the Nozick view but think it too extreme. They see a role for taxes and government income support schemes to transfer some income from the rich to the poor. Such transfers could be considered voluntary in the sense that they are decided by majority voting, and even those who vote against such transfers voluntarily participate in the political process.

Once we agree that using the tax system to make transfers from the rich to the poor is fair, we need to determine just what we mean by a fair tax. We'll look at this big question when we study the tax system in Chapter 8.

MyEconLab Study Plan 6.5
Key Terms Quiz
Solutions Video

CHECKPOINT 6.5

Explain the main ideas about fairness, and evaluate the fairness of the alternative methods of allocating scarce resources.

Practice Problems

A winter storm cuts the power supply and isolates a small town in the mountains. The people rush to buy candles from the town store, which is the only source of candles. The store owner decides to ration the candles to one per family but to keep the price of a candle unchanged.

1. Who gets to use the candles? Who receives the consumer surplus and who receives the producer surplus on candles?
2. Is the allocation efficient? Is the allocation fair?

In the News

Water wars are coming
Water use is growing at a faster pace than the rate of population growth. Earth has lots of water, but 97.5 percent of it is in the oceans and is salty. The problem is that a growing number of people have no clean fresh drinking water.

Source: PBS, November 16, 2015

Would a free world market in fresh water achieve a fair use of the world's water resources? Explain why or why not and be clear about the concept of fairness that you are using.

Solutions to Practice Problems

1. The people who buy candles from the town store are not necessarily the people who use the candles. A buyer from the town store can sell a candle and will do so if he or she can get a price that exceeds his or her marginal benefit. The people who value the candles most—who are willing to pay the most—will use the candles.
   Only the people who are willing to pay the most for candles receive the consumer surplus on candles, and the store owner receives the same producer surplus as normal. People who sell the candles they buy from the store receive additional producer surplus.
2. The allocation is efficient because the people who value the candles most use them. Whether the allocation is fair depends on which of the two views of fairness is adopted. In the fair-rules view, if the rule of one candle per family is followed and exchange is voluntary, then the outcome is fair. But in the fair-result view, if the candles are allocated unequally, then the allocation is unfair.

Solution to In the News

If the world market in fresh water were free, the market price would allocate the water. This allocation of water would be fair on the fair-rules view because the exchange of water would be voluntary, but it would not be fair on the fair-result view because poor people who own no water and those living in drought-stricken areas would not be able to afford water.

CHAPTER SUMMARY

Key Points

1. Describe the alternative methods of allocating scarce resources, and define and explain the features of an efficient allocation.

- The methods of allocating scarce resources are market price; command; majority rule; contest; first-come, first-served; sharing equally; lottery; personal characteristics; and force.
- Allocative efficiency occurs when resources are used to create the greatest value, which means that marginal benefit equals marginal cost.

2. Distinguish between value and price, and define consumer surplus.

- Marginal benefit is measured by the maximum price that consumers are willing to pay for another unit of a good or service.
- A demand curve is a marginal benefit curve.
- Value is what people are *willing to* pay; price is what they *must* pay.
- Consumer surplus equals the excess of marginal benefit over price, summed over the quantity consumed.

3. Distinguish between cost and price, and define producer surplus.

- Marginal cost is measured by the minimum price producers must be offered to increase production by one unit.
- A supply curve is a marginal cost curve.
- Opportunity cost is what producers *must* pay; price is what they *receive*.
- Producer surplus equals the excess of price over marginal cost, summed over the quantity produced.

4. Evaluate the efficiency of the alternative methods of allocating resources.

- In a competitive equilibrium, marginal benefit equals marginal cost and resource allocation is efficient.
- Price and quantity regulations, taxes, subsidies, externalities, public goods, common resources, monopoly, and high transactions costs lead to market failure and create deadweight loss.

5. Explain the main ideas about fairness, and evaluate the fairness of the alternative methods of allocating scarce resources.

- Ideas about fairness divide into two groups: fair *rules* and a fair *result*.
- Fair rules require private property rights and voluntary exchange, and a fair result requires income transfers from the rich to the poor.

Key Terms

MyEconLab Key Terms Quiz

Allocative efficiency, 143
Big tradeoff, 161
Command system, 141
Consumer surplus, 149
Deadweight loss, 157
Market failure, 157
Producer surplus, 152
Total surplus, 155
Transactions costs, 159

MyEconLab Chapter 6 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

At McDonald's, no reservations are accepted; at the St. Louis Art Museum Restaurant, reservations are accepted; at Le Bernardin in New York, reservations are essential. Use this information to answer Problems **1** to **3**.

1. Describe the method of allocating table resources in these three restaurants.

2. Why do you think restaurants have different reservation policies, and why might each restaurant be using an efficient allocation method?

3. Why don't all restaurants use the market price to allocate their tables?

TABLE 1

Price (dollars per sandwich)	Quantity demanded (sandwiches per hour)	Quantity supplied (sandwiches per hour)
0	400	0
1	350	50
2	300	100
3	250	150
4	200	200
5	150	250
6	100	300
7	50	350
8	0	400

Table 1 shows the demand and supply schedules for sandwiches. Use Table 1 to work Problems **4** to **7**.

4. Calculate the equilibrium price of a sandwich, the consumer surplus, and the producer surplus. What is the efficient quantity of sandwiches?

5. If the quantity demanded decreases by 100 sandwiches an hour at each price, what is the equilibrium price and what is the change in total surplus?

6. If the quantity supplied decreases by 100 sandwiches an hour at each price, what is the equilibrium price and what is the change in total surplus?

7. If Sandwiches To Go, Inc., buys all the sandwich producers and cuts production to 100 sandwiches an hour, what is the deadweight loss that is created? If Sandwiches To Go, Inc., rations sandwiches to two per person, by what view of fairness would the allocation be unfair?

TABLE 2

Price (dollars per bag)	Quantity demanded before flood (thousands of bags)	Quantity demanded during flood (thousands of bags)	Quantity supplied (thousands of bags)
0	40	70	0
1	35	65	5
2	30	60	10
3	25	55	15
4	20	50	20
5	15	45	25
6	10	40	30
7	5	35	35
8	0	30	40

Use the following information to work Problems **8** and **9**.

Table 2 shows the demand and supply schedules for sandbags before and during a major flood. During the flood, suppose that the government gave all families an equal quantity of sandbags. Resale of sandbags is not permitted.

8. How would total surplus and the price of a sandbag change?

9. Would the outcome be more efficient than if the government took no action? Explain.

10. The winner of the men's or women's tennis singles at the U.S. Open is paid twice as much as the runner-up, but it takes two players to have a singles final. Is this compensation arrangement efficient? Is it fair? Explain why it might illustrate the big tradeoff.

11. **eBay saves billions for bidders**

On eBay, the bidder who places the highest bid wins the auction and pays only what the second highest bidder offered. Researchers Wolfgang Jank and Galit Shmueli reported that purchasers on eBay in 2003 paid $7 billion less than their winning bids. Because each bid shows the buyer's willingness to pay, the winner receives an estimated consumer surplus of $4 or more.

Source: *InformationWeek*, January 28, 2008

What method is used to allocate goods on eBay? How does an eBay auction influence consumer surplus from the good?

12. Read *Eye on Price Gouging* on p. 162 and explain why it was inefficient to stop Mr. Shepperson from selling his generators.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. Mets World Series ticket prices spike after NLCS win

Now that the New York Mets are in baseball's World Series for the first time in 15 years, fans who don't have a ticket will pay a hefty $1,667.82 to get one. That's the average asking price for a resold ticket, which is the highest since World Series price-tracking started in 2010.

Source: CNBC.com, October 22, 2015

Why is a $1,667.82 ticket price similar to "price gouging"? Is the high price an example of the market price method of allocating scarce resources? Is the market for tickets efficient? Is it fair?

Table 1 shows the demand schedule for haircuts and the supply schedule of haircuts. Use Table 1 to work Problems **2** and **3**.

TABLE 1

Price (dollars per haircut)	Quantity demanded (haircuts per day)	Quantity supplied (haircuts per day)
0	100	0
10	80	0
20	60	20
30	40	40
40	20	60
50	0	80

2. What is the quantity of haircuts bought, the value of a haircut, and the total surplus from haircuts?

3. Suppose that all salons agree to charge $40 a haircut. How do consumer surplus and producer surplus change? What is the deadweight loss created?

In California, farmers pay a lower price for water than do city residents. Use this information to work Problems **4** to **6**.

4. What is this method of allocation of water resources? Is this allocation of water efficient? Is this use of scarce water fair? Why or why not?

5. If farmers were charged the same price as city residents pay, how would the price of agricultural produce, the quantity of produce grown, consumer surplus, and producer surplus change?

6. If all water in California is sold for the market equilibrium price, would the allocation of water be more efficient? Why or why not?

Use the following information to work Problems **7** and **8**.

The world's largest tulip and flower market

Every day over 19 million tulips and flowers are auctioned at the Dutch market called "The Bloemenveiling." These Dutch auctions match buyers and sellers.

Source: Tulip-Bulbs.com

In a Dutch auction, the auctioneer announces the highest price. If no one offers to buy the flowers, the auctioneer lowers the price until a buyer is found.

7. What method is used to allocate flowers at the Bloemenveiling?

8. How does a Dutch flower auction influence consumer surplus and producer surplus? Are the flower auctions at the Bloemenveiling efficient?

9. Take pride in U.S. forests

U.S. forestland has been a constant 755 million acres for the past century, but the number of trees has increased by 20 percent since 1970, the volume of wood has doubled since 1953, and the United States is the world's largest supplier of forest products. Decisions by millions of private forest-land owners are responsible for this remarkable performance.

Source: Frank Beidler letter, *Chicago Tribune*, October 23, 2015

Is the U.S. timber industry efficient and do forest-land owners operate in the social interest or self-interest? What effect does private ownership have on the efficiency of the timber industry?

MyEconLab Chapter 6 Study Plan

Multiple Choice Quiz

1. The method of allocation that most stores use during Thanksgiving sales is:

A. a combination of market price and lottery
B. first-come, first-served
C. a combination of contest and command
D. a combination of market price and first-come, first-served

2. All of the following statements are correct *except* _____.

A. the value of an additional unit of the good equals the marginal benefit from the good
B. marginal benefit is the excess of value over the price paid, summed over the quantity consumed
C. the maximum price willingly paid for a unit of a good is the marginal benefit from it
D. price is what we pay for a good but value is what we get from it

3. Choose the best statement.

A. An increase in the demand for a good increases producer surplus.
B. If producers decrease the supply of the good, their producer surplus will increase.
C. Producer surplus equals the total revenue from selling the good.
D. Producer surplus is the excess of the value of the good over the market price, summed over the quantity produced.

4. The market for a good is efficient if _____.

A. the marginal cost of producing the good is minimized
B. the marginal benefit from the good is maximized
C. the consumer surplus is maximized
D. the total surplus is maximized

5. When the marginal benefit from a good exceeds its marginal cost, _____.

A. there is overproduction of the good
B. a deadweight loss, which is the excess of marginal benefit over marginal cost, arises
C. producer surplus decreases and consumer surplus increases
D. total production increases and efficiency increases

6. Market failure arises if _____.

A. there is overproduction of the good but not if there is underproduction
B. the deadweight loss is zero
C. producer surplus exceeds consumer surplus
D. total surplus is not maximized

7. The allocation of resources is fair _____.

A. in the fair-rules view if everyone has equal opportunity
B. in the fair-result view if most resources are distributed to the poorest people
C. in the fair-rules view if owners of the resources are protected by property rights and all transfers of resources are voluntary
D. in the fair-result view if resources are transferred voluntarily so that everyone has the same quantity



Can Congress repeal the law of market forces?

Government Actions in Markets

7

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain how taxes change prices and quantities, are shared by buyers and sellers, and create inefficiency.
2. Explain how a price ceiling works, and why a rent ceiling creates a housing shortage and is inefficient and unfair.
3. Explain how a price floor works, and why the minimum wage creates unemployment and is inefficient and unfair.
4. Explain how a production quota works and why it brings a higher price and is inefficient and unfair.

MyEconLab Big Picture Video

MyEconLab Concept Video

7.1 TAXES ON BUYERS AND SELLERS



Does "Tax Free" really mean that the seller pays the tax?

Tax incidence
The division of the burden of a tax between the buyer and the seller.

Almost every time you buy something—a late-night order of chow mein, a plane ticket, a tank of gasoline—you pay a tax. On some items, you pay a sales tax that is added to the advertised price. On other items, you pay an excise tax—often at a high rate like the tax on gasoline—that is included in the advertised price.

But do you really pay these taxes? When a tax is added to the advertised price, isn't it obvious that *you* pay the tax? Isn't the price higher than it otherwise would be by an amount equal to the tax?

What about a tax that is buried in the price, such as that on gasoline? Who pays that tax? Does the seller just pass on the full amount of the tax to you, the buyer? Or does the seller pay the tax by taking a lower price and leaving the price you pay unchanged?

To answer these questions, let's suppose that TIFS, the Tax Illegal File Sharing lobby, has persuaded the government to collect a $10 tax on every new smartphone and to use the tax revenue to compensate artists. But an argument is raging between those who claim that the buyer benefits from using the smartphone and should pay the tax and those who claim that the seller profits and should pay the tax.

Tax Incidence

Tax incidence is the division of the tax between the buyer and the seller. We're going to find the incidence of a $10 tax on smartphones with two different taxes: a tax on the buyer and a tax on the seller.

Figure 7.1 shows the market for smartphones. With no tax, the equilibrium price is $100 and the equilibrium quantity is 5,000 smartphones a week.

When a good is taxed, it has two prices: a price that excludes the tax and a price that includes the tax. Buyers respond only to the price that includes the tax, because that is the price they pay. Sellers respond only to the price that excludes the tax, because that is the price they receive. The tax is like a wedge between these two prices.

Figure 7.1(a) shows what happens if the government taxes the buyer. The tax doesn't change the buyer's willingness and ability to pay. The demand curve, D, tells us the *total* amount that buyers are willing and able to pay. Because buyers must pay $10 to the government on each item bought, the curve that tells us what buyers are willing to pay to sellers is the red curve labeled $D - tax$. This curve lies $10 *below* the blue demand curve.

Market equilibrium occurs where the red curve $D - tax$ intersects the supply curve, S. Buyers pay the equilibrium net-of-tax price $95 plus the $10 tax: $105 per smartphone. Sellers receive the net-of-tax price $95 per smartphone. The government collects a tax revenue of $10 on each of the 2,000 smartphones, or $20,000 (shown by the purple rectangle).

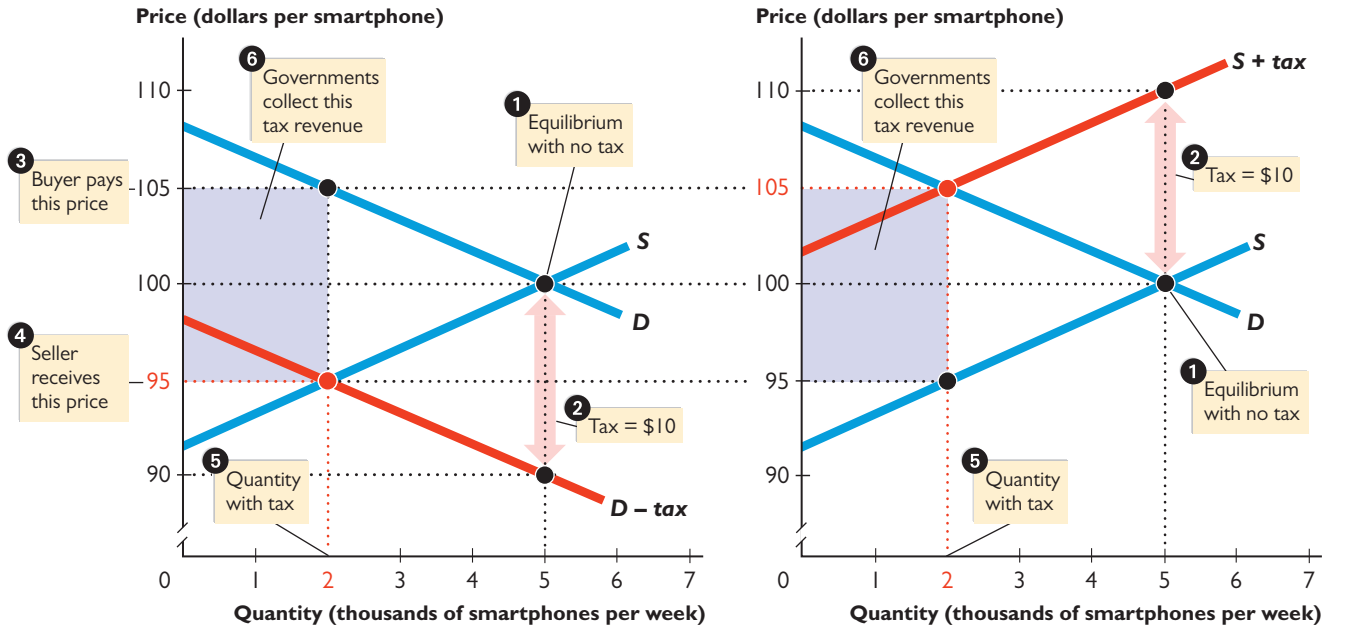
Figure 7.1(b) shows what happens if the government taxes the seller. The tax acts like an increase in the suppliers' cost, so supply decreases and the supply curve shifts to the red curve labeled $S + tax$. This curve tells us what sellers are willing to accept, given that they must pay the government $10 on each item sold. The red curve, $S + tax$, lies $10 *above* the blue supply curve.

Market equilibrium occurs where the red curve $S + tax$ intersects the demand curve, D. The buyer pays the equilibrium price $105. The seller receives the net-of-tax price $95. The government collects a tax revenue of $20,000.

FIGURE 7.1

A Tax on Smartphones

MyEconLab Animation



1. With no tax on smartphones, the price is $100 and 5,000 smartphones a week are bought—in both parts of the figure.
2. In part (a), a $10 tax on buyers shifts the demand curve down to the red curve $D - tax$ and in part (b), a $10 tax on sellers shifts the supply curve up to the red curve $S + tax$.

In both parts of the figure:

3. The price paid by the buyer rises to $105—an increase of $5;
4. The price received by the seller falls to $95—a decrease of $5;
5. The quantity decreases to 2,000 smartphones a week; and
6. The government collects tax revenue of $20,000 a week—the purple rectangle.

In both cases, the tax is split equally between the buyer and the seller—each pays $5 per smartphone.

In both cases, the buyer and the seller split the $10 tax and pay $5 each.

You can now see that the argument about making the buyer pay or the seller pay is futile. The buyer pays the same price, the seller receives the same price, and the government receives the same tax revenue on the same quantity regardless of whether the government taxes the buyer or the seller.

In this example, the tax is shared equally between the buyer and the seller. But in most cases, the tax will be shared unequally and might even fall entirely on one side of the market. We'll explore what determines the incidence of a tax, but first, let's see how a tax creates inefficiency.

Taxes and Efficiency

You've seen that resources are used efficiently when marginal benefit equals marginal cost. You've also seen that a tax places a wedge between the price the buyer pays and the price the seller receives. But the buyer's price equals marginal benefit and the seller's price equals marginal cost. So a tax puts a wedge between marginal benefit and marginal cost. The equilibrium quantity is less than the efficient quantity, and a deadweight loss arises.

Figure 7.2 shows the inefficiency of a tax. We'll assume that the government taxes the seller. In part (a), with no tax, marginal benefit equals marginal cost and the market is efficient. In part (b), with a tax, marginal benefit exceeds marginal cost. Consumer surplus and producer surplus shrink. Part of each surplus goes to the government as tax revenue—the purple area—and part becomes a deadweight loss—the gray area. The loss of total surplus is called the *burden of the tax*.

Excess burden
The amount by which the burden of a tax exceeds the tax revenue received by the government—the deadweight loss from a tax.

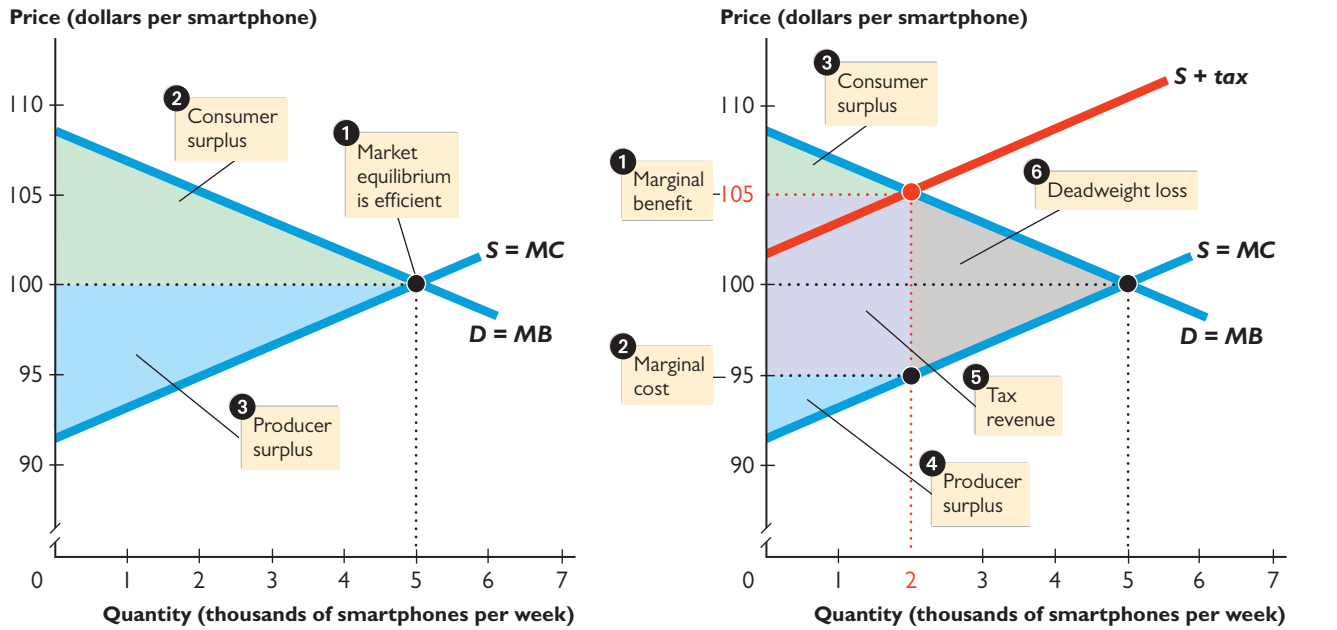
Because a tax creates a deadweight loss, the burden of the tax exceeds the tax revenue. To remind us of this fact, we call the deadweight loss that arises from a tax the **excess burden** of the tax. But because the government uses the tax revenue to provide goods and services that people value, only the excess burden measures the inefficiency of the tax.

In this example, the excess burden is large. You can see how large by calculating the area of the deadweight loss triangle. This area equals ($10 × 3,000) ÷ 2, which is $15,000 per week. The tax revenue is $20,000 per week, so the excess burden is 75 percent of the tax revenue.

Incidence, Inefficiency, and Elasticity

In the example of a $10 tax on smartphones, the buyer and the seller split the tax equally and the excess burden is large. What determines how the tax is split and the size of its excess burden?

FIGURE 7.2
Taxes and Efficiency
MyEconLab Animation



(a) Efficient outcome

❶ The market is efficient with marginal benefit equal to marginal cost. Total surplus—the sum of ❷ consumer surplus (green area) and ❸ producer surplus (blue area)—is at its maximum possible level.

(b) Burden of tax

A $10 tax drives a wedge between ❶ marginal benefit and ❷ marginal cost. ❸ Consumer surplus and ❹ producer surplus shrink by the amount of the ❺ tax revenue plus the ❻ deadweight loss. The deadweight loss is the excess burden of the tax.

The incidence of a tax and its excess burden depend on the elasticities of demand and supply in the following ways:

- For a given elasticity of supply, the more inelastic the demand for the good, the larger is the share of the tax paid by the buyer.
- For a given elasticity of demand, the more inelastic the supply of the good, the larger is the share of the tax paid by the seller.
- The excess burden is smaller, the more inelastic is demand *or* supply.

Incidence, Inefficiency, and the Elasticity of Demand

To see how the division of a tax between the buyer and the seller and the size of the excess burden depend on the elasticity of demand, we'll look at two extremes.

Perfectly Inelastic Demand: Buyer Pays and Efficient

Figure 7.3(a) shows the market for insulin, a vital daily medication of diabetics. Demand is perfectly inelastic at 100,000 doses a week, as shown by the vertical demand curve. With no tax, the price is $2 a dose. A tax of 20¢ a dose raises the price to $2.20, but the quantity does not change. The tax leaves the price received by the seller unchanged but raises the price paid by the buyer by the entire tax. The outcome is efficient (there is no deadweight loss) because marginal benefit equals marginal cost.

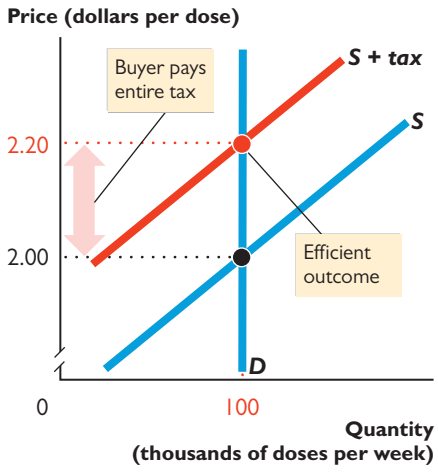
Perfectly Elastic Demand: Seller Pays and Inefficient

Figure 7.3(b) shows the market for pink marker pens. Demand is perfectly elastic at $1 a pen, as shown by the horizontal demand curve. If pink pens are less expensive than other pens, everyone uses pink. If pink pens are more expensive than other pens, no one uses a pink pen. With no tax, the price of a pink pen is $1 and the quantity is 4,000 pens a week. A tax of 10¢ a pen leaves the price at $1 a pen,

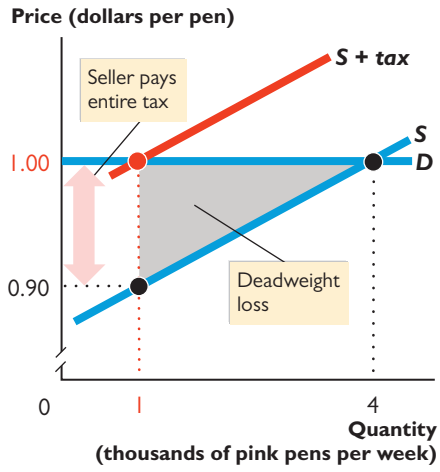
FIGURE 7.3

Incidence, Inefficiency, and the Elasticity of Demand

MyEconLab Animation



(a) Inelastic demand



(b) Elastic demand

In part (a), the demand for insulin is perfectly inelastic. A tax of 20¢ a dose raises the price by 20¢, and the buyer pays all the tax. But marginal benefit still equals marginal cost, so the outcome is efficient.

In part (b), the demand for pink marker pens is perfectly elastic. A tax of 10¢ a pen lowers the price received by the seller by 10¢, and the seller pays all the tax. Marginal benefit exceeds marginal cost, so the outcome is inefficient. The deadweight loss is the excess burden of the tax and measures its inefficiency.

but the quantity decreases to 1,000 pens a week. The price paid by the buyer is unchanged and the seller pays the entire tax. The outcome is inefficient because marginal benefit exceeds marginal cost and a deadweight loss arises.

Incidence, Inefficiency, and the Elasticity of Supply

To see how the division of a tax between the buyer and the seller depends on the elasticity of supply, we'll again look at two extremes.

Perfectly Inelastic Supply: Seller Pays and Efficient

Figure 7.4(a) shows the market for spring water that flows at a constant rate that can't be controlled. Supply is perfectly inelastic at 100,000 bottles a week, as shown by the vertical supply curve. With no tax, the price is 50¢ a bottle and the 100,000 bottles that flow from the spring are bought. A tax of 5¢ a bottle leaves the quantity unchanged at 100,000 bottles a week. Buyers are willing to buy 100,000 bottles a week only if the price is 50¢ a bottle. The price remains at 50¢ a bottle, but the tax lowers the price received by the seller by 5¢ a bottle. The seller pays the entire tax.

Because marginal benefit equals marginal cost, there is no deadweight loss and the outcome is efficient.

Perfectly Elastic Supply: Buyer Pays and Inefficient

Figure 7.4(b) shows the market for sand from which computer-chip makers extract silicon. Supply of this sand is perfectly elastic at a price of 10¢ a pound as shown by the horizontal supply curve. With no tax, the price is 10¢ a pound and 5,000 pounds a week are bought. A 1¢ a pound sand tax raises the price to 11¢, and the quantity decreases to 3,000 pounds a week. The buyer pays the entire tax.

Because marginal benefit exceeds marginal cost, a deadweight loss arises and the outcome is inefficient.

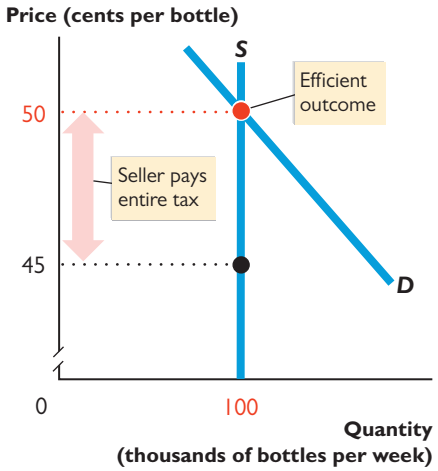
FIGURE 7.4

Incidence, Inefficiency, and the Elasticity of Supply

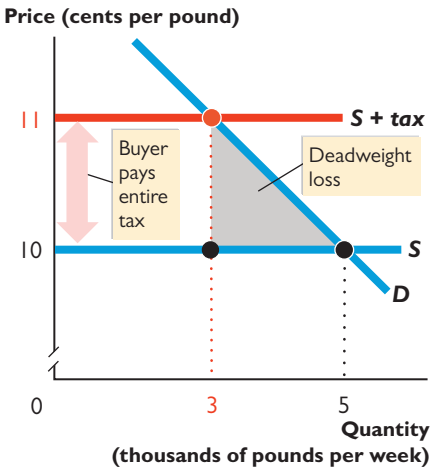
MyEconLab Animation

In part (a), the supply of bottled spring water is perfectly inelastic. A tax of 5¢ a bottle lowers the price received by the seller by 5¢ a bottle, and the seller pays all the tax. Marginal benefit equals marginal cost, so the outcome is efficient.

In part (b), the supply of sand is perfectly elastic. A tax of 1¢ a pound increases the price by 1¢ a pound, and the buyer pays all the tax. Marginal benefit exceeds marginal cost, so the outcome is inefficient. The deadweight loss is the excess burden of the tax and measures its inefficiency.



(a) Inelastic supply



(b) Elastic supply

CHECKPOINT 7.1

MyEconLab Study Plan 7.1
Key Terms Quiz
Solutions Video

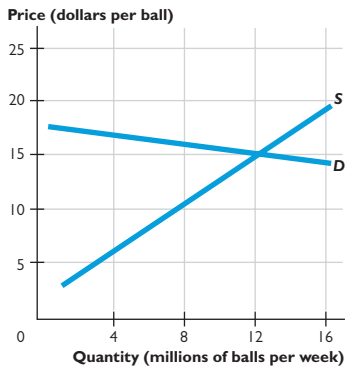
Explain how taxes change prices and quantities, are shared by buyers and sellers, and create inefficiency.

Practice Problems

Figure 1 shows the market for basketballs, when basketballs are not taxed.

1. If buyers of basketballs are taxed $6 a ball, what price does the buyer pay and how many do they buy? What is the tax revenue collected?
2. If sellers of basketballs are taxed $6 a ball, what price does the seller receive and how many do they sell? What is the tax revenue collected?
3. If basketballs are taxed at $6 a ball, what is the excess burden of the tax? Is the demand for basketballs or the supply of basketballs more inelastic? Explain your answer.

FIGURE 1



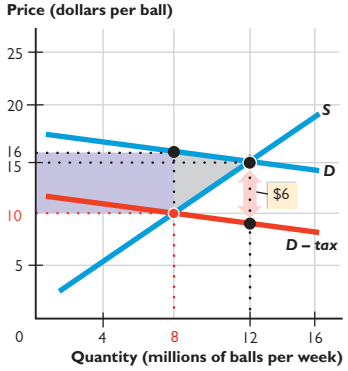
In the News

Gas tax increases by 7 cents in Washington State
Washington State gas taxes will rise by 7¢ a gallon now and by a further 4.9¢ a gallon next summer.

Source: *The Seattle Times*, August 1, 2015

If the demand for gasoline is inelastic and the supply of gasoline is elastic, who will pay more of the increase in Washington's gas tax: drivers or the gasoline companies? If there is a big switch to natural gas for big trucks, how will the tax incidence change?

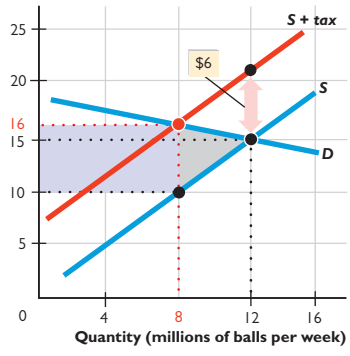
FIGURE 2



Solutions to Practice Problems

1. With a $6 tax on buyers, the demand curve shifts downward by $6 a ball as shown in Figure 2. The price that the buyer pays is $16 a basketball and 8 million basketballs a week are bought. The tax revenue is ($6 × 8) million, which is $48 million a week (the purple rectangle in Figure 2).
2. With a $6 tax on sellers, the supply curve shifts upward by $6 a ball as shown in Figure 3. The price that the seller receives is $10 a basketball and 8 million basketballs a week are sold. The tax revenue is ($6 × 8) million, which is $48 million a week (the purple rectangle in Figure 3).
3. The excess burden of the tax is $12 million. Excess burden equals the deadweight loss, the gray triangle, which is ($6 × 4 million) ÷ 2 = $12 million. The $6 tax increases the price paid by buyers by $1 and lowers the price received by sellers by $5. Because the seller pays the larger share of the tax, the supply of basketballs is more inelastic than the demand for basketballs.

FIGURE 3



Solution to In the News

If the demand for gasoline is inelastic and supply is elastic, drivers will pay more of the increase in Washington's gas tax than the gasoline companies will pay. Although the demand for gasoline is inelastic, the availablity of natural gas and big trucks switching to natural gas makes the demand for gasoline (and diesel) less inelastic, so the share of the tax paid by drivers will fall and the share paid by the gasoline companies will rise.

MyEconLab Concept Video

7.2 PRICE CEILINGS

Congress might want to set a price or a quantity at a level that it chooses rather than at the level determined by market forces. What are the effects of this type of government action in a market? You'll find the answer in this chapter, starting with a government attempt to place an upper limit on a price.

Price ceiling or **price cap**
A government regulation that places an *upper* limit on the price at which a particular good, service, or factor of production may be traded.

A government regulation that places an *upper* limit on the price at which a particular good, service, or factor of production may be traded is called a **price ceiling** (or a **price cap**). Trading at a higher price is illegal.

A price ceiling has been used in several markets, but the one that looms largest in everyone's budget is the housing market. The price of housing is the rent that people pay for a house or apartment.

Figure 7.5 illustrates the apartment rental market in Biloxi, Mississippi. The rent is $550 a month, and 4,000 apartments are rented.

A Rent Ceiling

Rent ceiling
A regulation that makes it illegal to charge more than a specified rent for housing.

Suppose the mayor of Biloxi gets elected on a promise to impose a **rent ceiling**—a regulation that makes it illegal to charge more than a specified rent for housing.

The effect of a rent ceiling depends on whether it is imposed at a level above or below the equilibrium rent.. In Figure 7.5, if the rent ceiling is set *above* $550 a month, nothing would change because people are already paying $550 a month.

But a rent ceiling that is set *below* the equilibrium rent has powerful effects on the market outcome. The reason is that the rent ceiling attempts to prevent the rent from rising high enough to regulate the quantities demanded and supplied. The law and the market are in conflict, and one (or both) of them must yield.

FIGURE 7.5
A Housing Market

MyEconLab Animation

The figure shows the demand curve, *D*, and the supply curve, *S*, for rental housing.

1. The market is in equilibrium when the quantity demanded equals the quantity supplied.
2. The equilibrium price (rent) is $550 a month.
3. The equilibrium quantity is 4,000 units of housing.

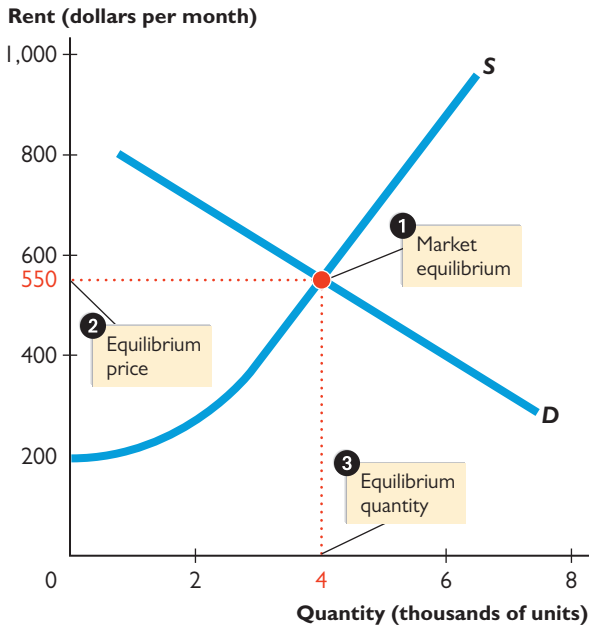


Figure 7.6 shows a rent ceiling that is set below the equilibrium rent at $400 a month. We've shaded the area *above* the rent ceiling because any rent in this region is illegal. The first effect of a rent ceiling is a housing shortage. At a rent of $400 a month, the quantity of housing supplied is 3,000 units and the quantity demanded is 6,000 units. So at $400 a month, there is a shortage of 3,000 units of housing.

But the story does not end here. The 3,000 units of housing that owners are willing to make available must somehow be allocated among people who are seeking 6,000 units. This allocation might be achieved in two ways:

- A black market
- Increased search activity

A Black Market

A **black market** is an illegal market that operates alongside a government-regulated market. A rent ceiling sometimes creates a black market in housing as frustrated renters and landlords try to find ways of raising the rent above the legally imposed ceiling. Landlords want higher rents because they know that renters are willing to pay more for the existing quantity of housing. Renters are willing to pay more to jump to the front of the line.

Black market
An illegal market that operates alongside a government-regulated market.

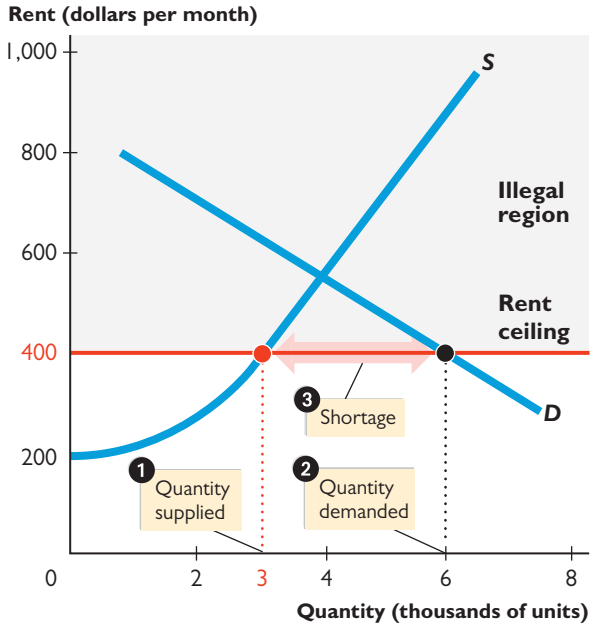
Because raising the rent is illegal, landlords and renters use creative tricks to get around the law. One of these tricks is for a new tenant to pay a high price for worthless fittings—perhaps paying $2,000 for threadbare drapes. Another is for the tenant to pay a high price for new locks and keys—called "key money."

Figure 7.7 shows how high the black market rent might go in Biloxi. With strict enforcement of the rent ceiling, the quantity of housing available is 3,000

FIGURE 7.6

A Rent Ceiling Creates a Shortage

MyEconLab Animation



A rent ceiling is imposed below the equilibrium rent. In this example, the rent ceiling is $400 a month.

1. The quantity of housing supplied decreases to 3,000 units.
2. The quantity of housing demanded increases to 6,000 units.
3. A shortage of 3,000 units arises.

units. But at this quantity, renters are willing to offer as much as $625 a month—the amount determined on the demand curve.

So a small number of landlords illegally offer housing for rents up to $625 a month. The black market rent might be at any level between the rent ceiling of $400 a month and the maximum that a renter is willing to pay of $625 a month.

Increased Search Activity

Search activity
The time spent looking for someone with whom to do business.

The time spent looking for someone with whom to do business is called **search activity**. We spend some time in search activity almost every time we buy something, and especially when we buy a big item such as a car or a home. When a price ceiling creates a shortage of housing, search activity *increases*. In a rent-controlled housing market, frustrated would-be renters do an Internet search or scan the newspapers. Keen apartment seekers race to be first on the scene when news of a possible apartment breaks.

The *opportunity cost* of a good is equal to its price *plus* the value of the search time spent finding the good. So the opportunity cost of housing is equal to the rent plus the value of the search time spent looking for an apartment. Search activity is costly. It uses time and other resources, such as telephones, automobiles, and gasoline that could have been used in other productive ways. In Figure 7.7, to find accommodation at $400 a month, someone who is willing to pay a rent of $625 a month would be willing to spend on search activity an amount that is equivalent to adding $225 a month to the rent ceiling.

A rent ceiling controls the rent portion of the cost of housing but not the search cost. So when the search cost is added to the rent, some people end up paying a higher opportunity cost for housing than they would if there were no rent ceiling.

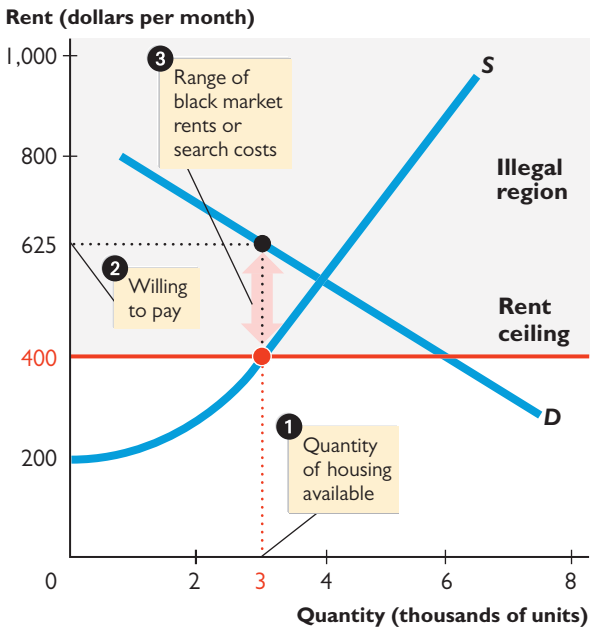
FIGURE 7.7

A Rent Ceiling Creates a Black Market and Housing Search

MyEconLab Animation

With a rent ceiling of $400 a month,

1. 3,000 units of housing are available.
2. Someone is willing to pay $625 a month for the 3,000th unit of housing.
3. Black market rent might be as high as $625 a month or search activity might be equivalent to adding $225 a month to the rent ceiling.



Are Rent Ceilings Efficient?

In a housing market with no rent ceiling, market forces determine the equilibrium rent. The quantity of housing demanded equals the quantity of housing supplied. In this situation, scarce housing resources are allocated efficiently because the marginal cost of housing equals the marginal benefit. Figure 7.8(a) shows this efficient outcome in the Biloxi apartment rental market. In this efficient market, total surplus—the sum of *consumer surplus* (the green area) and *producer surplus* (the blue area)—is maximized at the equilibrium rent and quantity of housing (see Chapter 6, p. 155).

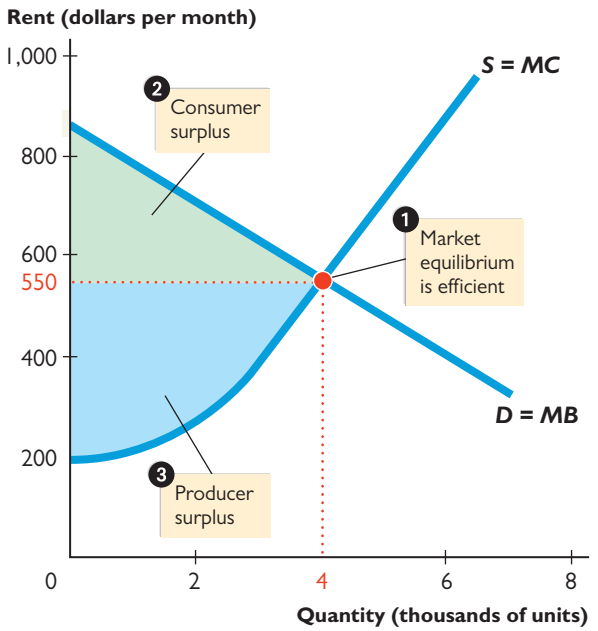
Figure 7.8(b) shows that with a rent ceiling, the outcome is inefficient. Marginal benefit exceeds marginal cost. Producer surplus and consumer surplus shrink, and a deadweight loss (the gray area) arises. This loss is borne by the people who can't find housing and by landlords who can't offer housing at the lower rent ceiling.

But the total loss *exceeds* the deadweight loss. Resources get used in costly search activity or in evading the law in the black market. The value of these resources might be as large as the area of the red rectangle. There is yet a further loss: the cost of enforcing the rent ceiling law. This loss, which is borne by taxpayers, is not visible in the figure.

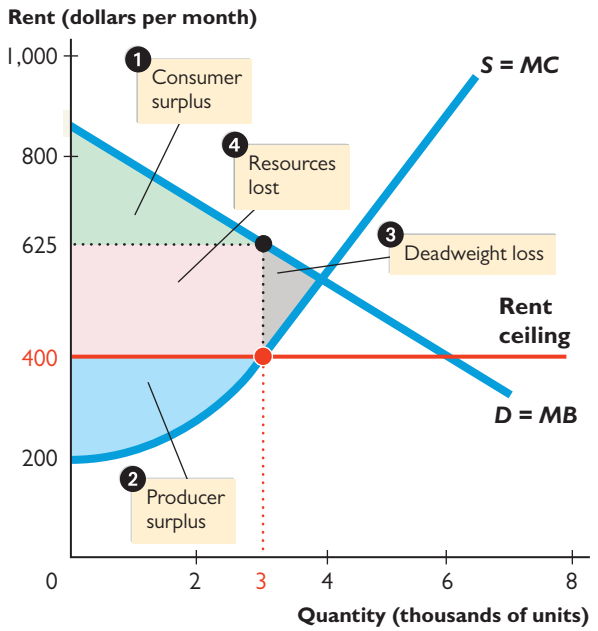
FIGURE 7.8

The Inefficiency of a Rent Ceiling

MyEconLab Animation



(a) Efficient housing market



(b) Inefficient housing market

❶ The market equilibrium is efficient with marginal benefit equal to marginal cost. Total surplus, the sum of ❷ consumer surplus (green area) and ❸ producer surplus (blue area), is maximized.

A rent ceiling is inefficient. ❶ Consumer surplus and ❷ producer surplus shrink, a ❸ deadweight loss arises, and ❹ resources are lost in search activity and evading the rent ceiling law.



With rent ceilings, landlords have no incentive to maintain buildings, and both the quality and quantity of housing supplied decrease.

Although a rent ceiling creates inefficiency, not everyone loses. The people who pay the rent ceiling get an increase in consumer surplus, and landlords who charge a black market rent get an increase in producer surplus.

The costs of a rent ceiling that we've just considered are only the initial costs. With the rent below the market equilibrium rent, landlords have no incentive to maintain their buildings. So over time, both the quality and quantity of housing supplied *decrease* and the loss arising from a rent ceiling increases.

The size of the loss from a rent ceiling depends on the elasticities of supply and demand. If supply is inelastic, a rent ceiling brings a small decrease in the quantity of housing supplied. And if demand is inelastic, a rent ceiling brings a small increase in the quantity of housing demanded. So the more inelastic the supply or the demand, the smaller is the shortage of housing and the smaller is the deadweight loss.

Are Rent Ceilings Fair?

We've seen that rent ceilings prevent scarce resources from being allocated efficiently—resources do not flow to their highest-valued use. But don't they ensure that scarce housing resources are allocated more fairly?

You learned in Chapter 6 (pp. 161–163) that fairness is a complex idea about which there are two broad views: fair *rules* versus a fair *result.* Rent controls violate the fair-rules view of fairness because they block voluntary exchange. But do they deliver a fair result? Do rent ceilings ensure that scarce housing goes to the poor people whose need is greatest?

Blocking rent adjustments that bring the quantity of housing demanded into equality with the quantity supplied doesn't end scarcity. So when the law prevents the rent from adjusting and blocks the price mechanism from allocating scarce housing, some other allocation mechanism must be used. If that mechanism were one that provided the housing to the poorest, then the allocation might be regarded as fair.

But the mechanisms that get used do not usually achieve such an outcome. First-come, first-served is one allocation mechanism. Discrimination based on race, ethnicity, or sex is another. Discrimination against young newcomers and in favor of old established families is yet another. None of these mechanisms delivers a fair outcome.

Rent ceilings in New York City provide examples of these mechanisms at work. The main beneficiaries of rent ceilings in New York City are families that have lived in the city for a long time—including some rich and famous ones. These families enjoy low rents while newcomers pay high rents for hard-to-find apartments.

If Rent Ceilings Are So Bad, Why Do We Have Them?

The economic case against rent ceilings is now widely accepted, so *new* rent ceiling laws are rare. But when governments try to repeal rent control laws, as the New York City government did in 1999, current renters lobby politicians to maintain the ceilings. Also, people who are prevented from finding housing would be happy if they got lucky and managed to find a rent-controlled apartment. For these reasons, there is plenty of political support for rent ceilings.

Apartment owners who oppose rent ceilings are a minority, so their views are not a powerful influence on politicians. Because more people support rent ceilings than oppose them, politicians are sometimes willing to support them too.

CHECKPOINT 7.2

MyEconLab Study Plan 7.2
Key Terms Quiz
Solutions Video

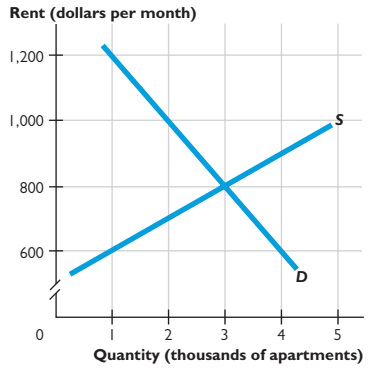
Explain how a price ceiling works, and why a rent ceiling creates a housing shortage and is inefficient and unfair.

Practice Problems

Figure 1 shows the rental market for apartments in Corsicana, Texas.

1. What is the rent and how many apartments are rented? If a rent ceiling of $900 a month is set, what is the rent and how many apartments are rented?
2. If the city government imposes a rent ceiling of $600 a month, what is the rent and how many apartments are rented? If a black market develops, how high could the black market rent be? Explain.
3. If the city government imposes a rent ceiling of $600 a month and enforces it, is the housing market efficient? What is the deadweight loss? Is the housing market fair? Explain.

FIGURE 1



In the News

A gas price ceiling

China has cut the price of natural gas and may install a price ceiling that prohibits a price rise of more than 20 percent above a benchmark.

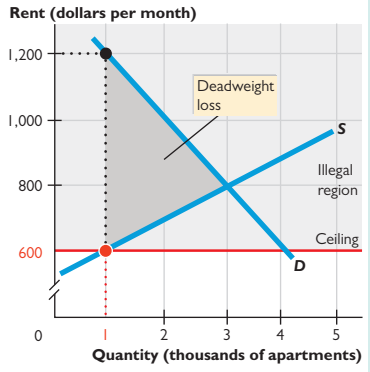
Source: *Bloomberg News*, November 18, 2015

Explain how a cut in the price and a price ceiling will influence consumer surplus, producer surplus, and deadweight loss in China's natural gas market.

Solutions to Practice Problems

1. The equilibrium rent is $800 a month, and 3,000 apartments are rented. A rent ceiling of $900 a month is above the equilibrium rent, so the outcome is the market equilibrium rent of $800 a month with 3,000 apartments rented.
2. With the rent ceiling at $600 a month, the number of apartments rented is 1,000 and the rent is $600 a month (Figure 2). In a black market, some people are willing to rent an apartment for more than the rent ceiling. The highest rent that someone would offer is $1,200 a month. This rent equals someone's willingness to pay for the 1,000th apartment (Figure 2).
3. The housing market is not efficient. With 1,000 apartments rented, marginal benefit exceeds marginal cost and a deadweight loss arises (Figure 2). The deadweight loss is equal to the area of the gray triangle, which equals (1,200 − 600) × (3,000 − 1,000) ÷ 2. The deadweight loss is $600,000. The allocation of housing is less fair on both views of fairness: It blocks voluntary transactions and does not provide more housing to those most in need.

FIGURE 2



Solution to In the News

If the price ceiling keeps the price of gas below the market equilibrium price, then the quantity produced will decrease and a shortage of gas will arise. The marginal benefit from gas will exceed the marginal cost of producing gas, and resources will be used trying to obtain gas. The lower price and reduced quantity will decrease consumer surplus, decrease producer surplus, and create a deadweight loss.

MyEconLab Concept Video

7.3 PRICE FLOORS

Price floor
A government regulation that places a *lower* limit on the price at which a particular good, service, or factor of production may be traded.

You've seen the effects of a price ceiling. Let's now look at the effects of a **price floor**, a government regulation that places a *lower* limit on the price at which a particular good, service, or factor of production may be traded. Trading at a lower price than the price floor is illegal.

Price floors are used in many markets, but the one that looms largest is the labor market. The price of labor is the wage rate that people earn. Demand and supply in the labor market determine the wage rate and the quantity of labor employed.

Figure 7.9 illustrates the market for fast-food servers in Yuma, Arizona. In this market, the demand for labor curve is *D*. On this demand curve, at a wage rate of $13 an hour, the quantity of fast-food servers demanded is zero. If Subway, Burger King, Taco Bell, McDonald's, Wendy's, and the other fast-food places had to pay servers $13 an hour, they wouldn't hire any. They would replace servers with vending machines! But at wage rates below $13 an hour, they would hire servers. At a wage rate of $7 an hour, firms would hire 6,000 servers.

On the supply side of the market, no one is willing to work for $4 an hour. To attract servers, firms must pay more than $4 an hour.

Equilibrium in this market occurs at a wage rate of $7 an hour with 6,000 people employed as servers.

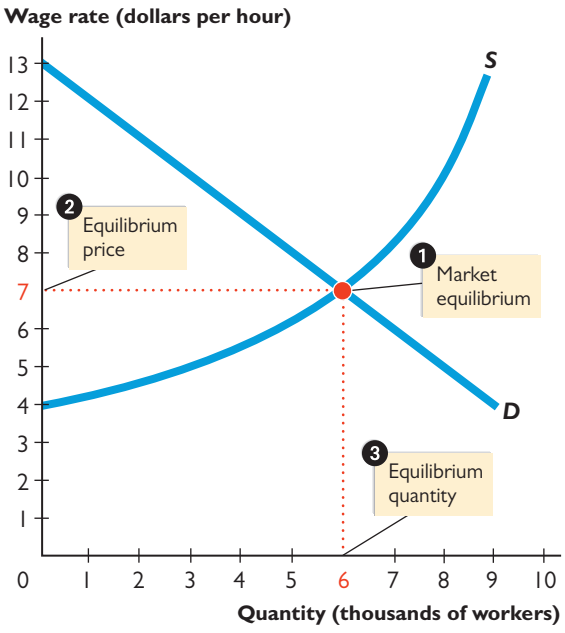
Suppose that the government thinks that no one should have to work for a wage rate as low as $7 an hour and decides that it wants to increase the wage rate. Can the government improve conditions for these workers by passing a minimum wage law? Let's find out.

FIGURE 7.9
A Market for Fast-Food Servers

MyEconLab Animation

The figure shows the demand curve, *D*, and the supply curve, *S*, for fast-food servers.

1. The market is in equilibrium when the quantity demanded equals the quantity supplied.
2. The equilibrium price (wage rate) is $7 an hour.
3. The equilibrium quantity is 6,000 servers.



The Minimum Wage

Minimum wage law
A government regulation that makes hiring labor services for less than a specified wage illegal.

A **minimum wage law** is a government regulation that makes hiring labor services for less than a specified wage illegal. Firms are free to pay a wage rate that exceeds the minimum wage but may not pay less than the minimum. A minimum wage is an example of a price floor.

The effect of a price floor depends on whether it is set below or above the equilibrium price. In Figure 7.9, the equilibrium wage rate is $7 an hour, and at this wage rate, firms hire 6,000 workers. If the government introduced a minimum wage below $7 an hour, nothing would change. The reason is that firms are already paying $7 an hour, and because this wage exceeds the minimum wage, the wage rate paid doesn't change. Firms continue to hire 6,000 workers.

But the aim of a minimum wage is to boost the incomes of low-wage earners. So in the markets for the lowest-paid workers, the minimum wage will exceed the equilibrium wage.

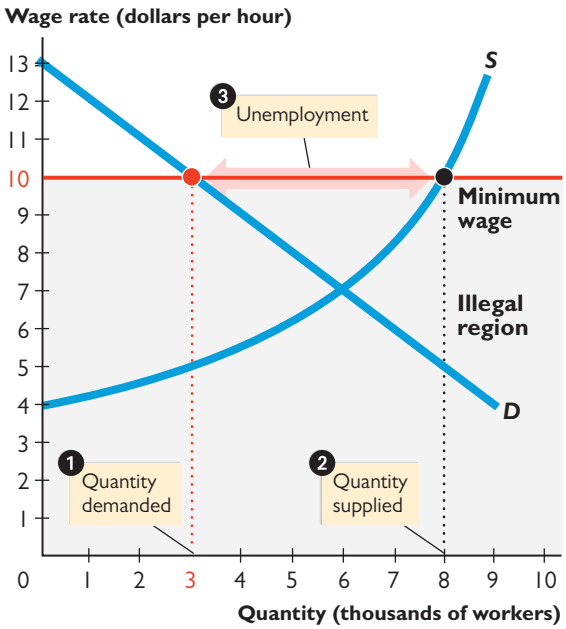
Suppose that the government introduces a minimum wage of $10 an hour. Figure 7.10 shows the effects of this law. Wage rates below $10 an hour are illegal, so we've shaded the illegal region *below* the minimum wage. Firms and workers are no longer permitted to operate at the equilibrium point in this market because it is in the illegal region. Market forces and political forces are in conflict.

The government can set a minimum wage, but it can't tell employers how many workers to hire. If firms must pay a wage rate of $10 an hour, they will hire only 3,000 workers. At the equilibrium wage rate of $7 an hour, firms hired 6,000 workers. So when the minimum wage is introduced, firms lay off 3,000 workers.

FIGURE 7.10

A Minimum Wage Creates Unemployment

MyEconLab Animation



A minimum wage is introduced above the equilibrium wage rate. In this example, the minimum wage rate is $10 an hour.

1. The quantity of labor demanded decreases to 3,000 workers.
2. The quantity of labor supplied increases to 8,000 people.
3. 5,000 people are unemployed.

But at a wage rate of $10 an hour, 2,000 people who didn't want to work for $7 an hour will now try to find work as servers. So at $10 an hour, the quantity supplied is 8,000 people. With 3,000 workers fired and another 2,000 looking for work at the higher wage rate, 5,000 people who would like to work as servers are unemployed.

The 3,000 jobs available must somehow be allocated among the 8,000 people who are willing to work as servers. How is this allocation achieved? The answer is by increased job-search activity and illegal hiring.

Increased Job-Search Activity

Finding a good job takes a great deal of time and other resources. With a minimum wage, more people are looking for jobs than the number of jobs available. Frustrated unemployed people spend time and other resources searching for hard-to-find jobs. In Figure 7.11, to find a job at $10 an hour, someone who is willing to work for $5 an hour (on the supply curve) would be willing to spend $5 an hour (the minimum wage rate of $10 an hour minus $5 an hour) on job-search activity. For a job that might last a year or more, this amount is large.

Illegal Hiring

With more people looking for work than the number of jobs available, some firms and workers might agree to do business at an illegal wage rate below the minimum wage in a black market. An illegal wage rate might be at any level between the minimum wage rate of $10 an hour and the lowest wage rate at which someone is willing to work, $5 an hour.

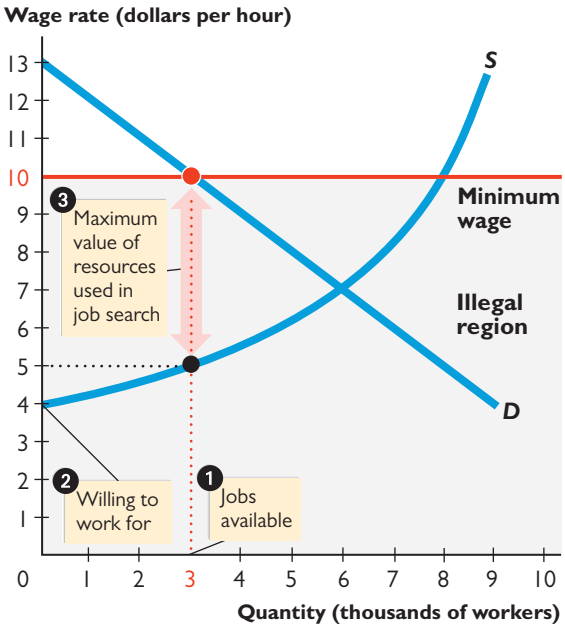
FIGURE 7.11

A Minimum Wage Creates Job Search and Illegal Hiring

MyEconLab Animation

The minimum wage rate is set at $10 an hour:

1. 3,000 jobs are available.
2. The lowest wage rate for which someone is willing to work is $5 an hour. In a black market, illegal wage rates might be as low as $5 an hour.
3. The maximum that might be spent on job search is an amount equivalent to $5 an hour—the $10 they would receive if they found a job *minus* the $5 at which they are willing to work.



EYE on the U.S. ECONOMY

The Federal Minimum Wage

The *Fair Labor Standards Act* sets the federal minimum wage, but most states set their own minimum at a higher level than the federal minimum.

The figure shows the minimum wage since 1993 in terms of what it would buy at 2015 prices.

The minimum wage creates unemployment, but how much? Between 2007 and 2009, when the minimum wage increased by 38 percent (see figure), the employment of 16- to 19-year-olds fell by 28 percent. Part of that decrease most likely was caused by the rise in the minimum wage.

Most economists believe that a 10 percent rise in the minimum wage decreases teenage employment by between 1 and 3 percent.

David Card of the University of California at Berkeley and Alan Krueger of Princeton University have challenged this consensus view. They say that a rise in the minimum wage in California, New Jersey, and Texas *increased* the employment rate of low-income workers. They suggest three reasons why a rise in the wage rate might increase employment:

(1) Workers become more conscientious and productive.

(2) Workers are less likely to quit, so costly labor turnover is reduced.

(3) Managers make a firm's operations more efficient.

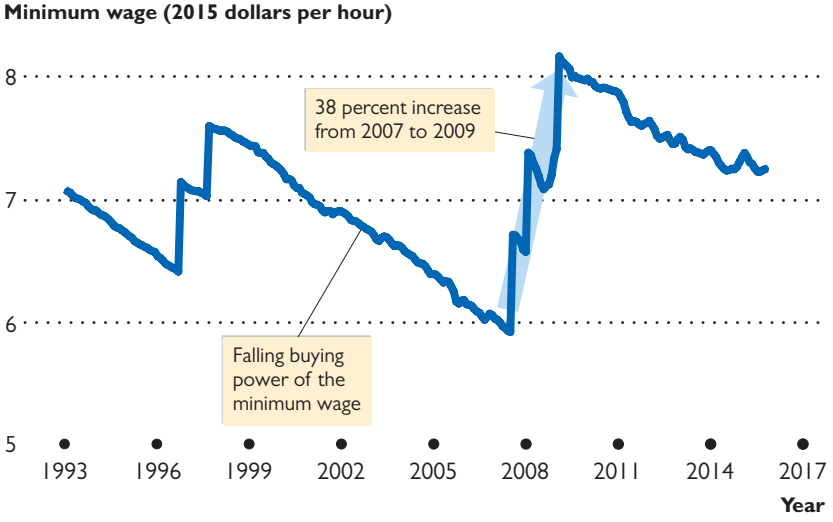
Most economists are skeptical about these ideas and say that if higher wages make workers more productive and reduce labor turnover, firms will freely pay workers a higher wage.They also argue that there are other explanations for the employment increase that Card and Krueger found.

Daniel Hamermesh of the University of Texas at Austin says that Card and Krueger got the timing wrong. Firms anticipated the wage rise and so cut employment before it occurred. Looking at employment changes after the minimum wage increased missed its main effect. Finis Welch of Texas A&M University and Kevin Murphy of the University of Chicago say that the employment effects that Card and Krueger found are caused by regional differences in economic growth, not by changes in the minimum wage.



Pizza delivery people gain from the minimum wage.

Also, looking only at employment misses the supply-side effect of the minimum wage. It brings an increase in the number of people who drop out of high school to look for work.



SOURCE OF DATA: Bureau of Labor Statistics.

Is the Minimum Wage Efficient?

The efficient allocation of a factor of production is similar to that of a good or service, which you studied in Chapter 6. The demand for labor tells us about the marginal benefit of labor to the firms that hire it. Firms benefit because the labor they hire produces the goods or services that they sell. Firms are willing to pay a wage rate equal to the benefit they receive from an additional hour of labor. In Figure 7.12(a), the demand curve for labor tells us the marginal benefit that the firms in Yuma receive from hiring fast-food servers. The marginal benefit minus the wage rate is a surplus for the firms.

The supply of labor tells us about the marginal cost of working. To work, people must forgo leisure or working in the home, activities that they value. The wage rate received minus the marginal cost of working is a surplus for workers.

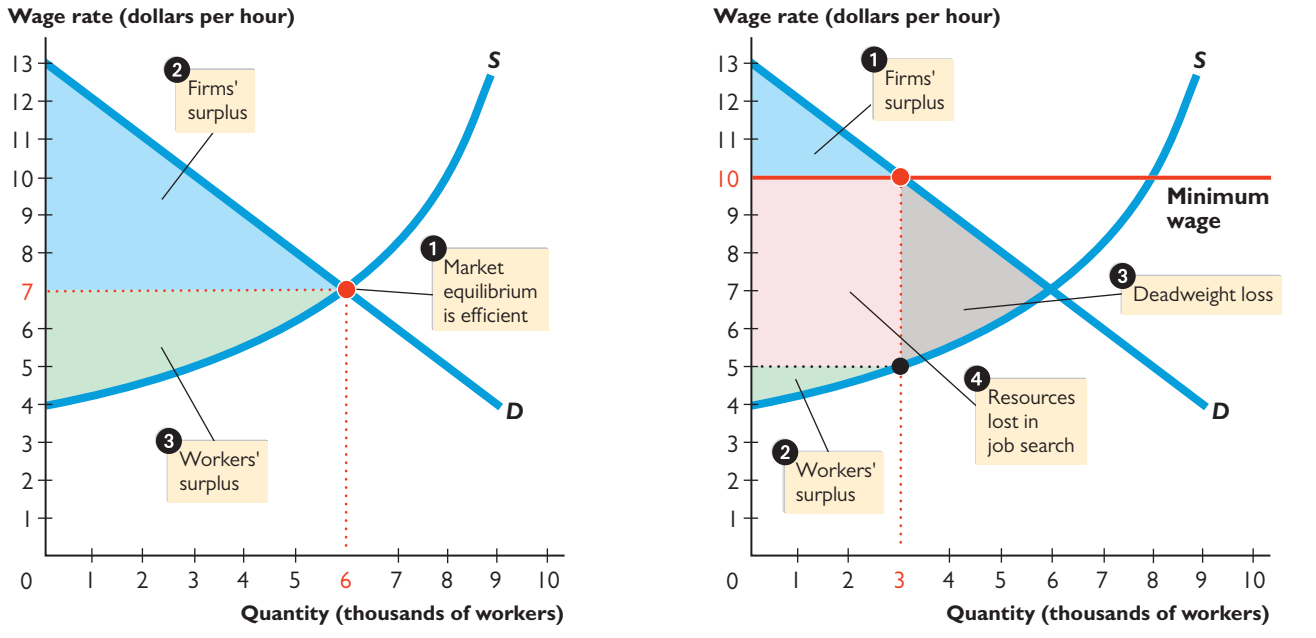
An efficient allocation of labor occurs when the marginal benefit to firms equals the marginal cost borne by workers. Such an allocation occurs in the labor market in Figure 7.12(a). Firms enjoy a surplus (the blue area), and workers enjoy a surplus (the green area). The sum of these surpluses is maximized.

Figure 7.12(b) shows the loss from a minimum wage. With a minimum wage of $10 an hour, 3,000 workers are hired. Marginal benefit exceeds marginal cost. The firms' surplus and workers' surplus shrink, and a deadweight loss (the gray area) arises. This loss falls on the firms that cut back employment and the people who can't find jobs at the higher wage rate.

FIGURE 7.12

The Inefficiency of the Minimum Wage

MyEconLab Animation



(a) Efficient labor market

❶ The market equilibrium is efficient with marginal benefit equal to marginal cost. The sum of ❷ the firms' surplus (blue area) and ❸ workers' surplus (green area) is maximized.

(b) Inefficient labor market

A minimum wage is inefficient. ❶ The firms' surplus and ❷ workers' surplus shrink, a ❸ deadweight loss arises, and ❹ resources are lost in job search.

But the total loss *exceeds* the deadweight loss. As each unemployed person keeps looking for a job, resources are used in costly job-search activity—writing letters, sending emails, making phone calls, going to interviews, and so on. The value of these resources might be as large as the area of the red rectangle.

Is the Minimum Wage Fair?

The minimum wage is unfair on both views of fairness: It delivers an unfair *result* and imposes unfair *rules*. The *result* is unfair because only those people who find jobs benefit. The people unemployed end up worse off than they would be with no minimum wage. And those who get jobs were probably not the least well off. Personal characteristics, which means discrimination, allocates jobs and is another source of unfairness. The minimum wage imposes unfair *rules* because it blocks voluntary exchange. Firms are willing to hire more labor and people are willing to work more, but they are not permitted by the minimum wage law to do so.

If the Minimum Wage Is So Bad, Why Do We Have It?

Although the minimum wage is inefficient, not everyone loses from it. The people who find jobs at the minimum wage rate are better off. Other supporters of the minimum wage believe that the elasticities of demand and supply in the labor market are low, so not much unemployment results. Labor unions support the minimum wage because it puts upward pressure on all wage rates, including those of union workers. Nonunion labor is a substitute for union labor, so when the minimum wage rises, the demand for union labor increases.



EYE on PRICE REGULATION

MyEconLab Critical Thinking Exercise

Can Congress Repeal the Law of Market Forces?

When Congress enacts a new law and the President signs it, the outcome is not always exactly what was intended. A mismatch between intention and outcome is almost inevitable when Congress seeks to block the law of market forces.

You've seen the problems created by a minimum wage law, which leaves teenagers without jobs. There would also be problems at the other extreme of the labor market if the law tried to place a cap on executive pay.

In the spring of 2009, the "Cap Executive Officer Pay Act of 2009" was introduced in the Senate. The goal of the Act was to limit the compensation of executives and directors of firms receiving government handouts. The Act defined compensation broadly as all forms of cash receipts, property, and any perks. The cap envisaged was an annual compensation no greater than that of the President of the United States.

This Act never made it into law, but you can see some of the problems that would have risen if it had.

First, there is the difficult task of determining the President's compensation. Does it include the use of the White House and Air Force One?

Second, assuming the first problem solved, placing a cap on executive pay would work like putting a ceiling on home rents that you've studied in this chapter.

The quantity of executive services supplied would decrease and the most talented executives would seek jobs with the unregulated employers. The firms in the most difficulty—those receiving government funding—would face the added challenge of recruiting and keeping competent executives and directors. The deadweight loss from this action would be large. It is fortunate that the idea didn't have legs!

MyEconLab Study Plan 7.3
Key Terms Quiz
Solutions Video

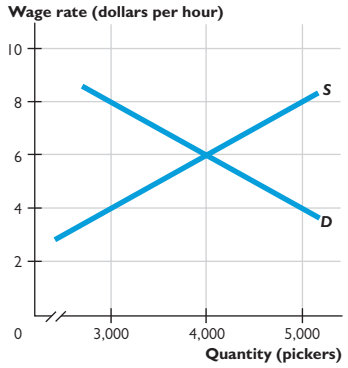
CHECKPOINT 7.3

Explain how a price floor works, and why the minimum wage creates unemployment and is inefficient and unfair.

Practice Problems

Figure 1 shows the market for tomato pickers in southern California.

FIGURE 1



1. What is the equilibrium wage rate and how many tomato pickers are employed? If California introduces a minimum wage of $4 an hour, how many tomato pickers are employed and how many are unemployed?
2. If California introduces a minimum wage of $8 an hour, how many tomato pickers are employed and how many are unemployed? What is the lowest wage that some workers might be able to earn if a black market develops?
3. Is the minimum wage of $8 an hour efficient? Who gains and who loses from the minimum wage of $8 an hour? Is it fair?

In the News

Will the United States raise the minimum wage to $15?
The labor movement is urging a minimum wage of $15 an hour. Currently, more than 40 percent of employees and 96 percent of fast-food workers earn less than $15 an hour. The U.S. Chamber of Commerce and the National Restaurant Association oppose the increase and say it will hurt small businesses and stifle job creation.

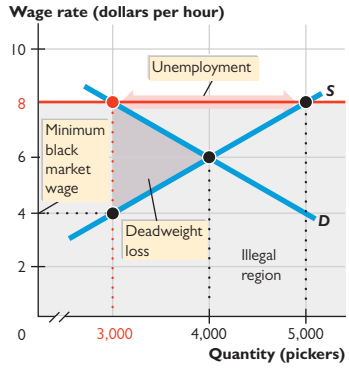
Source: *CBS News*, November 10, 2015

What will be the effects of a minimum wage set at $15 an hour?

Solutions to Practice Problems

1. The equilibrium wage rate is $6 an hour, and 4,000 pickers are employed. The minimum wage of $4 an hour is below the equilibrium wage rate, so 4,000 tomato pickers are employed and no worker is unemployed.
2. The minimum wage of $8 an hour is above the equilibrium wage rate, so 3,000 pickers are employed (determined by the demand) and 5,000 people would like to work as pickers for $8 an hour (determined by the supply), so 2,000 are unemployed (Figure 2). If a black market developed, the lowest wage that someone might be able to earn would be $4 an hour (Figure 2).
3. The minimum wage of $8 an hour is not efficient because it creates a dead-weight loss—the marginal benefit to growers exceeds the marginal cost to workers. Tomato pickers who find work at $8 an hour gain. Tomato growers and unemployed pickers lose. The minimum wage is unfair on both the fair-rules and fair-result views of fairness.

FIGURE 2



Solution to In the News

Given the information about how many workers currently earn less than $15 an hour, we can infer that a minimum wage of $15 an hour exceeds the equilibrium wage rate. Setting the minimum wage at $15 an hour will increase unemployment and create a deadweight loss. Some of this loss will be borne by employers whose profits will fall, but some will be borne by the workers who can't find jobs. Workers who do find jobs will gain.

7.4 PRODUCTION QUOTAS

MyEconLab Concept Video

So far in this chapter, we have examined the effects of government actions that seek to prevent the price from moving toward the equilibrium price. In this final section, we look at a market intervention that aims to block the quantity supplied from moving toward the equilibrium quantity. The tool used for this purpose is a **production quota**, which is a government regulation in a market that places an upper limit on the quantity that may be supplied.

Production quota
A government regulation in a market that places an upper limit on the quantity that may be supplied.

A government can't regulate the quantity supplied without isolating the domestic market from global competition. For this reason, production quotas usually are accompanied by *import quotas*—restrictions on the quantity that can be imported from other countries—that we study in Chapter 8.

To make a production quota effective—to successfully limit the quantity supplied—quotas must be allocated to each producer that sum to the market quota. Also, mechanisms must be used to prevent individual producers from exceeding their quotas.

An effective production quota (accompanied if needed by an import quota) decreases the quantity supplied below the equilibrium quantity. As a result, it raises the price. The higher price clearly damages the consumer, who pays more for a smaller quantity. Whether it benefits the producer depends on the elasticity of demand for the item. If the demand for the item subject to a quota is inelastic, the higher price brings an increase in total revenue and the producer gains. Not surprisingly, quotas are only used when demand is inelastic (see *Eye on the Global Economy*).

To see how consumers lose and producers gain and to see why a production quota is inefficient and unfair, we'll look at an example

Production Quota: An Example

To illustrate the effects of a production quota, we'll use the example of the market for dairy products in California. Markets in milk, both liquid and powder, cheese, and other dairy products are regulated by the California Department of Food and Agriculture. A production quota for the market is set and allocations are made to each producer that sum to the market quota.



EYE on the GLOBAL ECONOMY

Production Quotas

What do cranberries, peanuts, sugar, chicken, eggs, milk, cheese, and tobacco have in common?

The answer is that production quotas have been used, either in the past or in the present, to regulate the markets for these items. Each item has an inelastic demand, so if its quantity supplied can be restricted to below the equilibrium quantity, its price rises by a larger percentage than the percentage decrease in the quantity supplied. As a result, producers end up with a greater total revenue and producer surplus.

Consumers lose. The loss incurred by each consumer is too small to complain about, but with millions of consumers, the total loss is large.

Some of what consumers lose is deadweight loss, but most of the consumers' loss is the producers' gain. And because there are many fewer producers than consumers, each producer ends up with a gain that is large enough to be worth paying for in political contributions to legislators who vote to sustain the quotas.

Figure 7.13 illustrates this market. The demand curve, *D*, tells us the quantity demanded at each price and the supply curve, *S*, tells us the quantity supplied at each price.

Free Market Reference Point

In Figure 7.13(a), with no production quota, the equilibrium price is 10 cents per pound and the equilibrium quantity of dairy products is 60 billion pounds per year. The market is efficient because marginal benefit on the demand curve equals marginal cost on the supply curve, and total surplus, the sum of consumer surplus (green triangle) and producer surplus (blue triangle) is maximized.

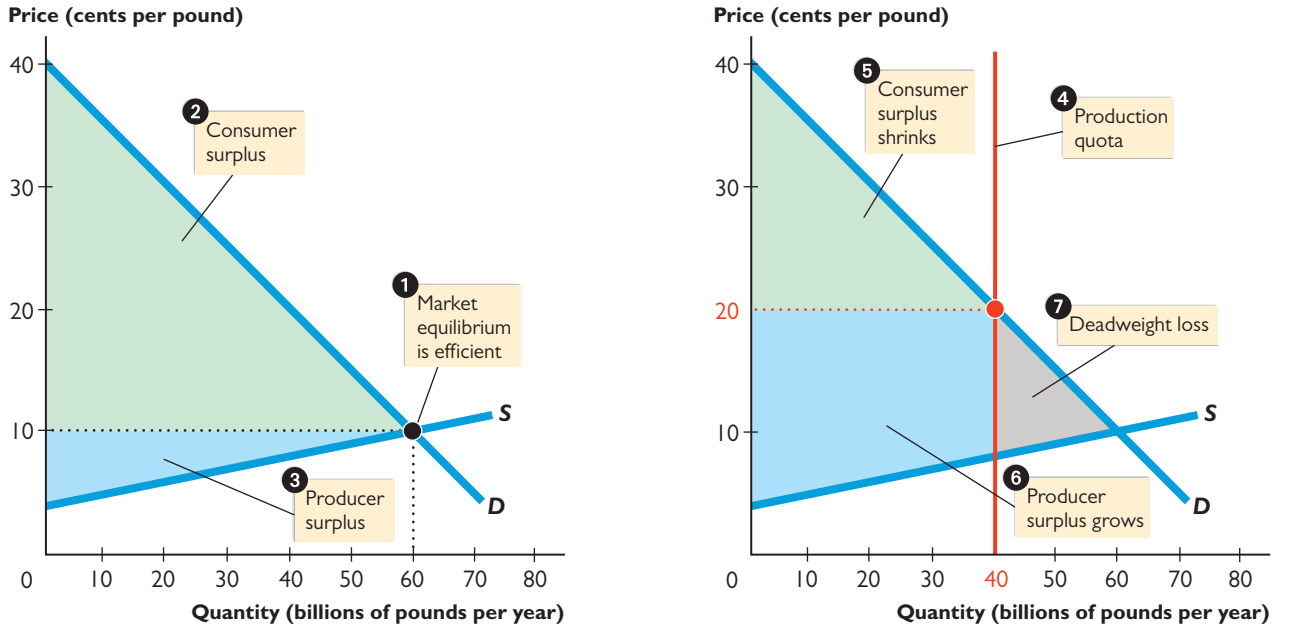
The Market with an Effective Production Quota

Figure 7.13(b) illustrates the effects of a production quota in this market. The government sets a production quota for the market of 40 billion pounds per year and allocates quotas to each producer that total the same 40 billion pounds. For now, we will assume that no one produces more than the allocated quota so the quantity supplied in the market is the quota quantity of 40 billion pounds.

FIGURE 7.13

The Inefficiency of a Production Quota

MyEconLab Animation



(a) Efficient dairy products market

(b) Inefficient dairy products market with production quota

In the market for dairy products:

❶ With no intervention, the market is competitive and the equilibrium price is 10 cents per pound and the equilibrium quantity of dairy products is 60 billion pounds per year.

❷ Consumer surplus plus ❸ producer surplus is maximized.

❹ The government imposes a production quota of 40 billion pounds per year.

❺ Consumer surplus shrinks, ❻ producer surplus grows, and ❼ a deadweight loss arises.

With no quota, the market is efficient. With a quota, it is inefficient.

At this quantity supplied, if the price remained at 10 cents per pound, there would be a shortage of dairy products. A shortage brings a rise in price and the market would achieve a new equilibrium at a price of 20 cents per pound.

At this smaller quantity and higher price, consumers are worse off. By how much they are worse off is shown by the shrinkage of consumer surplus.

Consumers lose, but dairy farmers gain. They produce a smaller quantity but sell it for a higher price. And the higher price more than counters the smaller quantity because the demand for dairy products is inelastic. Recall that when demand is inelastic, the percentage decrease in quantity is smaller than the percentage rise in price and a rise in price brings an incease in total revenue. You can see that total revenue increases from $6 billion to $8 billion. (Do the math and calculate the elasticity of demand between prices of 10 cents and 20 cents.)

Production Quota is Inefficient

The farmers' gain is smaller than the consumers' loss—the outcome is inefficient and a deadweight loss arises. The decreased quantity is valued on the demand curve more highly than its marginal cost on the supply curve. The area of the gray triangle shows the deadweight loss.

Production Quota is Unfair

A production quota is unfair on both views of fairness: It delivers an unfair *result* and imposes unfair *rules*. The result is unfair because well-off farmers benefit and consumers lose. A production quota imposes an unfair rule because it blocks voluntary exchange. Farmers are willing to produce a larger quantity and consumers are willing to buy the larger quantity, but they are not permitted by the quota to do so.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Price Ceilings and Price Floors You Encounter

Price ceilings and price floors operate in many of the markets in which you trade, and they require you to take a stand as a citizen and voter.

Unless you live in New York City, you're not likely to live in a rent controlled house or apartment. Because economists have explained the unwanted effects of rent ceilings that you've learned about in this chapter, this type of market intervention is now rare.

But you run into a price ceiling almost every time you use a freeway. The zero price for using a freeway is a type of price ceiling. The next time you're stuck in traffic and moving at a crawl, think about how a free market in road use would cut the congestion and allow you to zip along.

In Singapore, a transponder on your dashboard keeps track of your road use in dollars and cents as you drive around the city. The price varies with the time of day, the traffic density, and where in the city you are. As a result, you and other drivers are never stuck in slow-moving traffic.

You encounter a price floor in the labor market. Have you wanted a job and been willing and available to work, but unable to get hired? Would you have taken a job for a slightly lower wage if one had been available?

You also encounter price floors in the markets for food. You pay more for tomatoes, sugar, oranges, and many other food items than the minimum cost of producing them.

Develop your own policy position on price floors and price ceilings.

MyEconLab Study Plan 7.4
Key Terms Quiz
Solutions Video

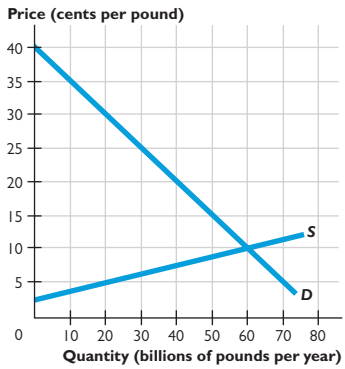
CHECKPOINT 7.4

Explain how a production quota works and why it brings a higher price and is inefficient and unfair.

Practice Problems

Figure 1 shows the market for cranberries.

FIGURE 1



1. What are the equilibrium price and quantity of cranberries? Is the market for cranberries efficient?
2. If the government sets a production quota of 20 billion pounds, what is the quantity of cranberries produced, the quantity demanded, and the price of a pound of cranberries?
3. If the government sets a production quota of 20 billion pounds, is the market for cranberries efficient? What is the deadweight loss created? Who gains and who loses from the production quota? Could the production quota be regarded as being fair?

In the News

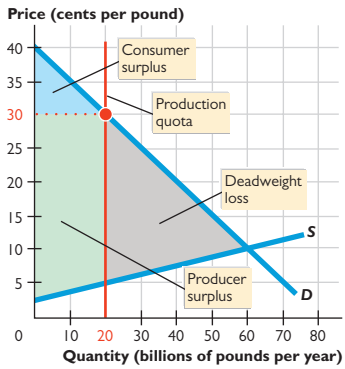
Conditions sour for California's dairy farmers
California dairy farmers are being hit by falling prices, drought, and rising feed costs.

Source: *The Wall Street Journal*, October 8, 2015

How would the events in the news clip affect a competitive market in milk? How would a production quota change the effects of these events?

Solutions to Practice Problems

FIGURE 2



1. The equilibrium price is 10 cents a pound; the equilibrium quantity is 60 billion pounds. The market is efficient—marginal benefit equals marginal cost.
2. The production quota decreases the quantity supplied and the quantity demanded to 20 billion pounds and the price is 30 cents per pound (Figure 2).
3. With the production quota, the market is not efficient because at the quantity produced, the marginal benefit (on the demand curve) exceeds the marginal cost (on the supply curve). The deadweight loss equals $5 billion, of which $4 billion is a decrease in consumer surplus and $1 billion is a decrease in producer surplus. But another $2 billion of consumer surplus is transferred to producers, so consumer surplus decreases by $6 billion. Consumers lose. The change in producer surplus is an increase of $1 billion. Farmers gain. The outcome is unfair on both views of fairness unless farmers are poorer than consumers, in which case it might be fair to boost farmers' incomes.

Solution to In the News

In a competitive milk market, drought and rising feed costs would decrease supply. With no other changes, the price would rise and the equilibrium quantity would decrease. Because the price of milk fell, the demand for California milk must have decreased, most likely from competition with other sources of supply. An effective production quota combined with an import quota would have prevented or lessened the fall in price, but it would not have avoided the decrease in supply caused by drought and rising feed prices.

CHAPTER SUMMARY

Key Points

1. Explain how taxes change prices and quantities, are shared by buyers and sellers, and create inefficiency.

- A tax on buyers has the same effect as a tax on sellers. It increases the price paid by the buyer and lowers the price received by the seller.
- A tax creates inefficiency by driving a wedge between marginal benefit and marginal cost and creating a deadweight loss.
- The less elastic the demand or the more elastic the supply, the greater is the price increase and the larger is the share of the tax paid by the buyer.

2. Explain how a price ceiling works, and why a rent ceiling creates a housing shortage and is inefficient and unfair.

- A price ceiling set above the equilibrium price has no effects.
- A price ceiling set below the equilibrium price creates a shortage and increased search activity or a black market.
- A price ceiling is inefficient and unfair.
- A rent ceiling is an example of a price ceiling.

3. Explain how a price floor works, and why the minimum wage creates unemployment and is inefficient and unfair.

- A price floor set below the equilibrium price has no effects.
- A price floor set above the equilibrium price creates a surplus and increased search activity or illegal trading.
- A price floor is inefficient and unfair.
- A minimum wage is an example of a price floor.

4. Explain how a production quota works and why it brings a higher price and is inefficient and unfair.

- A production quota decreases the quantity produced, decreases the quantity consumed, and raises the price.
- A production quota is used in the market for items that have an inelastic demand.
- A production quota benefits the producer but costs the consumer more than the producer gains—it creates a deadweight loss.
- A production quota is inefficient and unfair.

Key Terms

MyEconLab Key Terms Quiz

Black market, 177
Excess burden, 172
Minimum wage law, 183
Price cap, 176
Price ceiling, 176
Price floor, 182
Production quota, 189
Rent ceiling, 176
Search activity, 178
Tax incidence, 170

MyEconLab Chapter 7 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

TABLE 1

Price (dollars per month)	Quantity demanded (units per month)	Quantity supplied (units per month)
0	30	0
10	25	10
20	20	20
30	15	30
40	10	40

FIGURE 1

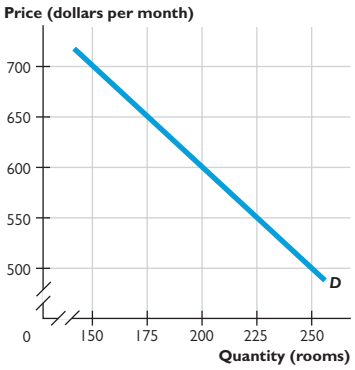


TABLE 2

Wage rate (dollars per hour)	Quantity demanded (student workers)	Quantity supplied (student workers)
10.00	600	300
10.50	500	350
11.00	400	400
11.50	300	450
12.00	200	500
12.50	100	550

TABLE 3

Price (dollars per pound)	Quantity demanded (pounds per week)	Quantity supplied (pounds per week)
1.00	4,500	0
2.00	4,000	1,000
3.00	3,500	2,000
4.00	3,000	3,000
5.00	2,500	4,000
6.00	2,000	5,000

1. In Florida, sunscreen and sunglasses are vital items. If the tax on sellers of these items is doubled from 5.5 percent to 11 percent, who will pay most of the tax increase: the buyer or the seller? Will the tax increase halve the quantity of sunscreen and sunglasses bought?

2. Suppose that the government imposes a $2-a-cup tax on coffee. What determines by how much Starbucks will raise its price? How will the quantity of coffee bought in coffee shops change? Will this tax raise much revenue?

3. Table 1 illustrates the market for Internet service. What is the market price of Internet service? If the government taxes Internet service $15 a month, what is the price the buyer pays? What is the price the seller receives? Does the buyer or the seller pay more of the tax?

Use Figure 1 to work Problems **4** to **6**. Figure 1 shows the demand for on-campus housing. The college has 200 rooms to rent.

4. If the college puts a rent ceiling on rooms of $650 a month, what is the rent, how many rooms are rented, and is the on-campus housing market efficient?

5. If the college puts a strictly enforced rent ceiling on rooms of $550 a month, what is the rent, how many rooms are rented, and is the on-campus housing market efficient? Explain why or why not.

6. Suppose that with a strictly enforced rent ceiling on rooms of $550 a month, a black market develops. How high could the black market rent be and would the on-campus housing market be fair? Explain your answer.

7. Table 2 shows the demand and supply schedules for student workers at on-campus venues. If the college introduces a strictly enforced minimum wage of $11.50 an hour, who gains and who loses from the minimum wage, and is the campus labor market efficient or fair?

8. Table 3 shows the demand and supply schedules for mushrooms. Suppose that the government introduces a production quota for mushrooms and sets it at 2,000 pounds a week. What is the market price of mushrooms? Calculate the producer surplus and the deadweight loss. Who gains and who loses?

Use the following news clip to work Problems **9** and **10**.

Venezuelans organize to overcome food shortages

The government of Venezuela controls the price of food and there are shortages of milk, rice, coffee, pasta, sugar, corn flour, and cooking oil. Eggs have disappeared from store shelves. While people stand in line for milk, cheese and yogurt are abundant. People who buy milk at the low price either sell it for a profit or exchange it for food items that other families stand in line to buy.

Source: www.teleSURtv.net/english, November 27, 2015

9. Are Venezuela's price controls price floors or price ceilings? Draw a graph to illustrate the shortages of food created by the price controls.

10. Explain how Venezuela's price controls on milk and cheese have changed total surplus and created a deadweight loss. Draw a graph to illustrate.

11. Read *Eye on Price Regulation* on p. 187 and explain why a mismatch between intention and outcome is inevitable if a price regulation seeks to block the law of market forces.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor.

1. Suppose that Congress caps executive pay at a level below the equilibrium.

- Explain how the quantity of executives demanded, the quantity supplied, and executive pay will change, and explain why the outcome is inefficient.
- Draw a graph of the market for corporate executives. On your graph, show the market equilibrium, the pay cap, the quantity of executives supplied and demanded at the pay cap, the deadweight loss created, and the highest pay that an executive might be offered in a black market.

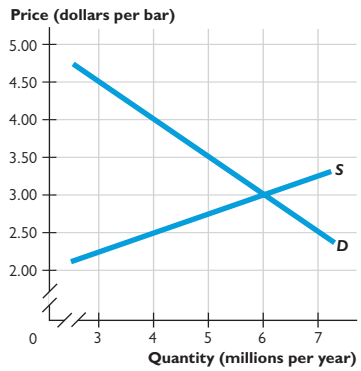
2. The supply of luxury boats is perfectly elastic, the demand for luxury boats is unit elastic, and with no tax on luxury boats the price is $1 million and 240 luxury boats a week are bought.

Now luxury boats are taxed at 20 percent. What is the price that buyers pay? How is the tax split between buyers and sellers? What is the government's tax revenue? On a graph, show the excess burden of this tax. Is this tax efficient?

3. Figure 1 shows the demand for and supply of chocolate bars. The government levies a $1.50 tax on a chocolate bar. What is the change in the quantity of chocolate bars bought, who pays most of the tax, and what is the deadweight loss?

4. Concerned about the political fallout from rising gas prices, suppose that the U.S. government imposes a price ceiling of $3.00 a gallon on gasoline. Explain how the market for gasoline would react to this price ceiling if a global shortage of oil sent the equilibrium price of gasoline to $3.50 a gallon. Would the U.S. gasoline market be efficient?

FIGURE 1



Use the following information to work Problems **5** and **6**.

New York seals deal on $15 minimum fast-food wage

Raising the minimum wage to $15 an hour will add fairness and bring dignity to between 135,000 and 200,000 workers whose hourly wage will rise to $15 by the end of 2018 in New York City and by 2021 in the rest of the state.

Source: CNNMoney, September 11, 2015

5. On a graph of the market for fast-food workers, show the effect of the $15-an-hour minimum wage on employment of fast-food workers.

6. Explain the effects of the higher minimum wage on the workers' surplus and the firms' surplus. Will the $15 wage bring fairness, dignity, and respect?

Use the following information to work Problems **7** and **8**.

Canada's dairy industry is a rich, closed club

If you want to be a dairy farmer, you buy a plot of land and some cows and start to sell your milk. Not in Canada. There, farmers must buy a quota to produce a set amount of milk. The situation is similar in the markets for chicken and eggs.

Source: *The Globe and Mail*, June 25, 2015

7. Draw a graph to illustrate the Canadian market for milk. With a production quota, show the quantity of milk produced, the price, consumer surplus, producer surplus, and the deadweight loss created.

8. In the Canadian market for milk with a production quota, explain what happens if a drought decreases supply.

MyEconLab Chapter 7 Study Plan

Multiple Choice Quiz

1. If a tax of $1 a can is imposed on the buyers of sugary drinks, the demand for sugary drinks _____ and the price that buyers pay _____.

A. doesn't change; doesn't change
B. doesn't change; rises by $1 a can
C. decreases; rises by more than $1 a can
D. decreases; rises by less than $1 a can

2. A tax on sugar will be paid by only _____.

A. buyers if the supply of sugar is perfectly elastic
B. sellers if the demand for sugar is perfectly inelastic
C. buyers if the demand for sugar is perfectly elastic
D. sellers if the supply of sugar is perfectly elastic

3. A price ceiling imposed below the equilibrium price _____.

A. creates a black market in which the price might equal or exceed the equilibrium price
B. creates a black market in which the price equals the price ceiling
C. leads to increased search activity, which reduces the shortage of the good
D. increases the demand for the good, which makes the shortage even larger

4. A price ceiling is _____ if it is set _____ the market equilibrium price.

A. efficient and fair; below
B. unfair but efficient; equal to
C. efficient and unfair; above
D. inefficient and unfair; below

5. A price floor influences the outcome of a market if it is _____.

A. set below the equilibrium price
B. set above the equilibrium price
C. an incentive for buyers to increase demand for the good
D. an incentive for sellers to decrease supply of the good

6. A minimum wage set above the market equilibrium wage rate _____.

A. increases both employment and the quantity of labor supplied
B. decreases unemployment and raises the wage rate of those employed
C. raises the wage rate of those employed and increases the supply of jobs
D. increases unemployment and decreases employment

7. A production quota set below the market equilibrium quantity _____.

A. increases the price, increases producer surplus, and is inefficient
B. creates a shortage and increases farmers' total revenue but is unfair
C. is inefficient because farmers' marginal cost exceeds consumers' marginal benefit
D. is efficient because farmers' surplus increases

8. An effective production quota for peanuts with no imports of peanuts will _____.

A. lower the peanut growers' costs, raise the market price of peanuts, and decrease consumer surplus
B. raise the price of peanuts, which will decrease the demand for peanuts
C. make the peanut market more efficient if the demand for peanuts is inelastic
D. decrease the quantity of peanuts produced, decrease the quantity consumed, and increase the total surplus from peanuts



Who wins and who loses from globalization?

Global Markets in Action

8

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain how markets work with international trade.
2. Identify the gains from international trade and its winners and losers.
3. Explain the effects of international trade barriers.
4. Explain and evaluate arguments used to justify restricting international trade.

MyEconLab Big Picture Video

MyEconLab Concept Video

8.1 HOW GLOBAL MARKETS WORK

Imports
The goods and services that people and firms in one country buy from firms in other countries.

Exports
The goods and services that firms in one country sell to people and firms in other countries.

Because we trade with people in other countries, the goods and services that we buy and consume are not limited by what we produce. The goods and services that we buy from people and firms in other countries are our **imports**; the goods and services that we sell to people and firms in other countries are our **exports**.

International Trade Today

Global trade today is enormous. In 2015, global exports and imports (the two numbers are the same because what one country exports another imports) were about $23 trillion, which is 31 percent of the value of global production. The United States is the world's largest international trader and accounts for 10 percent of world exports and 12 percent of world imports. Germany and China, which rank 2 and 3 behind the United States, lag by a large margin.

In 2015, total U.S. exports were $2.3 trillion, which is about 13 percent of the value of U.S. production. Total U.S. imports were $2.8 trillion, which is about 16 percent of the value of total expenditure in the United States.

The United States trades both goods and services. In 2015, exports of services were $0.75 trillion (33 percent of total exports) and imports of services were $0.5 trillion (16 percent of total imports).

Our largest exports are private services such as banking, insurance, and business consulting. Our largest exports of goods are automobile parts. Our largest import used to be crude oil, and it remains a large item. But in 2015, computers were our largest import. *Eye on the U.S. Economy* (p. 199) provides a bit more detail on ten large exports and imports.

What Drives International Trade?

The fundamental force that drives international trade is *comparative advantage*. We defined comparative advantage in Chapter 3 (p. 73) as the ability of a person to perform an activity or produce a good or service at a lower opportunity cost than anyone else. This same idea applies to nations. We can define *national comparative advantage* as the ability of a *nation* to perform an activity or produce a good or service at a lower opportunity cost than *any other nation*.

The opportunity cost of producing a T-shirt is lower in China than in the United States, so China has a comparative advantage in producing T-shirts. The opportunity cost of producing an airplane is lower in the United States than in China, so the United States has a comparative advantage in producing airplanes.

You saw in Chapter 3 how Liz and Joe reaped gains from trade by specializing in the production of the good at which they have a comparative advantage and then trading. Both were better off. This same principle applies to trade among nations.

China has a comparative advantage at producing T-shirts and the United States has a comparative advantage at producing airplanes, so the people of both countries can gain from specialization and trade. China can buy airplanes from the United States at a lower opportunity cost than that at which it can produce them. Americans can buy T-shirts from China for a lower opportunity cost than that at which U.S. firms can produce them. Also, through international trade, Chinese producers can get higher prices for their T-shirts and Boeing can sell airplanes for a higher price. Both countries gain from international trade.

We're going to illustrate the gains from trade that we've just described by studying demand and supply in the global markets for T-shirts and airplanes.

EYE on the U.S. ECONOMY

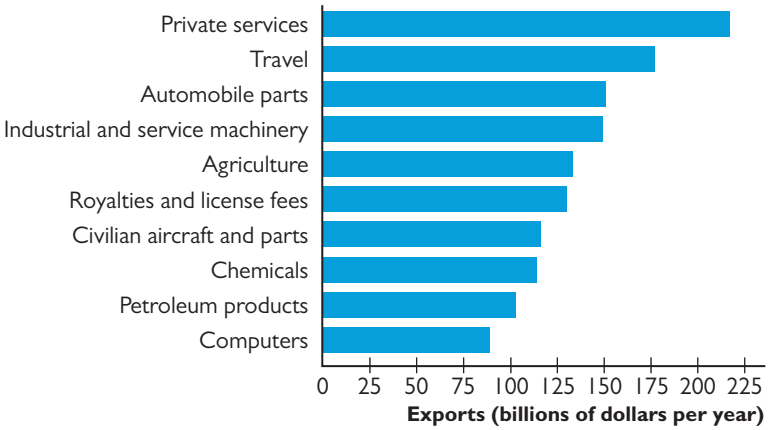
U.S. Exports and Imports

The blue bars in part (a) of the figure show ten large U.S. exports and the red bars in part (b) show ten large U.S. imports. Some items appear in both parts (a) and (b) because the United States exports and imports items in many of the broad categories.

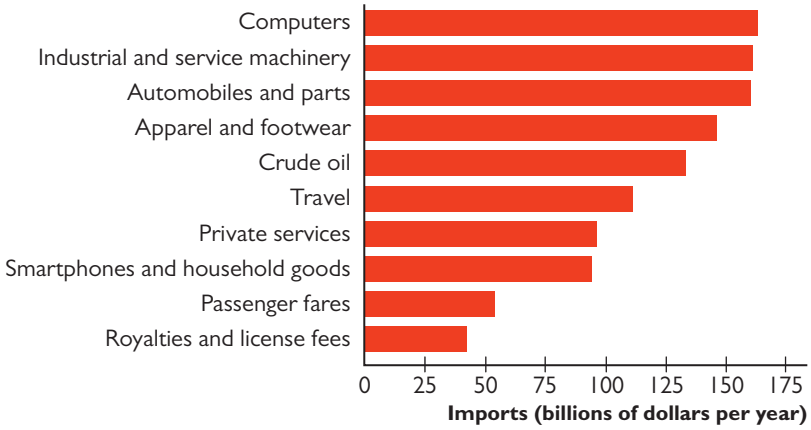
Three of the leading U.S. exports are services—private services, which include financial, business, professional and technical services (such as the sale of advertising by Google to Adidas, a European sportswear maker), and education (foreign students in our colleges and universities); travel (such as the expenditure on a Florida vacation by a visitor from England); and royalties and license fees (such as fees received by Hollywood movie producers on films shown abroad).

Computers such as laptops and tablets are the largest import. We also import large quantities of industrial ands service machinery, automobiles and parts, clothing, crude oil, and travel. Private services also feature as a large imports category.

Although we import a large quantity of computers, we export some too. We also export the semiconductors (computer chips) inside those imported computers. The Intel chip in a Lenovo laptop built in China and imported into the United States is an example. This chip is made in the United States and exported to China.



(a) Ten large U.S. exports



(b) Ten large U.S. imports

SOURCE OF DATA: Bureau of Economic Analysis.



The United States exports airplanes …



and imports computers.

Why the United States Imports T-Shirts

Figure 8.1 illustrates the effects of international trade in T-shirts. The demand curve D_{US} and the supply curve S_{US} show the demand and supply in the U.S. domestic market only. The demand curve tells us the quantity of T-shirts that Americans are willing to buy at various prices. The supply curve tells us the quantity of T-shirts that U.S. garment makers are willing to sell at various prices.

Figure 8.1(a) shows what the U.S. T-shirt market would be like with no international trade. The price of a T-shirt would be $8 and 40 million T-shirts a year would be produced by U.S. garment makers and bought by U.S. consumers.

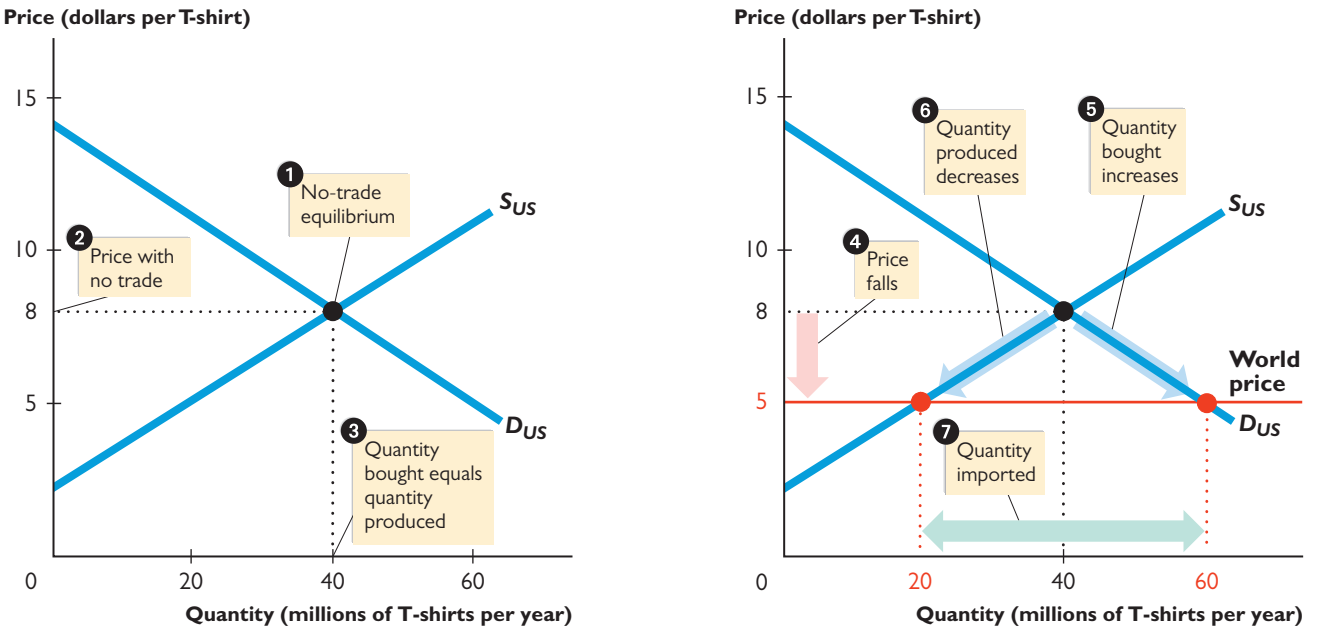
Figure 8.1(b) shows the market for T-shirts *with* international trade. Now the price of a T-shirt is determined in the world market, not the U.S. domestic market. The world price is *less than* $8 a T-shirt, which means that the rest of the world has a comparative advantage in producing T-shirts. The world price line shows the world price as $5 a T-shirt.

The U.S. demand curve, D_{US}, tells us that at $5 a T-shirt, Americans buy 60 million T-shirts a year. The U.S. supply curve, S_{US}, tells us that at $5 a T-shirt, U.S. garment makers produce 20 million T-shirts. To buy 60 million T-shirts when only 20 million are produced in the United States, we must import T-shirts from the rest of the world. The quantity of T-shirts imported is 40 million a year.

FIGURE 8.1

A Market with Imports

MyEconLab Animation



With no international trade, in part (a), ❶ domestic demand and domestic supply determine ❷ the equilibrium price at $8 a T-shirt and ❸ the quantity at 40 million T-shirts a year.

With international trade, in part (b), world demand and world supply determine the world price, which is $5 per T-shirt. ❹ The domestic price falls to $5 a T-shirt. ❺ Domestic purchases increase to 60 million T-shirts a year, and ❻ domestic production decreases to 20 million T-shirts a year. ❼ 40 million T-shirts a year are imported.

Why the United States Exports Airplanes

Figure 8.2 illustrates the effects of international trade in airplanes. The demand curve D_{US} and the supply curve S_{US} show the demand and supply in the U.S. domestic market only. The demand curve tells us the quantity of airplanes that U.S. airlines are willing to buy at various prices. The supply curve tells us the quantity of airplanes that U.S. aircraft makers are willing to sell at various prices.

Figure 8.2(a) shows what the U.S. airplane market would be like with no international trade. The price of an airplane would be $100 million and 400 airplanes a year would be produced by U.S. aircraft makers and bought by U.S. airlines.

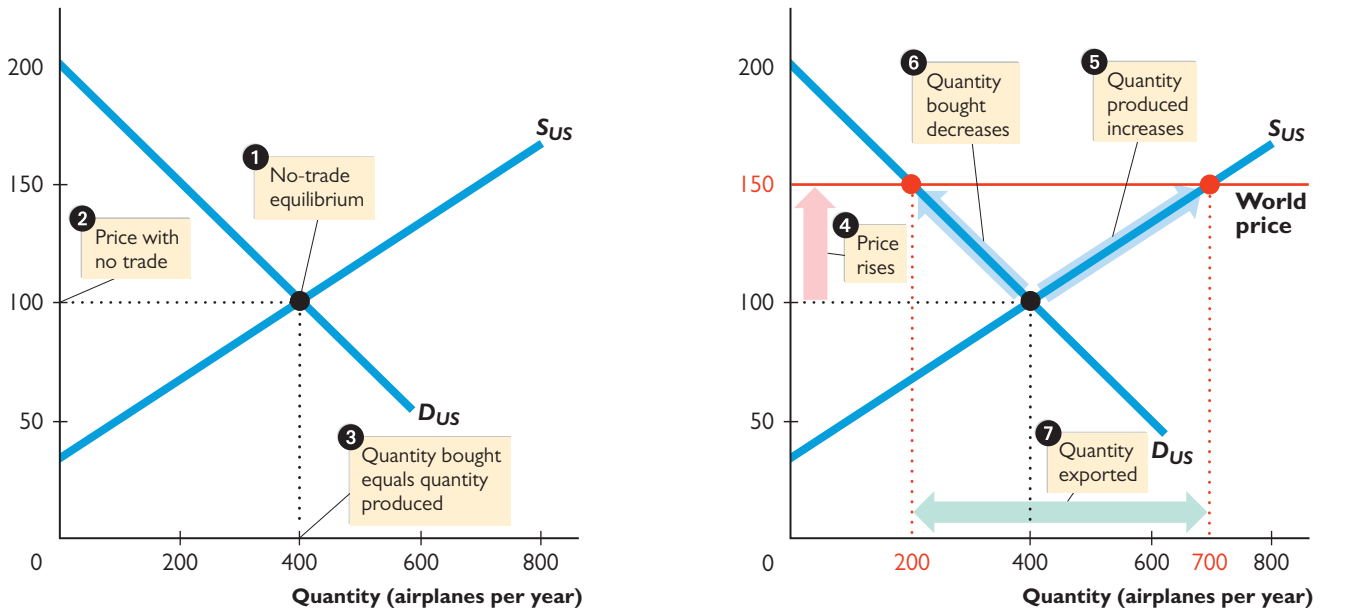
Figure 8.2(b) shows the U.S. airplane market *with* international trade. Now the price of an airplane is determined in the world market, not the U.S. domestic market. The world price is *higher than* $100 million, which means that the United States has a comparative advantage in producing airplanes. The world price line shows the world price as $150 million.

At $150 million per airplane, the U.S. demand curve, D_{US}, tells us that airlines in the United States buy 200 airplanes a year and the U.S. supply curve, S_{US}, tells us that U.S. aircraft makers produce 700 airplanes a year. The quantity produced in the United States (700 a year) minus the quantity purchased by U.S. airlines (200 a year) is the quantity of U.S. exports, which is 500 airplanes a year.

FIGURE 8.2

A Market with Exports

MyEconLab Animation



(a) Equilibrium with no international trade

(b) Equilibrium in a market with exports

With no international trade, in part (a), ❶ domestic demand and domestic supply determine ❷ the equilibrium price at $100 million an airplane and ❸ the equilibrium quantity at 400 airplanes a year. With international trade, in part (b), world demand and world supply determine the world price, which is $150 million an airplane. ❹ The domestic price rises. ❺ Domestic production increases to 700 airplanes a year, ❻ domestic purchases decrease to 200 airplanes a year, and ❼ 500 airplanes a year are exported.

MyEconLab Study Plan 8.1
Key Terms Quiz
Solutions Video

CHECKPOINT 8.1

Explain how markets work with international trade.

Practice Problems

1. Suppose that the world price of sugar is 10¢ a pound, the United States does *not* trade internationally, and the U.S. equilibrium price of sugar is 20¢ a pound. The United States then begins to trade internationally.
   - How does the price of sugar in the United States change?
   - Do U.S. consumers buy more or less sugar?
   - Do U.S. sugar growers produce more or less sugar?
   - Does the United States export or import sugar?
2. Suppose that the world price of steel is $100 a ton, India does *not* trade internationally, and the equilibrium price of steel in India is $60 a ton. India then begins to trade internationally.
   - How does the price of steel in India change?
   - How does the quantity of steel produced in India change?
   - How does the quantity of steel bought by India change?
   - Does India export or import steel?

In the News

The great American shale boom
In the past five years, U.S. oil output has doubled. In 2014, the United States and a few smaller countries added 2.4 million barrels a day to total world supply. Thanks to incredible advances in technology, instead of having to import more oil we've cut our reliance on foreign oil.

Source: *Forbes*, November 20, 2015

Describe the comparative advantage that the United States has in producing oil, and explain why its comparative advantage has changed.

Solutions to Practice Problems

1. With no international trade, the U.S. domestic price of sugar exceeds the world price so we know that the rest of the world has a comparative advantage at producing sugar. With international trade, the price of sugar in the United States falls to the world price, U.S. consumers buy more sugar, and U.S. sugar growers produce less sugar. The United States imports sugar.
2. With no international trade, the domestic price of steel in India is below the world price so we know that India has a comparative advantage at producing steel. With international trade, the price of steel in India rises to the world price, steel mills in India increase the quantity they produce, and the quantity of steel bought by Indians decreases. India exports steel.

Solution to In the News

Before new fracking technology was developed, the opportunity cost of producing oil in the United States was higher than the world market price, so the United States imported most of its oil. With the development of fracking, the cost of producing a barrel of oil in the United States is below the world price. Now the United States has a comparative advantage in the production of oil.

8.2 WINNERS, LOSERS, AND NET GAINS FROM TRADE

MyEconLab Concept Video

You've seen how international trade lowers the price of an imported good and raises the price of an exported good. Buyers of imported goods benefit from lower prices, and sellers of exported goods benefit from higher prices. But some people complain about international competition: Not everyone gains. We're now going to see who wins and who loses from free international trade. You will then be able to understand who complains about international competition and why.

We'll also see why we never hear the consumers of imported goods complaining and why we never hear exporters complaining, except when they want greater access to foreign markets. And we'll see why we *do* hear complaints from producers about cheap foreign imports.



EYE on GLOBALIZATION

MyEconLab Critical Thinking Exercise

Who Wins and Who Loses from Globalization?

Economists generally agree that the gains from globalization vastly outweigh the losses, but there are both winners and losers.

The U.S. consumer is a big winner. Globalization has brought iPads, Wii games, Nike shoes, and a wide range of other products to our shops at ever lower prices.

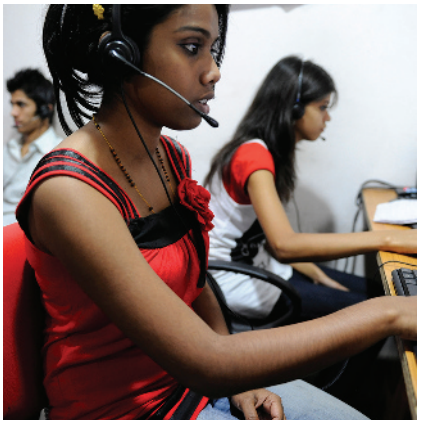
The Indian (and Chinese and other Asian) worker is another big winner. Globalization has brought a wider range of more interesting jobs and higher wages.

The U.S. (and European) textile workers and furniture makers are big losers. Their jobs have disappeared and many of them have struggled to find new jobs, even when they've been willing to take a pay cut.

But one of the biggest losers is the African farmer. Blocked from global agricultural markets by trade restrictions and subsidies in the United States and Europe, globalization is leaving much of Africa on the sidelines.



The U.S. consumer …



and Indian workers gain from globalization.



But some U.S. workers and …



African farmers lose.

Gains and Losses from Imports

We measure the gains and losses from imports by examining their effect on consumer surplus, producer surplus, and total surplus. The winners are those whose surplus increases and the losers are those whose surplus decreases.

Figure 8.3(a) shows what consumer surplus and producer surplus would be with no international trade. Domestic demand, D_{US}, and domestic supply, S_{US}, determine the price and quantity. The green area shows consumer surplus and the blue area shows producer surplus. Total surplus is the sum of consumer surplus and producer surplus.

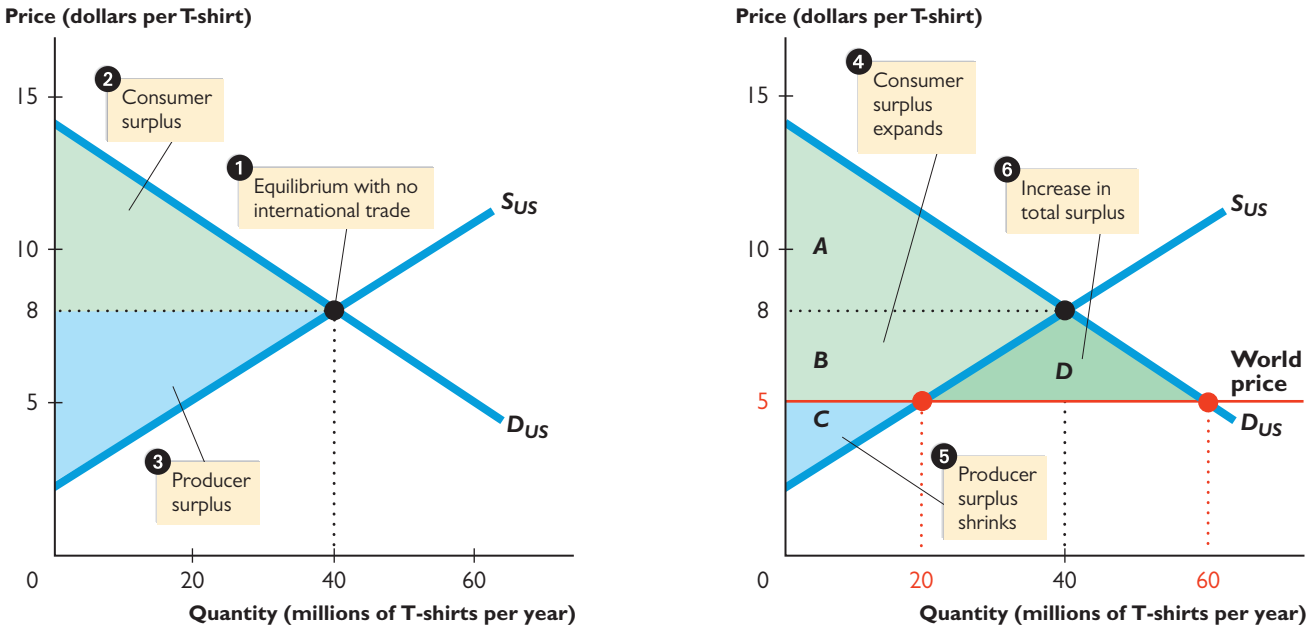
Figure 8.3(b) shows how these surpluses change when the market opens to imports. The price falls to the world price. The quantity purchased increases to the quantity demanded at the world price, and consumer surplus expands to the larger green area $A + B + D$. The quantity produced decreases to the quantity supplied at the world price, and producer surplus shrinks to the smaller blue area C.

Part of the gain in consumer surplus, the area B, is a loss of producer surplus—a redistribution of total surplus. But the other part of the increase in consumer surplus, the area D, is a net gain. This increase in total surplus is the gain from imports and results from the lower price and increased purchases.

FIGURE 8.3

Gains and Losses in a Market with Imports

MyEconLab Animation



(a) Consumer surplus and producer surplus with no international trade

With no international trade, ❶ equilibrium at the intersection of the domestic demand and domestic supply curves determines the price and quantity. ❷ The green area shows the consumer surplus and ❸ the blue area shows the producer surplus.

(b) Gains and losses from imports

With international trade, the domestic price falls to the world price. ❹ Consumer surplus expands to the area $A + B + D$. Area B is a transfer of surplus from producers to consumers, and ❺ producer surplus shrinks to area C. ❻ Area D is an increase in total surplus.

Gains and Losses from Exports

We measure the gains and losses from exports just like we measured those from imports, by examining their effect on consumer surplus, producer surplus, and total surplus.

Figure 8.4(a) shows what the consumer surplus and producer surplus would be with no international trade. Domestic demand, D_{US}, and domestic supply, S_{US}, determine the price and quantity. The green area shows consumer surplus and the blue area shows producer surplus. The two surpluses sum to total surplus.

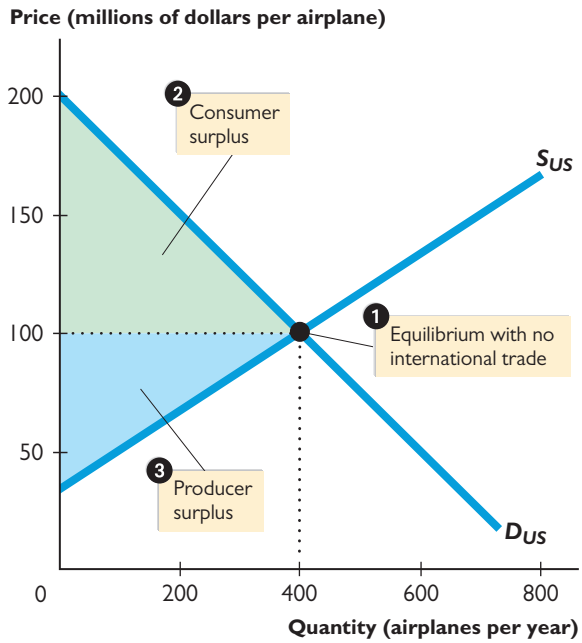
Figure 8.4(b) shows how the consumer surplus and producer surplus change when the good is exported. The price rises to the world price. The quantity bought decreases to the quantity demanded at the world price, and the consumer surplus shrinks to the green area *A*. The quantity produced increases to the quantity supplied at the world price, and the producer surplus expands from the blue area *C* to the larger blue area

Part of the gain in producer surplus, the area *B*, is a loss in consumer surplus—a redistribution of the total surplus. But the other part of the increase in producer surplus, the area *D*, is a net gain. This increase in total surplus is the gain from exports and results from the higher price and increased production.

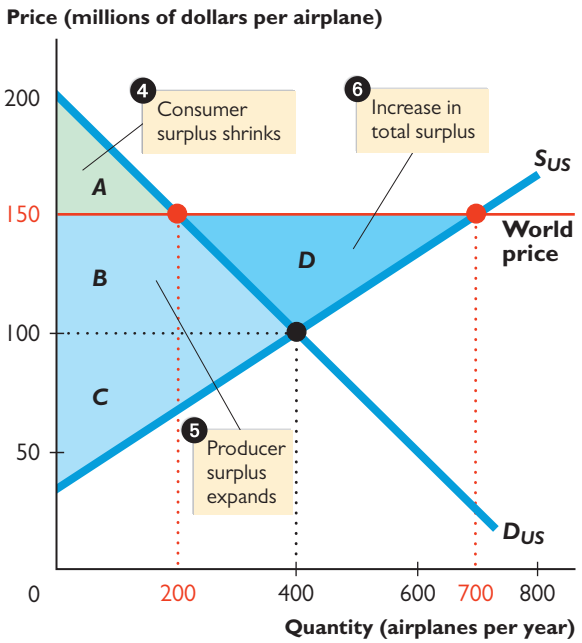
FIGURE 8.4

Gains and Losses in a Market with Exports

MyEconLab Animation



(a) Consumer surplus and producer surplus with no international trade



(b) Gains and losses from exports

With no international trade, ❶ equilibrium at the intersection of the domestic demand and domestic supply curves determines the price and quantity. ❷ The green area shows the consumer surplus and ❸ the blue area shows the producer surplus.

With international trade, the domestic price rises to the world price. ❹ Consumer surplus shrinks to the area *A*. ❺ Producer surplus expands to the area *B* + *C* + *D*. Area *B* is transferred from consumers to producers. ❻ Area *D* is an increase in total surplus.

MyEconLab Study Plan 8.2
Solutions Video

CHECKPOINT 8.2

Identify the gains from international trade and its winners and losers.

Practice Problems

Before the 1980s, China did not trade internationally: It was self-sufficient. Then China began to trade internationally in, among other items, coal and shoes. The world price of coal was less than China's domestic price and the world price of shoes was higher than its domestic price.

1. Does China import or export coal? Who in China gains and who loses from international trade in coal? Does China gain from this trade in coal? On a graph of the market for coal in China show the gains, losses, and net gain or loss from international trade in coal.
2. Does China import or export shoes? Who in China gains and who loses from international trade in shoes? Does China gain from this trade in shoes? On a graph of the market for shoes in China, show the gains, losses, and net gain or loss from international trade in shoes.

In the News

The commodity prices nightmare of 2015
Commodity prices have been decimated in 2015: natural gas down 38.5% and nickel down nearly 43%.

Source: *Money Morning*, December 3, 2015

The United States imports nickel from Canada and exports natural gas to Mexico. How do these price falls change the U.S. gains from trade in each good and the distribution of the gains?

FIGURE 1

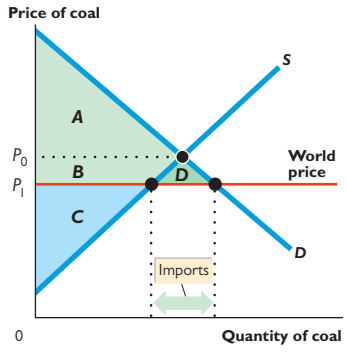
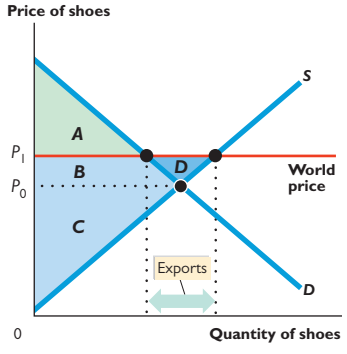


FIGURE 2



Solutions to Practice Problems

1. The rest of the world has a comparative advantage in producing coal. China imports coal, Chinese coal users gain, and Chinese coal producers lose. The gains exceed the losses: China gains from international trade in coal. Figure 1 shows the market for coal in China. The price before trade is P_0. With trade, the price falls to the world price, P_1. Consumers gain the area B, producers lose the area B, and the net gain from trade in coal is D.
2. China has a comparative advantage in producing shoes. China exports shoes, Chinese shoe producers gain, and Chinese consumers of shoes lose. The gains exceed the losses: China gains from international trade in shoes. Figure 2 shows the shoe market in China. The price before trade is P_0. With trade, the price rises to the world price, P_1. Producers gain the area B, consumers lose the area B, and the net gain from trade in shoes is area D.

Solution to In the News

Canada has a comparative advantage in producing nickel, which the United States imports. A fall in the world price increases U.S. imports and increases U.S. consumer surplus and total surplus. The United States has a comparative advantage in producing natural gas, so the fall in the world price decreases U.S. production and exports. U.S. producer surplus decreases, consumer surplus increases, but producers lose more than consumers gain. Total surplus decreases.

8.3 INTERNATIONAL TRADE RESTRICTIONS

MyEconLab Concept Video

Governments use four sets of tools to influence international trade and protect domestic industries from foreign competition. They are

- Tariffs
- Import quotas
- Other import barriers
- Export subsidies

Tariffs

A **tariff** is a tax that is imposed on a good when it is imported. For example, the government of India imposes a 100 percent tariff on wine imported from California. When an Indian firm imports a $10 bottle of Californian wine, it pays the Indian government a $10 import duty.

Tariff
A tax imposed on a good when it is imported.

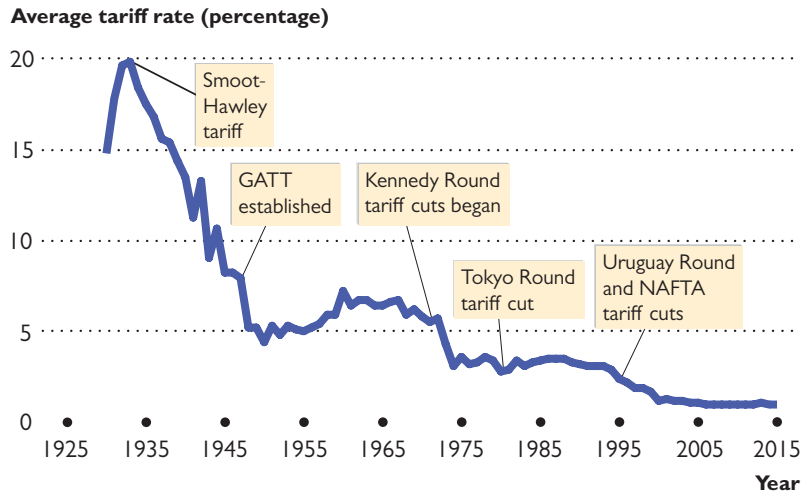
The incentive for governments to impose tariffs is strong. First, they provide revenue to the government. Second, they enable the government to satisfy the self-interest of people who earn their incomes in import-competing industries. As you will see, tariffs and other restrictions on free international trade decrease the gains from trade and are not in the social interest. Let's see how.



EYE on the PAST

The History of U.S. Tariffs

The figure shows the average tariff rate on U.S. imports since 1930. Tariffs peaked during the 1930s when Congress passed the Smoot-Hawley Act. With other nations, the United States signed the General Agreement on Tariffs and Trade (GATT) in 1947. In a series of rounds of negotiations, GATT achieved widespread tariff cuts for the United States and many other nations. Today, the World Trade Organization (WTO) continues the work of GATT and seeks to promote unrestricted trade among all nations.



SOURCES OF DATA: The Budget for Fiscal Year 2015, Historical Tables, Table 2.5 and Bureau of Economic Analysis.

The United States is a party to many trade agreements with individual countries or regions. These agreements include the North American Free Trade Agreement (NAFTA) and the Central American Free Trade Agreement (CAFTA). These agreements have eliminated tariffs on most goods traded between the United States and the countries of North and Central America.

The Effects of a Tariff

To see the effects of a tariff, let's return to the example in which, with free international trade, the United States imports T-shirts. The T-shirts are imported and sold at the world price. Then, under pressure from U.S. garment makers, the U.S. government imposes a tariff on imported T-shirts. Buyers of T-shirts must now pay the world price plus the tariff. Several consequences follow in the market for T-shirts. Figure 8.5 illustrates these consequences.

Figure 8.5(a) is the same as Figure 8.1(b) and shows the situation with free international trade. The United States produces 20 million T-shirts and imports 40 million T-shirts a year at the world price of $5 a T-shirt.

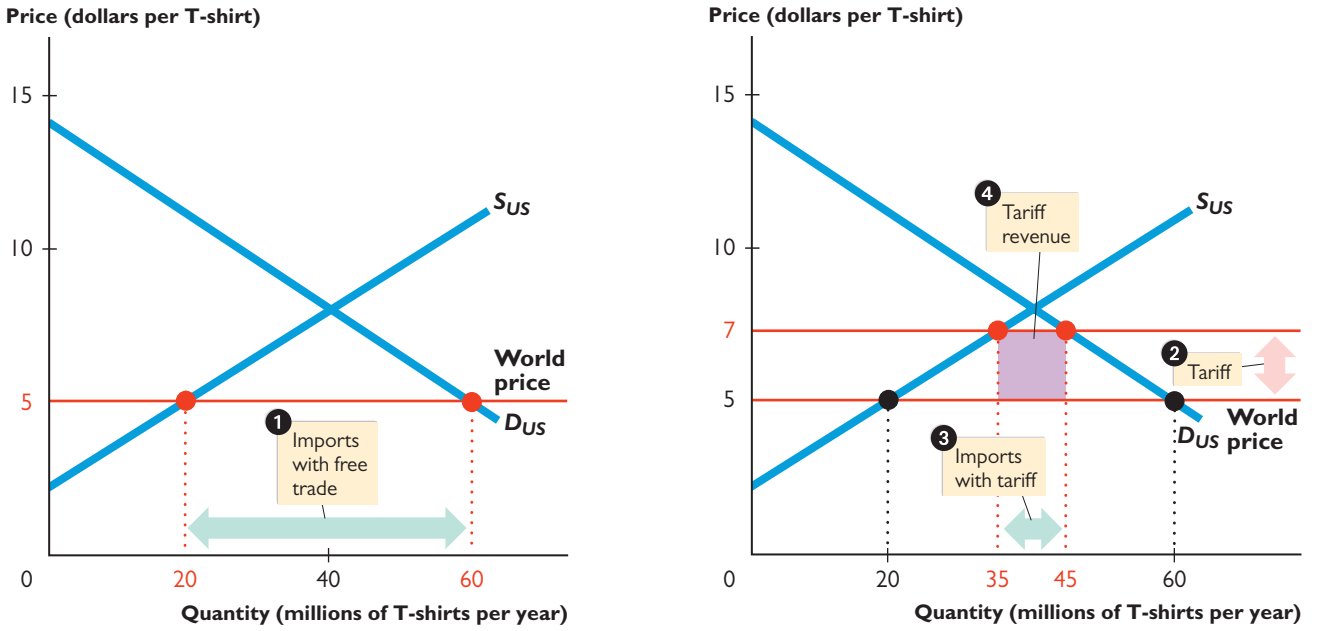
Figure 8.5(b) shows what happens with a tariff, which is set at $2 per T-shirt. The following changes occur in the U.S. market for T-shirts:

- The price of a T-shirt in the United States rises by $2.
- The quantity of T-shirts bought in the United States decreases.
- The quantity of T-shirts produced in the United States increases.
- The quantity of T-shirts imported into the United States decreases.
- The U.S. government collects a tariff revenue.

FIGURE 8.5

The Effects of a Tariff

MyEconLab Animation



(a) Free trade

(b) Market with tariff

The world price of a T-shirt is $5. With free trade, in part (a), Americans buy 60 million T-shirts. The United States produces 20 million T-shirts and ❶ imports 40 million T-shirts. In part (b), ❷ with a tariff of $2 per T-shirt, the domestic price rises to $7 a T-shirt (the world price plus the tariff). Domestic production increases, purchases decrease, and ❸ the quantity imported decreases. ❹ The U.S. government collects tariff revenue of $2 on each T-shirt imported and shown by the purple rectangle.

Rise in Price of a T-Shirt To buy a T-shirt, Americans must pay the world price plus the tariff, so the price of a T-shirt rises by $2 to $7. Figure 8.5(b) shows the new domestic price line, which lies $2 above the world price line.

Decrease in Purchases The higher price of a T-shirt brings a decrease in the quantity demanded, which Figure 8.5(b) shows as a movement along the demand curve from 60 million T-shirts at $5 a T-shirt to 45 million T-shirts at $7 a T-shirt.

Increase in Domestic Production The higher price of a T-shirt stimulates domestic production, which Figure 8.5(b) shows as a movement along the supply curve from 20 million T-shirts at $5 a T-shirt to 35 million T-shirts at $7 a T-shirt.

Decrease in Imports T-shirt imports decrease by 30 million from 40 million to 10 million a year. Both the decrease in purchases and the increase in domestic production contribute to this decrease in imports.

Tariff Revenue The government's tariff revenue is $20 million—$2 per T-shirt on 10 million imported T-shirts—shown by the purple rectangle.

Winners, Losers, and the Social Loss from a Tariff

A tariff on an imported good creates winners and losers. When the U.S. government imposes a tariff on an imported good,

- U.S. producers of the good gain.
- U.S. consumers of the good lose.
- U.S. consumers lose more than U.S. producers gain.

U.S. Producers of the Good Gain Because the price of an imported T-shirt rises by the tariff, U.S. T-shirt producers are now able to sell their T-shirts for a higher price—the world price plus the tariff. As the price of a T-shirt rises, U.S. producers increase the quantity supplied. Because the marginal cost of producing a T-shirt in the United States is less than the higher price of all the T-shirts sold, except for the marginal T-shirt, producer surplus increases. This increase in producer surplus is the gain to U.S. producers.

U.S. Consumers of the Good Lose Because the price of a T-shirt in the United States rises, the quantity of T-shirts demanded decreases. The combination of a higher price and smaller quantity bought decreases consumer surplus. This loss of consumer surplus represents the loss to U.S. consumers that arises from a tariff.

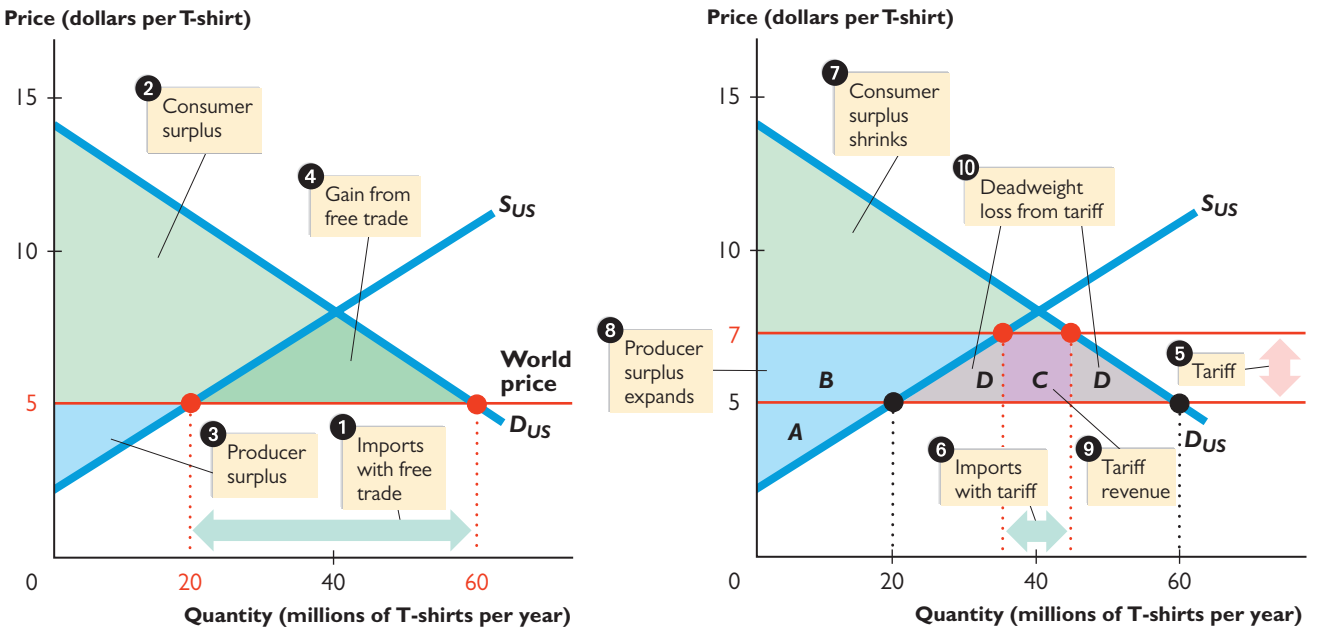
U.S. Consumers Lose More Than U.S. Producers Gain You've just seen that consumer surplus decreases and producer surplus increases, but which changes by more? Do consumers lose more than producers gain, or do producers gain more than consumers lose? Or is there just a straight transfer from consumers to producers? To answer these questions, we need to return to the demand and supply analysis of the market for T-shirts and compare the changes in consumer surplus and producer surplus.

Figure 8.6(a) is the same as Figure 8.3(b) and shows the consumer surplus and producer surplus with free international trade in T-shirts. The dark green area is the increase in total surplus that comes from free international trade. By comparing

FIGURE 8.6

The Winners and Losers from a Tariff

MyEconLab Animation



The world price of a T-shirt is $5. With free trade, ❶ the United States imports 40 million T-shirts. ❷ Consumer surplus, ❸ producer surplus, and ❹ the gains from free international trade are as large as possible. ❺ A tariff of $2 per T-shirt raises the price of a T-shirt to $7. ❻ The quantity imported decreases. ❼ Consumer surplus shrinks by the areas *B*, *C*, and *D*. ❽ Producer surplus expands by area *B*. ❾ The government's tariff revenue is area *C*, and ❿ a deadweight loss equal to the two areas *D* is created.

Figure 8.6(b) with Figure 8.6(a), you can see how a $2 tariff on imported T-shirts changes the surpluses. Producer surplus—the blue area—increases by the area labeled *B*. The increase in producer surplus is the gain to U.S. producers from the tariff on T-shirts. Consumer surplus—the green area—shrinks.

The decrease in consumer surplus divides into three parts. First, some of the consumer surplus is transferred to producers. The blue area *B* represents this loss of consumer surplus (and gain of producer surplus). Second, part of the consumer surplus is transferred to the government. The purple area *C* represents this loss of consumer surplus (and gain of government revenue). When the tariff revenue is spent, both consumers and producers receive some benefit, but there is no expectation that the buyers of T-shirts will receive the benefits of the expenditure of this tariff revenue from T-shirts. The tariff revenue is a loss to buyers of T-shirts.

The third part of the loss of consumer surplus is a transfer to no one: it is a *deadweight loss*. Consumers buy a smaller quantity at a higher price. The two gray areas labeled *D* represent this loss of consumer surplus. Total surplus decreases by this amount, which is the social loss from the tariff.

Let's now look at the second tool for restricting trade: quotas.

Import Quotas

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Import quota
A quantitative restriction on the import of a good that limits the maximum quantity of a good that may be imported in a given period.

An **import quota** is a quantitative restriction on the import of a good that limits the maximum quantity of a good that may be imported in a given period. The United States imposes import quotas on many items, including sugar, bananas, beef, and textiles.

Quotas enable the government to satisfy the self-interest of people who earn their incomes in import-competing industries. You will see that like a tariff, a quota on imports decreases the gains from trade and is not in the social interest.

The Effects of an Import Quota

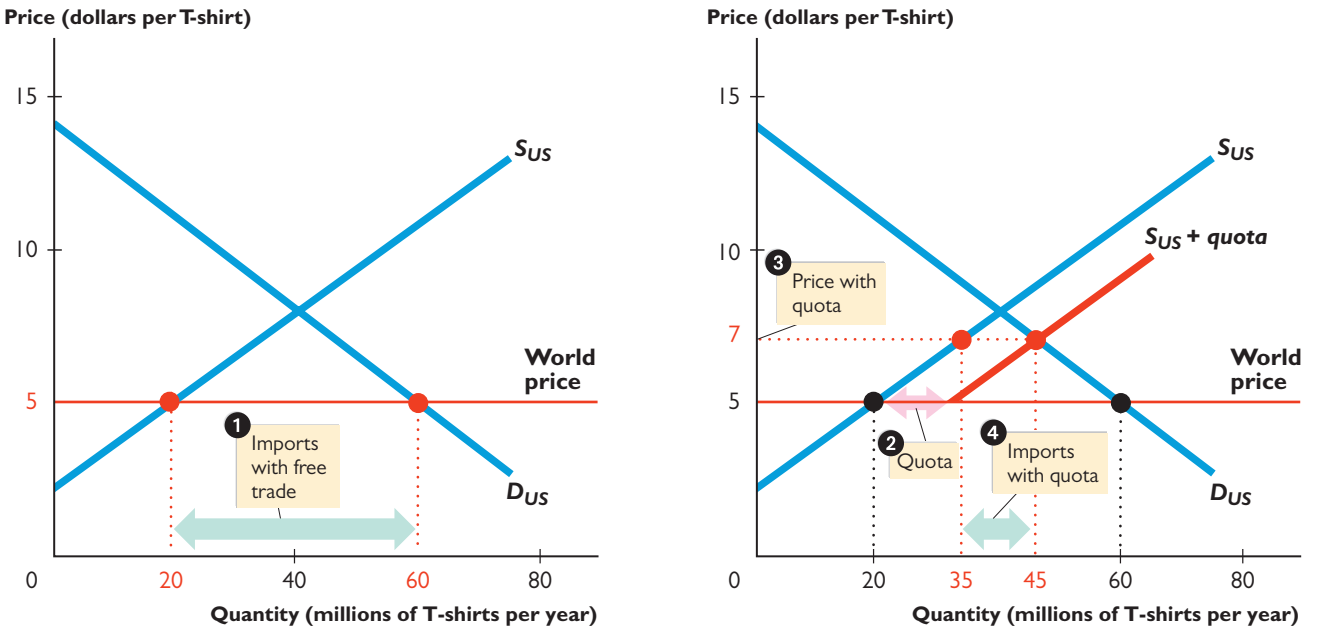
The effects of an import quota are similar to those of a tariff. The price rises, the quantity bought decreases, and the quantity produced in the United States increases. Figure 8.7 illustrates the effects.

Figure 8.7(a) shows the situation with free international trade. Figure 8.7(b) shows what happens with a quota that limits imports to 10 million T-shirts a year. The U.S. supply curve of T-shirts becomes the domestic supply curve, S_{US}, plus the quantity that the quota permits to be imported. So the U.S. supply curve becomes the curve labeled S_{US} + *quota*. The price of a T-shirt rises to $7, the

FIGURE 8.7

The Effects of an Import Quota

MyEconLab Animation



(a) Free trade

(b) Market with quota

With free trade, in part (a), Americans buy 60 million T-shirts at the world price. The United States produces 20 million T-shirts and ❶ imports 40 million T-shirts. In part (b), ❷ with an import quota of 10 million T-shirts, the U.S. supply curve becomes S_{US} + *quota*. ❸ The price rises to $7 a T-shirt. Domestic production increases, purchases decrease, and ❹ the quantity imported decreases.

quantity of T-shirts bought in the United States decreases to 45 million a year, the quantity of T-shirts produced in the United States increases to 35 million a year, and the quantity of T-shirts imported into the United States decreases to the quota quantity of 10 million a year. All these effects of a quota are identical to the effects of a tariff set at $2 per T-shirt, as you can check in Figure 8.6(b).

Winners, Losers, and the Social Loss from an Import Quota

An import quota creates winners and losers that are similar to those of a tariff but with an interesting difference. When the government imposes an import quota,

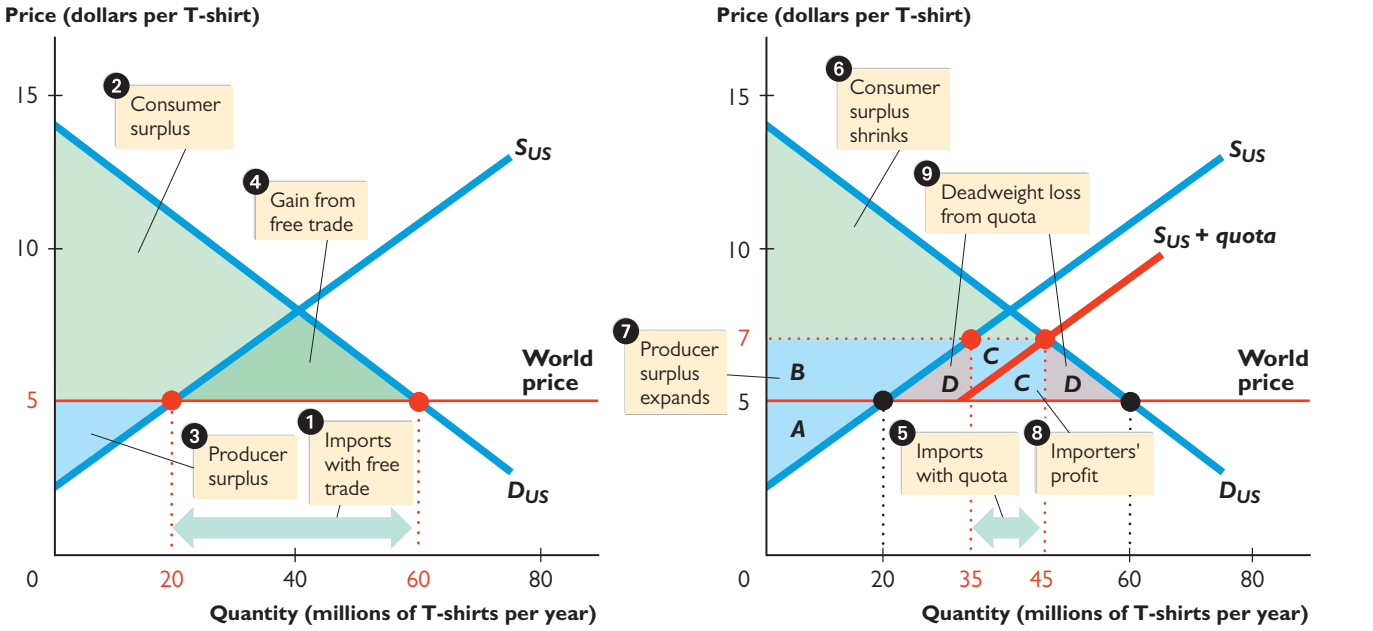
- U.S. producers of the good gain.
- U.S. consumers of the good lose.
- Importers of the good gain.
- U.S. consumers lose more than U.S. producers and importers gain.

Figure 8.8 compares the gains from trade under free trade with those under a quota. Figure 8.8(a) shows the consumer surplus and producer surplus with free international trade in T-shirts. By comparing Figure 8.8(b) with Figure 8.8(a), you can see how an import quota of 10 million T-shirts changes the surpluses. Producer surplus—the blue area—increases by the area labeled *B*. The increase in

FIGURE 8.8

The Winners and Losers from an Import Quota

MyEconLab Animation



(a) Free trade

(b) Market with quota

The world price of a T-shirt is $5. With free trade, ❶ the United States imports 40 million T-shirts. ❷ Consumer surplus, ❸ producer surplus, and ❹ the gains from free trade are as large as possible. In part (b), an import quota raises the domestic price to $7 a T-shirt. ❺ The quantity imported decreases. ❻ Consumer surplus shrinks by the areas *B*, *C*, and *D*. ❼ Producer surplus expands by area *B*. ❽ Importers' profit equals the two areas *C*, and the quota creates ❾ a deadweight loss equal to the two areas *D*.

producer surplus is the gain by U.S. producers from the import quota. Consumer surplus—the green area—shrinks. This decrease is the loss to consumers from the import quota.

The decrease in consumer surplus divides into three parts. First, some of the consumer surplus is transferred to producers. The blue area *B* represents this loss of consumer surplus (and gain of producer surplus). Second, part of the consumer surplus is transferred to importers who buy T-shirts for $5 (the world price) and sell them for $7 (the domestic price). The blue areas *C* represent this loss of consumer surplus and the importers' profit.

The third part of the loss of consumer surplus is a transfer to no one: it is a *deadweight loss*. Consumers buy a smaller quantity at a higher price. The two gray areas labeled *D* represent this loss of consumer surplus. Total surplus decreases by this amount, which is the social loss from the import quota.

You can now see the one difference between an import quota and a tariff. A tariff brings in revenue for the government while an import quota brings a profit for the importer. All the other effects are the same, provided the quota is set at the same level of imports that results from the tariff.

Other Import Barriers

Two sets of policies that influence imports are

- Health, safety, and regulation barriers
- Voluntary export restraints

Health, Safety, and Regulation Barriers

Thousands of detailed health, safety, and other regulations restrict international trade. For example, U.S. food imports are examined by the Food and Drug Administration to determine whether the food is "pure, wholesome, safe to eat, and produced under sanitary conditions." The discovery of BSE (mad cow disease) in just one U.S. cow in 2003 was enough to close down international trade in U.S. beef. The European Union bans imports of most genetically modified foods, such as U.S.-produced soybeans. Although regulations of the type we've just described are not designed to limit international trade, they have that effect.

Voluntary Export Restraints

A *voluntary export restraint* is like a quota allocated to a foreign exporter of the good. A voluntary export restraint decreases imports just like an import quota does, but the foreign exporter gets the profit from the gap between the domestic price and the world price.

Export Subsidies

An **export subsidy** is a payment by the government to the producer to cover part of the cost of production that is exported. The U.S. and European Union governments subsidize farm products. These subsidies stimulate the production and export of farm products, but they make it harder for producers in other countries, notably in Africa and Central and South America, to compete in global markets. Export subsidies bring gains to domestic producers, but they result in overproduction in the domestic economy and underproduction in the rest of the world and so create a deadweight loss (see Chapter 6, p. 157).

Export subsidy
A payment by the government to a producer to cover part of the cost of production that is exported.

MyEconLab Study Plan 8.3
Key Terms Quiz
Solutions Video

CHECKPOINT 8.3

Explain the effects of international trade barriers.

Practice Problems

Before 1995, the United States imposed tariffs on goods imported from Mexico and Mexico imposed tariffs on goods imported from the United States. In 1995, Mexico joined NAFTA. U.S. tariffs on imports from Mexico and Mexican tariffs on imports from the United States are gradually being removed.

1. Explain how the price that U.S. consumers pay for goods imported from Mexico and the quantity of U.S. imports from Mexico have changed. Who, in the United States, are the winners and losers from this free trade?
2. Explain how the quantity of U.S. exports to Mexico and the U.S. government's tariff revenue from trade with Mexico have changed.
3. Suppose that this year, tomato growers in Florida lobby the U.S. government to impose an import quota on Mexican tomatoes. Explain who, in the United States, would gain and who would lose from such a quota.

In the News

The Trans-Pacific Partnership (TPP)
If the TPP comes into effect, Canada will remove import quotas on American milk, Japan will free imports of American beef, and the United States will remove import tariffs on items such as steel, auto-parts, garments, and solar panels.
Source: *The New York Times*, October 6, 2015

Explain how the changes described in the news clip will change U.S. exports and imports and who in the United States will gain and lose from the TPP.

Solutions to Practice Problems

1. The price that U.S. consumers pay for goods imported from Mexico has fallen and the quantity of U.S. imports from Mexico has increased. The winners are U.S. consumers of goods imported from Mexico and the losers are U.S. producers of goods imported from Mexico.
2. The quantity of U.S. exports to Mexico has increased and the U.S. government's tariff revenue from trade with Mexico has fallen.
3. With an import quota, the price of tomatoes in the United States would rise and the quantity bought would decrease. Consumer surplus would decrease. Growers would receive a higher price, produce a larger quantity, and producer surplus would increase. The U.S. total surplus in the tomato market would be redistributed from consumers to producers, but it would decrease.

Solution to In the News

Removing trade barriers on milk and beef will raise the price at which U.S. farmers can sell each item and exports will increase. U.S. farmers will gain and U.S. consumers will lose. Removing U.S. tariffs on steel and other manufactures will lower their prices in the United States and increase U.S. imports. With the lower prices, U.S. consumer surplus increases—consumers gain. U.S. producer surplus decreases—producers lose. For both exports and imports, total surplus increases.

8.4 THE CASE AGAINST PROTECTION

MyEconLab Concept Video

For as long as nations and international trade have existed, people have debated whether free international trade or protection from foreign competition is better for a country. The debate continues, but most economists believe that free trade promotes prosperity for all countries while protection reduces the potential gains from trade. We've seen the most powerful case for free trade: All countries benefit from their comparative advantage. But there is a broader range of issues in the free trade versus protection debate. Let's review these issues.

Three Traditional Arguments for Protection

Three traditional arguments for protection and restricting international trade are

- The national security argument
- The infant-industry argument
- The dumping argument

Let's look at each in turn.

The National Security Argument

The national security argument is that a country must protect industries that produce defense equipment and armaments and those on which the defense industries rely for their raw materials and other intermediate inputs. This argument for protection can be taken too far.

First, it is an argument for international isolation, for in a time of war, there is no industry that does not contribute to national defense. Second, if the case is made for boosting the output of a strategic industry—say aerospace—it is more efficient to achieve this outcome with a subsidy financed out of taxes than with a tariff or import quota. A subsidy would keep the industry operating at the scale that is judged appropriate, and free international trade would keep the prices faced by consumers at their world market levels.



Should producers of national security equipment be protected from international competition?

The Infant-Industry Argument

The **infant-industry argument** is that it is necessary to protect a new industry to enable it to grow into a mature industry that can compete in world markets. The argument is based on an idea called *learning-by-doing*. By working repeatedly at a task, workers become better at that task and can increase the amount they produce in a given period.

Infant-industry argument
The argument that it is necessary to protect a new industry to enable it to grow into a mature industry that can compete in world markets.

There is nothing wrong with the idea of learning-by-doing. It is a powerful engine of human capital accumulation and economic growth. Learning-by-doing can change comparative advantage. If on-the-job experience lowers the opportunity cost of producing a good, a country might develop a comparative advantage in producing that good.

But learning-by-doing does not justify protection. It is in the self-interest of firms and workers who benefit from learning-by-doing to produce the efficient quantities. If the government protected these firms to boost their production, there would be an inefficient overproduction (just like the overproduction in Chapter 6, p. 157).

Historical evidence is against the protection of infant industries. Countries in East Asia that have not given such protection have performed well. Countries that have protected infant industries, as India once did, have performed poorly.



India's protection of manufacturing industries from international competition is generally regarded as a failure.

The Dumping Argument

Dumping
When a foreign firm sells its exports at a lower price than its cost of production.

Dumping occurs when a foreign firm sells its exports at a lower price than its cost of production. You might be wondering why a firm would ever want to sell any of its output at a price below the cost of production. Wouldn't such a firm be better off either selling nothing or, if it could do so, raising its price to at least cover its costs? Two possible reasons why a firm might sell at a price below cost and therefore engage in dumping are

- Predatory pricing
- Subsidy



China, a major producer of solar panels, is accused of dumping them on the U.S. and European markets.

Predatory Pricing A firm that engages in *predatory pricing* sets its price below cost in the hope that it can drive its competitors out of the market. If a firm in one country tries to drive out competitors in another country, it will be *dumping* its product in the foreign market. The foreign firm sells its output at a price below its cost to drive domestic firms out of business. When the domestic firms have gone, the foreign firm takes advantage of its monopoly position and charges a higher price for its product. The higher price will attract new competitors, which makes it unlikely that this strategy will be profitable. For this reason, economists are skeptical that this type of dumping occurs.

Subsidy A *subsidy* is a payment by the government to a producer. A firm that receives a subsidy is able to sell profitably for a price below cost. Subsidies are very common in almost all countries. The United States and the European Union subsidize the production of many agricultural products and dump their surpluses on the world market. This action lowers the prices that farmers in developing nations receive and weakens the incentive to expand farming in poor countries. India and Europe have been suspected of dumping steel in the United States.

Whatever its source, dumping is illegal under the rules of the WTO, NAFTA, and CAFTA and is regarded as a justification for temporary tariffs. Consequently, anti-dumping tariffs have become important in today's world.

But there are powerful reasons to resist the dumping argument for protection. First, it is virtually impossible to detect dumping because it is hard to determine a firm's costs. As a result, the test for dumping is whether a firm's export price is below its domestic price. This test is a weak one because it can be rational for a firm to charge a lower price in markets in which the quantity demanded is highly sensitive to price and a higher price in a market in which demand is less price-sensitive.

Second, it is hard to think of a good that is produced by a single firm. Even if all the domestic firms were driven out of business in some industry, it would always be possible to find several and usually many alternative foreign sources of supply and to buy at prices determined in competitive markets.

Third, if a good or service were a truly global natural monopoly, the best way to deal with it would be by regulation—just as in the case of domestic monopolies. Such regulation would require international cooperation.

The three arguments for protection that we've just examined have an element of credibility. The counterarguments are in general stronger, so these arguments do not make the case for protection. They are not the only arguments that you might encounter. There are many others, four of which we'll now examine.

Four Newer Arguments for Protection

Four newer and commonly made arguments for restricting international trade are that protection

- Saves jobs
- Allows us to compete with cheap foreign labor
- Brings diversity and stability
- Penalizes lax environmental standards

Saves Jobs

When Americans buy imported goods such as shoes from Brazil, U.S. workers who produce shoes lose their jobs. With no earnings and poor prospects, these workers become a drain on welfare and spend less, which creates a ripple effect of further job losses. The proposed solution is to protect U.S. jobs by banning imports of cheap foreign goods. The proposal is flawed for the following reasons.

First, free trade does cost some jobs, but it also creates other jobs. It brings about a global rationalization of labor and allocates labor resources to their highest-valued activities. Because of international trade in textiles, tens of thousands of workers in the United States have lost jobs because shoe factories and textile mills have closed. Tens of thousands of workers in other countries now have jobs because shoe factories and textile mills have opened there. And tens of thousands of U.S. workers now have better-paying jobs than as shoe makers or textile workers because other export industries have expanded and created more jobs than have been destroyed.

Second, imports create jobs. They create jobs for retailers that sell imported goods and for firms that service those goods. They also create jobs by creating incomes in the rest of the world, some of which are spent on imports of U.S.-made goods and services.

Protection saves some particular jobs, but it does so at a high cost. For example, until 2005, textile jobs in the United States were protected by import quotas imposed under an international agreement called the Multifiber Arrangement (or MFA). The U.S. International Trade Commission (ITC) estimated that because of import quotas, 72,000 jobs existed in textiles that would otherwise have disappeared and that the annual clothing expenditure in the United States was $15.9 billion ($160 per family) higher than it would be with free trade. An implication of the ITC estimate is that each textile job saved cost consumers $221,000 a year. The end of the MFA led to the destruction of a large number of textile jobs in the United States and Europe in 2005.



Few shoe factories remain in the United States and manufacturing jobs have been lost …



… but well-paid professional and service jobs have been created to replace the lost manufacturing jobs.

Allows Us to Compete with Cheap Foreign Labor

With the removal of protective tariffs in U.S. trade with Mexico, some people said that jobs would be sucked into Mexico and that the United States would not be able to compete with its southern neighbor. Let's see what's wrong with this view.

Labor costs depend on the wage rate and the quantity a worker produces. For example, if a U.S. auto worker earns $30 an hour and produces 15 units of output an hour, the average labor cost of a unit of output is $2. If a Mexican auto worker earns $3 an hour and produces 1 unit of output an hour, the average labor cost of a unit of output is $3. Other things remaining the same, the greater the output a worker produces, the higher is the worker's wage rate. High-wage workers produce a large output. Low-wage workers produce a small output.

Although high-wage U.S. workers are more productive, on the average, than lower-wage Mexican workers, there are differences across industries. U.S. labor is relatively more productive in some activities than in others. For example, the productivity of U.S. workers in producing movies, financial services, and customized computer chips is relatively higher than their productivity in the production of metals and some standardized machine parts. The activities in which U.S. workers are relatively more productive than their Mexican counterparts are those in which the United States has a comparative advantage. By engaging in free trade, increasing our production and exports of the goods and services in which we have a comparative advantage, and decreasing our production and increasing our imports of the goods and services in which our trading partners have a comparative advantage, we can make ourselves and the citizens of other countries better off.

Brings Diversity and Stability

A diversified investment portfolio is less risky than one that has "all of its eggs in one basket." The same is true for an economy's production. A diversified economy fluctuates less than an economy that produces only one or two goods.

Most economies—the rich advanced economies of the United States, Japan, and Europe and the developing economies of China and Brazil—have diversified production and do not have this type of stability problem. A few economies, such as Saudi Arabia, have a comparative advantage that leads to the specialized production of only one good. But even these economies can stabilize their income and consumption by investing in a wide range of production activities in other countries.

Penalizes Lax Environmental Standards

A new argument for protection is that many poorer countries, such as Mexico, do not have the same environmental standards that we have, and because they are willing to pollute and we are not, we cannot compete with them without tariffs. If these countries want free trade with the richer and "greener" countries, then they must raise their environmental standards.

This argument for trade restrictions is not entirely convincing. A poor country is less able than a rich one to devote resources to achieving high environmental standards. If free trade helps a poor country to become richer, then it will also help that country to develop the means to improve its environment. But there probably is a case for using the negotiation of free trade agreements such as NAFTA and CAFTA to hold member countries to higher environmental standards. There is an especially large payoff from using such bargaining to try to avoid irreversible damage to resources such as tropical rainforests.

So the four common arguments that we've just considered do not provide overwhelming support for protection. They all have flaws and leave the case for free international trade a strong one.

Why Is International Trade Restricted?

Why, despite all the arguments against protection, is international trade restricted? One reason that applies to developing nations is that the tariff is a convenient source of government revenue, but this reason does not apply to the United States where the government has access to income taxes and sales taxes.

Political support for international trade restrictions in the United States and most other developed countries arises from rent seeking. **Rent seeking** is lobbying and other political activity that seeks to capture the gains from trade. You've seen that free trade benefits consumers but shrinks the producer surplus of firms that compete in markets with imports.

Rent seeking
Lobbying and other political activity that aims to capture the gains from trade.

The winners from free trade are the millions of consumers of low-cost imports, but the benefit per individual consumer is small. The losers from free trade are the producers of import-competing items. Compared to the millions of consumers, there are only a few thousand producers.

Now think about imposing a tariff on clothing. Millions of consumers will bear the cost in the form of a smaller consumer surplus and a few thousand garment makers and their employees will share the gain in producer surplus.

Because the gain from a tariff is large, producers have a strong incentive to incur the expense of lobbying *for* a tariff and *against* free trade. On the other hand, because each consumer's loss is small, consumers have little incentive to organize and incur the expense of lobbying *for* free trade. The gain from free trade for any one person is too small for that person to spend much time or money on a political organization to lobby for free trade. The loss from free trade will be seen as being so great by those bearing that loss that they will find it profitable to join a political organization to prevent free trade. Each group weighs benefits against costs and chooses the best action for themselves, but the anti-free-trade group will undertake more political lobbying than will the pro-free-trade group.



EYE on YOUR LIFE

International Trade

MyEconLab Critical Thinking Exercise

International trade plays an extraordinarily large role in your life in three broad ways. It affects you as a

- Consumer
- Producer
- Voter

As a *consumer*, you benefit from the availability of a wide range of low-cost, high-quality goods and services that are produced in other countries.

Look closely at the labels on the goods that you buy. Where was your computer made? Where were your shirt and your shoes made? Where are the fruits and vegetables that you buy, especially in winter, grown?

The answers to all these questions are most likely Asia, Mexico, or South America. A few goods were produced in Europe, Canada, and the United States.

As a *producer* (or as a potential producer if you don't yet have a job), you benefit from huge global markets for U.S. products. Your job prospects would be much dimmer if the firm for which you work didn't have global markets in which to sell its products.

People who work in the aircraft industry, for example, benefit from the huge global market for large passenger jets. Airlines from Canada to China are buying Boeing 737 and 787 aircraft as fast as they can be pushed out of the production line.

Even if you were to become a college professor, you would benefit from international trade in education services when your school admits foreign students.

As a *voter*, you have a big stake in the politics of free trade versus protection. As a buyer, your self-interest is hurt by tariffs and quotas on imported goods. Each time you buy a $20 sweater, you contribute $5 to the government in tariff revenue. But as a worker, your self-interest might be hurt by freer access to U.S. markets for foreign producers.

So as you decide how to vote, you must figure out what trade policy serves your self-interest and what best serves the social interest.

MyEconLab Study Plan 8.4
Key Terms Quiz
Solutions Video

CHECKPOINT 8.4

Explain and evaluate arguments used to justify restricting international trade.

Practice Problems

1. Japan sets an import quota on rice. California rice growers would like to export more rice to Japan. What are Japan's arguments for restricting imports of Californian rice? Are these arguments correct? Who loses from this restriction in trade?
2. The United States has, from time to time, limited imports of steel from Europe. What argument has the United States used to justify this quota? Who wins from this restriction? Who loses?
3. The United States maintains an import quota on sugar. What is the argument for this import quota? Is this argument flawed? If so, explain why.

In the News

India looks at raising duty on steel imports to 20%
India's steel imports are 58 percent higher than a year ago and the country's steel producers have complained that cheap imports have driven market prices below their production costs.

Source: *The Financial Times*, September 10, 2015

What is the argument that Indian steel producers are using to support an increase in the tariff on steel imports? What is wrong with their argument?

Solutions to Practice Problems

1. The main arguments are that Japanese rice is a better quality rice and that the quota limits competition faced by Japanese farmers. The arguments are not correct. If Japanese consumers do not like the quality of Californian rice, they will not buy it. The quota does limit competition and the quota allows Japanese farmers to use their land less efficiently. The big losers are the Japanese consumers who pay about three times the U.S. price for rice.
2. The U.S. argument is that European producers dump steel on the U.S. market. With an import quota, U.S. steel producers will face less competition and U.S. jobs will be saved. Workers in the steel industry and owners of steel companies will win at the expense of U.S. buyers of steel.
3. The argument is that the import quota protects the jobs of U.S. workers. The argument is flawed because the United States does not have a comparative advantage in producing sugar and so an import quota allows the U.S. sugar industry to be inefficient. With free international trade in sugar, the U.S. sugar industry would exist but it would be much smaller and more efficient.

Solution to In the News

Indian steel producers are using the dumping argument: Protection is needed because foreign producers are selling steel in India at prices below the cost of production. What's wrong with this argument is that it is difficult to determine whether foreign producers are selling at prices below their costs and unlikely that they would want to do so. So foreign producers might have a comparative advantage in producing steel.

CHAPTER SUMMARY

Key Points

1. Explain how markets work with international trade.

- Comparative advantage drives international trade.
- When the world price of a good is lower than the price that balances domestic demand and supply, a country gains by decreasing production and importing the good.
- When the world price of a good is higher than the price that balances domestic demand and supply, a country gains by increasing production and exporting the good.

2. Identify the gains from international trade and its winners and losers.

- Compared to a no-trade situation, in a market with imports, consumer surplus is larger, producer surplus is smaller, and total surplus is larger with free international trade.
- Compared to a no-trade situation, in a market with exports, consumer surplus is smaller, producer surplus is larger, and total surplus is larger with free international trade.

3. Explain the effects of international trade barriers.

- Countries restrict international trade by imposing tariffs, import quotas, other import barriers, and export subsidies.
- Trade restrictions raise the domestic price of imported goods, lower the quantity imported, decrease consumer surplus, increase producer surplus, and create a deadweight loss.

4. Explain and evaluate arguments used to justify restricting international trade.

- The arguments that protection is necessary for national security, for infant industries, and to prevent dumping are weak.
- Arguments that protection saves jobs, allows us to compete with cheap foreign labor, makes the economy diversified and stable, and is needed to penalize lax environmental standards are flawed.
- Trade is restricted because protection brings small losses to a large number of people and large gains to a small number of people.

Key Terms

MyEconLab Key Terms Quiz

Dumping, 216
Export subsidy, 213
Exports, 198
Import quota, 211
Imports, 198
Infant-industry argument, 215
Rent seeking, 219
Tariff, 207

MyEconLab Chapter 8 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

Use Figures 1 and 2 to work Problems **1** to **4**. Figure 1 and Figure 2 show the markets for shoes if there is no trade between the United States and Brazil.

FIGURE 1 U.S. SHOE MARKET

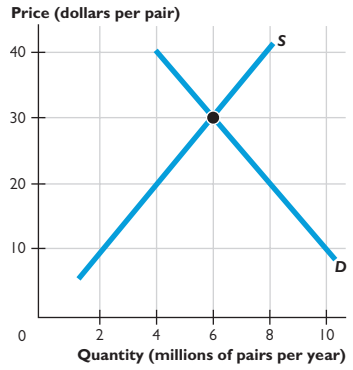
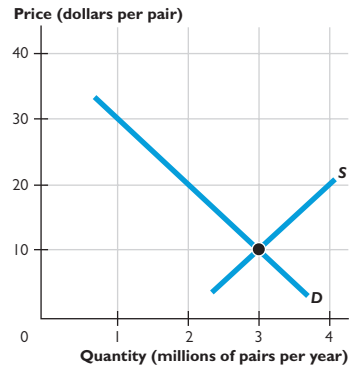


FIGURE 2 BRAZIL'S SHOE MARKET



1. Which country has a comparative advantage in producing shoes? With international trade, explain which country would export shoes and how the price of shoes in the importing country and the quantity produced by the importing country would change. Explain which country gains from this trade.

2. The world price of a pair of shoes is $20. Explain how consumer surplus and producer surplus in the United States change as a result of international trade. On the graph, show the change in U.S. consumer surplus (label it *A*) and the change in U.S. producer surplus (label it *B*).

3. The world price of a pair of shoes is $20. Explain how consumer surplus and producer surplus in Brazil change as a result of international trade. Show the change in Brazil's consumer surplus (label it *C*) and the change in Brazil's producer surplus (label it *D*).

4. Who in the United States loses from free trade in shoes with Brazil? Explain.

Use the following information to work Problems **5** to **7**.

5. The supply of roses in the United States is made up of U.S.-grown roses and imported roses. Draw a graph to illustrate the U.S. rose market with free international trade. On your graph, mark the price of roses and the quantities of roses bought, produced, and imported into the United States.

6. Who in the United States loses from this trade in roses and would lobby for a restriction on the quantity of imported roses? If the U.S. government put a tariff on rose imports, show on your graph the U.S. consumer surplus that is redistributed to U.S. producers and also the government's tariff revenue.

7. Suppose that the U.S. government puts an import quota on roses. Show on your graph the consumer surplus that is redistributed to producers and importers and also the deadweight loss created by the import quota.

Use the following information to work Problems **8** to **10**.

U.S. steelmakers seek antidumping action
Steelmakers want the United States to put restrictions on imports from five nations, alleging unfair pricing of steel for the automobile and construction industries.

Source: *Wall Street Journal*, June 3, 2015

8. Explain who in the United States gains and who loses from restrictions on steel imports. How do you expect the prices of automobiles and office towers to be affected?

9. What is dumping? Who in the United States loses from foreign firms' dumping of steel?

10. Explain what an antidumping tariff is. What argument might U.S. steelmakers use to get the government to raise the tariff on steel imports?

11. Read *Eye on Globalization* on p. 203 and draw two graphs to show how U.S. consumers gain from iPads manufactured in China and why Chinese workers also gain.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

Use the following information to work Problems **1** and **2**.

The future of U.S.–India relations

When she was Secretary of State, Hillary Clinton gave a major speech covering all the issues in U.S.–India relations. On economic and trade relations she noted that India maintains significant barriers to U.S. trade. The United States also maintains barriers against Indian imports such as textiles. Mrs. Clinton, President Obama, and Anand Sharma, the Indian Minister of Commerce and Industry, say they want to dismantle these trade barriers.

Source: www.state.gov

1. Explain who in the United States would gain and who might lose from dismantling trade barriers between the United States and India.

2. Draw a graph of the U.S. market for textiles and show how removing a tariff would change producer surplus, consumer surplus, and the deadweight loss from the tariff.

3. The United States exports wheat. Draw a graph to illustrate the U.S. wheat market if there is free international trade in wheat. On your graph, mark the price of wheat and the quantities bought, produced, and exported by the United States.

4. Suppose that the world price of sugar is 20¢ a pound, Brazil does not trade internationally, and the equilibrium price of sugar in Brazil is 10¢ a pound. Brazil then begins to trade internationally.
- How does the price of sugar in Brazil change? Do Brazilians buy more or less sugar? Do Brazilian sugar growers produce more or less sugar?
- Does Brazil export or import sugar and why?

5. The United States exports services and imports coffee. Why does the United States gain from exporting services and importing coffee? How do economists measure the net gain from this international trade?

6. In the 1950s, Ford and General Motors established a small car-producing industry in Australia and argued for a high tariff on car imports. The tariff has remained through the years. Until 2000, the tariff was 22.5 percent. What might have been Ford's and General Motors' argument for the high tariff? Is the tariff the best way to achieve the goals of the argument?

Use Figure 1 and the following information to work Problems **7** to **9**.

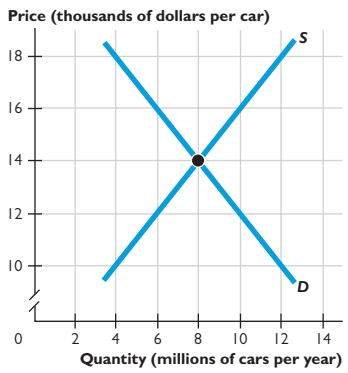
Figure 1 shows the car market in Mexico when Mexico places no restriction on the quantity of cars imported. The world price of a car is $10,000.

7. If the government of Mexico introduces a $2,000 tariff on car imports, what will be the price of a car in Mexico, the quantity of cars produced in Mexico, the quantity imported into Mexico, and the government's tariff revenue?

8. If the government of Mexico introduces an import quota of 4 million cars a year, what will be the price of a car in Mexico, the quantity of cars produced in Mexico, and the quantity imported?

9. What argument might be used to encourage the government of Mexico to introduce a $2,000 tariff on car imports from the United States? Who will gain and who will lose as a result of Mexico's tariff?

FIGURE 1



MyEconLab Chapter 8 Study Plan

Multiple Choice Quiz

1. The fundamental force driving international trade is comparative _____.

A. advantage: a country exports those goods that have high prices
B. abundance: the country that produces more than it needs exports the good
C. advantage: the country with the lower opportunity cost of production exports the good
D. cost: a country trades with other countries that produce cheaper goods

2. A country will export wheat if, with no international trade, _____.

A. it produces a surplus of wheat
B. its opportunity cost of producing wheat is below the world price
C. its domestic price of wheat exceeds the world price
D. other countries have a shortage of wheat

3. With free trade between the United States and Canada, the United States exports tomatoes and Canada exports maple syrup. U.S. consumers _____.

A. of tomatoes gain and Canadian consumers of maple syrup lose
B. of both tomatoes and maple syrup gain more than either producer
C. of maple syrup gain more than U.S. producers of maple syrup lose
D. of tomatoes gain more than U.S. producers of tomatoes lose

4. With free trade between China and the United States, the winners are _____ and the losers are _____.

A. U.S. consumers of U.S. imports; U.S. producers of the U.S. import good
B. China's consumers of China's imports; China's producers of its export good
C. U.S. producers of the U.S. export good; U.S. consumers of U.S. imports
D. China's consumers of China's export good; China's producers of its imported good

5. The U.S. tariff on paper _____ the U.S. price of paper, _____ U.S. production of paper and _____ the U.S. gains from trade.

A. raises; increases; increases
B. doesn't change; increases; increases
C. doesn't change; doesn't change; decreases
D. raises; increases; decreases

6. If Korea imposes an import quota on U.S. oranges, losers include Korean _____ of oranges and U.S. _____ of oranges.

A. consumers; consumers
B. consumers; producers
C. producers; consumers
D. producers; producers

7. The people who support restricted international trade say that _____.

A. protection saves jobs, in both the United States and foreign economies
B. U.S. firms won't be able to compete with low-wage foreign labor if trade is free
C. outsourcing sends jobs abroad, which brings diversification and makes our economy more stable
D. protection is needed to enable U.S. firms to produce the things at which they have a comparative advantage



How can we limit carbon emissions?

Externalities: Pollution, Education, and Healthcare

9

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain why negative externalities lead to inefficient overproduction and how property rights and pollution taxes can achieve a more efficient outcome.
2. Explain why positive externalities lead to inefficient underproduction and how public provision, subsidies, and vouchers can achieve a more efficient outcome.

MyEconLab Big Picture Video

MyEconLab Concept Video

EXTERNALITIES IN OUR DAILY LIVES

Climate change is an externality, and a huge one. You will learn what economists say about limiting it in this chapter. But first we need to build a foundation. We begin by classifying and illustrating the range of externalities in our daily lives.

Externality
A cost or a benefit that arises from production and that falls on someone other than the producer; or a cost or benefit that arises from consumption and that falls on someone other than the consumer.

Negative externality
A production or consumption activity that creates an external cost.

Positive externality
A production or consumption activity that creates an external benefit.

An **externality** is a cost or a benefit that arises from production and that falls on someone other than the producer; or a cost or a benefit that arises from consumption and that falls on someone other than the consumer. An externality can arise from either a production activity or a consumption activity. It can be either a **negative externality**, which imposes an external cost, or a **positive externality**, which provides an external benefit. So there are four types of externalities:

- Negative production externalities
- Positive production externalities
- Negative consumption externalities
- Positive consumption externalities

Negative Production Externalities



Negative production externality.

Negative production externalities are among the most serious challenges faced by the world today. Starting in the Industrial Revolution of the eighteenth century, humans have poured billions of tons of pollutants into the air, oceans, lakes, and rivers.

Power generators, airplanes, and road vehicles are the biggest polluters. Burning coal to generate electricity emits carbon dioxide that warms the planet and it emits other chemicals that pollute the atmosphere. The coal-burning Navajo Generating Station near Page, Arizona, emits about 16 million tons of carbon into the atmosphere every year, an amount similar to that of 3.3 million passenger car miles each year.

Logging and the clearing of forests in California, Oregon, and Washington destroy the habitat of wildlife and also influence the amount of carbon dioxide in the atmosphere.

Noise is another negative production externality. When planes take off and land at LaGuardia airport in New York City, the noise they make imposes a large cost on the people who live under the flight paths. This noise is replicated at airports in every major city around the world.

All these activities are examples of production that brings negative externalities. The costs of these production activities are borne by everyone, and even by future generations.

Positive Production Externalities



Positive production externality.

Positive production externalities are a smaller problem than negative ones. But they pose interesting problems. A notable one arises in the production of fruit and vegetables and honey. To produce honey, bee-keepers locate their hives next to fruit orchards and vegetable farms. The honeybees collect pollen and nectar from the fruit and vegetable blossoms to make the honey. At the same time, they transfer pollen between the blossoms, which helps to fertilize the blossoms. Two positive production externalities are present in this example. Honey producers get a positive production externality from the owners of the orchards and farms; and the fruit growers and vegetable farmers get a positive production externality from the honey producer.

Negative Consumption Externalities

Negative consumption externalities are a source of irritation for most of us. Smoking tobacco in a confined space creates fumes that many people find unpleasant and that pose a health risk. So smoking in restaurants and on airplanes generates a negative externality. To avoid this negative externality, many restaurants and all airlines ban smoking. But while a smoking ban avoids a negative consumption externality for most people, it imposes a negative external cost on smokers who would prefer to enjoy the consumption of tobacco while dining or traveling by air.



Negative consumption externality.

Noisy parties and outdoor rock concerts are other examples of negative consumption externalities. They are also examples of the fact that a simple ban on an activity is not a solution. Banning noisy parties avoids the external cost on sleep-seeking neighbors, but it results in the sleepers imposing an external cost on the fun-seeking partygoers.

Leaving beer bottles on the beach, allowing a dog to bark loudly or to foul a neighbor's lawn, and letting a smartphone ring during a lecture are other examples of negative consumption externalities.

Positive Consumption Externalities

When you get a flu vaccination, you lower your risk of being infected. If you avoid the flu, your neighbor, who didn't get vaccinated, has a better chance of remaining healthy too. Flu vaccinations generate positive consumption externalities.

When the owner of a historic building restores it, everyone who sees the building gets pleasure. Similarly, when someone erects a spectacular home or other exciting construction or building such as the Walt Disney Concert Hall in Los Angeles, an external consumption benefit flows to everyone who has an opportunity to view it.

Education, which we examine in more detail in this chapter, is a major example of a positive consumption and production externality.



Positive consumption externality.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Externalities in Your Life

Think about the externalities, both negative and positive, that play a huge part in *your* life; and think about the incentives that attempt to align your self-interest with the social interest.

You respond to the gasoline tax by buying a little less gas than you otherwise would. As you will see in *Eye on Climate Change* (pp. 236–237), this incentive is small compared to that in some other countries. With a bigger gas tax, such as that in the United Kingdom, you would find ways of getting by with a smaller quantity of gasoline and your actions and those of millions of others would make the traffic on our highways much lighter.

You are responding to the huge incentive of subsidized tuition by being in school. Without subsidized college education, fewer people would attend college and university and with fewer college graduates, the benefits we all receive from living in a well-educated society would be smaller.

Think about your attitude as a citizen–voter to these two externalities. Should the gas tax be higher to discourage the use of the automobile? Should tuition be even lower to encourage even more people to enroll in school? Or have we got these incentives just right in the social interest?

MyEconLab Concept Video

9.1 NEGATIVE EXTERNALITIES: POLLUTION

Climate change is a *negative externality*. It is the unintended consequence of production and consumption activities that create carbon emissions and global warming. We'll address the challenge of limiting climate change in this chapter.

Although climate change from human actions is new, pollution and other environmental problems are not. Preindustrial towns in Europe had sewage disposal problems that brought cholera and plagues that killed millions. Nor is the desire to find solutions to environmental problems new. The fourteenth century development of a pure water supply and the hygienic disposal of garbage and sewage are examples of early efforts to improve the quality of the environment.

Popular discussions about climate change and pollution focus on physical aspects of the problem and not on costs and benefits. A common assumption is that activities that damage the environment are wrong and must cease. An economic study of the same problems emphasizes costs and benefits, and economists talk about the efficient amount of pollution. This emphasis on costs and benefits does not mean that economists have the right answers. Rather, economics provides a set of tools and principles that help to clarify the issues.

We illustrate the economics of a negative externality with the example of a paint factory that dumps waste into a river. The people who live by the river use it for fishing and boating and bear the cost of the pollution. The paint factory does not consider these costs when it decides the quantity of paint to produce. The factory's production decision is based on its own costs of production, not on the costs that it inflicts on others. You're going to see that when external costs are present, output exceeds the efficient quantity and we get more than the efficient quantity of pollution.

The starting point for an economic analysis of a negative externality is the distinction between private costs and social costs.

Private Costs and Social Costs

A *private cost* of production is a cost that is borne by the producer of a good or service. *Marginal cost* is the cost of producing an *additional unit* of a good or service. So **marginal private cost** (*MC*) is the cost of producing an additional unit of a good or service that is borne by the producer of that good or service.

Marginal private cost
The cost of producing an additional unit of a good or service that is borne by the producer of that good or service.

You've seen that an *external cost* is a cost of producing a good or service that is *not* borne by the producer but borne by other people. A **marginal external cost** is the cost of producing an additional unit of a good or service that falls on people other than the producer.

Marginal external cost
The cost of producing an additional unit of a good or service that falls on people other than the producer.

Marginal social cost (*MSC*) is the marginal cost incurred by the entire society—by the producer and by everyone else on whom the cost falls—and is the sum of marginal private cost and marginal external cost. That is,

Marginal social cost
The marginal cost incurred by the entire society—by the producer and by everyone else on whom the cost falls. It is the sum of marginal private cost and marginal external cost.

$$MSC = MC + \text{Marginal external cost}$$

We express costs in dollars, but we must always remember that a cost is an opportunity cost—the best thing we give up to get something. A marginal external cost is what someone other than the producer of a good or service must give up when the producer makes one more unit of the item. Something real that people value, such as a clean river or clean air, is given up.

Valuing an External Cost

Economists use market prices to put a dollar value on the cost of pollution. For example, suppose that there are two similar rivers, one polluted and the other clean, with identical homes along the side of each river. The homes on the clean river rent for $1,000 a month more than those on the polluted river. If pollution is the only detectable difference between the two locations, the $1,000 a month rent difference is the social cost per home of the pollution. The $1,000 multiplied by the number of homes on the polluted river is the total external cost of this pollution.

External Cost and Output

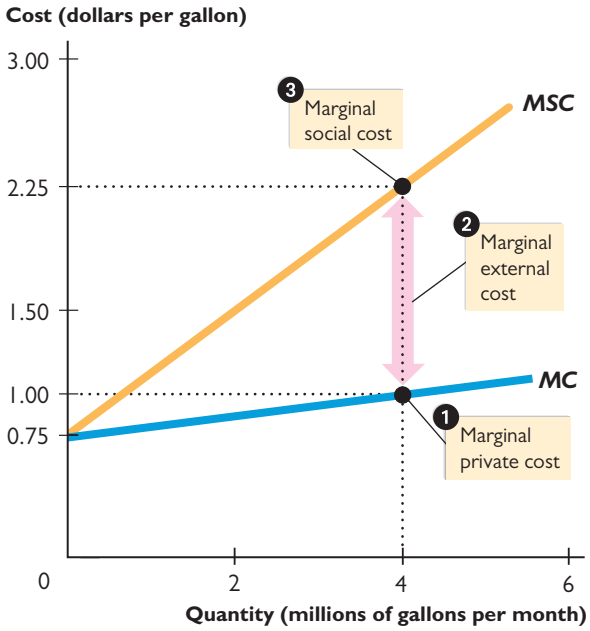
Figure 9.1 shows an example of the relationship between output and cost in a polluting paint industry. The marginal cost curve, *MC*, describes the private marginal cost borne by the firms that produce the paint. Marginal cost increases as the quantity of the paint produced increases. If the firms dump waste into a river, they impose an external cost that increases with the amount of the paint produced. The marginal social cost curve, *MSC*, is the sum of the marginal private cost and the marginal external cost. For example, when firms produce 4 million gallons of paint a month, marginal private cost is $1.00 a gallon, marginal external cost is $1.25 a gallon, and marginal social cost is $2.25 a gallon.

In Figure 9.1, as the quantity of the paint produced increases, the amount of pollution increases and the external cost of pollution increases. The quantity of the paint produced and the pollution created depend on how the market for the paint operates. First, we'll see what happens when the industry is free to pollute.

FIGURE 9.1

An External Cost

MyEconLab Animation



The *MC* curve shows the marginal private cost borne by the factories that produce paint. The *MSC* curve shows the sum of marginal private cost and marginal external cost.

When firms produce 4 million gallons of paint a month

1. Marginal private cost is $1.00 per gallon.
2. Marginal external cost is $1.25 per gallon.
3. Marginal social cost is $2.25 per gallon.

Production and Pollution: How Much?

When a polluting industry is unregulated, the market outcome is one of inefficient *overproduction.* In the pursuit of their self-interest, firms produce too much, and they pollute too much. Figure 9.2, which illustrates a market for paint in which the producers pollute, explains why.

The demand curve and marginal benefit curve for paint is $D = MB$ (see Chapter 6, p. 148). The supply curve and marginal private cost curve of producers of the paint is $S = MC$ (see Chapter 6, p. 151). The supply curve is the marginal *private* cost curve because when firms make their supply decisions, they pursue their self-interest and consider only the costs that they will bear. The market *equilibrium* occurs where marginal benefit equals marginal *private* cost. The price is $1.00 a gallon and the quantity is 4 million gallons of paint a month. This outcome is inefficient because marginal *social* cost exceeds marginal benefit.

The efficient outcome is when marginal benefit *equals* marginal *social* cost. In Figure 9.2, the efficient quantity is 2 million gallons of paint a month, where marginal social cost and marginal benefit each equal $1.50 per gallon.

The equilibrium outcome is one of inefficient *overproduction* and the gray triangle shows the deadweight loss that arises in this situation.

If some method can be found to get paint factories to create less pollution and eliminate the deadweight loss, everyone—the owners of the factories and the residents of the riverside homes—can gain. So what can be done to fix the inefficiency? Three methods are available and we'll examine each of them. They are

- Establish property rights
- Mandate clean technology
- Tax or cap and price pollution

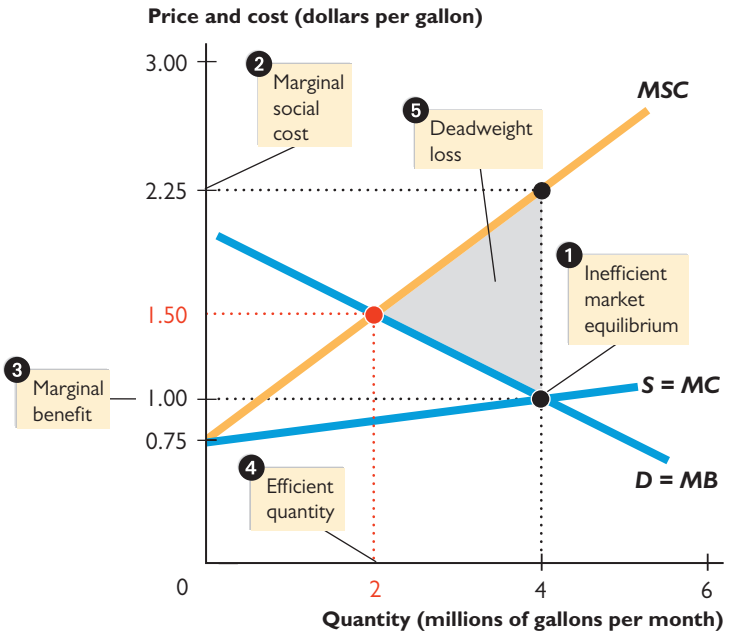
FIGURE 9.2

Inefficiency with an External Cost

MyEconLab Animation

The market supply curve is the marginal private cost curve, $S = MC$. The demand curve is the marginal benefit curve, $D = MB$. The marginal social cost curve is *MSC*.

1. Market equilibrium at a price of $1.00 a gallon and 4 million gallons of paint a month is inefficient because 2 marginal social cost exceeds 3 marginal benefit.
4. The efficient quantity of paint is 2 million gallons a month where marginal benefit equals marginal social cost.
5. The area of the gray triangle shows the deadweight loss created by the pollution externality.



Establish Property Rights

Property rights are legally established titles to the ownership, use, and disposal of factors of production and goods and services that are enforceable in the courts. Establishing property rights where they do not currently exist can confront producers with the costs of their actions and provide them with an incentive to allocate resources efficiently.

Property rights
Legally established titles to the ownership, use, and disposal of factors of production and goods and services that are enforceable in the courts.

To see how property rights work, suppose that the paint producers have property rights on a river and the homes alongside it—they own the river and the homes. The rental income that the paint producers earn on the homes depends on the amount of pollution they create. If people are willing to pay $1,000 a month more to live alongside a pollution-free river, the paint producers can earn that amount for each of the homes they own by not polluting the river.

The forgone rental income from homes alongside a polluted river is an opportunity cost of producing paint. It is part of the paint producers' marginal *private* cost and the paint producers must now decide how to respond to this cost. There are two things they might do:

- Use an abatement technology
- Produce less and pollute less

Use an Abatement Technology

An **abatement technology** is a production technology that reduces or prevents pollution. The catalytic converter in every U.S. car is an example of an abatement technology. Its widespread adoption, along with lead-free gasoline, has dramatically reduced pollution from highway vehicles and helped to achieve the trends in U.S. air quality shown on p. 235.

Abatement technology
A production technology that reduces or prevents pollution.

Abatement technologies are available to reduce carbon emissions from electricity generation and pollution from industrial processes and paint manufacture.

Produce Less and Pollute Less

An alternative to incurring the cost of using an abatement technology is to use the polluting technology but cut production, which will reduce pollution and result in higher income from renting homes by the river. Firms will choose the least-cost alternative method of lowering pollution.

The Coase Theorem

Does it matter whether the polluter or the victim of the pollution owns the resource that might be polluted? The Coase theorem (named for British economist Ronald Coase who was the first to have this remarkable insight) says it doesn't matter.

The **Coase theorem** is the proposition that if property rights exist and the costs of enforcing them are low, then the market outcome is efficient and it doesn't matter who has the property rights.

Coase theorem
The proposition that if property rights exist and the costs of enforcing them are low, then the market outcome is efficient and it doesn't matter who has the property rights.

Application of the Coase Theorem

Suppose that the residents own their homes and the river. Now the factories must pay a fee to the homeowners for the right to dump waste into the river. The greater the quantity of waste dumped, the more the factories must pay. So again, the factories face the opportunity cost of the pollution they create as part of their marginal *private* cost. The quantity of paint produced and the amount of waste

dumped are the same whoever owns the homes and the river. If the factories own them, they bear the cost of pollution because they receive a lower income from home rents. If the residents own the homes and the river, the factories bear the cost of pollution because they must pay a fee to the homeowners. In both cases, the factories bear the cost of their pollution and dump the efficient amount of waste into the river.

Efficient Market Equilibrium With Property Rights

Figure 9.3 illustrates the efficient market outcome with property rights in place. The paint producers face the pollution costs or the abatement costs, whichever is lower. The *MSC* curve includes the cost of producing paint plus either the cost of abatement or the cost of pollution (forgone rent), whichever is lower. This curve, labeled $S = MC = MSC$, is now the market supply curve.

Market equilibrium occurs at a price of $1.50 per gallon and 2 million gallons of paint per month. This outcome is efficient.

If the forgone rent is less than the abatement cost, the factories will still create some pollution, but it will be the efficient quantity. If the abatement cost is lower than the forgone rent, the factories will stop polluting, but they will produce less paint because marginal cost includes the abatement cost.

The Coase property rights solution works only when the cost of reaching an agreement between property owners is low. In many situations, these negotiation costs are high, so this solution is not available and government action is needed. One such action is to mandate the use of a clean abatement technology.

FIGURE 9.3

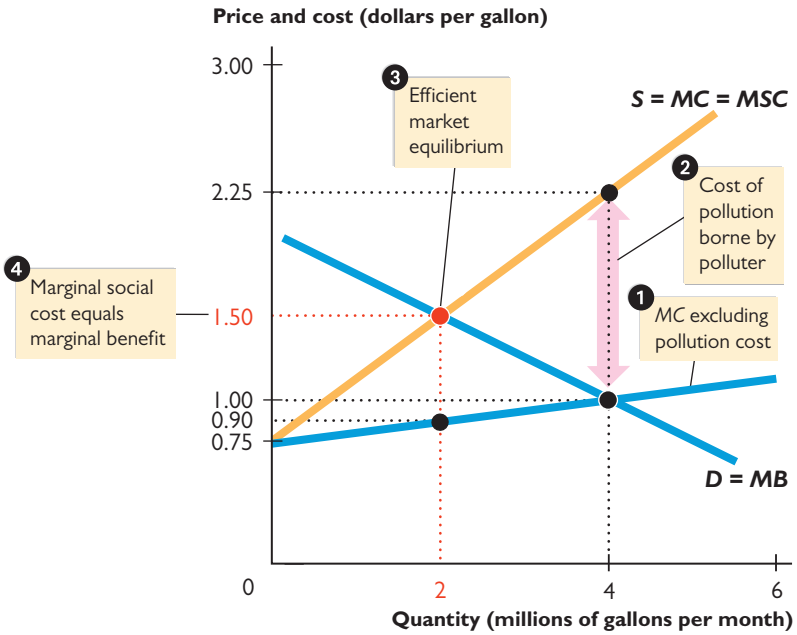
Property Rights Achieve an Efficient Outcome

MyEconLab Animation

❶ With property rights, the marginal cost curve that excludes the cost of pollution shows only part of the producers' marginal cost.

The marginal private cost curve includes ❷ the cost of pollution, so the supply curve of paint is $S = MC = MSC$.

❸ Market equilibrium is at a price of $1.50 a gallon and a quantity of 2 million gallons of paint a month. The market outcome is efficient because ❹ marginal social cost equals marginal benefit.



Mandate Clean Technology

The governments of most countries regulate what may be emitted into the atmosphere and dumped into rivers and lakes. The direct regulation of what is and is not legally permitted is called **command-and-control regulation**.

Command-and-control regulation
The direct regulation of what is and is not permitted.

Command-and-control environmental regulation in the United States is conducted under the provisions of the Clean Air Act of 1970 and the Clean Water Act of 1972. These Acts give the Environmental Protection Agency (EPA) the authority to issue regulations that limit emissions and achieve defined air and water quality standards.

The EPA has issued thousands of regulations that require chemical plants, utilities, and steel mills to adopt best-practice pollution-abatement technologies and to either eliminate or limit their emissions of specified pollutants. Other regulations have been issued that govern road vehicle emission limits, which must be met by vehicle manufacturers.



A Supreme Court decision says greenhouse gas emissions are pollution—the EPA must regulate them.

Command-and-control regulation works particularly well for keeping water resources clean because even a small breach of safety standards can bring a large catastrophic consequence. An example is what happened in Michigan when the state switched Flint's water supply from Lake Huron (clean) to the Flint River (polluted). Tap water became discolored and its lead level tripled, prompting residents to bring a class action against the state. But Flint's problem is rare because command-and-control water regulation is usually effective.

Although command-and-control regulation provides clean water and has improved air quality, economists see three problems with this approach. It doesn't confront individual producers with incentives to limit pollution. A one-size-fits-all solution is generally not the lowest-cost solution to a pollution problem. And lawmakers are subject to lobbying by the polluters whose actions they seek to control. The third approach for dealing with pollution directly addresses these three concerns.

Tax or Cap and Price Pollution

Governments use two main methods of confronting polluters with the costs of their decisions:

- Taxes
- Cap-and-trade

Taxes

Governments can use taxes as an incentive for producers to reduce the pollution they create. Taxes used in this way are called Pigovian taxes, (named for Arthur Cecil Pigou, the British economist who first worked out this method of dealing with external costs during the 1920s).

By setting the tax equal to the marginal external cost (or marginal abatement cost if it is lower), firms can be made to behave in the same way as they would if they bore the cost of the externality directly.

To see how government actions can change the outcome in a market with external costs, let's return to the example of paint factories and the river. Assume that the government has assessed the marginal external cost of pollution accurately and imposes a tax on the factories that exactly equals this cost. The producers are now confronted with the social cost of their actions. The market equilibrium is one in which price equals marginal social cost—an efficient outcome.

Figure 9.4 illustrates the effects of a Pigovian tax on pollution from paint factories. The curve $D = MB$ is the market demand for paint and the marginal benefit curve. The curve MC is the marginal private cost of producing paint. The tax equals the marginal external cost of the pollution. We add this tax to the marginal private cost to find the market supply curve, the curve labeled $S = MC + tax$. This curve is the market supply curve because it tells us the quantity of paint supplied at each price, given the factories' marginal cost and the tax they must pay. This curve is also the marginal social cost curve MSC because the pollution tax has been set equal to the marginal external cost at the quantity produced.

Demand and supply now determine the market equilibrium price at $1.50 per gallon and a quantity of 2 million gallons of paint a month. At this quantity of paint produced, the marginal social cost is $1.50 per gallon and the marginal benefit is $1.50 per gallon, so the market outcome is efficient. The factories incur a marginal private cost of 90¢ per gallon and pay a pollution tax of 60¢ per gallon. The government collects tax revenue of $1.2 million per month.

Cap-and-Trade

Cap-and-trade places a cap or ceiling on emissions and assigns or sells emission rights to individual producers who are then free to trade permits with each other. It is a tool that seeks to combine the power of government to limit total emissions with the power of the market to minimize cost and maximize benefit.

A government that uses this method must first estimate the efficient quantity of pollution and set the overall emissions cap to achieve the efficient outcome. Then the government must somehow allocate shares of the cap to individual

FIGURE 9.4

A Pollution Tax

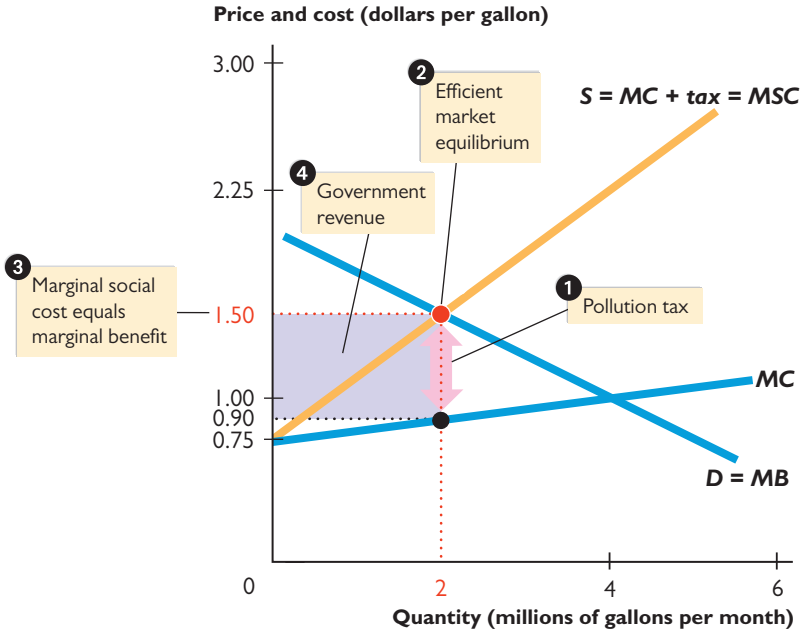
MyEconLab Animation

1. A pollution tax is imposed that is equal to the marginal external cost of pollution.

   Because the pollution tax equals the marginal external cost, the supply curve is the marginal social cost curve: $S = MC + tax = MSC$.

2. Market equilibrium is efficient because 3 marginal social cost equals marginal benefit.

4. The government collects tax revenue equal to the area of the purple rectangle.



firms (and possibly even households). In an efficient allocation of emissions quotas to firms, each firm has the same marginal social cost of production and emissions abatement. So to allocate the cap efficiently across firms, the government would need to know a lot about each firm's production and abatement costs.

A Pigovian tax achieves an efficient allocation of pollution across firms because each firm chooses how much to produce and pollute by taking the tax into account, and then produces the quantity at which marginal social cost equals price. Because all firms face the same market price, they also incur the same marginal social cost.

The government solves the allocation problem by making an initial distribution of the cap across firms and then allows the firms to trade in a market for emission permits. Firms that have a low marginal abatement cost sell permits and make big cuts in pollution. Firms that have a high marginal abatement cost buy permits and make smaller cuts or perhaps even no cuts in pollution.

The market in permits determines the equilibrium price of emissions and each firm, confronted with that price, maximizes profit by setting its marginal pollution cost or marginal abatement cost, whichever is lower, equal to the market price of a permit. By confronting polluters with a price of pollution, trade in pollution permits can achieve the same efficient outcome as a Pigovian tax.

Cap-and-trade has been used by the EPA to address sulfur dioxide and lead emissions and has been very successful in reducing the levels of concentration of these pollutants in the atmosphere. (See *Eye on the U.S. Economy* on p. 235.)



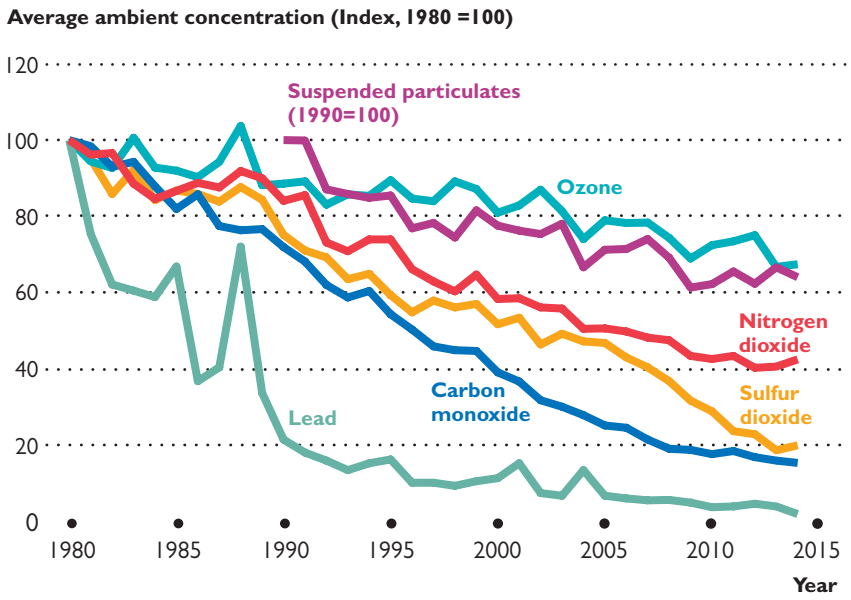
EYE on the U.S. ECONOMY

U.S. Air Pollution Trends

Air quality in the United States has improved. The figure shows the trends for the atmospheric concentrations of five main air pollutants monitored by the Environmental Protection Agency (EPA) since 1980 and a sixth pollutant (suspended particulates) monitored since 1990.

By using a mix of regulation, pollution limits, economic incentives, and permit trading, the EPA has almost eliminated lead and has substantially decreased sulfur dioxide, carbon monoxide, nitrogen dioxide, and suspended particulates.

Ozone is harder to eliminate, but it has nonetheless fallen to 70 percent of its 1980 level.



SOURCE OF DATA: Environmental Protection Agency, http://www.epa.gov/airtrends.



EYE on CLIMATE CHANGE

MyEconLab Critical Thinking Exercise

How Can We Limit Carbon Emissions?

The Problem

The Earth's temperature is rising and so is the amount of carbon dioxide, CO_2, in the atmosphere. Figure 1 shows these trends. The scientific consensus is that human economic activity is their major source.

Figure 2 shows that China, the United States, and Europe create 54 percent of carbon emissions and another eight large emitters create a further 25 percent.

On current trends, by 2050, three quarters of carbon emissions will come from developing economies and by 2100, the temperature will have increased by 3°C to a level that brings extreme weather and widespread coastal flooding.

Economist Nicholas Stern, principal author of *The Stern Review on the Economics of Climate Change*, says that carbon emission is "the greatest market failure the world has ever seen," and to avoid the risk of catastrophic climate change, the upward CO_2 trend must be stopped. Most economists agree with Stern and favor action.

Coping with the Problem

A global problem requires global action, and the first steps in this direction were taken at a 2015 United Nations climate change conference in Paris where 197 countries agreed to

1. Limit greenhouse gases emitted by human activity to the same levels that can be absorbed naturally, beginning as early as possible between 2050 and 2100.

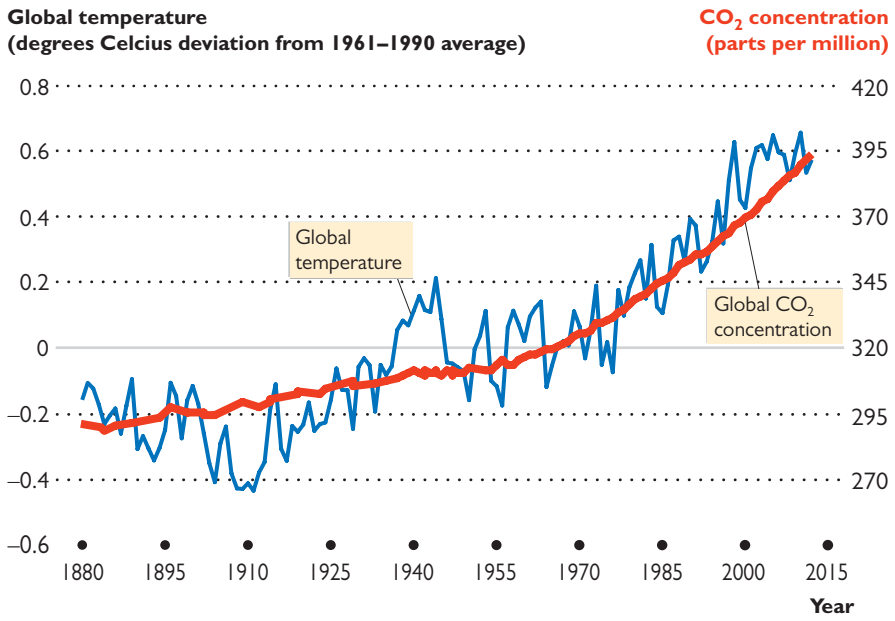


Figure 1 Temperature and CO_2

SOURCES OF DATA: Met Office Hadley Centre and Scripps Institution of Oceanography.

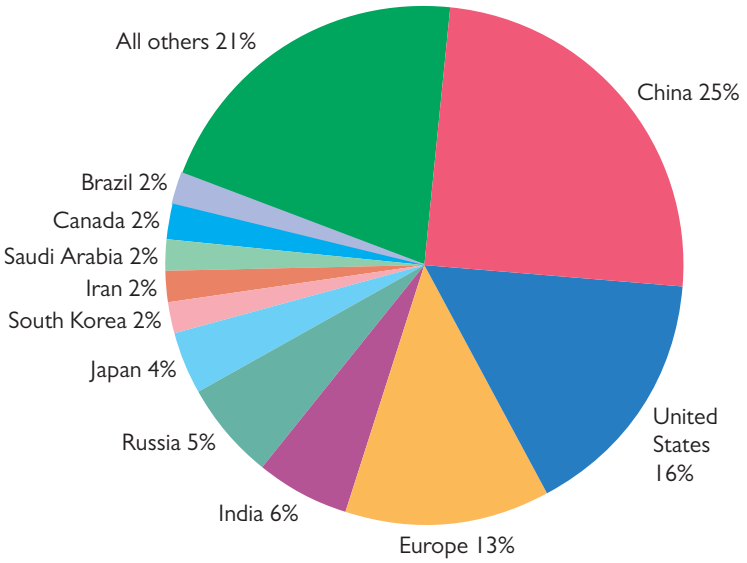
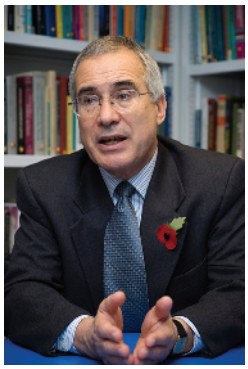


Figure 2 The Global Distribution of CO_2 Emissions

SOURCES OF DATA: Energy Information Administration.



Greenhouse gas emission is "the greatest market failure the world has ever seen."

To avoid the risk of catastrophic climate change, the upward CO_2 trend must be stopped.

Nicholas Stern

2. Keep global temperatures "well below" 2°C above pre-industrial levels and to "endeavor to limit" them to 1.5°C above by 2100.
3. Provide "climate finance" payments by rich countries of at least $100 billion a year starting in 2020 and more by 2025 to help poorer countries leapfrog fossil fuels and move straight to renewables.
4. Review each country's voluntary contribution to cutting emissions every five years.

If carbon emissions are to be cut, incentives must change. The cost of carbon-emitting activities must rise and the cost of alternative clean-energy technologies must fall. Disagreement centers on how to change incentives.

Should countries use carbon taxes or should they cap emissions and introduce carbon trading? Should clean energy and the research to develop new green technologies be subsidized?

Carbon Taxes

The Canadian province of British Columbia, Ireland, and the United Kingdom are among those making their carbon footprints smaller by taxing carbon-emitting activities. British Columbia has a tax of $30 per ton of carbon emitted. Ireland and the United Kingdom have steep taxes on gasoline. Figure 3 shows the large U.K. gas tax and contrasts it with the very low U.S. gas tax.

Cap-and-Trade

Cap-and-trade—capping emissions and issuing tradeable emissions permits—has been used successfully by the EPA to cut local air pollutants, particularly lead. The system is also in use in Europe, but the cap is too large and the price is too low.

Subsidize Green Alternatives

Many countries provide subsidies to power utilities when they install wind farms or arrays of solar panels. The cost of these technologies is falling and they provide an increasing percentage of energy demand.

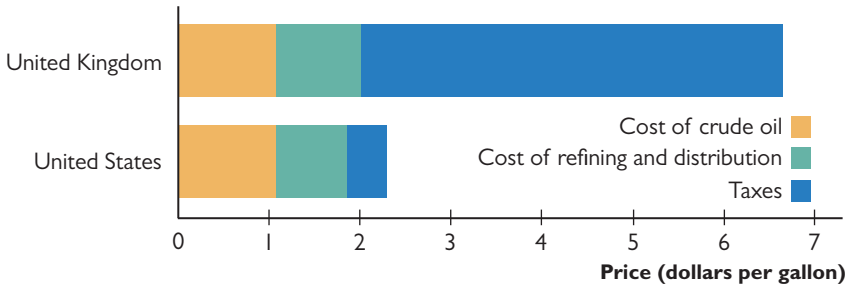


Figure 3 Gasoline Taxes

SOURCES OF DATA: Energy Information Administration, Automobile Association, and authors' assumptions.

"For little environmental benefit, we could end up sacrificing growth, jobs, and opportunities for the big majority, especially in the developing world."



Bjørn Lomborg

Why Isn't More Being Done?

Why don't we have more aggressive caps and stronger incentives to encourage a larger reduction in carbon emissions? Four reasons are

1. Developing economies want to develop *and* want low-cost energy. With the currently available technologies, coal is an attractive choice for them.
2. Getting global agreement is hard. Paris 2015 was the first time that every country signed onto a plan.
3. The costs of lowering emissions are certain and are borne now while most of the benefits come in the future. Bjørn Lomborg, author of *The Skeptical Environmentalist*, says that "For little environmental benefit, we could end up sacrificing growth, jobs, and opportunities for the big majority, especially in the developing world."
4. Technology is advancing and the cost of cleaner energy is falling, so there is a temptation to rely on this trend continuing. An example is replacing coal with gas, which halves the carbon emissions from electricity generation and which fracking technology has made a cost-effective option.

MyEconLab Study Plan 9.1
Key Terms Quiz
Solutions Video

CHECKPOINT 9.1

Explain why negative externalities lead to inefficient overproduction and how property rights and pollution taxes can achieve a more efficient outcome.

Practice Problems

FIGURE 1

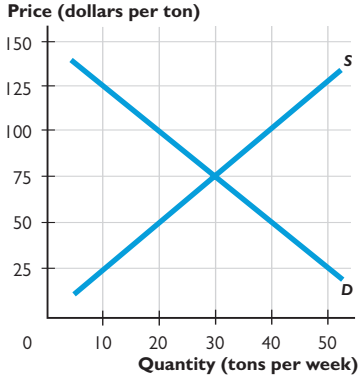


Figure 1 illustrates the unregulated market for a pesticide. When factories produce pesticide, they also create waste, which they dump into a lake on the edge of the town. The marginal external cost of the dumped waste is equal to the marginal private cost of producing the pesticide (that is, the marginal social cost of producing the pesticide is double the marginal private cost).

1. What is the quantity of pesticide produced if no one owns the lake and what is the efficient quantity of pesticide? What is the deadweight loss?
2. If the town owns the lake, what is the quantity of pesticide produced and how much does the town charge the factories to dump waste?
3. If the pesticide factories own the lake, how much pesticide is produced?
4. If no one owns the lake and the government levies a pollution tax, what is the tax per ton of pesticide that achieves the efficient outcome?

In the News

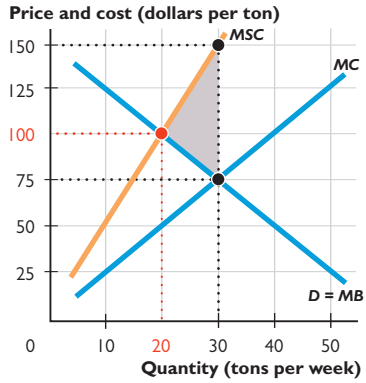
Could U.S. pollution regulations help smog-enshrouded China?
Beijing officials issued a "red alert" for air quality, closed schools, limited automobile traffic, and kept people indoors to avoid toxic smog. Most of Beijing's energy comes from carbon-emitting coal. The U.S. EPA is working with China to develop a national cap-and-trade system.

Source: *The Christian Science Monitor*, December 8, 2015

Explain the inefficiency in Beijing's market for electricity and contrast it with the U.S. market. How can cap-and-trade achieve an efficient outcome?

Solutions to Practice Problems

FIGURE 2



1. In Figure 2, production is 30 tons a week, the efficient quantity is 20 tons a week, and the deadweight loss is the area of the gray triangle.
2. The quantity of pesticide produced is the efficient quantity, 20 tons a week, and the town charges the factories $50 a ton of pesticide, which is the marginal external cost of the pollution produced by that quantity.
3. The factories produce the efficient quantity: 20 tons a week.
4. A pollution tax of $50 a ton paid by the factories achieves the efficient quantity of pesticide because the pollution tax equals the external cost.

Solution to In the News

The Beijing market for electricity is inefficient because it has a large external cost arising from carbon (and other) emissions from coal-powered generators. The marginal social cost of electricity exceeds its marginal benefit by a large amount. The U.S. market for electricity is also inefficient but less so than Beijing's. Cap-and-trade can achieve an efficient outcome by confronting power utilities with the marginal *social* cost of their production.

9.2 POSITIVE EXTERNALITIES: EDUCATION AND HEALTHCARE

MyEconLab Concept Video

Education and healthcare create benefits for those who receive the service and the many other people with whom they interact. We'll use college education as the main example and then apply the ideas to healthcare. To begin we must distinguish between its private benefits and its social benefits.

Private Benefits and Social Benefits

A *private benefit* is a benefit that the consumer of a good or service receives. The **marginal private benefit** (*MB*) is the benefit from an additional unit of a good or service that the consumer of that good or service receives.

An *external benefit* is a benefit from a good or service that someone other than the consumer receives. A **marginal external benefit** is the benefit from an additional unit of a good or service that people other than the consumer enjoy.

Marginal social benefit (*MSB*) is the marginal benefit enjoyed by society—by the consumers of a good or service (marginal private benefit) and by everyone else who benefits from it (the marginal external benefit). That is,

$$MSB = MB + \text{Marginal external benefit}$$

Figure 9.5 illustrates these benefit concepts. It uses college education as an example, but the same principles apply to all levels of education. The marginal benefit curve, *MB*, describes the marginal private benefit—such as expanded job opportunities and higher incomes—enjoyed by college graduates. Marginal private benefit decreases as the quantity of education increases.

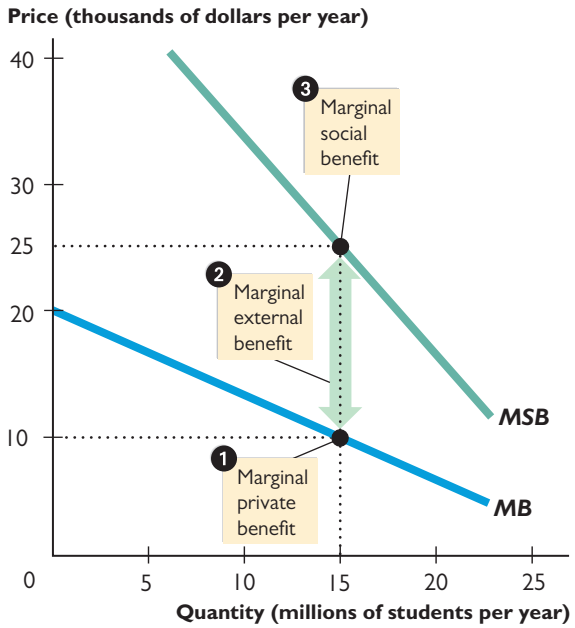
Marginal private benefit
The benefit from an additional unit of a good or service that the consumer of that good or service receives.

Marginal external benefit
The benefit from an additional unit of a good or service that people other than the consumer of that good or service enjoy.

Marginal social benefit
The marginal benefit enjoyed by society—by the consumer of a good or service and by everyone else who benefits from it. It is the sum of marginal private benefit and marginal external benefit.

FIGURE 9.5
An External Benefit

MyEconLab Animation



The *MB* curve shows the marginal private benefit enjoyed by the people who receive a college education. The *MSB* curve shows the sum of marginal private benefit and marginal external benefit.

When 15 million students attend college

1. Marginal private benefit is $10,000 per year.
2. Marginal external benefit is $15,000 per year.
3. Marginal social benefit is $25,000 per year.

But college graduates generate external benefits. On the average, college graduates communicate more effectively with others and tend to be better citizens. Their crime rates are lower, and they are more tolerant of the views of others. A society with a large number of college graduates can support activities such as high-quality music, theater, and other organized social activities.

In the example in Figure 9.5, the marginal external benefit is $15,000 per year when 15 million students enroll in college. Marginal social benefit is the sum of marginal private benefit and marginal external benefit. For example, when 15 million students a year enroll in college, the marginal private benefit is $10,000 per year and the marginal external benefit is $15,000 per year, so the marginal social benefit is $25,000 per year.

The marginal social benefit curve, *MSB*, is the sum of marginal private benefit and marginal external benefit. It is steeper than the *MB* curve because marginal external benefit diminishes for the same reasons that *MB* diminishes.

When people make decisions about how much schooling to undertake, they consider only its private benefits and if education were provided by private schools that charged full-cost tuition, there would be too few college graduates.

Figure 9.6 shows the underproduction that would occur if all college education were left to the private market. The supply curve is the marginal cost curve of the private schools, $S = MC$. The demand curve is the marginal private benefit curve, $D = MB$. Market equilibrium is at a tuition of $15,000 per year and 7.5 million students enroll per year. At this equilibrium, the marginal social benefit is $38,000 per year, which exceeds the marginal cost by $23,000 per year. Too few students enroll in college. The efficient number of students is 15 million per year, with marginal social benefit equal to marginal cost. The gray triangle shows the deadweight loss created by the underproduction.

FIGURE 9.6

Underproduction with an External Benefit

MyEconLab Animation

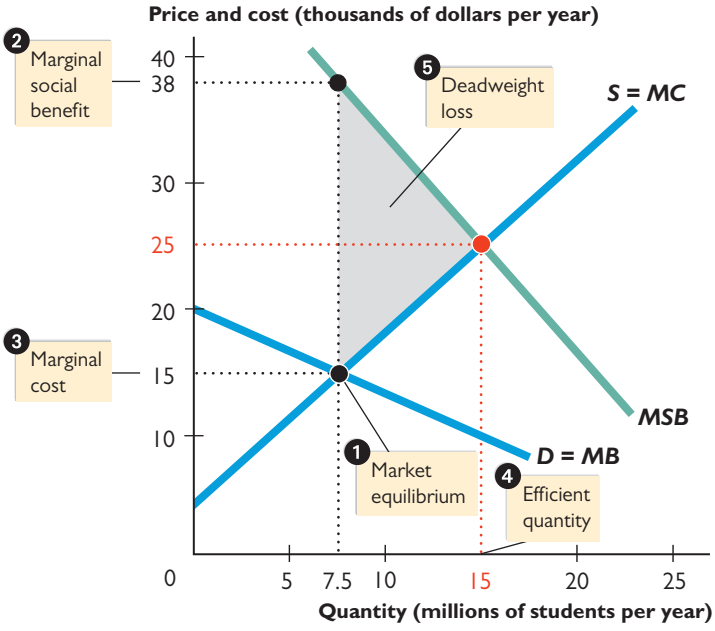
The market demand curve is the marginal private benefit curve, $D = MB$. The supply curve is the marginal cost curve, $S = MC$.

❶ Market equilibrium is at a tuition of $15,000 per year with 7.5 million students per year enrolled.

The marginal social benefit curve is *MSB*, so the market equilibrium is inefficient because ❷ marginal social benefit exceeds ❸ marginal cost.

❹ The efficient number of students is 15 million a year.

❺ The gray triangle shows the deadweight loss created because too few students enroll in college.



Government Actions in the Face of External Benefits

To get closer to producing the efficient quantity of a good or service that generates an external benefit, we make public choices through governments and modify the market outcome. To achieve a more efficient allocation of resources in the presence of external benefits, such as those that arise from education, governments can use three devices:

- Public provision
- Private subsidies
- Vouchers

Public Provision

Public provision is the production of a good or service by a public authority that receives most of its revenue from the government. Education services produced by public universities, colleges, and schools are examples of public provision.

Public provision
The production of a good or service by a public authority that receives most of its revenue from the government.

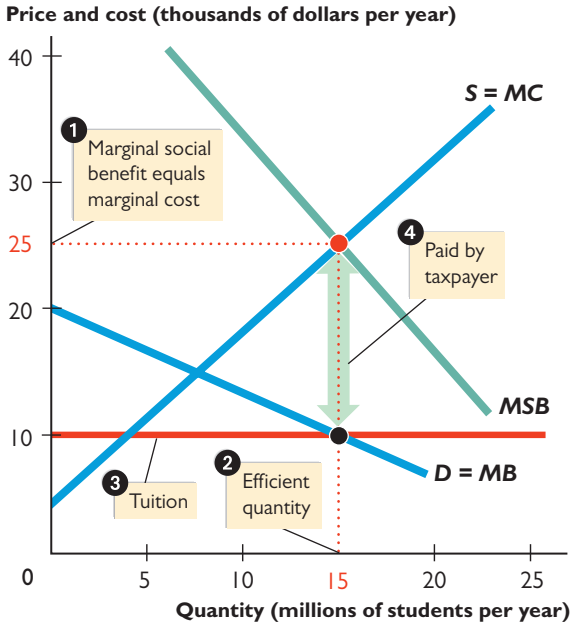
Figure 9.7 shows how public provision might overcome the underproduction that arises in Figure 9.6. Public provision cannot lower the cost of production, so marginal cost is the same as before. Marginal private benefit, marginal external benefit, and marginal social benefit are also the same as in Figure 9.6.

The efficient quantity occurs where marginal social benefit equals marginal cost. In Figure 9.7, this quantity is 15 million students per year. Tuition is set to ensure that the efficient number of students enroll. That is, tuition is set at the level that equals the marginal private benefit at the efficient quantity. In Figure 9.7, tuition is $10,000 a year. The rest of the cost of the public college is borne by the taxpayers and, in this example, is $15,000 per student per year.

FIGURE 9.7

Public Provision to Achieve an Efficient Outcome

MyEconLab Animation



1. Marginal social benefit equals marginal cost with 15 million students enrolled in college.
2. The efficient quantity is 15 million students per year.
3. Tuition is set at $10,000 per year.
4. Taxpayers cover the remaining $15,000 of marginal cost per student per year.

Private Subsidies

Subsidy
A payment by the government to a producer to cover part of the costs of production.

A **subsidy** is a payment by the government to a producer to cover part of the costs of production. By giving producers a subsidy, the government can induce private decision makers to consider external benefits when they make their choices.

Figure 9.8 shows how a subsidy to private colleges works. In the absence of a subsidy, the marginal cost curve is the market supply curve of private college education, $S = MC$. The marginal benefit is the demand curve, $D = MB$. In this example, the government provides a subsidy to colleges of $15,000 per student per year. We must subtract the subsidy from the marginal cost of education to find the colleges' supply curve. That curve is $S = MC - subsidy$ in the figure. The equilibrium tuition (market price) is $10,000 per year, and the equilibrium number of students is 15 million per year. To educate 15 million students, colleges incur a marginal cost of a student of $25,000 per year. The marginal social benefit of a student is also $25,000 per year. So with marginal cost equal to marginal social benefit, the subsidy achieves an efficient outcome. The tuition and the subsidy just cover the colleges' marginal cost of a student per year.

Public Provision Versus Private Subsidy In the two methods we've just studied, the number of students who enroll and the tuition are the same. So are these two methods of providing education services equally good? This question is difficult to resolve. The bureaucrats that operate public schools don't have as strong an incentive to minimize costs and maximize *quality* as those who run private schools. But for elementary and secondary education, charter schools might be an efficient compromise between traditional public schools and subsidized private schools.

FIGURE 9.8

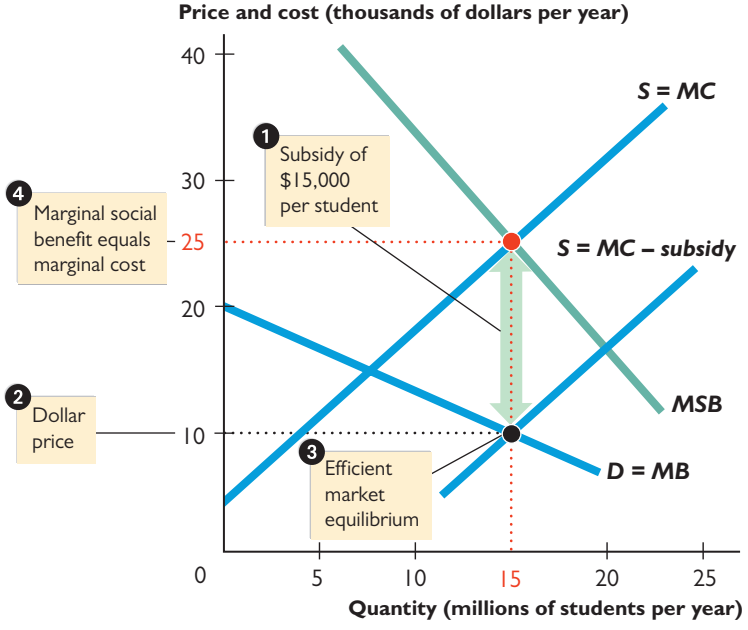
Private Subsidy to Achieve an Efficient Outcome

MyEconLab Animation

With ❶ a subsidy of $15,000 per student per year, the supply curve is $S = MC - subsidy$.

❷ The equilibrium tuition is $10,000 per year and 15 million students per year enroll in college.

❸ The market equilibrium is efficient because with 15 million students enrolled in college, ❹ marginal social benefit equals marginal cost.



Vouchers

Voucher
A token that the government provides to households, which they can use to buy specified goods or services.

A **voucher** is a token that the government provides to households, which they can use to buy specified goods or services. The SNAP food stamp benefits provided by the U.S. Department of Agriculture to low-income households are an example of a voucher. Vouchers for college education could be provided to students.

Suppose that the government provides each student with a voucher. Students would choose the college to attend and use dollars plus the voucher to pay the tuition. Colleges would exchange the vouchers they receive for dollars from the government. If the government set the value of the voucher equal to the marginal external benefit of a year of college at the efficient number of students, then the outcome would be efficient.

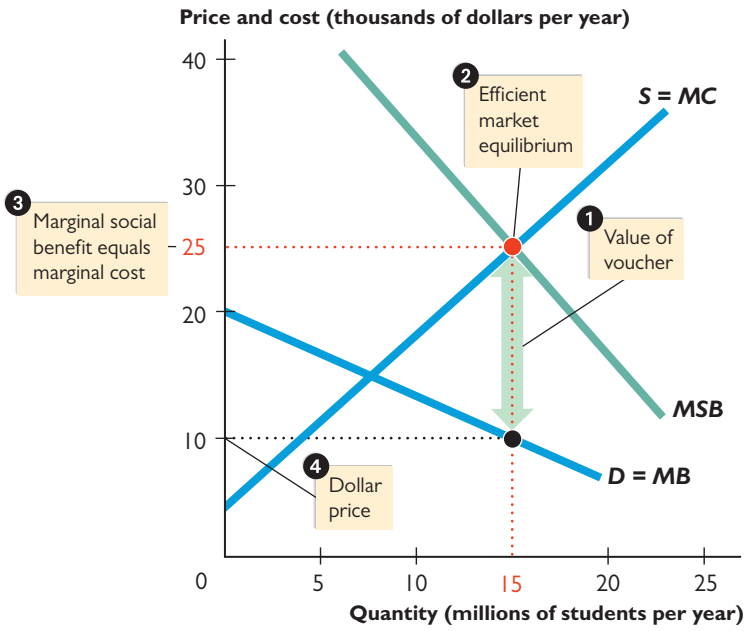
Figure 9.9 illustrates an efficient voucher scheme. The government issues vouchers worth $15,000 per year, equal to the marginal external benefit at the efficient number of students. Each student pays $10,000 per year tuition and the government pays $15,000 per voucher, so the college collects $25,000 per student per year. The voucher scheme results in 15 million students attending college, the marginal cost equals the marginal social benefit, and the outcome is efficient.

Do Vouchers Beat Public Provision and Subsidy? Vouchers provide public financial resources to the consumer rather than the producer. Economists generally believe that vouchers offer a more efficient outcome than public provision and subsidies because they combine the benefits of competition among private colleges with the injection of the public funds needed to achieve an efficient number of students. Also, students and their parents can monitor school performance more effectively than the government can.

FIGURE 9.9

Vouchers Achieve an Efficient Outcome

MyEconLab Animation



With vouchers for college, students are willing to pay *MB* plus the value of the voucher.

1. The government issues vouchers to each student valued at $15,000, equal to the marginal external benefit of a year of college at the efficient number of students.
2. The market equilibrium is efficient because with 15 million students enrolled in college, 3 marginal social benefit equals marginal cost.
4. Each student pays tuition of $10,000 (the dollar price) and the school collects $15,000 (the value of the voucher) from the government.

Economic Problems in Healthcare Markets

Healthcare consists of two distinct healthcare services (the services of physicians, specialists, nurses, other professionals, and hospitals) and health insurance. Left to the competitive market, both of these components of healthcare would be underprovided and unfairly distributed without some government action. So government plays a major role in the healthcare markets that we briefly describe in *Eye on the U.S. Economy* on pp. 244–245.

Reasons for Underprovision in Healthcare Markets

First, positive consumption externalities arise from the provision of public sanitation systems and vaccination programs. People who get a flu shot protect not only themselves but everyone with whom they come into contact. The marginal social benefit of flu shots exceeds the marginal private benefit. The efficient quantity of flu shots exceeds the quantity that an unregulated market would provide.

Public health consumption externalities are one reason, but not the main reason why healthcare markets underprovide. The main reason is that health insurance markets suffer from an *asymmetric information* problem. People know more about the risk they impose to an insurance company than the insurer knows, and doctors know more about the treatment that should be prescribed and its cost than the insurance company knows. The result is an underprovision of health insurance. The young and healthy don't insure and those who have the highest chance of making claims buy insurance, so insurance premiums are high and the aged and the poor get priced out of the market. Also, people with pre-existing health issues find it difficult or impossible to get insurance.



EYE on the U.S. ECONOMY

Healthcare in the United States: A Snapshot

Expenditure on healthcare takes 17.5 percent of U.S. incomes. Forty-one percent of this expenditure is private—spending on health insurance and out-of-pocket payments for healthcare services. The rest is financed by taxes—spending by federal and state governments on Medicare, Medicaid, and other public programs.

Figure 1 shows the distribution of the healthcare dollar across these types of expenditures.

Of the 318 million people in the United States in 2014, 190 million had private health insurance.

More than one half of all employed people—about 70 million—buy health insurance through their employer.

Tax breaks are available on health-insurance payments, the largest being for the self-employed who can deduct the entire payment.

About 75 million people limit their healthcare cost by using a Health Maintenance Organization (HMO).

The federal and state Medicare and Medicaid programs cover almost 119 million people.

An estimated 36 million have no health insurance, and a further 25 million are reckoned to be underinsured—have some insurance but not enough for a big emergency.

Some of the uninsured are healthy and *choose* not to insure. Others can't afford insurance and don't qualify for Medicare or Medicaid.

Per person covered, government programs are more costly than private insurance because they serve the aged, the disabled, and the chronically sick.

Figure 2 shows expenditure per person. With almost 119 million people covered by Medicare and Medicaid at a total cost of $1,115 billion, governments spend $9,389 per person per year on public programs.

The cost of private insurance per person covered is 56 percent of the cost of the government programs at $5,219 per person per year.

Out-of-pocket expenditure, which includes spending by the uninsured, is $1,037 per person per year.

Not only are many people underprovided with healthcare, but those who do get care get very good and extremely costly care. And the costs keep rising as the population ages and healthcare technology advances to keep more and more people living longer (see *Eye on the U.S. Economy* on pp. 244–245).

A Reform Idea

The Medicare and Medicaid programs are in effect an open-ended commitment of public funds to the healthcare of the aged and those too poor to buy private healthcare. Healthcare in the United States faces two problems: Too many people are uninsured and healthcare costs too much. These problems are going to get worse if nothing major is done to reverse a trend.

The Patient Protection and Affordable Care Act (Obamacare) addresses the first of these problems by requiring everyone to be insured and by creating a new Pre-Existing Condition Insurance Plan, financed partly by the government. But the Act does little to address the problem of overexpenditure, and this problem is extremely serious. It is so serious that without massive change, the present open-ended healthcare programs will bankrupt the United States.

A solution to both the problem of coverage and access and the problem of overexpenditure has been suggested by Laurence Kotlikoff, an economics professor at Boston University. His proposal uses healthcare vouchers to ensure universal coverage and a cap on total expenditure. Everyone would get a voucher and those with higher expected healthcare costs would get a bigger voucher. Healthcare vouchers would work like education vouchers. They would provide the choice that is so important and valued by Americans, combined with a cost discipline similar to that of the healthcare systems of Europe and Canada.



Professor Laurence J. Kotlikoff of Boston University; author of The Healthcare Fix *and creator of* Medicare Part C for All.

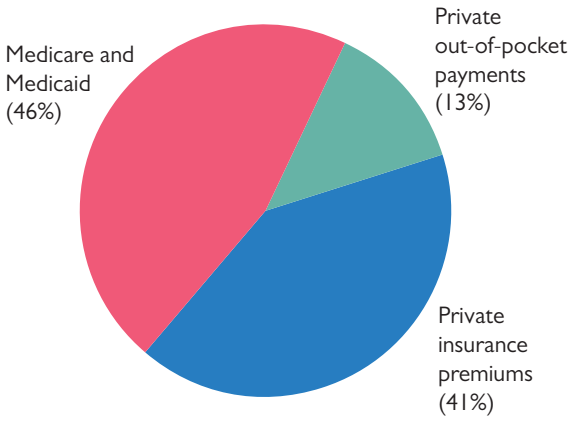


Figure 1 Private and Public Expenditures on Healthcare

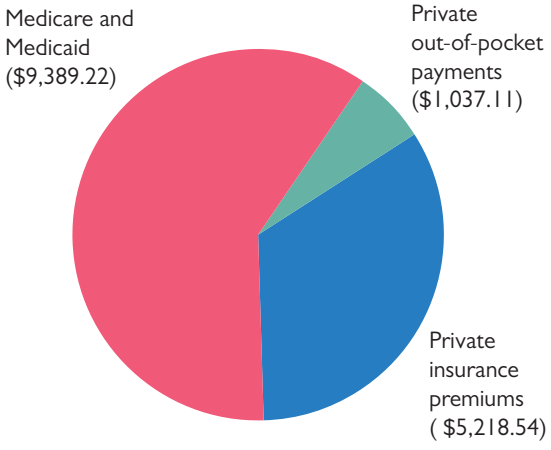


Figure 2 Private and Public Expenditures per Person

SOURCE OF DATA: Centers for Medicare and Medicaid Services, Data Tables 1, 2, and 22.

MyEconLab Study Plan 9.2
Key Terms Quiz
Solutions Video

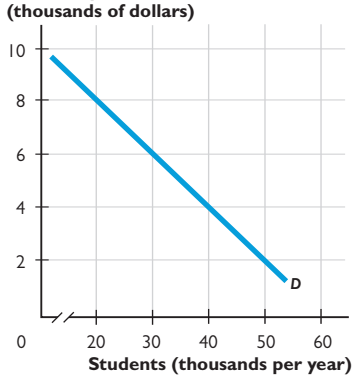
CHECKPOINT 9.2

Explain why positive externalities lead to inefficient underproduction and how public provision, subsidies, and vouchers can achieve a more efficient outcome.

Practice Problems

Figure 1 shows the marginal private benefit from college education. The marginal cost of a college education is a constant $6,000 a year. The marginal external benefit from a college education is a constant $4,000 per student per year.

FIGURE 1



1. What is the efficient number of students? If colleges are private (no government involvement), how many people enroll, what is the tuition, and what is the deadweight loss?
2. If the government provides public colleges, what is the tuition that will achieve the efficient number of students? How much must taxpayers pay?
3. If the government subsidizes private colleges, what subsidy will achieve the efficient number of college students?
4. If the government offers each student a voucher, what value of the voucher will achieve the efficient number of students?

In the News

Students across America march for tuition-free college

Students at colleges and universities from Los Angeles to New York are demonstrating in support of free education. The website studentmarch.org says: "Education should be free. The United States is the richest country in the world, yet students have to take on crippling debt in order to get a college education."

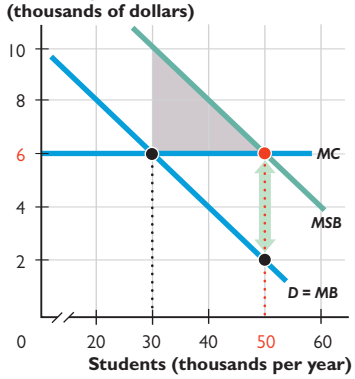
Sources: *Reuters*, November 12, 2015, and www.studentmarch.org

If college becomes tuition free, how will the number of students enrolled change and will the outcome be efficient?

Solutions to Practice Problems

1. In Figure 2, the efficient number of students is 50,000 a year. With no government involvement, enrollment is 30,000 students a year and tuition is $6,000 a year. The gray triangle shows the deadweight loss.
2. To enroll the efficient 50,000 students, public colleges would charge $2,000 per student and taxpayers would pay $4,000 per student (Figure 2).
3. A subsidy of $4,000 per student (equal to marginal external benefit).
4. A voucher valued at $4,000 will achieve an efficient enrollment of 50,000. The private college tuition is $6,000. 50,000 students will enroll if the dollar cost is $2,000 per student. So the value of the voucher will have to be $4,000.

FIGURE 2



Solution to In the News

Setting tuition at zero will increase the number of students enrolled in colleges and universities—a movement downward along the demand curve. College education has an external benefit, so an efficient outcome occurs when tuition is less than marginal cost and marginal social benefit equals marginal cost. It is unlikely that zero tuition is efficient and it is likely that it would bring overproduction.

CHAPTER SUMMARY

Key Points

1. Explain why negative externalities lead to inefficient overproduction and how property rights and pollution taxes can achieve a more efficient outcome.

- External costs are costs of production that fall on people other than the producer of a good or service. Marginal social cost equals marginal private cost plus marginal external cost.
- Producers take account only of marginal private cost and produce more than the efficient quantity when there is a marginal external cost.
- Sometimes it is possible to overcome a negative externality by assigning a property right.
- When property rights cannot be assigned, governments might overcome a negative externality by mandating clean technologies (command-and-control), imposing pollution taxes, or using a cap-and-trade program.

2. Explain why positive externalities lead to inefficient underproduction and how public provision, subsidies, and vouchers can achieve a more efficient outcome.

- External benefits are benefits that are received by people other than the consumer of a good or service. Marginal social benefit equals marginal private benefit plus marginal external benefit.
- External benefits from education arise because better-educated people are better citizens, commit fewer crimes, and support social activities.
- Public provision, subsidies, and vouchers can achieve a more efficient provision of a good with positive externalities such as education and healthcare.

Key Terms

MyEconLab Key Terms Quiz

Abatement technology, 231
Coase theorem, 231
Command-and-control regulation, 233
Externality, 226
Marginal external benefit, 239
Marginal external cost, 228
Marginal private benefit, 239
Marginal private cost, 228
Marginal social benefit, 239
Marginal social cost, 228
Negative externality, 226
Positive externality, 226
Property rights, 231
Public provision, 241
Subsidy, 242
Voucher, 243

MyEconLab Chapter 9 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

Table 1 shows the demand schedule for electricity from a coal-burning utility. Table 2 shows the utility's cost of producing electricity and the external cost of the pollution created. Use this information to work Problems **1** to **3**.

TABLE 1 DEMAND FOR ELECTRICITY

Price (cents per kilowatt)	Quantity demanded (kilowatts per day)
4	500
8	400
12	300
16	200
20	100
24	0

TABLE 2 PRIVATE AND EXTERNAL COSTS

Quantity (kilowatts per day)	Marginal cost	Marginal external cost
	(cents per kilowatt)	
0	0	0
100	2	2
200	4	4
300	6	6
400	8	8
500	10	10

TABLE 3

Students (millions per year)	Marginal benefit (dollars per student per year)
1	5,000
2	3,000
3	2,000
4	1,500
5	1,200
6	1,000
7	800
8	500

1. With no pollution control, calculate the quantity of electricity produced, the price of electricity, and the marginal external cost of the pollution generated.
2. With no pollution control, calculate the quantity of electricity produced, the marginal social cost of the electricity generated, and the deadweight loss.
3. If the government levies a pollution tax such that the utility generates the efficient quantity of electricity, calculate the quantity of electricity generated, the price of electricity, the size of the pollution tax, and the tax revenue.

Use the following information to work Problems **4** and **5**.

Tom and Larry must spend a day working together. Tom likes to smoke cigars and the price of a cigar is $2. Larry likes a smoke-free environment.

4. If Tom's marginal benefit from a cigar a day is $20 and Larry's marginal benefit from a smoke-free environment is $25 a day, what is the outcome if they meet at Tom's home? What is the outcome if they meet at Larry's home?
5. If Tom's marginal benefit from a cigar a day is $25 and Larry's marginal benefit from a smoke-free environment is $20 a day, what is the outcome if they meet at Tom's home? What is the outcome if they meet at Larry's home?

Use Table 3 and the following information to work Problems **6** to **8**.

The marginal cost of educating a college student is $5,000 a year. Table 3 shows the marginal benefit schedule from a college education. The marginal external benefit from a college education is a constant $2,000 per student per year. There are no public colleges.

6. With no government involvement in college education, how many students enroll, what is the tuition, and what is the deadweight loss created?
7. If the government subsidizes colleges and sets the subsidy so that the efficient number of students enroll, what is the subsidy per student, how many students enroll, and what is the cost to taxpayers?
8. If the government offers vouchers to students, what is the value of the voucher that will encourage the efficient number of students to enroll?
9. **Two Philadelphia highways waste a million hours**
   A study of highway use says that on two short stretches of expressway in Philadelphia, delays of 1 million hours a year cost $22 million in lost time and waste 375,700 gallons of fuel.
   Source: Bob McGovern, *PhillyVoice*, November 23, 2015
   What is the externality described in the news clip? How could road tolls and high parking levies reduce congestion on Philadelpia roads? If road tolls and parking charges cut commute times, would the Philadelphia road system be more efficient? Explain your answers.
10. Read *Eye on Climate Change* on pp. 236–237 and then describe the government actions that could decrease carbon emissions. Explain why the government is not taking these actions more aggressively.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. The price of gasoline in Europe is about three times that in the United States, mainly because the European gas tax is higher than the U.S. gas tax. How would an increase in the gas tax in the United States to the European level change carbon emissions? Would this tax increase bring greater efficiency or would it increase deadweight loss?

2. The warming Arctic affects us all
Arctic temperatures are rising twice as fast as the global average and receding sea ice threatens polar bears, walruses, and seals that exist nowhere else on earth and face an increased risk of extinction.

Source: *Truthout*, December 4, 2015

What is the externality described in the news clip? How could property rights influence the amount of damage done to the Arctic Sea and its wildlife?

Use the following information to work Problems **3** and **4**.

City ponders ban on plastic bags
Most plastic shopping bags end up in the landfill or as litter. Tacoma city officials are considering banning them or allowing them for a fee of 5 or 10 cents.

Source: *Tacoma Weekly*, December 8, 2015

3. Explain how a Tacoma charge will change the use of plastic bags and how the deadweight loss created by plastic bags will change.

4. Explain why a Tacoma ban on plastic bags would be inefficient.

Use the following information to work Problems **5** to **7**.

The marginal cost of educating a college student online is $3,000 a year. Table 1 shows the marginal private benefit schedule from a college education. The marginal external benefit is 50 percent of the marginal private benefit.

TABLE 1

Students (millions per year)	Marginal private benefit (dollars per student per year)
1	6,000
2	5,000
3	4,000
4	3,000
5	2,000
6	1,000

5. With no government involvement in college education, how many students enroll and what is the tuition? Calculate the deadweight loss created.

6. If the government subsidizes colleges so that the efficient number of students will enroll, what is the cost to taxpayers?

7. If the government offers vouchers to students and values them so that the efficient number of students will enroll, what is the value of the voucher?

8. Worse than useless
Europe's Emissions Trading Scheme (ETS) has too many carbon emission permits trading at too low a price.

Source: *The Economist*, January 25, 2014

Explain the conditions under which the ETS, a cap-and-trade system, would reduce the amount of carbon emissions to the efficient quantity. Use a graph of the European market for electricity to illustrate your explanation. On your graph, show the effects of having too many emission permits.

9. Carbon tax debate heats up in Montpelier, VT

Vermonters are debating the pros and cons of a state carbon tax—a new tax on gasoline, heating oil, and other fossil fuels sold in the state. Backers say the tax revenue would be used to cut other taxes and increase energy efficiency.

Source: Watchdog.org, December 3, 2015

Draw a graph of the market for gasoline in Vermont to show the effects of a state carbon tax.

MyEconLab Chapter 9 Study Plan

Multiple Choice Quiz

1. Electricity has a negative production externality because _____.

A. its marginal benefit decreases as more of it is consumed
B. the marginal private cost of producing it increases as more of it is produced
C. the marginal social cost of producing it exceeds the marginal private cost of producing it
D. a marginal external cost lowers the marginal benefit from consuming it

2. A steelmaking plant pollutes the air and water so _____.

A. the marginal social cost of producing steel exceeds the marginal private cost by the amount of the marginal external cost
B. the marginal social cost of producing steel is less than the marginal private cost by the amount of the marginal external cost
C. the marginal private cost of producing steel equals the marginal external cost plus the marginal social cost
D. the marginal private cost of producing steel minus the marginal social cost equals the marginal external cost

3. An unregulated paint factory that pollutes a river results in _____ and _____.

A. overproduction; a price that exceeds the marginal benefit from the good
B. underproduction; a price that equals the marginal benefit from the good
C. the efficient quantity produced; a marginal benefit equal to the marginal social cost
D. an inefficient quantity produced; a marginal benefit below the marginal social cost

4. Steel production creates pollution. If a tax is imposed on steel production equal to the marginal external cost of the pollution it creates, _____.

A. steel producers will cut pollution to zero
B. the deadweight loss created by steel producers will be cut to zero
C. the market price of steel will rise by the amount of the tax
D. steel producers will continue to produce the inefficient quantity of steel

5. A good or service with a positive externality is one which _____.

A. everyone wants to have access to
B. is produced in the social interest
C. the marginal social benefit exceeds the marginal private benefit
D. the marginal external benefit exceeds the marginal private benefit

6. Because education generates a positive externality, _____.

A. everyone who wants a college education should get one
B. graduates' marginal benefit exceeds the society's value of the education
C. the quantity of education undertaken will achieve the social interest if it is free
D. subsidies to colleges or vouchers to students are means of achieving the efficient number of graduates





Which store has the lower costs: Walmart or 7-Eleven?

10

Production and Cost

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain and distinguish between the economic and accounting measures of a firm's cost of production and profit.
2. Explain the relationship between a firm's output and labor employed in the short run.
3. Explain the relationship between a firm's output and costs in the short run.
4. Derive and explain a firm's long-run average cost curve.

MyEconLab Big Picture Video

MyEconLab Concept Video

10.1 ECONOMIC COST AND PROFIT

A Walmart store is much larger than a 7-Eleven and clearly costs more to operate. But which store has the lower cost per customer served? Now the answer is not so obvious. You'll find the answer at the end of this chapter.

Like a Walmart store and a 7-Eleven, the 20 million firms in the United States differ in size. They also differ in what they produce. But all firms perform the same basic economic function: They hire factors of production and organize them to produce and sell goods and services. To understand the behavior of a firm, we need to know its goals.

The Firm's Goal

If you asked a group of entrepreneurs what they are trying to achieve, you would get many different answers. Some would talk about making a high-quality product, others about business growth, others about market share, and others about job satisfaction of the work force. All of these goals might be pursued, but they are not the fundamental goal. They are a means to a deeper goal.

The firm's goal is to *maximize profit*. A firm that does not seek to maximize profit is either eliminated or bought by firms that *do* seek to achieve that goal. To calculate a firm's profit, we must determine its total revenue and total cost. Economists have a special way of defining and measuring cost and profit, which we'll explain and illustrate by looking at Sam's Smoothies, a firm that is owned and operated by Samantha.

Accounting Cost and Profit

In 2016, Sam's Smoothies' total revenue from the sale of smoothies was $150,000. The firm paid $20,000 for fruit, yogurt, and honey; $22,000 in wages for the labor it hired; and $3,000 in interest to the bank. These items totaled $45,000.

Sam's accountant said that the depreciation of the firm's blenders, refrigerators, and shop during 2016 was $10,000. Depreciation is the fall in the value of the firm's capital, and accountants calculate it by using the Internal Revenue Service's rules, which are based on standards set by the Financial Accounting Standards Board. So the accountant reported the firm's total cost for 2016 as $55,000 and the firm's profit as $95,000—$150,000 of total revenue minus $55,000 of total costs.

Sam's accountant measures cost and profit to ensure that the firm pays the correct amount of income tax and to show the bank how Sam's has used its bank loan. Economists have a different purpose: to predict the firm's decisions. These decisions respond to *opportunity cost* and *economic profit*.

Opportunity Cost

To produce its output, a firm employs factors of production: land, labor, capital, and entrepreneurship. Another firm could have used these same resources to produce other goods or services. In Chapter 3 (pp. 66–67), resources can be used to produce either smartphones or bikes, so the opportunity cost of producing a smartphone is the number of bikes forgone. Pilots who fly passengers for Southwest Airlines can't at the same time fly freight for FedEx. Construction workers who are building an office high-rise can't simultaneously build apartments. A journalist writing for the *New York Times* can't at the same time create

Web news reports for CNN. And Samantha can't simultaneously run her smoothies business and a flower shop.

The highest-valued alternative forgone is the opportunity cost of a firm's production. From the viewpoint of the firm, this opportunity cost is the amount that the firm must pay the owners of the factors of production it employs to attract them from their best alternative use. So a firm's opportunity cost of production is the cost of the factors of production it employs.

To determine these costs, let's return to Sam's and look at the opportunity cost of producing smoothies.

Explicit Costs and Implicit Costs

The amount that a firm pays to attract resources from their best alternative use is either an explicit cost or an implicit cost. A cost paid in money is an **explicit cost**. Because the amount spent could have been spent on something else, an explicit cost is an opportunity cost. The wages that Samantha pays labor, the interest she pays the bank, and her expenditure on fruit, yogurt, and honey are explicit costs.

Explicit cost
A cost paid in money.

A firm incurs an **implicit cost** when it uses a factor of production but does not make a direct money payment for its use. The two categories of implicit cost are economic depreciation and the cost of the resources of the firm's owner.

Implicit cost
An opportunity cost incurred by a firm when it uses a factor of production for which it does not make a direct money payment.

Economic depreciation is the opportunity cost of the firm using capital that it owns. It is measured as the change in the *market value* of capital—the market price of the capital at the beginning of the period minus its market price at the end of the period. Suppose that Samantha could have sold her blenders, refrigerators, and shop on December 31, 2015, for $250,000. If she can sell the same capital on December 31, 2016, for $246,000, her economic depreciation during 2016 is $4,000. This is the opportunity cost of using her capital during 2016, not the $10,000 depreciation calculated by Sam's accountant.

Economic depreciation
An opportunity cost of a firm using capital that it owns—measured as the change in the *market value* of capital over a given period.

Interest is another cost of capital. When the firm's owner provides the funds used to buy capital, the opportunity cost of those funds is the interest income forgone by not using them in the best alternative way. If Sam loaned her firm funds that could have earned her $1,000 in interest, this amount is an implicit cost of producing smoothies.

When a firm's owner supplies labor, the opportunity cost of the owner's time spent working for the firm is the wage income forgone by not working in the best alternative job. For example, instead of working at her next best job that pays $34,000 a year, Sam supplies labor to her smoothies business. This implicit cost of $34,000 is part of the opportunity cost of producing smoothies.

Finally, a firm's owner often supplies entrepreneurship, the factor of production that organizes the business and bears the risk of running it. The return to entrepreneurship is **normal profit**. Normal profit is part of a firm's opportunity cost because it is the cost of a forgone alternative—running another firm. Instead of running Sam's Smoothies, Sam could earn $16,000 a year running a flower shop. This amount is an implicit cost of production at Sam's Smoothies.

Normal profit
The return to entrepreneurship. Normal profit is part of a firm's opportunity cost because it is the cost of not running another firm.

Economic Profit

A firm's **economic profit** equals total revenue minus total cost. Total revenue is the amount received from the sale of the product. It is the price of the output multiplied by the quantity sold. Total cost is the sum of the explicit costs and implicit costs and is the opportunity cost of production.

Economic profit
A firm's total revenue minus total cost.

TABLE 10.1

Economic Accounting

Item		
Total Revenue		**$150,000**
Explicit Costs		
Cost of fruit, yogurt, and honey	$20,000	
Wages	$22,000	
Interest	$3,000	
Implicit Costs		
Samantha's forgone wages	$34,000	
Samantha's forgone interest	$1,000	
Economic depreciation	$4,000	
Normal profit	$16,000	
Opportunity Cost		**$100,000**
Economic Profit		**$50,000**

Because one of the firm's implicit costs is *normal profit*, the return to the entrepreneur equals normal profit plus economic profit. If a firm incurs an economic loss, the entrepreneur receives less than normal profit.

Table 10.1 summarizes the economic cost concepts, and Figure 10.1 compares the economic view and the accounting view of cost and profit. Sam's total revenue (price multiplied by quantity sold) is $150,000; the opportunity cost of the resources that Sam uses is $100,000; and Sam's economic profit is $50,000.

FIGURE 10.1

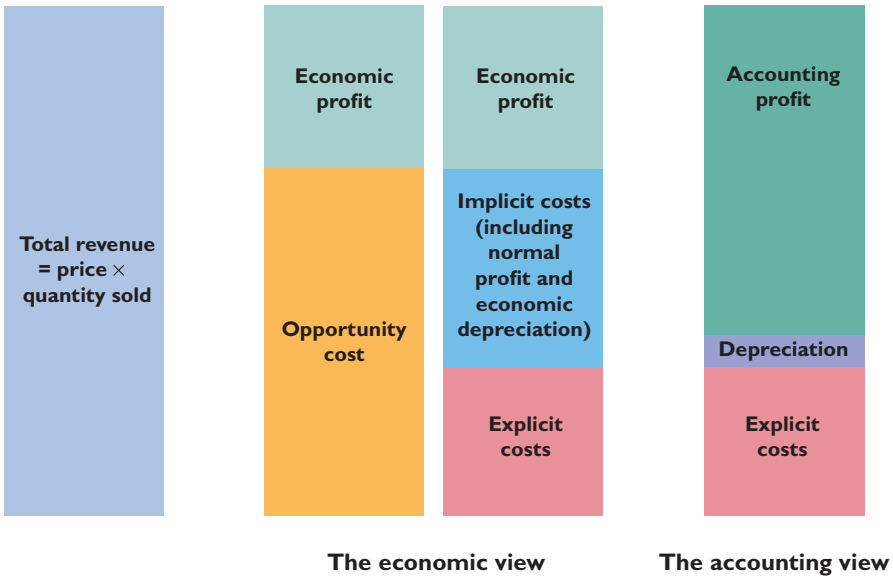
Two Views of Cost and Profit

MyEconLab Animation

Both economists and accountants measure a firm's total revenue the same way. It equals the price multiplied by the quantity sold of each item.

Economists measure economic profit as total revenue minus opportunity cost. Opportunity cost includes explicit costs and implicit costs. Normal profit is an implicit cost.

Accountants measure profit as total revenue minus explicit costs—costs paid in money—and depreciation.



CHECKPOINT 10.1

MyEconLab Study Plan 10.1
Key Terms Quiz
Solutions Video

Explain and distinguish between the economic and accounting measures of a firm's cost of production and profit.

Practice Problems

Lee, a programmer, earned $35,000 in 2015, but in 2016, he began to manufacture body boards. After one year, he submitted the following data to his accountant.

- He stopped renting out his cottage for $3,500 a year and used it as his factory. The market value of the cottage increased from $70,000 to $71,000.
- He spent $50,000 on materials, phone, utilities, etc.
- He leased machines for $10,000 a year.
- He paid $15,000 in wages.
- He used $10,000 from his savings account, which pays 5 percent a year interest.
- He borrowed $40,000 at 10 percent a year from the bank.
- He sold $160,000 worth of body boards.
- Normal profit is $25,000 a year.

1. Calculate Lee's explicit costs, implicit costs, and economic profit in 2016.
2. Lee's accountant recorded the depreciation on Lee's cottage during 2016 as $7,000. What did the accountant say Lee's profit or loss was in 2016?

In the News

What does it cost to make 100 pairs of running shoes?
An Asian manufacturer of running shoes pays its workers $275 to make 100 pairs an hour. Workers use company-owned equipment that costs $300 an hour in forgone interest and economic depreciation. Materials cost $900.

Source: washpost.com

Which costs are explicit costs? Which are implicit costs? With total revenue from the sale of 100 pairs of shoes of $1,650, calculate economic profit.

Solutions to Practice Problems

1. Lee's explicit costs are costs paid with money: $50,000 on materials, phone, utilities, etc; $10,000 on leased machines; $15,000 in wages; and $4,000 in bank interest. These items total $79,000.
   Lee's implicit costs are $35,000 in forgone wages; $3,500 in forgone rent; the $1,000 increase in the value of his cottage is economic depreciation of −$1,000; $500 in forgone interest; and $25,000 in normal profit. These items total $63,000.
   Economic profit equals total revenue ($160,000) minus total cost, which equals $79,000 + $63,000, or $142,000. So economic profit in 2016 was $160,000 − $142,000, or $18,000.
2. The accountant measures Lee's profit as total revenue minus explicit costs minus depreciation: $160,000−$79,000−$7,000, or $74,000.

Solution to In the News

Explicit costs are wages ($275) and materials ($900). Implicit costs are the forgone interest and economic depreciation ($300). Economic profit equals total revenue ($1,650) minus total cost ($1,475), which is $175.

MyEconLab Concept Video

SHORT RUN AND LONG RUN

The main goal of this chapter is to explore the influences on a firm's costs. The key influence on cost is the quantity of output that the firm produces per period. The greater the output rate, the higher is the total cost of production. But the effect of a change in production on cost depends on how soon the firm wants to act. A firm that plans to change its output rate tomorrow has fewer options than a firm that plans ahead and intends to change its production six months from now.

To study the relationship between a firm's output decision and its costs, we distinguish between two decision time frames:

- The short run
- The long run

The Short Run: Fixed Plant

Short run
The time frame in which the quantities of some resources are fixed. In the short run, a firm can usually change the quantity of labor it uses but not its technology and quantity of capital.

The **short run** is the time frame in which the quantities of some resources are fixed. For most firms, the fixed resources are the firm's technology and capital—its equipment and buildings. The management organization is also fixed in the short run. The fixed resources that a firm uses are its *fixed factors of production* and the resources that it can vary are its *variable factors of production*. The collection of fixed resources is the firm's *plant*. So in the short run, a firm's plant is fixed.

Sam's Smoothies' plant is its blenders, refrigerators, and shop. Sam's cannot change these inputs in the short run. An electric power utility can't change the number of generators it uses in the short run. An airport can't change the number of runways, terminal buildings, and traffic-control facilities in the short run.

To increase output in the short run, a firm must increase the quantity of variable factors it uses. Labor is usually the variable factor of production. To produce more smoothies, Sam must hire more labor. Similarly, to increase the production of electricity, a utility must hire more engineers and run its generators for longer hours. To increase the volume of traffic it handles, an airport must hire more check-in clerks, cargo handlers, and air-traffic controllers.

Short-run decisions are easily reversed. A firm can increase or decrease output in the short run by increasing or decreasing the number of labor hours it hires.

The Long Run: Variable Plant

Long run
The time frame in which the quantities of *all* resources can be varied.

The **long run** is the time frame in which the quantities of *all* resources can be varied. That is, the long run is a period in which the firm can change its *plant*.

To increase output in the long run, a firm can increase the size of its plant. Sam's Smoothies can install more blenders and refrigerators and increase the size of its shop. An electric power utility can install more generators. And an airport can build more runways, terminals, and traffic-control facilities.

Long-run decisions are not easily reversed. Once a firm buys a new plant, its resale value is usually much less than the amount the firm paid for it. The fall in value is economic depreciation. It is called a *sunk cost* to emphasize that it is irrelevant to the firm's decisions. Only the short-run cost of changing its labor inputs and the long-run cost of changing its plant size are relevant to a firm's decisions.

We're going to study costs in the short run and the long run. We begin with the short run and describe the limits to the firm's production possibilities.

10.2 SHORT-RUN PRODUCTION

MyEconLab Concept Video

To increase the output of a fixed plant, a firm must increase the quantity of labor it employs. We describe the relationship between output and the quantity of labor employed by using three related concepts:

- Total product
- Marginal product
- Average product

Total Product

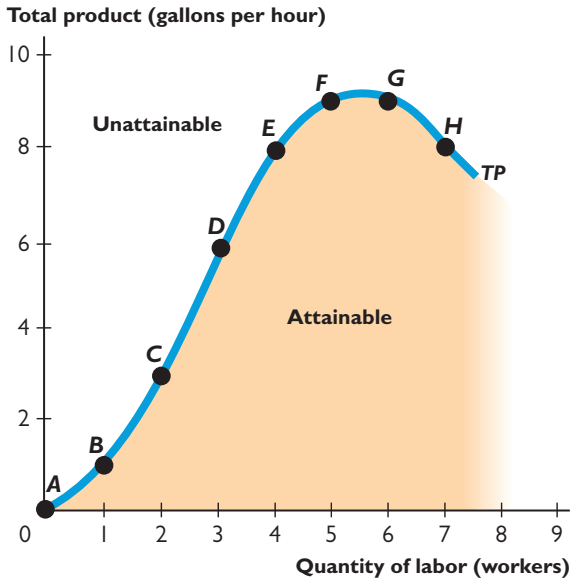
Total product (*TP*) is the total quantity of a good produced in a given period. Total product is an output *rate*—the number of units produced per unit of time (for example, per hour, day, or week). Total product changes as the quantity of labor employed increases and we illustrate this relationship as a total product schedule and total product curve like those in Figure 10.2. The total product schedule (the table below the graph) lists the maximum quantity of smoothies per hour that Sam can produce with her existing plant at each quantity of labor. Points *A* through *H* on the *TP* curve correspond to the columns in the table.

Total product
The total quantity of a good produced in a given period.

FIGURE 10.2

Total Product Schedule and Total Product Curve

MyEconLab Animation



Quantity of labor (workers)	0	1	2	3	4	5	6	7
Total product (gallons per hour)	0	1	3	6	8	9	9	8
	A	***B***	***C***	***D***	***E***	***F***	***G***	***H***

The total product schedule shows how the quantity of smoothies that Sam's can produce changes as the quantity of labor employed changes. In column *C*, Sam's employs 2 workers and can produce 3 gallons of smoothies an hour.

The total product curve, *TP*, graphs the data in the table. Points *A* through *H* on the curve correspond to the columns of the table. The total product curve separates attainable outputs from unattainable outputs. Points below the *TP* curve are inefficient. Points on the *TP* curve are efficient.

Like the *production possibilities frontier* (see Chapter 3, p. 62), the total product curve separates attainable outputs from unattainable outputs. All the points that lie above the curve are unattainable. Points that lie below the curve, in the orange area, are attainable, but they are inefficient: They use more labor than is necessary to produce a given output. Only the points *on* the total product curve are efficient.

Marginal Product

Marginal product
The change in total product that results from a one-unit increase in the quantity of labor employed.

Marginal product (*MP*) is the change in total product that results from a one-unit increase in the quantity of labor employed. It tells us the contribution to total product of adding one additional worker. When the quantity of labor increases by more than one worker, we calculate marginal product as

Marginal product = Change in total product ÷ Change in quantity of labor.

Figure 10.3 shows Sam's Smoothies' marginal product curve, *MP*, and its relationship with the total product curve. You can see that as the quantity of labor increases from 1 to 3 workers, marginal product increases. But as more than 3 workers are employed, marginal product decreases. When the seventh worker is employed, marginal product is negative.

Notice that the steeper the slope of the total product curve in part (a), the greater is marginal product in part (b). And when the total product curve turns downward in part (a), marginal product is negative in part (b).

The total product curve and marginal product curve in Figure 10.3 incorporate a feature that is shared by all production processes in firms as different as the Ford Motor Company, Jim's Barber Shop, and Sam's Smoothies:

- Increasing marginal returns initially
- Decreasing marginal returns eventually

Increasing Marginal Returns

Increasing marginal returns
When the marginal product of an additional worker exceeds the marginal product of the previous worker.

Increasing marginal returns occur when the marginal product of an additional worker exceeds the marginal product of the previous worker. The source of increasing marginal returns is increased specialization and greater division of labor in the production process.

For example, if Samantha employs just one worker, that person must learn all the aspects of making smoothies: running the blender, cleaning it, fixing breakdowns, buying and checking the fruit, and serving the customers. That one person must perform all these tasks.

If Samantha hires a second person, the two workers can specialize in different parts of the production process. As a result, two workers can produce more than twice as much as one worker. The marginal product of the second worker is greater than the marginal product of the first worker. Marginal returns are increasing. Most production processes experience increasing marginal returns initially.

Decreasing Marginal Returns

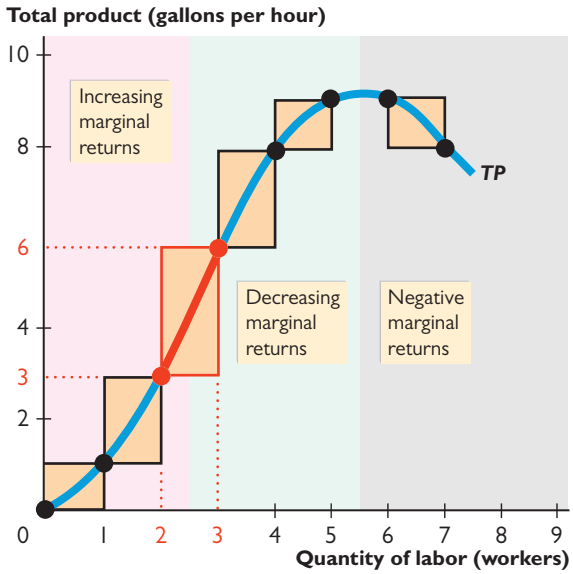
Decreasing marginal returns
When the marginal product of an additional worker is less than the marginal product of the previous worker.

All production processes eventually reach a point of *decreasing* marginal returns. **Decreasing marginal returns** occur when the marginal product of an additional worker is less than the marginal product of the previous worker. Decreasing marginal returns arise from the fact that more and more workers use the same equipment and work space. As more workers are employed, there is less and less that is productive for the additional worker to do. For example, if Samantha hires a

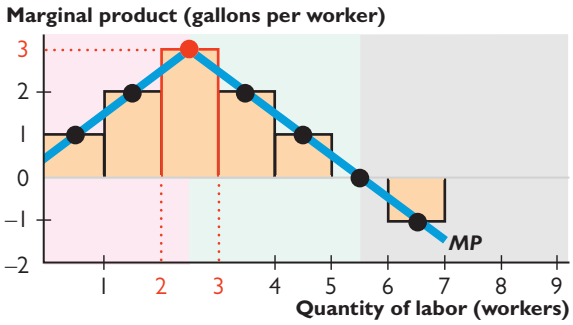
FIGURE 10.3

Total Product and Marginal Product

MyEconLab Animation



(a) Total product curve



(b) Marginal product curve

Quantity of labor (workers)	0	1	2	3	4	5	6	7
Total product (gallons per hour)	0	1	3	6	8	9	9	8
Marginal product (gallons per worker)		1	2	3	2	1	0	–1

The table calculates marginal product, and the orange bars illustrate it. When labor increases from 2 to 3 workers, total product increases from 3 gallons to 6 gallons of smoothies an hour. So marginal product is the orange bar whose height is 3 gallons (in both parts of the figure).

In part (b), marginal product is graphed midway between the labor inputs to emphasize that marginal product is the result of *changing* the labor input. Marginal product increases to a maximum (when 3 workers are employed in this example) and then declines—diminishing marginal product.

fourth worker, output increases but not by as much as it did when she hired the third worker. In this case, three workers exhaust all the possible gains from specialization and the division of labor. By hiring a fourth worker, Sam's produces more smoothies per hour, but the equipment is being operated closer to its limits. Sometimes the fourth worker has nothing to do because the machines are running without the need for further attention.

Hiring yet more workers continues to increase output but by successively smaller amounts until Samantha hires the sixth worker, at which point total product

stops rising. Add a seventh worker, and the workplace is so congested that the workers get in each other's way and total product falls.

Decreasing marginal returns are so pervasive that they qualify for the status of a law: the **law of decreasing returns**, which states that

Law of decreasing returns
As a firm uses more of a variable factor of production, with a given quantity of fixed factors, the marginal product of the variable factor eventually decreases.

As a firm uses more of a variable factor of production, with a given quantity of fixed factors of production, the marginal product of the variable factor eventually decreases.

Average Product

Average product (*AP*) is the total product per worker employed. It is calculated as

Average product = Total product ÷ Quantity of labor.

Average product
Total product divided by the quantity of a factor of production. The average product of labor is total product divided by the quantity of labor employed.

Another name for average product is *productivity*.

Figure 10.4 shows the average product of labor, *AP*, and the relationship between average product and marginal product. Average product increases from 1 to 3 workers (its maximum value) but then decreases as yet more workers are employed. Notice also that average product is largest when average product and marginal product are equal. That is, the marginal product curve cuts the average

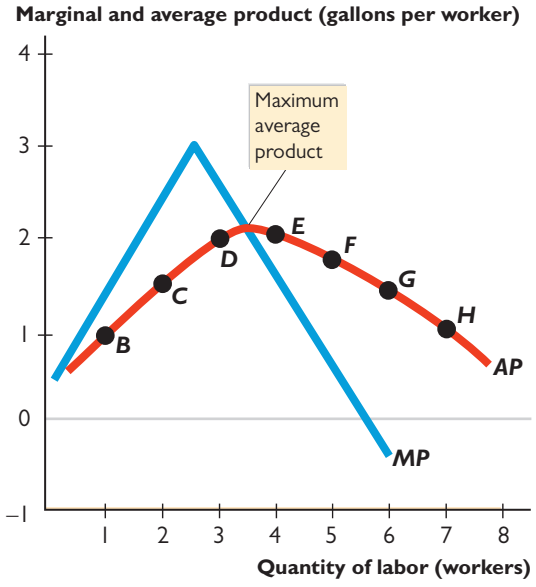
FIGURE 10.4
Average Product and Marginal Product
MyEconLab Animation

The table calculates average product. For example, when the quantity of labor is 3 workers, total product is 6 gallons an hour, so average product is 6 gallons ÷ 3 workers, which equals 2 gallons per worker.

The average product curve is *AP*.

For the quantity of labor at which marginal product *exceeds* average product, average product is *increasing* and the *AP* curve is upward sloping.

For the quantity of labor at which marginal product is *less than* average product, average product is *decreasing* and the *AP* curve is downward sloping.



Quantity of labor (workers)	0	1	2	3	4	5	6	7
Total product (gallons per hour)	0	1	3	6	8	9	9	8
Marginal product (gallons per worker)		1	2	3	2	1	0	−1
Average product (gallons per worker)		1.0	1.5	2.0	2.0	1.8	1.5	1.1
		B	*C*	*D*	*E*	*F*	*G*	*H*

product curve at the point of maximum average product. For employment levels at which marginal product exceeds average product, the average product curve slopes upward and average product increases as more labor is employed. For employment levels at which marginal product is less than average product, the average product curve slopes downward and average product decreases as more labor is employed.

The relationship between average product and marginal product is a general feature of the relationship between the average value and the marginal value of any variable. *Eye on Your Life* looks at a familiar example.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Your Average and Marginal Grades

Jen, a part-time student, takes one course each semester over five semesters. In the first semester, she takes calculus and her grade is a C (2). This grade is her marginal grade. It is also her average grade—her GPA.

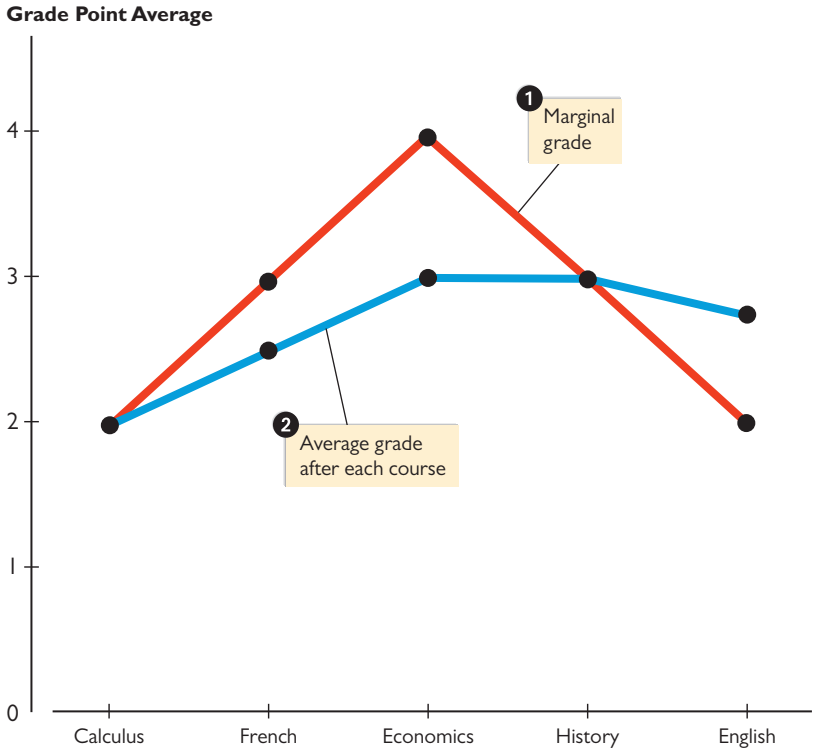
In the next semester, Jen takes French and gets a B (3)—her new marginal grade. When the marginal value exceeds the average value, the average rises. Because Jen's marginal grade exceeds her average grade, the marginal grade pulls her average up. Her GPA rises to 2.5.

In the third semester, Jen takes economics and gets an A (4). Again her marginal grade exceeds her average, so the marginal grade pulls her average up. Jen's GPA is now 3—the average of 2, 3, and 4.

In the fourth semester, she takes history and gets a B (3). Now her marginal grade equals her average. When the marginal value equals the average value, the average doesn't change. So Jen's average remains at 3.

In the fifth semester, Jen takes English and gets a C (2). When the marginal value is below the average value, the average falls. Because Jen's marginal grade, 2, is below her average of 3, the marginal grade pulls the average down. Her GPA falls.

This relationship between Jen's ❶ marginal grade and ❷ average grade is similar to the relationship between marginal product and average product.



MyEconLab Study Plan 10.2
Key Terms Quiz
Solutions Video

CHECKPOINT 10.2

Explain the relationship between a firm's output and labor employed in the short run.

Practice Problems

Tom leases a farmer's field and grows pineapples. Tom hires students to pick and pack the pineapples. Table 1 sets out Tom's total product schedule.

TABLE 1

Labor (students)	Total product (pineapples per day)
0	0
1	100
2	220
3	300
4	360
5	400
6	420
7	430

1. Calculate the marginal product of the third student and the average product of three students.
2. Over what range of numbers of students does marginal product increase?
3. When marginal product increases, is average product greater than, less than, or equal to marginal product?

In the News

Deere, struggling with sales, to lay off 220
Deere & Co. plans to lay off 220 workers and decrease its output of farm equipment.

Source: *The Wall Street Journal*, November 30, 2015

If Deere & Co. is operating at maximum total product before it cuts its workforce, how will the marginal product of a worker change in the short run?

Solutions to Practice Problems

1. The marginal product of the third student is the change in total product that results from hiring the third student. When Tom hires 2 students, total product is 220 pineapples a day. When Tom hires 3 students, total product is 300 pineapples a day. Marginal product of the third student is the total product of 3 students minus the total product of 2 students, which is 300 pineapples − 220 pineapples or 80 pineapples a day.
   Average product equals total product divided by the number of students. When Tom hires 3 students, total product is 300 pineapples a day, so average product is 300 pineapples ÷ 3 students, which equals 100 pineapples per student.
2. Marginal product of the first student is 100 pineapples a day, of the second student is 120 pineapples a day, and of the third is 80 pineapples a day. So marginal product increases when Tom hires the first and second students.
3. When Tom hires 1 student, marginal product is 100 pineapples and average product is 100 pineapples per student. When Tom hires 2 students, marginal product is 120 pineapples and average product is 110 pineapples per student. When Tom hires the second student, marginal product is increasing and average product is less than marginal product.

Solution to In the News

As Deere cuts its workforce, output at the plant will decrease as Deere slides back down along its total product curve. At the same time, Deere's marginal product will increase in the short run (see Fig 10.3 on p. 259).

10.3 SHORT-RUN COST

MyEconLab Concept Video

To produce more output (total product) in the short run, a firm must employ more labor, which means that it must increase its costs. We describe the relationship between output and cost using three cost concepts:

- Total cost
- Marginal cost
- Average cost

Total Cost

A firm's **total cost** (*TC*) is the cost of all the factors of production used by the firm. Total cost divides into two parts: total fixed cost and total variable cost. **Total fixed cost** (*TFC*) is the cost of a firm's fixed factors of production: land, capital, and entrepreneurship. In the short run, the quantities of these inputs don't change as output changes, so total fixed cost doesn't change as output changes. **Total variable cost** (*TVC*) is the cost of a firm's variable factor of production—labor. To change its output in the short run, a firm must change the quantity of labor it employs, so total variable cost changes as output changes.

Total cost
The cost of all the factors of production used by a firm.

Total fixed cost
The cost of the firm's fixed factors of production—the cost of land, capital, and entrepreneurship.

Total variable cost
The cost of the firm's variable factor of production—the cost of labor.

Total cost is the sum of total fixed cost and total variable cost. That is,

$$TC = TFC + TVC.$$

Table 10.2 shows Sam's Smoothies' total costs. Sam's fixed costs are $20 an hour regardless of whether it operates or not—*TFC* is $20 an hour. To produce smoothies, Samantha hires labor, which costs $12 an hour. *TVC* equals the number of workers multiplied by $12 per hour. For example, to produce 6 gallons an hour, Samantha hires 3 workers, so *TVC* is $36. *TVC* increases as output increases. *TC* is the sum of *TFC* and *TVC*. So to produce 6 gallons an hour, *TC* is $56 an hour. Check the calculation in each row and note that to produce some outputs—2 gallons an hour, for example—Sam hires a worker for only part of an hour.

TABLE 10.2

Sam's Smoothies' Total Costs

Labor (workers per hour)	Output (gallons per hour)	Total fixed cost	Total variable cost	Total cost
		(dollars per hour)		
0	0	20	0	20.00
1.00	1	20	12.00	32.00
1.60	2	20	19.20	39.20
2.00	3	20	24.00	44.00
2.35	4	20	28.20	48.20
2.65	5	20	31.80	51.80
3.00	6	20	36.00	56.00
3.40	7	20	40.80	60.80
4.00	8	20	48.00	68.00
5.00	9	20	60.00	80.00

Sam's fixed factors of production are land, capital, and entrepreneurship. Total fixed cost is constant regardless of the quantity produced. Sam's variable factor of production is labor. Total variable cost is the cost of labor. Total cost is the sum of total fixed cost and total variable cost.

The highlighted row shows that to produce 6 gallons of smoothies, Sam's hires 3 workers. Total fixed cost is $20 an hour. Total variable cost is the cost of the 3 workers. At $12 an hour, 3 workers cost $36. Sam's total cost of producing 6 gallons an hour is $20 plus $36, which equals $56.

Figure 10.5 illustrates Sam's total cost curves. The green total fixed cost curve (*TFC*) is horizontal because total fixed cost does not change when output changes. It is a constant $20 an hour. The purple total variable cost curve (*TVC*) and the blue total cost curve (*TC*) both slope upward because variable cost increases as output increases. The arrows highlight total fixed cost as the vertical distance between the *TVC* and *TC* curves.

Let's now look at Sam's Smoothies' marginal cost.

Marginal Cost

In Figure 10.5, total variable cost and total cost increase at a decreasing rate at small levels of output and then begin to increase at an increasing rate as output increases. To understand these patterns in the changes in total cost, we need to use the concept of *marginal cost*.

Marginal cost
The change in total cost that results from a one-unit increase in output.

A firm's **marginal cost** is the change in total cost that results from a one-unit increase in output. Table 10.3 on p. 265 calculates the marginal cost for Sam's Smoothies. When, for example, output increases from 5 gallons to 6 gallons an hour, total cost increases from $51.80 to $56. So the marginal cost of this gallon of smoothies is ($56 − $51.80), or $4.20. Notice that marginal cost is located midway between the total costs to emphasize that it is the result of *changing* outputs.

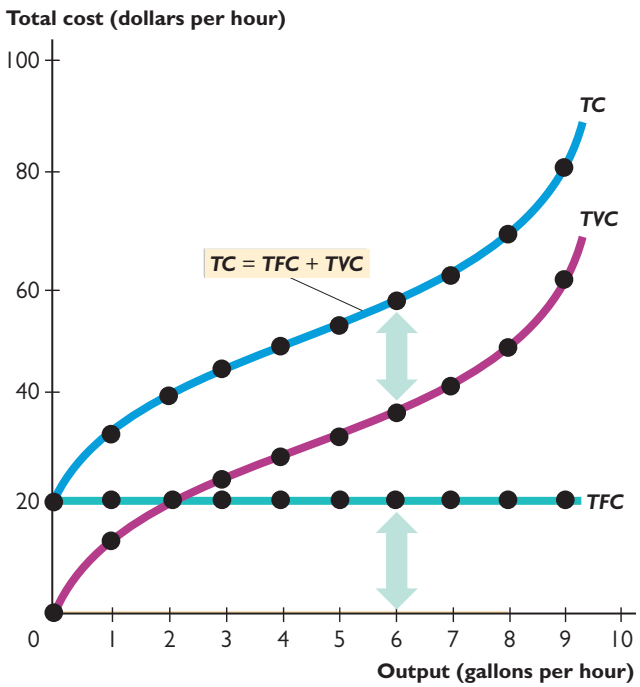
Marginal cost tells us how total cost changes as output changes. The final cost concept tells us what it costs, on average, to produce a unit of output. Let's now look at Sam's average costs.

FIGURE 10.5
Total Cost Curves at Sam's Smoothies

MyEconLab Animation

Total fixed cost (*TFC*) is constant—it graphs as a horizontal line—and total variable cost (*TVC*) increases as output increases. Total cost (*TC*) also increases as output increases.

The vertical distance between the total cost curve and the total variable cost curve is total fixed cost, as illustrated by the two arrows.



Average Cost

There are three average cost concepts:

- Average fixed cost
- Average variable cost
- Average total cost

Average fixed cost (*AFC*) is total fixed cost per unit of output. **Average variable cost** (*AVC*) is total variable cost per unit of output. **Average total cost** (*ATC*) is total cost per unit of output. The average cost concepts are calculated from the total cost concepts as follows:

$$TC = TFC + TVC.$$

Divide each total cost term by the quantity produced, Q, to give

$$\frac{TC}{Q} = \frac{TFC}{Q} + \frac{TVC}{Q}.$$

or

$$ATC = AFC + AVC$$

Table 10.3 shows these average costs. For example, when output is 6 gallons an hour, *AFC* is ($20 ÷ 6), which equals $3.33; *AVC* is ($36 ÷ 6), which equals $6.00; and *ATC* is ($56 ÷ 6), which equals $9.33. Note that *ATC* ($9.33) equals *AFC* ($3.33) plus *AVC* ($6.00).

Average fixed cost
Total fixed cost per unit of output.

Average variable cost
Total variable cost per unit of output.

Average total cost
Total cost per unit of output, which equals average fixed cost plus average variable cost.

TABLE 10.3

Sam's Smoothies' Marginal Cost and Average Cost

Output (gallons per hour)	Total cost (dollars per hour)	Marginal cost (dollars per gallon)	Average fixed cost	Average variable cost	Average total cost
			(dollars per gallon)		
0	20.00		–	–	–
		12.00			
1	32.00		20.00	12.00	32.00
		7.20			
2	39.20		10.00	9.60	19.60
		4.80			
3	44.00		6.67	8.00	14.67
		4.20			
4	48.20		5.00	7.05	12.05
		3.60			
5	51.80		4.00	6.36	10.36
		4.20			
6	56.00		3.33	6.00	9.33
		4.80			
7	60.80		2.86	5.83	8.69
		7.20			
8	68.00		2.50	6.00	8.50
		12.00			
9	80.00		2.22	6.67	8.89

To produce 6 gallons of smoothies an hour, Sam's total cost is $56. Table 10.2 shows that this total cost is the sum of total fixed cost ($20) and total variable cost ($36).

Marginal cost is the increase in total cost that results from a one-unit increase in output. When Sam's increases output from 5 gallons to 6 gallons an hour, total cost increases from $51.80 to $56.00, an increase of $4.20 a gallon. The marginal cost of the sixth gallon an hour is $4.20. Marginal cost is located midway between the total costs to emphasize that it is the result of *changing* output.

When Sam's produces 6 gallons an hour, average fixed cost ($20 ÷ 6 gallons) is $3.33 a gallon; average variable cost ($36 ÷ 6 gallons) is $6.00 a gallon; average total cost ($56 ÷ 6 gallons) is $9.33 a gallon.

Figure 10.6 graphs the marginal cost and average cost data in Table 10.3. The red marginal cost curve (*MC*) is U-shaped because of the way in which marginal product changes. Recall that when Samantha hires a second or a third worker, marginal product increases and output increases to 6 gallons an hour (Figure 10.3 on p. 259). Over this output range, marginal cost decreases as output increases. When Samantha hires a fourth or a fifth worker, marginal product decreases but output increases up to 9 gallons an hour (Figure 10.3). Over this output range, marginal cost increases as output increases.

The green average fixed cost curve (*AFC*) slopes downward. As output increases, the same constant total fixed cost is spread over a larger output. The blue average total cost curve (*ATC*) and the purple average variable cost curve (*AVC*) are U-shaped. The vertical distance between the average total cost and average variable cost curves is equal to average fixed cost—as indicated by the two arrows. That distance shrinks as output increases because average fixed cost decreases with increasing output.

The marginal cost curve intersects the average variable cost curve and the average total cost curve at their minimum points. That is, when marginal cost is less than average cost, average cost is decreasing; and when marginal cost exceeds average cost, average cost is increasing. This relationship holds for both the *ATC* curve and the *AVC* curve and is another example of the relationship you saw in Figure 10.4 for average product and marginal product.

FIGURE 10.6

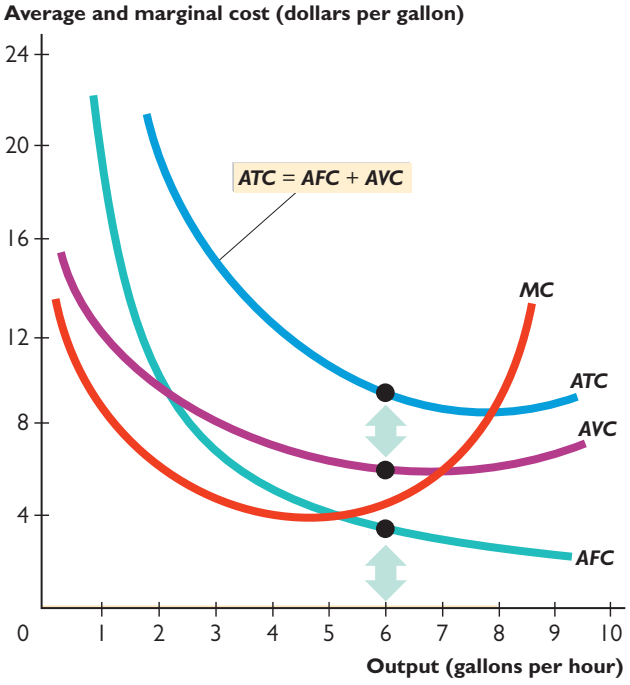
Average Cost Curves and Marginal Cost Curve at Sam's Smoothies

MyEconLab Animation

Average fixed cost decreases as output increases. The average fixed cost curve (*AFC*) slopes downward.

The average total cost curve (*ATC*) and average variable cost curve (*AVC*) are U-shaped. The vertical distance between these two curves is equal to average fixed cost, as illustrated by the two arrows.

Marginal cost is the change in total cost when output increases by one unit. The marginal cost curve (*MC*) is U-shaped and intersects the average variable cost curve (*AVC*) and the average total cost curve (*ATC*) at their minimum points.



Why the Average Total Cost Curve Is U-Shaped

MyEconLab Concept Video

Average total cost, *ATC*, is the sum of average fixed cost, *AFC*, and average variable cost, *AVC*. So the shape of the *ATC* curve combines the shapes of the *AFC* and *AVC* curves. The U shape of the average total cost curve arises from the influence of two opposing forces:

- Spreading total fixed cost over a larger output
- Decreasing marginal returns

When output increases, the firm spreads its total fixed costs over a larger output and its average fixed cost decreases—its average fixed cost curve slopes downward.

Decreasing marginal returns means that as output increases, ever larger amounts of labor are needed to produce an additional unit of output. So average variable cost eventually increases, and the *AVC* curve eventually slopes upward.

The shape of the average total cost curve combines these two effects. Initially, as output increases, both average fixed cost and average variable cost decrease, so average total cost decreases and the *ATC* curve slopes downward. But as output increases further and decreasing marginal returns sets in, average variable cost begins to increase. Eventually, average variable cost increases more quickly than average fixed cost decreases, so average total cost increases and the *ATC* curve slopes upward.

All the short-run cost concepts that you've met are summarized in Table 10.4.

TABLE 10.4

A Compact Glossary of Costs

Term	Symbol	Definition	Equation
Fixed cost		**The cost of a fixed factor of production that is independent of the quantity produced**	
Variable cost		**The cost of a variable factor of production that varies with the quantity produced**	
Total fixed cost	***TFC***	**Cost of the fixed factors of production**	
Total variable cost	***TVC***	**Cost of the variable factor of production**	
Total cost	***TC***	**Cost of all factors of production**	$TC = TFC + TVC$
Marginal cost	***MC***	**Change in total cost resulting from a one-unit increase in output (*Q*)**	$MC = \Delta TC \div \Delta Q^*$
Average fixed cost	***AFC***	**Total fixed cost per unit of output**	$AFC = TFC \div Q$
Average variable cost	***AVC***	**Total variable cost per unit of output**	$AVC = TVC \div Q$
Average total cost	***ATC***	**Total cost per unit of output**	$ATC = AFC + AVC$

*In this equation, the Greek letter delta (Δ) stands for "change in."

Cost Curves and Product Curves

A firm's cost curves and product curves are linked, and Figure 10.7 shows how. The upper graph shows the average product curve, *AP*, and the marginal product curve, *MP*. The lower graph shows the average variable cost curve, *AVC*, and the marginal cost curve, *MC*.

As labor increases up to 2.5 workers a day (upper graph), output increases to 4 units a day (lower graph). Marginal product and average product rise and marginal cost and average variable cost fall. At the point of maximum marginal product, marginal cost is at a minimum.

As labor increases to 3.5 workers a day (upper graph), output increases to 7 units a day (lower graph). Marginal product falls and marginal cost rises, but average product continues to rise and average variable cost continues to fall. At the point of maximum average product, average variable cost is at a minimum. As labor increases further, output increases. Average product diminishes and average variable cost increases.

Shifts in the Cost Curves

The position of a firm's short-run cost curves, in Figures 10.5 and 10.6, depends on two factors:

- Technology
- Prices of factors of production

Technology

A technological change that increases productivity shifts the total product curve upward. It also shifts the marginal product curve and the average product curve upward. With a better technology that increases productivity, the same factors of production can produce more output, so an advance in technology lowers the average and marginal costs and shifts the short-run cost curves downward.

For example, advances in robotic technology have increased productivity in the automobile industry. As a result, the product curves of Chrysler, Ford, and GM have shifted upward, and their average and marginal cost curves have shifted downward. But the relationships between their product curves and cost curves have not changed. The curves are still linked, as in Figure 10.7.

Often a technological advance results in a firm using more capital, a fixed factor of production, and less labor, a variable factor of production. For example, today telephone companies use computers to connect long-distance calls instead of the human operators they used in the 1980s. When a telephone company makes this change, total variable cost decreases and total cost decreases, but total fixed cost increases. This change in the mix of fixed cost and variable cost means that at small output levels, average total cost might increase, but at large output levels, average total cost decreases.

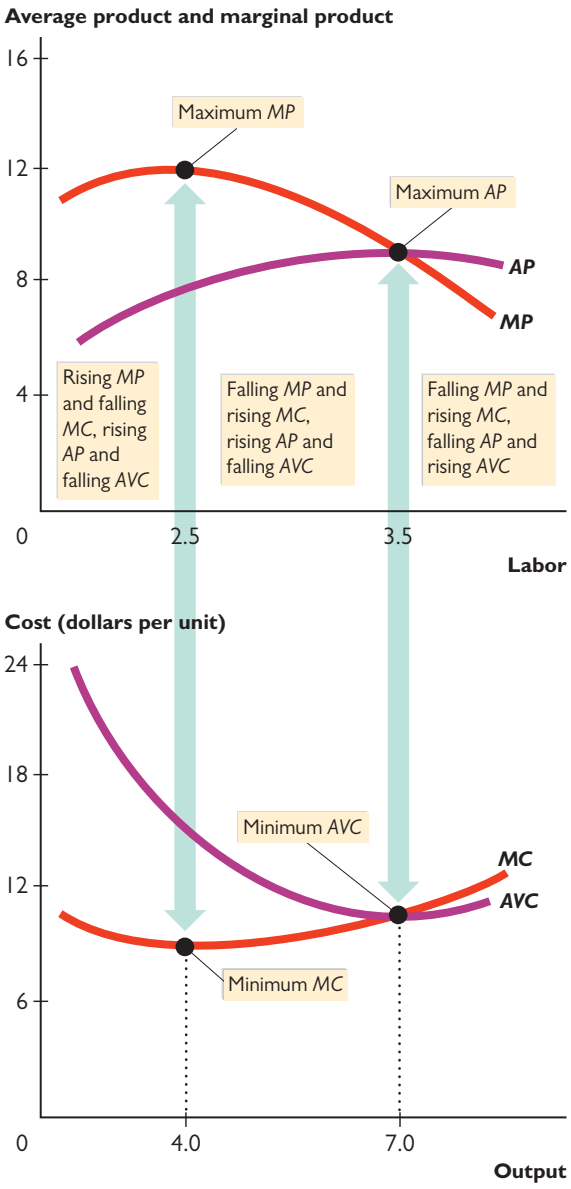
Prices of Factors of Production

An increase in the price of a factor of production increases costs and shifts the cost curves. But how the curves shift depends on which resource price changes. An increase in rent or some other component of *fixed* cost shifts the fixed cost curves (*TFC* and *AFC*) upward and shifts the total cost curve (*TC*) upward but leaves the variable cost curves (*AVC* and *TVC*) and the marginal cost curve (*MC*) unchanged.

FIGURE 10.7

Product Curves and Cost Curves

MyEconLab Animation



A firm's *MC* curve is linked to its *MP* curve. If, as the firm hires more labor up to 2.5 workers a day, the firm's marginal product rises, its marginal cost falls. If marginal product is at a maximum, marginal cost is at a minimum. If, as the firm hires more labor, its marginal product diminishes, its marginal cost rises.

A firm's *AVC* curve is linked to its *AP* curve. If, as the firm hires more labor up to 3.5 workers a day, its average product rises, its average variable cost falls. If average product is at a maximum, average variable cost is at a minimum. If as the firm hires more labor its average product diminishes, its average variable cost rises.

An increase in wage rates or some other component of *variable* cost shifts the variable cost curves (*TVC* and *AVC*) and the marginal cost curve (*MC*) upward but leaves the fixed cost curves (*AFC* and *TFC*) unchanged. So, for example, if the interest expense paid by a trucking company increases, the fixed cost of transportation services increases, but if the wage rate paid to truck drivers increases, the variable cost and marginal cost of transportation services increase.

MyEconLab Study Plan 10.3
Key Terms Quiz
Solutions Video

CHECKPOINT 10.3

Explain the relationship between a firm's output and costs in the short run.

Practice Problems

Tom leases a farmer's field for $120 a day and grows pineapples. He pays students $100 a day each to pick pineapples and he leases capital at $80 a day. Table 1 shows Tom's daily output.

TABLE 1

Labor (students)	Output (pineapples per day)
0	0
1	100
2	220
3	300
4	360
5	400
6	420
7	430

1. What is Tom's total cost and average total cost of 300 pineapples a day?
2. What is the marginal cost of picking a pineapple when the quantity increases from 360 to 400 pineapples a day?
3. At what output is Tom's average total cost a minimum?

In the News

Colorado companies plan to hire in 2016
Nearly a quarter of Denver-area technology executives plan to increase production and add new positions in 2016.

Source: *Denver Business Journal*, December 21, 2015

Explain how increasing production by adding new positions changes a Denver-area firm's short-run average cost and marginal cost. How will the firm's short-run average cost curve and marginal cost curve change if the wage rate rises?

Solutions to Practice Problems

TABLE 2

Labor	*TP*	*TC*	*MC*	*ATC*
0	0	200		–
			1.00	
1	100	300		3.00
			0.83	
2	220	400		1.82
			1.25	
3	300	500		1.67
			1.67	
4	360	600		1.67
			2.50	
5	400	700		1.75
			5.00	
6	420	800		1.90
			10.00	
7	430	900		2.09

1. Total cost is the sum of total fixed cost and total variable cost. Tom leases the field for $120 a day and capital for $80 a day, so Tom's total fixed cost is $200 a day. Total variable cost is the wages of the students. To produce 300 pineapples a day, Tom hires 3 students, so total variable cost is $300 a day and total cost is $500 a day. Table 2 shows the total cost (*TC*) schedule. Average total cost is the total cost divided by total product. The total cost of 300 pineapples a day is $500, so average total cost is $1.67 a pineapple. Table 2 shows the average total cost schedule.
2. Marginal cost is the increase in total cost that results from picking one additional pineapple a day. When the quantity picked increases from 360 to 400 pineapples a day, total cost (from Table 2) increases from $600 to $700. The increase in the number of pineapples is 40, and the increase in total cost is $100. Marginal cost is the increase in total cost ($100) divided by the increase in the number of pineapples (40), which is $2.50 per pineapple. So the marginal cost of a pineapple is $2.50.
3. At the minimum of average total cost, average total cost equals marginal cost. Minimum average total cost of a pineapple between 300 and 360 pineapples is $1.67. Table 2 shows that the marginal cost of increasing output from 300 to 360 pineapples a day is $1.67 a pineapple.

Solution to In the News

An increase in output and employment increases the firm's short-run average cost and marginal cost as the firm moves along its *ATC* and *MC* curves. If the wage rate rises, average cost and marginal cost increase at *all* output levels and the *MC*, *AVC*, and *ATC* curves shift upward.

10.4 LONG-RUN COST

MyEconLab Concept Video

In the long run, a firm can vary both the quantity of labor and the quantity of capital. A small firm, such as Sam's Smoothies, can increase its plant size by moving into a larger building and installing more machines. A big firm such as General Motors can decrease its plant size by closing down some production lines.

We are now going to see how costs vary in the long run when a firm varies its plant—the quantity of capital it uses—along with the quantity of labor it uses.

The first thing that happens is that the distinction between fixed cost and variable cost disappears. All costs are variable in the long run.

Plant Size and Cost

When a firm changes its plant size, its cost of producing a given output changes. In Table 10.3 on p. 265 and Figure 10.6 on p. 266, the lowest average total cost that Samantha can achieve is $8.50 a gallon, which occurs when she produces 8 gallons of smoothies an hour. Samantha wonders what would happen to her average total cost if she increased the size of her plant by renting a bigger building and installing a larger number of blenders and refrigerators. Will the average total cost of producing a gallon of smoothies fall, rise, or remain the same?

Each of these three outcomes is possible, and they arise because when a firm changes the size of its plant, it might experience

- Economies of scale
- Diseconomies of scale
- Constant returns to scale

Economies of Scale

Economies of scale are features of a firm's technology that make average total cost *fall* as the output rate increases. The main source of economies of scale is greater specialization of both labor and capital.

Economies of scale
Features of a firm's technology that make average total cost *fall* as output increases.

Specialization of Labor If Ford produced 100 cars a week, each production line worker would have to perform many different tasks. But if Ford produces 10,000 cars a week, each worker can specialize in a small number of tasks and become highly proficient at them. The result is that the average product of labor increases and the average total cost of producing a car falls.

Specialization also occurs off the production line. For example, a small firm usually does not have a specialist sales manager, personnel manager, and production manager. One person covers all these activities. But when a firm is large enough, specialists perform these activities. Average product increases, and the average total cost falls.

Specialization of Capital At a small output rate, firms often must employ general-purpose machines and tools. For example, with an output of a few gallons an hour, Sam's Smoothies uses regular blenders like the one in your kitchen. But if Sam's produces hundreds of gallons an hour, it uses commercial blenders that fill, empty, and clean themselves. The result is that the output rate is larger and the average total cost of producing a gallon of smoothies is lower.



Specialization of both labor and capital on an auto-assembly line.

Diseconomies of Scale

Diseconomies of scale
Features of a firm's technology that make average total cost *rise* as output increases.

Diseconomies of scale are features of a firm's technology that make average total cost *rise* as output increases. Diseconomies of scale arise from the difficulty of coordinating and controlling a large enterprise. The larger the firm, the greater is the cost of communicating both up and down the management hierarchy and among managers. Eventually, management complexity brings rising average total cost. Diseconomies of scale occur in all production processes but in some perhaps only at a very large output rate.

Constant Returns to Scale

Constant returns to scale
Features of a firm's technology that keep average total cost constant as output increases.

Constant returns to scale are features of a firm's technology that keep average total cost *constant* as output increases. Constant returns to scale occur when a firm is able to replicate its existing production facility including its management system. For example, Ford might double its production of Fusion cars by doubling its production facility for those cars. It can build an identical production line and hire an identical number of workers. With the two identical production lines, Ford produces exactly twice as many cars. The average total cost of producing a Fusion is identical in the two plants. Ford's average total cost remains constant as it increases production.

The Long-Run Average Cost Curve

Long-run average cost curve
A curve that shows the lowest average total cost at which it is possible to produce each output when the firm has had sufficient time to change both its plant size and labor employed.

The **long-run average cost curve** shows the lowest average total cost at which it is possible to produce each output when the firm has had sufficient time to change both its plant size and its labor force.

Figure 10.8 shows Sam's Smoothies' long-run average cost curve *LRAC*. This long-run average cost curve is derived from the short-run average total cost curves for different possible plant sizes.

With its current small plant, Sam's Smoothies operates on the average total cost curve ATC_1 in Figure 10.8. The other three average total cost curves are for

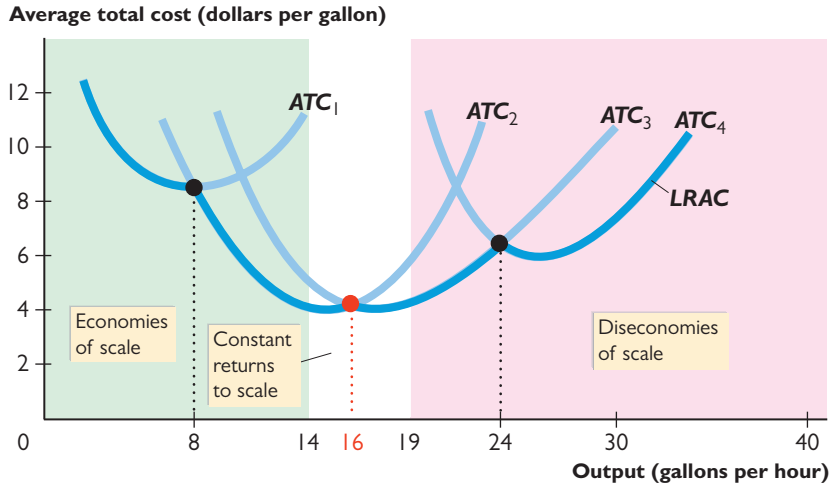
FIGURE 10.8

Long-Run Average Cost Curve

MyEconLab Animation

In the long run, Samantha can vary both the plant size and the quantity of labor she employs. The long-run average cost curve traces the lowest attainable average total cost of producing each output. The dark blue curve is the long-run average cost curve *LRAC*.

Sam's experiences economies of scale as output increases up to 14 gallons an hour, constant returns to scale for outputs between 14 gallons and 19 gallons an hour, and diseconomies of scale for outputs that exceed 19 gallons an hour.



successively bigger plants. In this example, for outputs up to 8 gallons an hour, the existing plant with average total cost curve ATC_1 produces smoothies at the lowest attainable average cost. For outputs between 8 and 16 gallons an hour, average total cost is lowest on ATC_2. For outputs between 16 and 24 gallons an hour, average total cost is lowest on ATC_3. And for outputs in excess of 24 gallons an hour, average total cost is lowest on ATC_4.

The segment of each of the four average total cost curves for which that plant has the lowest average total cost is highlighted in dark blue in Figure 10.8. The scallop-shaped curve made up of these four segments is Sam's Smoothies' long-run average cost curve.

Economies and Diseconomies of Scale

When economies of scale are present, the *LRAC* curve slopes downward. The *LRAC* curve in Figure 10.8 shows that Sam's Smoothies experiences economies of scale for output rates up to 14 gallons an hour. At output rates between 14 and 19 gallons an hour, the firm experiences constant returns to scale. And at output rates that exceed 19 gallons an hour, the firm experiences diseconomies of scale.



EYE on RETAILERS' COSTS

MyEconLab Critical Thinking Exercise

Which Store Has the Lower Costs: Walmart or 7-Eleven?

Walmart's "small" supercenters measure 99,000 square feet and serve an average of 30,000 customers a week. The average 7-Eleven store, most of which today are attached to gas stations, measures 2,000 square feet and serves 5,000 customers a week.

Which retailing technology has the lower operating cost? The answer depends on the scale of operation.

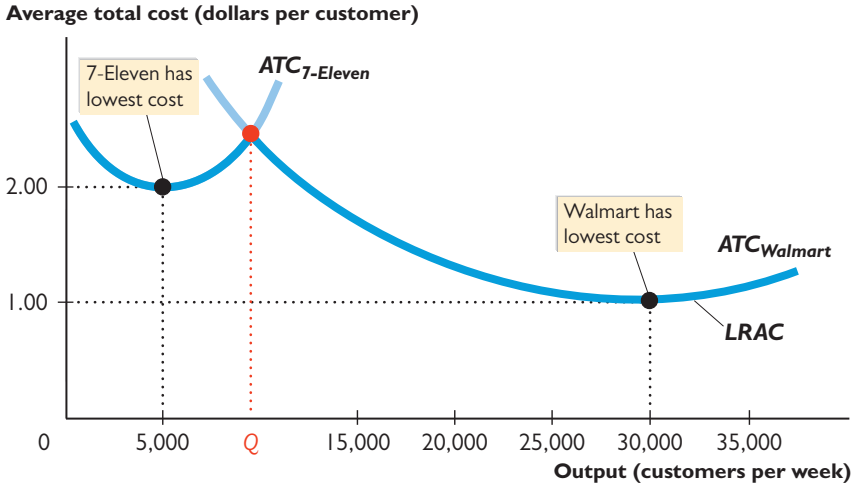
At a small number of customers per week, it costs less per customer to operate a store of 2,000 square feet than one of 99,000 square feet.

In the figure, the average total cost curve of operating a 7-Eleven store of 2,000 square feet is $ATC_{7\text{-}Eleven}$ and the average total cost curve of a store of 99,000 square feet is $ATC_{Walmart}$. The dark blue curve is a retailer's long-run average cost curve *LRAC*.

If the number of customers is *Q* a week, the average total cost per transaction is the same for both stores.

For a store that serves more than *Q* customers a week, the least-cost method is the big store.

For fewer than *Q* customers a week, the least-cost method is the small store. The least-cost store is not always the biggest store.



MyEconLab Study Plan 10.4
Key Terms Quiz
Solutions Video

CHECKPOINT 10.4

Derive and explain a firm's long-run average cost curve.

Practice Problems

To grow pineapples, Tom leases 1 field for $120 a day and capital for $80 a day and hires students at $100 a day each. Suppose that Tom now leases 2 fields for $240 a day and twice as much capital for $160 a day. Table 1 shows his outputs.

1. What is Tom's average total cost of a pinapple when he farms 2 fields and produces 220 pineapples a day?
2. Make a graph of Tom's average total cost curves using 1 field and 2 fields. Show on the graph Tom's long-run average cost curve. Over what output range will Tom use 1 field? 2 fields?
3. Does Tom experience constant returns to scale, economies of scale, or diseconomies of scale?

TABLE 1

Labor (students per day)	Output 1 field (pineapples per day)	Output 2 fields (pineapples per day)
0	0	0
1	100	220
2	220	460
3	300	620
4	360	740
5	400	820
6	420	860
7	430	880

In the News

Hiring spree at Tesla Motors

Bay Area-based electric car maker Tesla is looking to hire 1,648 workers to expand its model lineup, build a battery factory, and develop self-driving cars.

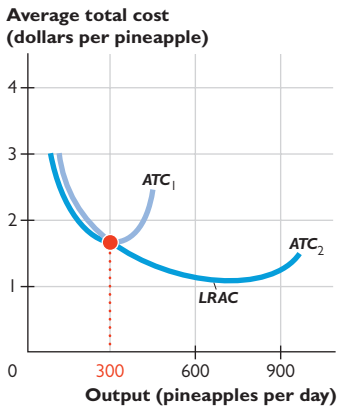
Source: *CBS San Francisco*, December 8, 2015

Explain the effects of the expansion plan on Tesla's total fixed cost, total variable cost, short-run *ATC* curve, and *LRAC* curve.

TABLE 2

TP (1 field)	*ATC* (1 field)	*TP* (2 fields)	*ATC* (2 fields)
100	3.00	220	2.27
220	1.82	460	1.30
300	1.67	620	1.13
360	1.67	740	1.08
400	1.75	820	1.10
420	1.90	860	1.16
430	2.09	880	1.25

FIGURE 1



Solutions to Practice Problems

1. Total cost equals fixed cost ($400 a day) plus $100 a day for each student. Tom can produce 220 pineapples with 2 fields and 1 student, so total cost is $500 a day. Average total cost is the total cost divided by output, which at 220 pineapples a day is $500 divided by 220, or $2.27. The "*ATC* (2 fields)" column of Table 2 shows Tom's average total cost schedule for 2 fields.
2. Figure 1 shows Tom's average total cost curve using 1 field as ATC_1. This curve graphs the data on *ATC* (1 field) and *TP* (1 field) in Table 2, which was calculated in Table 2 on p. 270. Using 2 fields, the average total cost curve is ATC_2. Tom's long-run average cost curve is the lower segments of the two *ATC* curves, highlighted in Figure 1. If Tom produces up to 300 pineapples a day, he will use 1 field. If he produces more than 300 pineapples a day, he will use 2 fields.
3. Tom experiences economies of scale up to an output of 740 pineapples a day because as he increases his plant and produces up to 740 pineapples a day, the average total cost of picking a pineapple decreases. (We don't have enough information to know what happens to Tom's average total cost if he uses three fields and three units of capital.)

Solution to In the News

Expanding the model lineup, building a battery factory, and developing a self-driving car will raise Tesla's total fixed cost; hiring 1,648 workers will raise Tesla's total variable cost. As Tesla increases output, it will move along its *ATC* curve. With a larger capacity, Tesla will move rightward along its *LRAC* curve.

CHAPTER SUMMARY

Key Points

1. Explain and distinguish between the economic and accounting measures of a firm's cost of production and profit.

- Firms seek to maximize economic profit, which is total revenue minus total cost.
- Total cost equals opportunity cost—the sum of explicit costs and implicit costs, which include normal profit.

2. Explain the relationship between a firm's output and labor employed in the short run.

- In the short run, the firm can change the output it produces by changing only the quantity of labor it employs.
- A total product curve shows the limits to the output that the firm can produce with a given quantity of capital and different quantities of labor.
- As the quantity of labor increases, the marginal product of labor increases initially but eventually decreases—the law of decreasing returns.

3. Explain the relationship between a firm's output and costs in the short run.

- As total product increases, total fixed cost is constant, and total variable cost and total cost increase.
- As total product increases, average fixed cost decreases; average variable cost, average total cost, and marginal cost decrease at small outputs and increase at large outputs so their curves are U-shaped.

4. Derive and explain a firm's long-run average cost curve.

- In the long run, the firm can change the size of its plant.
- Long-run cost is the cost of production when all inputs have been adjusted to produce at the lowest attainable cost.
- The long-run average cost curve traces out the lowest attainable average total cost at each output when both the plant size and labor can be varied.
- The long-run average cost curve slopes downward with economies of scale and upward with diseconomies of scale.

Key Terms

MyEconLab Key Terms Quiz

Average fixed cost, 265
Average product, 260
Average total cost, 265
Average variable cost, 265
Constant returns to scale, 272
Decreasing marginal returns, 258
Diseconomies of scale, 272
Economic depreciation, 253
Economic profit, 253
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Normal profit, 253
Short run, 256
Total cost, 263
Total fixed cost, 263
Total product, 257
Total variable cost, 263

MyEconLab Chapter 10 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. Joe runs a shoe shine stand at the airport. Joe has no skills, no job experience, and no alternative job. Entrepreneurs in the shoe shine business earn $10,000 a year. Joe pays the rent of $2,000 a year, and his total revenue is $15,000 a year. He borrowed $1,000 at 20 percent a year to buy equipment. At the end of one year, Joe was offered $500 for his business and all its equipment. Calculate Joe's annual explicit costs, implicit costs, and economic profit.

2. Len's body board factory rents equipment for shaping boards and hires students. Table 1 sets out Len's total product schedule. Construct Len's marginal product and average product schedules. Over what range of workers do marginal returns increase?

TABLE 1

Labor (workers per day)	Total product (body boards per day)
0	0
1	20
2	44
3	60
4	72

Use the following information to work Problems **3** to **6**.

Len's body board factory pays $60 a day for equipment and $200 a day to each student it hires. Table 1 sets out Len's total product schedule.

3. Construct Len's total variable cost and total cost schedules. What does the difference between total cost and total variable cost at each output equal?

4. Construct the average fixed cost, average variable cost, and average total cost schedules and the marginal cost schedule.

5. At what output is Len's average total cost at a minimum? At what output is Len's average variable cost at a minimum?

6. Explain why the output at which average variable cost is at a minimum is smaller than the output at which average total cost is at a minimum.

7. Table 2 shows the costs incurred at Pete's peanut farm. Complete the table.

TABLE 2

Labor	*TP*	*TVC*	*TC*	*AFC*	*AVC*	*ATC*	*MC*
0	0	0	100				
1	10	35					
2	24	70					
3	38	105					
4	44	140					

8. Gap to close 175 stores in North America
Gap announced that it will close 175 (nearly 26 percent) of its North American stores. It will terminate an unknown number of workers and cut 250 headquarters jobs.

Source: *The Washington Post*, June 15, 2015

Thinking of a Gap store as a unit of capital, explain why Gap is reducing the number of stores and workers. Is Gap making a long-run decision or a short-run decision? Is Gap taking advantage of economies of scale?

9. Read *Eye on Retailers' Costs* on p. 273 and draw a graph to show how the retailers' cost curves would change if they introduced cost-saving self-checkouts.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. If the *ATC* curves of a Walmart store and a 7-Eleven are like those in *Eye on Retailers' Costs* on p. 273, and if each type of store operates at its minimum *ATC*, which store has the lower total cost? How can you be sure? Which has the lower marginal cost? How can you be sure? Sketch each firm's marginal cost curve.

2. Sonya used to earn $25,000 a year selling real estate, but she now sells greeting cards. The return to entrepreneurship in the greeting cards industry is $14,000 a year. Over the year, Sonya bought $10,000 worth of cards from manufacturers and sold them for $58,000. Sonya rents a shop for $5,000 a year and spends $1,000 on utilities and office expenses. Sonya owns a cash register, which she bought for $2,000 with funds from her savings account. Her bank pays 3 percent a year on savings accounts. At the end of the year, Sonya was offered $1,600 for her cash register.
Calculate Sonya's explicit costs, implicit costs, and economic profit for the year.

Use the following information to work Problems **3** to **5**.

Yolanda runs a bullfrog farm.When she employs 1 person, she produces 1,000 bullfrogs a week. When she hires a second worker, her total product doubles. Her total product doubles again when she hires a third worker. When she hires a fourth worker, her total product increases but by only 1,000 bullfrogs. Yolanda pays $1,000 a week for equipment and $500 a week to each worker she hires.

3. Construct Yolanda's marginal product and average product schedules. Over what range of workers does Yolanda's experience increasing marginal returns?

4. Construct Yolanda's total variable cost and total cost schedules. Calculate Yolanda's total fixed cost.

5. At what output is Yolanda's average total cost at a minimum?

6. Table 1 shows some of the costs incurred at Bill's Bakery. Calculate the values of *A*, *B*, *C*, *D*, and *E*. Show your work.

TABLE 1

Labor	*TP*	*TVC*	*TC*	*AFC*	*AVC*	*ATC*	*MC*
1	100	350	850	***C***	3.50	***D***	
							2.50
2	240	700	***B***	2.08	2.92	5.00	
							E
3	380	***A***	1,550	1.32	2.76	4.08	
							5.83
4	440	1,400	1,900	1.14	3.18	4.32	
							11.67
5	470	1,750	2,250	1.06	3.72	4.79	

7. Solar and wind got so cheap, so fast
Solar panels and wind turbines are more efficient than they used to be and they cost less to produce.

Source: *The Atlantic*, December 2, 2015

Explain how the facts reported in the news clip affect the short-run and long-run average total cost of producing electricity. How do the facts affect the marginal cost of producing electricity?

MyEconLab Chapter 10 Study Plan

Multiple Choice Quiz

1. A firm's cost of production equals _____.

A. all the costs paid with money, called explicit costs
B. the implicit costs of using all the firm's own resources
C. all explicit costs and implicit costs, excluding normal profit
D. the costs of all resources used by the firm whether bought in the marketplace or owned by the firm

2. The average product of labor increases as output increases if _____.

A. marginal product exceeds average product
B. average product exceeds marginal product
C. total product increases
D. marginal product increases

3. Marginal returns start to decrease when more and more workers _____.

A. have to share the same equipment and workspace
B. produce less and less total output
C. require jobs to be too specialized
D. produce less and less average product

4. Average variable cost is at a minimum when _____.

A. marginal cost equals average variable cost
B. average total cost is at a minimum
C. marginal cost exceeds average fixed cost
D. average total cost exceeds average variable cost

5. An increase in the rent that a firm pays for its factory does not increase _____.

A. total cost
B. fixed cost
C. marginal cost
D. average fixed cost

6. An increase in the wage rate _____.

A. shifts the average total cost curve and the marginal cost curve upward
B. shifts the average fixed cost and average variable cost curve upward
C. increases average variable cost but does not change marginal cost
D. does not change average variable cost but increases average total cost

7. When average variable cost is at its minimum level, marginal product _____.

A. equals average product
B. exceeds average product
C. is less than average product
D. is at its maximum level

8. In the long run, with an increase in the plant size, _____.

A. the short-run average total cost curve shifts downward
B. the long-run average cost curve slopes downward
C. the short-run average total cost curve shifts downward if economies of scale exist
D. the average total cost of production rises



Where have all the record stores gone?

11

Perfect Competition

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain a perfectly competitive firm's profit-maximizing choices and derive its supply curve.
2. Explain how output, price, and profit are determined in the short run.
3. Explain how output, price, and profit are determined in the long run and explain why perfect competition is efficient.

MyEconLab Big Picture Video

MyEconLab Concept Video

MARKET TYPES

The four market types are

- Perfect competition
- Monopoly
- Monopolistic competition
- Oligopoly

Perfect Competition

Perfect competition
A market in which there are many firms, each selling an identical product; many buyers; no barriers to the entry of new firms into the industry; no advantage to established firms; and buyers and sellers are well informed about prices.

Perfect competition exists when

- Many firms sell an identical product to many buyers.
- There are no barriers to entry into (or exit from) the market.
- Established firms have no advantage over new firms.
- Sellers and buyers are well informed about prices.

These conditions that define perfect competition arise when the market demand for the product is large relative to the output of a single producer. This situation arises when economies of scale are absent so the efficient scale of each firm is small. But a large market and the absence of economies of scale are not sufficient to create perfect competition. In addition, each firm must produce a good or service that has no characteristics that are unique to that firm so that consumers don't care from which firm they buy. Firms in perfect competition all look the same to the buyer.

Wheat farming, fishing, wood pulping and paper milling, the manufacture of paper cups and plastic shopping bags, lawn service, dry cleaning, and the provision of laundry services are all examples of highly competitive industries.

Other Market Types

Monopoly
A market in which one firm sells a good or service that has no close substitutes and a barrier blocks the entry of new firms.

Monopolistic competition
A market in which a large number of firms compete by making similar but slightly different products.

Oligopoly
A market in which a small number of interdependent firms compete.

Monopoly arises when one firm sells a good or service that has no close substitutes and a barrier blocks the entry of new firms. In some places, the phone, gas, electricity, and water suppliers are local monopolies—monopolies that are restricted to a given location. For many years, a global firm called DeBeers had a near international monopoly in diamonds. Microsoft has a near monopoly in producing the operating system for a personal computer.

Monopolistic competition arises when a large number of firms compete by making similar but slightly different products. Each firm is the sole producer of the particular version of the good in question. For example, in the market for running shoes, Nike, Reebok, Fila, Asics, New Balance, and many others make their own versions of the perfect shoe. The term "monopolistic competition" reminds us that each firm has a monopoly on a particular brand of shoe but the firms compete with each other.

Oligopoly arises when a small number of *interdependent* firms compete. Airplane manufacture is an example of oligopoly. Oligopolies might produce almost identical products, such as Duracell and Energizer batteries; or they might produce differentiated products, such as the colas produced by Coke and Pepsi.

We study perfect competition in this chapter, monopoly in Chapter 12, and monopolistic competition and oligopoly in Chapter 13.

11.1 A FIRM'S PROFIT-MAXIMIZING CHOICES

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A firm's objective is to maximize its *economic profit*, which is equal to *total revenue* minus the *total cost* of production. *Normal profit*, the return that the firm's entrepreneur can obtain on average, is part of the firm's cost.

In the short run, a firm achieves its objective by deciding the quantity to produce. This quantity influences the firm's total revenue, total cost, and economic profit. In the long run, a firm achieves its objective by deciding whether to enter or exit a market.

These are the key decisions that a firm in perfect competition makes. Such a firm does *not* choose the price at which to sell its output. The firm in perfect competition is a **price taker**—it cannot influence the price of its product.

Price taker
A firm that cannot influence the price of the good or service that it produces.

Price Taker

To see why a firm in perfect competition is a price taker, imagine that you are a wheat farmer in Kansas. You have a thousand acres under cultivation—which sounds like a lot. But then you go on a drive through Colorado, Oklahoma, Texas, and back up to Nebraska and the Dakotas. You find unbroken stretches of wheat covering millions of acres. And you know that there are similar vistas in Canada, Argentina, Australia, and Ukraine. Your thousand acres are a drop in the ocean. Nothing makes your wheat any better than any other farmer's, and all the buyers of wheat know the price they must pay. If the going price of wheat is $4 a bushel, you are stuck with that price. You can't get a higher price than $4, and you have no incentive to offer it for less than $4 because you can sell your entire output at that price.

The producers of most agricultural products are price takers. We'll illustrate perfect competition with another agriculture example: the market for maple syrup. The next time you pour syrup on your pancakes, think about the competitive market that gets this product from the sap of the maple tree to your table!

Dave's Maple Syrup is one of more than 11,000 similar firms in the maple syrup market of North America. Dave is a price taker. Like the Kansas wheat farmer, he can sell any quantity he chooses at the going price but none above that price. Dave faces a *perfectly elastic* demand. The demand for Dave's syrup is perfectly elastic because syrup from Don Harlow, Casper Sugar Shack, and all the other maple farms in North America are *perfect substitutes* for Dave's syrup.

We'll explore Dave's decisions and their implications for the way a competitive market works. We begin by defining some revenue concepts.





Wheat farmers and maple syrup farmers are price takers.

Revenue Concepts

In perfect competition, market demand and market supply determine the price. A firm's *total revenue* equals this given price multiplied by the quantity sold. A firm's **marginal revenue** is the change in total revenue that results from a one-unit increase in the quantity sold.

Marginal revenue
The change in total revenue that results from a one-unit increase in the quantity sold.

In perfect competition, marginal revenue equals price.

The reason is that the firm can sell any quantity it chooses at the going market price. So if the firm sells one more unit, it sells it for the market price and total revenue increases by that amount. This increase in total revenue is marginal revenue.

The table in Figure 11.1 illustrates the equality of marginal revenue and price. The price of syrup is $8 a can. Total revenue is equal to the price multiplied by the

quantity sold. So if Dave sells 10 cans, his total revenue is \$8 × 10, which equals \$80. If the quantity sold increases from 10 cans to 11 cans, total revenue increases from \$80 to \$88, so marginal revenue is \$8 a can, the same as the price.

Figure 11.1 illustrates price determination and revenue in the perfectly competitive market. Market demand and market supply in part (a) determine the market price. Dave is a price taker, so he sells his syrup for the market price. The demand curve for Dave's syrup is the horizontal line at the market price in part (b). Because price equals marginal revenue, the demand curve for Dave's syrup is Dave's marginal revenue curve (*MR*). The total revenue curve (*TR*), in part (c), shows the total revenue at each quantity sold. Because he sells each can for the market price, the total revenue curve is an upward-sloping straight line.

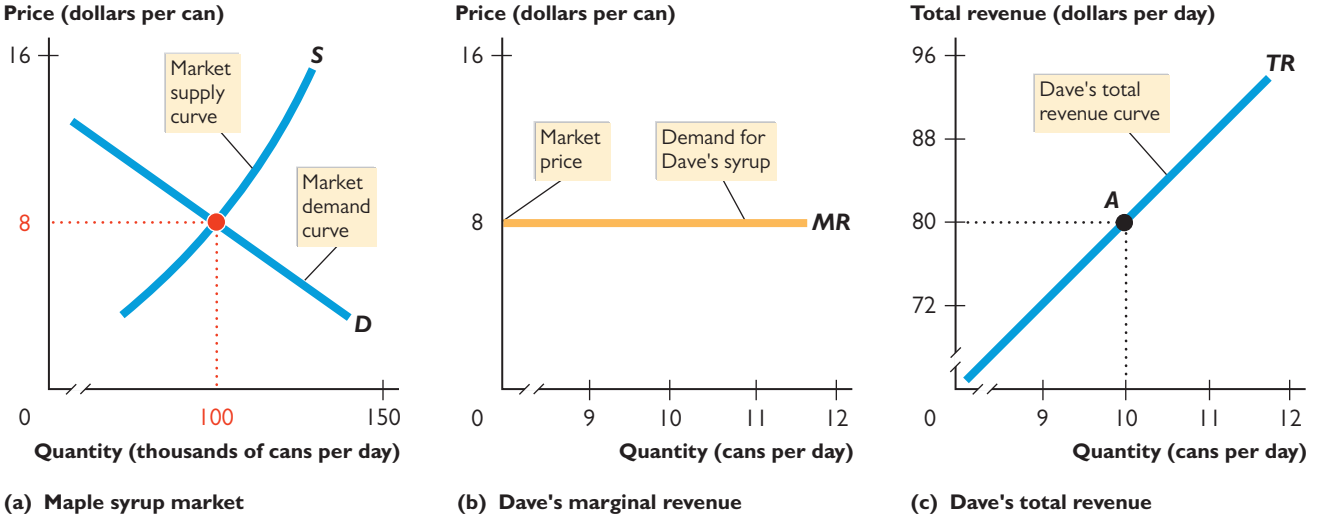
Profit-Maximizing Output

As output increases, total revenue increases, but total cost also increases. Because of *decreasing marginal returns* (see Chapter 10, pp. 258–260), total cost eventually increases faster than total revenue. There is one output level that maximizes economic profit, and a perfectly competitive firm chooses this output level.

FIGURE 11.1

Demand, Price, and Revenue in Perfect Competition

MyEconLab Animation



Quantity sold (cans per day)	9	10	11
Price (dollars per can)	8	8	8
Total revenue (dollars per day)	72	80	88
Marginal revenue (dollars per can)		8	8

Part (a) shows the market for maple syrup. The market price is \$8 a can. The table calculates total revenue and marginal revenue.

Part (b) shows Dave's marginal revenue curve (*MR*), which is also the demand curve for Dave's syrup.

Part (c) shows Dave's total revenue curve (*TR*). Point *A* corresponds to the second column of the table.

One way to find the profit-maximizing output is to use a firm's total revenue and total cost curves. Profit is maximized at the output level at which total revenue exceeds total cost by the largest amount. Figure 11.2 shows how to do this for Dave's Maple Syrup.

The table lists Dave's total revenue, total cost, and economic profit at different output levels. Figure 11.2(a) shows the total revenue and total cost curves. These curves are graphs of the numbers shown in the first three columns of the table. The total revenue curve (*TR*) is the same as that in Figure 11.1(c). The total cost curve (*TC*) is similar to the one that you met in Chapter 10 (p. 264). Figure 11.2(b) is an economic profit curve.

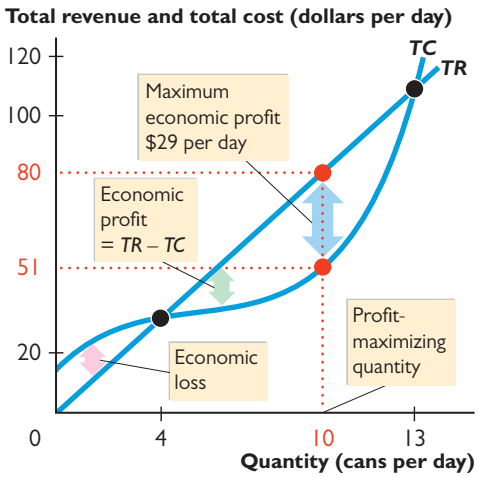
Dave makes an economic profit on outputs between 4 and 13 cans of syrup a day. At outputs of fewer than 4 cans a day and more than 13 cans a day, he incurs an economic loss. Outputs of 4 cans and 13 cans of syrup a day are *break-even points*—points at which total cost equals total revenue and economic profit is zero.

The profit curve is at its highest when the vertical distance between the *TR* and *TC* curves is greatest. In this example, profit maximization occurs at an output of 10 cans of syrup a day. At this output, Dave's economic profit is $29 a day.

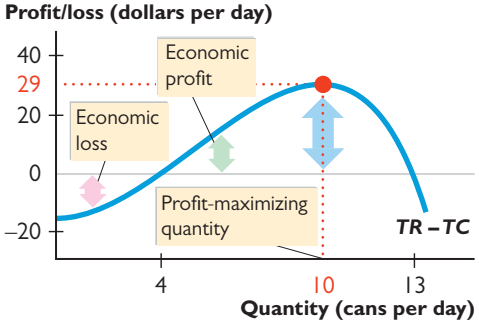
FIGURE 11.2

Total Revenue, Total Cost, and Economic Profit

MyEconLab Animation



(a) Revenue and cost



(b) Economic profit and loss

Quantity (*Q*) (cans per day)	Total revenue (*TR*)	Total cost (*TC*)	Economic profit (*TR* – *TC*)
	(dollars per day)		
0	0	15	–15
1	8	22	–14
2	16	27	–11
3	24	30	–6
4	**32**	**32**	**0**
5	40	33	7
6	48	34	14
7	56	36	20
8	64	40	24
9	72	44	28
10	**80**	**51**	**29**
11	88	60	28
12	96	76	20
13	**104**	**104**	**0**
14	112	144	–32

The table calculates Dave's economic profit at each quantity of syrup produced.

In part (a), economic profit (total revenue minus total cost) is the vertical distance between the total revenue (*TR*) and total cost (*TC*) curves.

In part (b), economic profit is the height of the profit curve, *TR* − *TC*.

If Dave produces less than 4 cans of syrup a day, he incurs an economic loss.

If Dave produces between 4 and 13 cans of syrup a day, he makes an economic profit. Dave's maximum economic profit is $29 a day when he produces 10 cans of syrup a day.

Marginal Analysis and the Supply Decision

Another way to find the profit-maximizing output is to use *marginal analysis*, which compares marginal revenue, *MR*, with marginal cost, *MC*. As output increases, marginal revenue is constant but marginal cost eventually increases.

If marginal revenue exceeds marginal cost ($MR > MC$), then the revenue from selling one more unit exceeds the cost of producing that unit and an *increase* in output increases economic profit. If marginal revenue is less than marginal cost ($MR < MC$), then the revenue from selling one more unit is less than the cost of producing that unit and a *decrease* in output increases economic profit. If marginal revenue equals marginal cost ($MR = MC$), then the revenue from selling one more unit equals the cost incurred to produce that unit. Economic profit is maximized and either an increase or a decrease in output *decreases* economic profit. The rule ($MR = MC$) is a prime example of marginal analysis.

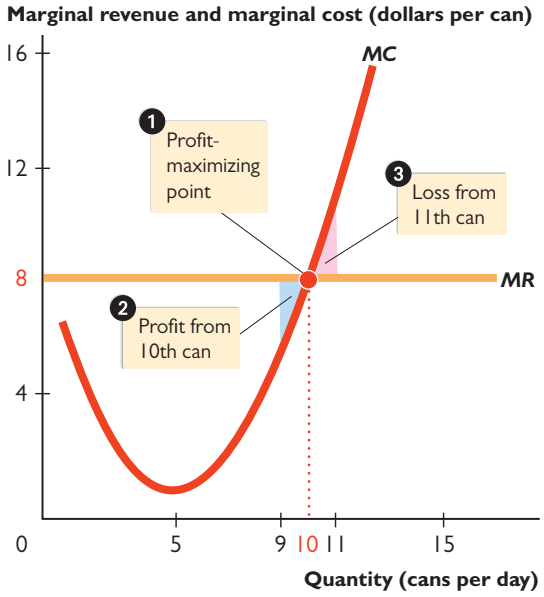
Figure 11.3 illustrates these propositions. If Dave increases output from 9 to 10 cans of syrup a day, marginal revenue ($8) exceeds marginal cost ($7), so by producing the 10th can economic profit increases. The last column of the table shows that economic profit increases from $28 to $29. The blue area in the figure shows the increase in economic profit when Dave produces the 10th can per day.

If Dave increases production from 10 to 11 cans of syrup a day, marginal revenue ($8) is less than marginal cost ($9), so by producing the 11th can, economic profit decreases. The last column of the table shows that economic profit decreases from $29 to $28. The red area in the figure shows the economic loss that arises when Dave increases production from 10 to 11 cans of syrup per day.

FIGURE 11.3

Profit-Maximizing Output

MyEconLab Animation



Quantity (Q) (cans per day)	Total revenue (TR) (dollars per day)	Marginal revenue (MR) (dollars per can)	Total cost (TC) (dollars per day)	Marginal cost (MC) (dollars per can)	Economic profit (TR – TC) (dollars per day)
8	64		40		24
		8		4	
9	72		44		28
		8		7	
10	80		51		29
		8		9	
11	88		60		28
		8		16	
12	96		76		20

❶ Profit is maximized when marginal revenue equals marginal cost at 10 cans of syrup a day. ❷ If Dave increases output from 9 to 10 cans of syrup a day, marginal cost is $7, which is less than the marginal revenue of $8, so profit increases. ❸ If Dave increases output from 10 to 11 cans of syrup a day, marginal cost is $9, which exceeds the marginal revenue of $8, so profit decreases.

Dave maximizes economic profit by producing 10 cans of syrup a day, the quantity at which marginal revenue equals marginal cost.

A firm's profit-maximizing output is its *quantity supplied*. Dave's *quantity supplied* at a price of $8 a can is 10 cans a day. If the price were higher than $8 a can, he would increase production. If the price were lower than $8 a can, he would decrease production. These profit-maximizing responses to different prices are the foundation of the law of supply:

Other things remaining the same, the higher the price of a good, the greater is the quantity supplied of that good.

Temporary Shutdown Decision

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Sometimes, the price falls so low that a firm cannot cover its costs. What does the firm do in such a situation? The answer depends on whether the firm expects the low price to be permanent or temporary.

If a firm incurs an economic loss that it believes is permanent and sees no prospect of ending, the firm exits the market. We'll study this action later in this chapter when we look at the firm's decisions in the long run (pp. 294–297).

If a firm incurs an economic loss that it believes is temporary, it remains in the market, but it might temporarily shut down. To decide whether to produce or to shut down, the firm compares the loss it would incur in the two situations.

Loss When Shut Down

If the firm shuts down temporarily, it receives no revenue and incurs no variable costs. The firm still incurs fixed costs. So, if a firm shuts down, it incurs an economic loss equal to total fixed cost. This loss is the largest that a firm need incur.

Loss When Producing

A firm that produces an output receives revenue and incurs both fixed costs and variable costs. The firm incurs an economic loss equal to total fixed cost *plus* total variable cost *minus* total revenue. If total revenue exceeds total variable cost, the firm's economic loss is less than total fixed cost. But if total revenue is less than total variable cost, the firm's economic loss will exceed total fixed cost.

The Shutdown Point

If total revenue is less than total variable cost, a firm shuts down temporarily and limits its loss to an amount equal to total fixed cost. If total revenue just equals total variable cost, a firm is indifferent between producing and shutting down. This situation arises when price equals minimum average variable cost and the firm produces the quantity at which average variable cost is a minimum—called the **shutdown point**.

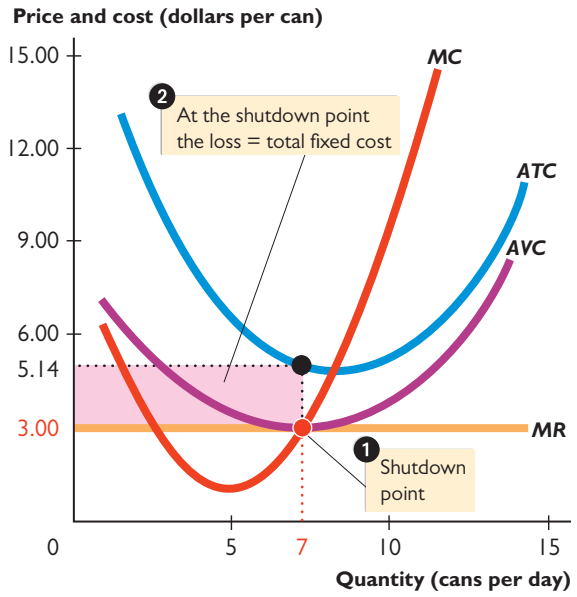
Shutdown point
The point at which price equals minimum average variable cost and the quantity produced is that at which average variable cost is at its minimum.

Figure 11.4 illustrates the firm's shutdown decision and the shutdown point that we've just described for Dave's maple syrup farm. Dave's average variable cost curve is *AVC* and his marginal cost curve is *MC*. Average variable cost has a minimum of $3 a can when output is 7 cans of syrup a day. The *MC* curve intersects the *AVC* curve at its minimum. (We explained this relationship between the marginal and average values of a variable in Chapter 10; see pp. 258–261.) The figure shows the marginal revenue curve *MR* when the price is $3 a can, a *price equal to minimum average variable cost*.

FIGURE 11.4

The Shutdown Decision

MyEconLab Animation



Quantity (Q) (cans per day)	Total revenue (TR)	Total variable cost (TVC)	Total fixed cost (TFC)	Total cost (TC)	Economic profit (TR – TC)
	(dollars per day)				
6	18	19	15	34	–16
7	21	21	15	36	–15
8	24	25	15	40	–16

❶ The shutdown point is at minimum average variable cost. At a price below minimum average variable cost, the firm shuts down and produces no output. At a price equal to minimum average variable cost, the firm is indifferent between shutting down and producing no output or producing the output at minimum average variable cost. Either way, ❷ the firm minimizes its economic loss and incurs a loss equal to total fixed cost.

If Dave produces at the shutdown point, he produces 7 cans of syrup a day and sells them for $3 a can. He incurs an economic loss equal to $2.14 a can and a total economic loss of $15 a day. Dave's loss equals total fixed cost. If Dave shuts down, he also incurs an economic loss equal to total fixed cost.

The table lists Dave's total revenue, total variable cost, total fixed cost, total cost, and economic profit at three output levels. The middle output, 7 cans of syrup a day, is that at which Dave's average variable cost is at its minimum—$3 a can. The numbers in the table show that when the price is $3 a can and Dave produces 7 cans of syrup a day, he incurs a loss, and that loss equals total fixed cost.

The Firm's Short-Run Supply Curve

A perfectly competitive firm's short-run supply curve shows how the firm's profit-maximizing output varies as the price varies, other things remaining the same. This supply curve is based on the marginal analysis and shutdown decision that we've just explored.

Figure 11.5 derives Dave's supply curve. Part (a) shows the marginal cost and average variable cost curves, and part (b) shows the supply curve. There is a direct link between the marginal cost and average variable cost curves and the firm's supply curve. Let's see what that link is.

In Figure 11.5(a), if the price is above minimum average variable cost, Dave maximizes profit by producing the output at which marginal cost equals marginal revenue, which also equals price. We determine the quantity produced at each price from the marginal cost curve. At a price of $8 a can, the marginal revenue curve is MR_1 and Dave maximizes profit by producing 10 cans a day. If the price

rises to $12 a can, the marginal revenue curve is MR_2 and Dave increases production to 11 cans a day.

If price equals minimum average variable cost, Dave maximizes profit (minimizes loss) by either producing the quantity at the shutdown point or shutting down and producing no output. But if the price is below minimum average variable cost, Dave shuts down and produces no output.

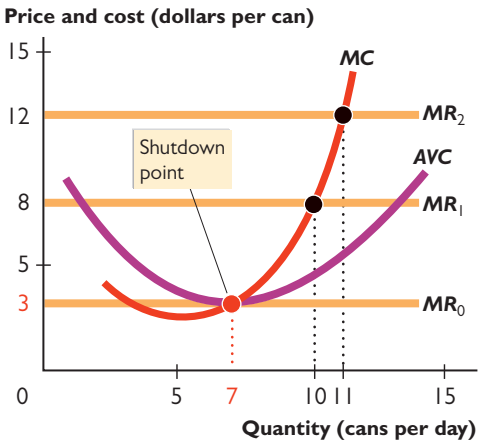
Figure 11.5(b) shows Dave's short-run supply curve. At prices that exceed minimum average variable cost, the supply curve is the same as the marginal cost curve. At prices below minimum average variable cost, Dave shuts down and produces nothing. His supply curve runs along the vertical axis. At a price of $3 a can, Dave is indifferent between shutting down and producing 7 cans of syrup a day at the shutdown point (*T*). Either way, he incurs a loss equal to total fixed cost.

So far, we have studied one firm in isolation. We have seen that the firm's profit-maximizing actions depend on the price, which the firm takes as given. In the next section, you'll learn how market supply is determined.

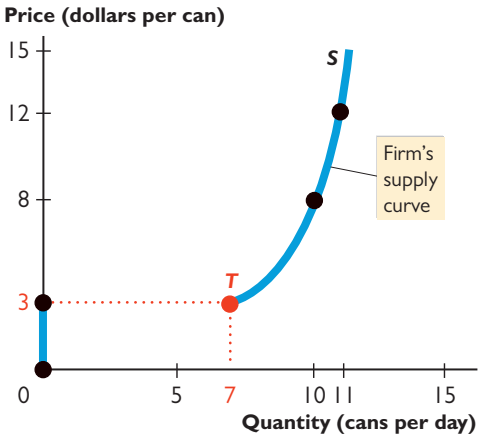
FIGURE 11.5

A Perfectly Competitive Firm's Supply Curve

MyEconLab Animation



(a) Marginal cost and average variable cost



(b) Firm's supply curve

Part (a) shows Dave's profit-maximizing output at various prices. At $12 a can, Dave produces 11 cans of syrup a day; at $8 a can, he produces 10 cans of syrup a day; and at $3 a can, he produces either 7 cans of syrup a day or nothing.

At any price below $3 a can, Dave produces nothing. The minimum average variable cost is the shutdown point.

Part (b) shows Dave's supply curve. At $3 a can, Dave is indifferent between producing the quantity at the shutdown point *T* and not producing.

At all prices above $3 a can, Dave's supply curve is made up of the marginal cost curve, in part (a), *above* minimum average variable cost.

At all prices below $3 a can, Dave produces nothing and his supply curve runs along the vertical axis.

MyEconLab Study Plan 11.1
Key Terms Quiz
Solutions Video

CHECKPOINT 11.1

Explain a perfectly competitive firm's profit-maximizing choices and derive its supply curve.

Practice Problems

1. Sarah's Salmon Farm produced 1,000 fish last week. The marginal cost was $30 a fish, average variable cost was $20 a fish, and the market price was $25 a fish. Did Sarah maximize profit? If Sarah did not maximize profit and if nothing has changed will she increase or decrease the number of fish she produces to maximize her profit this week?

Use the following information to work Problems **2** to **4**.

Trout farming is a perfectly competitive industry and all trout farms have the same cost curves. When the market price of a fish is $25, farms maximize profit by producing 200 fish a week. At this output, average total cost is $20 a fish, and average variable cost is $15 a fish. Minimum average variable cost is $12 a fish.

2. If the price of a fish falls to $20, will a farm produce 200 fish a week?

3. If the price of a fish falls to $12, what will the trout farmer do?

4. What are two points on a trout farm's supply curve?

In the News

U.S. Steel lays off 756
With a drop in the demand for steel pipe and tube, U.S. Steel Corporation will idle plants in Ohio and Texas and lay off 756 workers.

Source: *The Wall Street Journal*, January 6, 2015

As U.S. Steel responded to the fall in demand, how did its marginal cost change? What can you say about minimum *AVC* in the plants that closed?

Solutions to Practice Problems

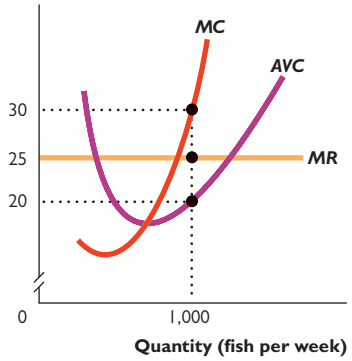
1. Profit is maximized when marginal cost equals marginal revenue. In perfect competition, marginal revenue equals the market price, which was $25 a fish last week. Because marginal cost exceeded marginal revenue, Sarah did not maximize profit. To maximize profit, Sarah will decrease her output until marginal cost falls to $25 a fish (Figure 1).

2. The farm will produce fewer than 200 fish a week. The marginal cost curve slopes upward, so to lower marginal cost to $20, the farm cuts production.

3. If the price of a fish falls to $12, farms cut output until marginal cost equals $12. Because $12 a fish is also minimum average variable cost, farms are at the shutdown point—some farms produce the profit-maximizing output and others produce nothing.

4. One point on a farmer's supply curve is 200 fish at $25 a fish. Another point is the shutdown point (Solution **3**) or zero at a price below $12 a fish.

FIGURE 1



Solution to In the News

The fall in demand for steel pipe and tube lowered the price of steel pipe and tube. U.S. Steel cut production. Marginal cost decreased to equal the lower price. At the plants that closed temporarily, the firm's minimum *AVC* exceeded price.

11.2 OUTPUT, PRICE, AND PROFIT IN THE SHORT RUN

MyEconLab Concept Video

Demand and supply determine the price and quantity in a perfectly competitive market. We first study short-run supply when the number of firms is fixed.

Market Supply in the Short Run

The market supply curve in the short run shows the quantity supplied at each price by a fixed number of firms. The quantity supplied at a given price is the sum of the quantities supplied by all firms at that price.

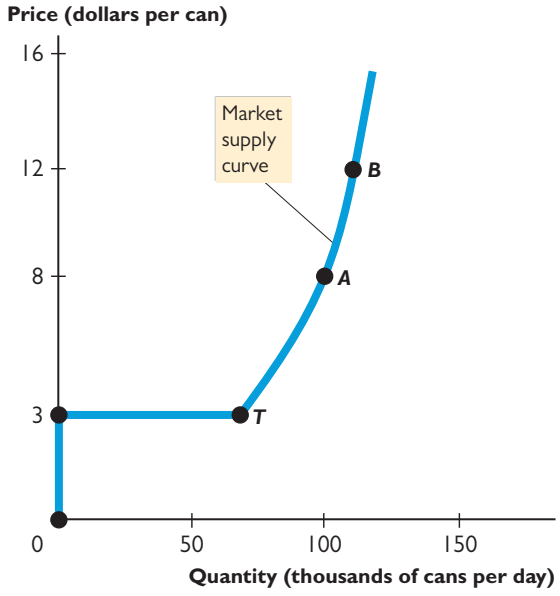
Figure 11.6 shows the supply curve for the competitive syrup market. In this example, the market consists of 10,000 firms exactly like Dave's Maple Syrup. The table shows how the market supply schedule is constructed. The shutdown point occurs at a price of $3 a can. At prices below $3 a can, every firm in the market shuts down; the quantity supplied is zero. At a price of $3 a can, each firm is indifferent between shutting down (producing nothing) or operating and producing 7 cans of syrup a day. The quantity supplied by each firm is *either* 0 or 7 cans of syrup a day, and the quantity supplied in the market is *between* 0 (all firms shut down) and 70,000 cans (all firms produce 7 cans a day each). At prices above $3 a can, we sum the quantities supplied by the 10,000 firms, so the quantity supplied in the market is 10,000 times the quantity supplied by one firm.

At prices below $3 a can, the market supply curve runs along the vertical axis. Supply is perfectly inelastic. At $3 a can, the market supply curve is horizontal. Supply is perfectly elastic. Above $3 a can, the supply curve is upward sloping.

FIGURE 11.6

The Market Supply Curve

MyEconLab Animation



	Price (dollars per can)	Dave's quantity supplied (cans per day)	Market quantity supplied (cans per day)
B	12	11	110,000
A	8	10	100,000
T	3	0 or 7	0 to 70,000

A market with 10,000 identical firms has a supply schedule like that of an individual firm, but the quantity supplied is 10,000 times greater. Market supply is perfectly elastic at the price at which the shutdown point occurs.

Short-Run Equilibrium in Normal Times

Market demand and market supply determine the price and quantity bought and sold. Figure 11.7(a) shows a short-run equilibrium in the syrup market. The market supply curve *S* is the same as that in Figure 11.6.

If the demand curve D_1 shows market demand, the equilibrium price is $5 a can. Although market demand and market supply determine this price, each firm takes the price as given and produces its profit-maximizing output, which is 9 cans of syrup a day. With 10,000 identical firms, market output is 90,000 cans a day.

Figure 11.7(b) shows the situation that Dave faces. The price is $5 a can, so Dave's marginal revenue is constant at $5 a can. Dave maximizes profit by producing 9 cans of syrup a day.

Figure 11.7(b) also shows Dave's average total cost curve (*ATC*). Recall that average total cost is the cost per unit produced. It equals total cost divided by the quantity of output produced.

Here, when Dave produces 9 cans of syrup a day, his average total cost is $5 a can, exactly the same as the market price. So Dave sells syrup for exactly the same price as his average cost of production and economic profit is zero.

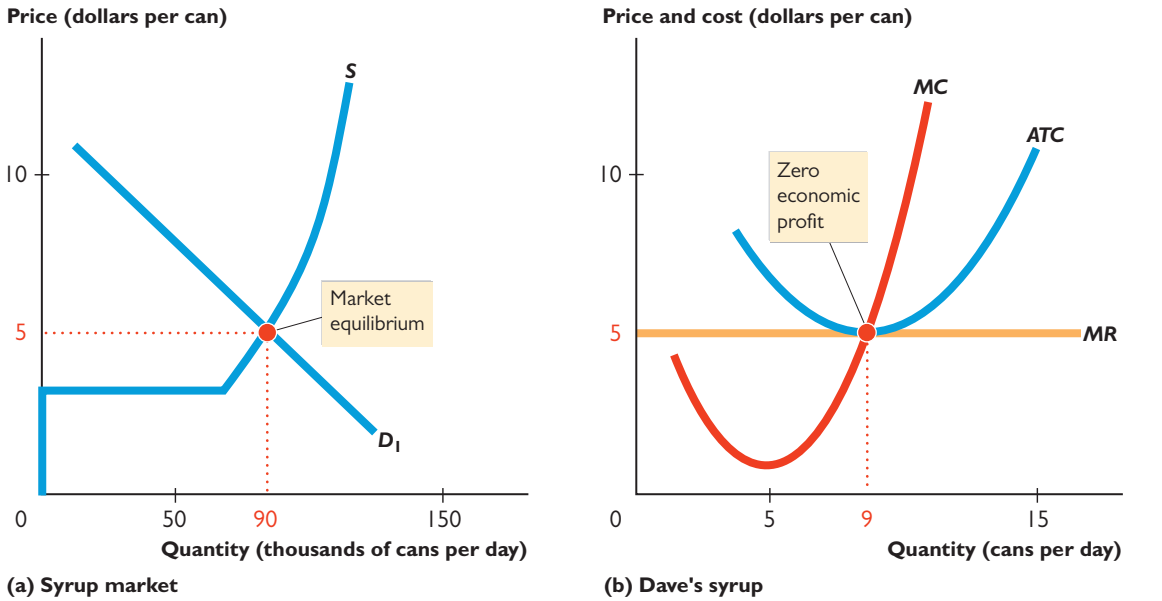
Making zero economic profit means that Dave earns *normal profit* from running his business.

The short-run equilibrium in which a firm makes zero economic profit is just one of three possible situations. A competitive market might also deliver a positive economic profit or an economic loss. Let's look at these other two cases.

FIGURE 11.7

Zero Economic Profit in the Short Run

MyEconLab Animation



In part (a), with the market demand curve D_1 and the market supply curve *S*, the equilibrium market price of syrup is $5 a can.

In part (b), marginal revenue is $5 a can, so Dave produces 9 cans a day. At this quantity, the price ($5) equals average total cost, so Dave makes zero economic profit.

Short-Run Equilibrium in Good Times

Market demand might be greater or less than D_1 in Figure 11.7 and the price might be higher or lower than $5 a can. Figure 11.8(a) shows another short-run equilibrium in the syrup market. The supply curve *S* is the same as that in Figure 11.6.

If the demand curve D_2 shows market demand, the equilibrium price is $8 a can. Although market demand and market supply determine this price, each firm takes the price as given and produces its profit-maximizing output, which is 10 cans of syrup a day. Because the market has 10,000 identical firms, market output is 100,000 cans of syrup a day.

Figure 11.8(b) shows the situation that Dave faces. The price is $8 a can, so Dave's marginal revenue is constant at $8 a can. Dave maximizes profit by producing 10 cans of syrup a day.

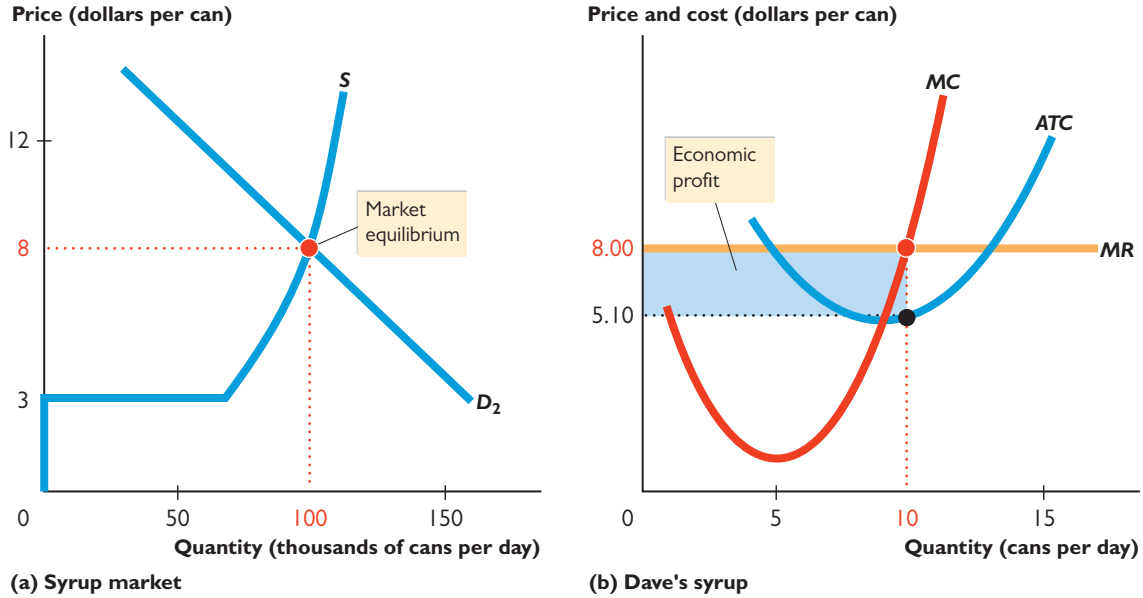
Figure 11.8(b) also shows Dave's average total cost curve (*ATC*). Recall that average total cost is the cost per unit produced. It equals total cost divided by the quantity of output produced. Here, when Dave produces 10 cans of syrup a day, his average total cost is $5.10 a can. So the price of $8 a can exceeds average total cost by $2.90 a can. This amount is Dave's economic profit per can.

If we multiply the economic profit per can of $2.90 by the quantity of syrup produced, 10 cans a day, we arrive at Dave's economic profit, which is $29 a day. The blue rectangle shows this economic profit. The height of that rectangle is the profit per can, $2.90, and the length is the 10 cans of syrup a day, so the area of the rectangle (height × length) measures Dave's economic profit of $29 a day.

FIGURE 11.8

Positive Economic Profit in the Short Run

MyEconLab Animation



In part (a), with the market demand curve D_2 and the market supply curve *S*, the equilibrium market price of syrup is $8 a can.

In part (b), marginal revenue is $8 a can. Dave produces 10 cans a day. Because price ($8) exceeds average total cost ($5.10), Dave makes a positive economic profit.

Short-Run Equilibrium in Bad Times

Figure 11.9 shows the syrup market in a loss-incurring situation. The market demand curve is now D_3. The market still has 10,000 firms and their costs are the same as before, so the market supply curve, *S*, is also the same as before.

With the demand and supply curves shown in Figure 11.9(a), the equilibrium price of syrup is $3 a can and the equilibrium quantity is 70,000 cans a day.

Figure 11.9(b) shows the situation that Dave faces. The price is $3 a can, so Dave's marginal revenue is constant at $3 a can. Dave maximizes profit by producing 7 cans of syrup a day.

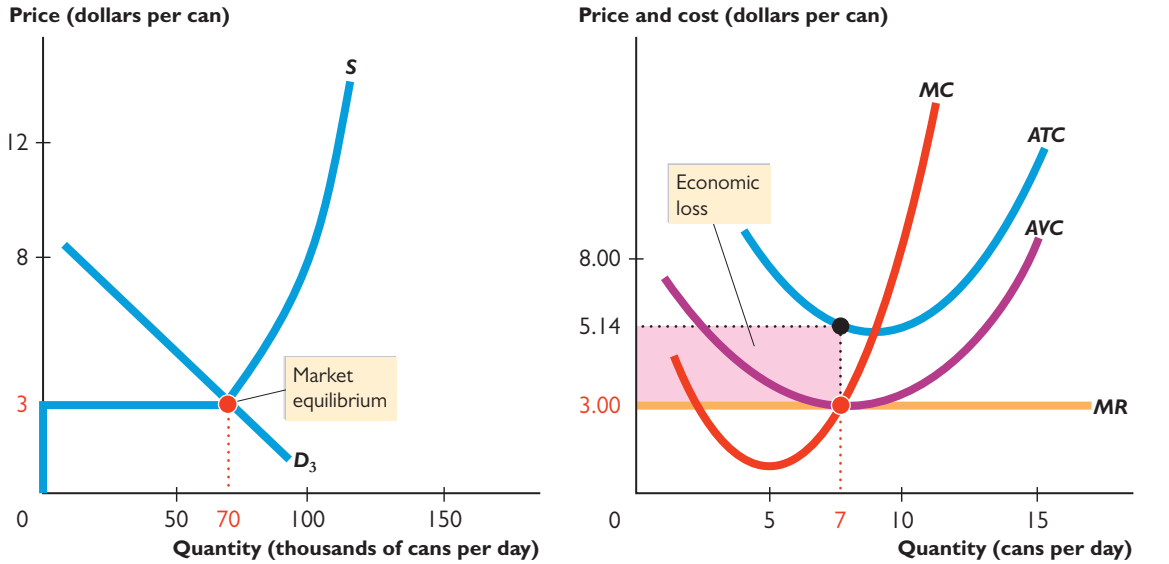
Figure 11.9(b) also shows Dave's average total cost curve (*ATC*), and you can see that when Dave produces 7 cans of syrup a day, his average total cost is $5.14 a can. Now the price of $3 a can is less than average total cost by $2.14 a can. This amount is Dave's economic loss per can. If we multiply the economic loss per can of $2.14 by the quantity of syrup produced, 7 cans a day, we arrive at Dave's economic loss, which is shown by the red rectangle.

Figure 11.9(b) also shows Dave's average variable cost curve (*AVC*). Notice that Dave is operating at the shutdown point. Dave might equally well produce no output. Either way, his economic loss would be equal to his total fixed cost. If the price were a bit higher than $3 a can, Dave would still incur an economic loss, but a smaller one. And if the price were lower than $3 a can, Dave would shut down and incur an economic loss equal to total fixed cost.

FIGURE 11.9

Economic Loss in the Short Run

MyEconLab Animation



In part (a), with the market demand curve D_3 and the market supply curve *S*, the equilibrium market price of syrup is $3 a can.

In part (b), Dave's marginal revenue is $3 a can, so he produces 7 cans of syrup a day. At this quantity, the price ($3) is less than average total cost ($5.14), so Dave incurs an economic loss shown by the red rectangle.

CHECKPOINT 11.2

MyEconLab Study Plan 11.2
Solutions Video

Explain how output, price, and profit are determined in the short run.

Practice Problems

Tulip growing is perfectly competitive and all growers have the same costs. The market price is $25 a bunch, and each grower maximizes profit by producing 2,000 bunches a week. Average total cost is $20 a bunch, and average variable cost is $15 a bunch. Minimum average variable cost is $12 a bunch.

1. What is the economic profit that each grower is making in the short run?
2. What is the price at the grower's shutdown point?
3. What is each grower's economic profit at the shutdown point?

In the News

Airfares will drop to record lows this fall
With a fall in the price of jet fuel, the price of an average round-trip airline ticket will slip to $244 next month, about 5% lower than the same time last year.
Source: *Fortune*, July 27, 2015

Explain how a fall in the price of jet fuel changes the marginal cost of producing air trips and changes the equilibrium price and quantity of air trips in the short run.

Solutions to Practice Problems

1. The market price ($25) exceeds the average total cost ($20), so growers make an economic profit of $5 a bunch. Each grower produces 2,000 bunches a week, so a grower's economic profit is $10,000 a week.
   Figure 1 illustrates the situation. The grower's marginal revenue equals the market price ($25 a bunch). The grower maximizes profit by producing 2,000 bunches, so at 2,000 bunches the marginal cost curve (*MC*) cuts the marginal revenue curve (*MR*). The average total cost of producing 2,000 bunches is $20, so the *ATC* curve passes through this point. Economic profit equals the area of the blue rectangle.
2. The price at which a grower will shut down temporarily is equal to minimum average variable cost—$12 a bunch (Figure 1).
3. At the shutdown point, the grower incurs an economic loss equal to total fixed cost. Figure 2 shows the data to calculate *TFC*. When 2,000 bunches a week are grown, *ATC* is $20 a bunch and *AVC* is $15 a bunch.
   $ATC = AFC + AVC$, so $AFC = ATC - AVC$. *AFC* is $5 a bunch. Total fixed cost equals $10,000 a week— $TFC = AFC \times Q$, $5 a bunch × 2,000 bunches a week. At the shutdown point, the grower incurs an economic loss of $10,000 a week.

FIGURE 1
Price and cost (dollars per bunch)

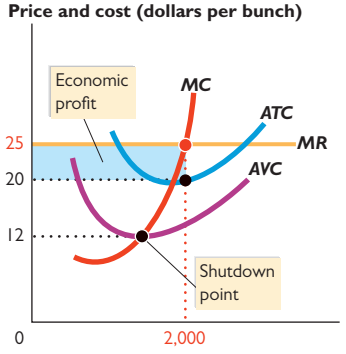
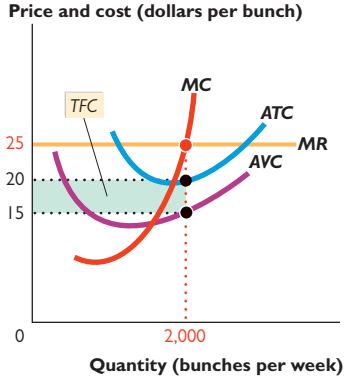


FIGURE 2
Price and cost (dollars per bunch)



Solution to In the News

A fall in the price of jet fuel decreases an airline's marginal cost of producing air trips. The airline's marginal cost curve shifts downward. With lower marginal cost of an air trip, the market supply of air trips increases and the market supply curve shifts rightward. The increase in supply lowers the equilibrium price of an air trip and increases the equilibrium quantity of air trips in the short run.

MyEconLab Concept Video

11.3 OUTPUT, PRICE, AND PROFIT IN THE LONG RUN

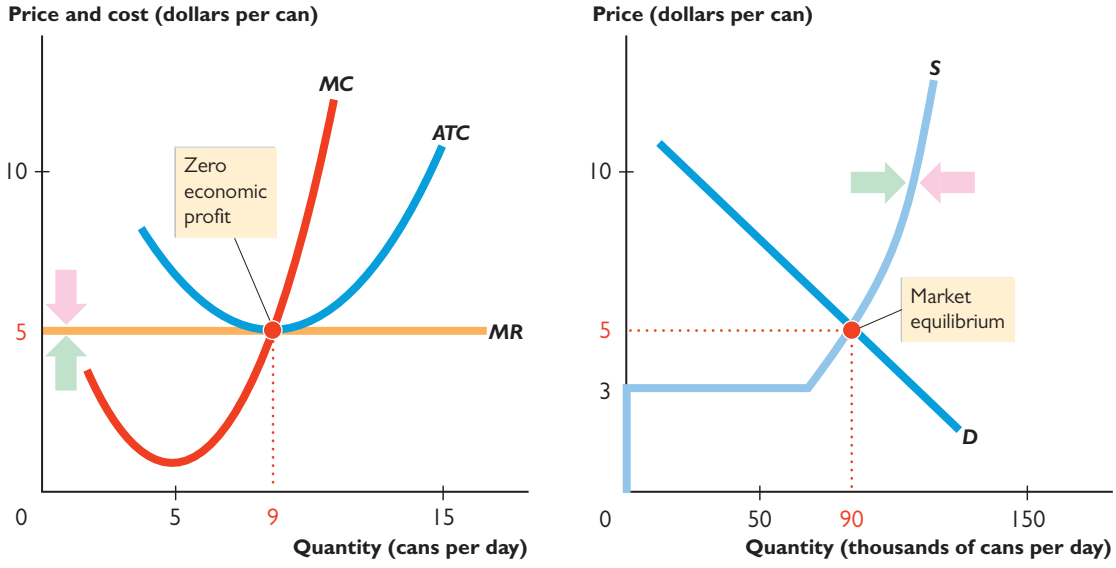
Competitive markets are in a constant state of change. Price, quantity, and economic profit fluctuate as demand and supply change. None of the three situations that we described on the previous pages—normal times, good times, or bad times—last forever in perfect competition. Market forces operate to compete away economic profits and eliminate economic losses to move the price toward the lowest possible price. That price equals minimum average total cost. In the long run, a firm in perfect competition produces at minimum average total cost and makes zero economic profit. (The firm's entrepreneur earns normal profit—part of the firm's total costs.)

Figure 11.10 illustrates a perfectly competitive market in long-run equilibrium and highlights the forces that bring the market to this situation. In Figure 11.10(a), the firm's average total cost curve is *ATC*, and the firm produces at the point of minimum average total cost—9 cans a day at an average total cost of $5 a can. If the price rises above or falls below $5 a can, market forces operate to move the price back toward $5 a can. The arrows pointing toward $5 represent these forces.

In Figure 11.10(b) the market demand curve is *D*. With this market demand, the price equals minimum average total cost only if the market supply curve is *S*. If supply is less than *S* (the supply curve is to the left of *S*), the price is above $5 a can; if supply exceeds *S* (the supply curve is to the right of *S*), the price is below $5 a can. Market forces operate to shift the supply curve back to *S*, and the arrows pointing toward *S* represent these forces.

FIGURE 11.10
Long-Run Equilibrium

MyEconLab Animation



In part (a), minimum average total cost is $5 a can. In long-run equilibrium, the price and marginal revenue are pulled to this level. The firm makes zero economic profit.

In part (b), if the price is above $5 a can, above minimum *ATC* in part (a), supply increases and the price falls. If the price is below $5, supply decreases and the price rises.

Entry and Exit

Entry and exit are the market forces that shift the supply curve and move the price to minimum average total cost in the long run. In the short run, firms might make a positive economic profit (as in Figure 11.8) or incur an economic loss (as in Figure 11.9). But in the long run, firms makes zero economic profit.

In the long run, firms respond to economic profit and economic loss by either entering or exiting a market. New firms enter a market in which the existing firms are making economic profits, and some existing firms exit a market in which firms are incurring economic losses. Temporary economic profit or temporary economic loss, like a win or loss at a casino, does not trigger entry and exit. But the prospect of persistent economic profit or economic loss does.

Entry and exit influence the market price, the quantity produced, and economic profit. The immediate effect of the decision to enter or exit a market is to shift the market supply curve. If more firms enter a market, supply increases and the market supply curve shifts rightward. If some firms exit a market, supply decreases and the market supply curve shifts leftward.

Let's see what happens when new firms enter a market.



With the prospect of economic profit, a new business opens.

The Effects of Entry

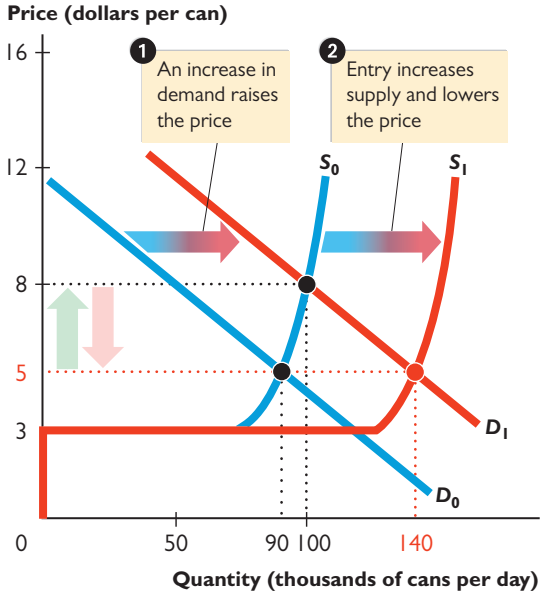
Figure 11.11 shows the effects of entry. Initially, the market is in long-run equilibrium. Demand is D_0, supply is S_0, the price is \$5 a can, and the quantity is 90,000 cans of syrup a day. A surge in the popularity of syrup increases market demand, and the demand curve shifts to D_1. The price rises to \$8 a can, and firms in the syrup market increase output to 100,000 cans a day and make an economic profit.

Times are good for syrup producers like Dave, so other potential syrup producers want some of the action. New firms begin to enter the market. As they enter,

FIGURE 11.11

The Effects of Entry

MyEconLab Animation



Starting in long-run equilibrium,

1. Market demand increases and the market demand curve shifts from D_0 to D_1. The price of syrup rises from \$5 to \$8 a can.

Economic profit brings entry.

2. As firms enter the market, the market supply curve shifts rightward, from S_0 to S_1. The equilibrium price falls from \$8 to \$5 a can, and the quantity produced increases from 100,000 to 140,000 cans of syrup a day.

supply increases and the market supply curve shifts rightward to S_1. With the greater market supply and unchanged market demand, the market price falls from $8 to $5 a can and the equilibrium quantity increases to 140,000 cans a day.

Market output increases, but because the price falls, Dave and the other producers decrease output. As the price falls, each firm's output gradually returns to its original level. Because the number of firms in the market increases, the market as a whole produces more.

As the price falls, each firm's economic profit decreases. When the price falls to $5 a can, economic profit disappears and each firm makes zero economic profit. The entry process stops, and the market is again in long-run equilibrium.

You have just discovered a key proposition:

Economic profit is an incentive for new firms to enter a market, but as they do so, the price falls and the economic profit of each existing firm decreases.

The Effects of Exit



Economic loss brings exit.

Figure 11.12 shows the effects of exit. Again we begin on demand curve D_0 and supply curve S_0 in long-run equilibrium. A new high-nutrition breakfast food decreases the demand for maple syrup. The market demand curve shifts from D_0 to D_2. Firms' costs are the same as before, so the market supply curve is S_0.

With demand at D_2 and supply at S_0, the price falls to $3 a can and 70,000 cans a day are produced. The firms in the syrup market incur economic losses.

Times are tough for syrup producers, and Dave must seriously think about leaving his dream business and finding some other way of making a living. But other producers are in the same situation as Dave, and some start to exit the market while Dave is still thinking through his options.

FIGURE 11.12

The Effects of Exit

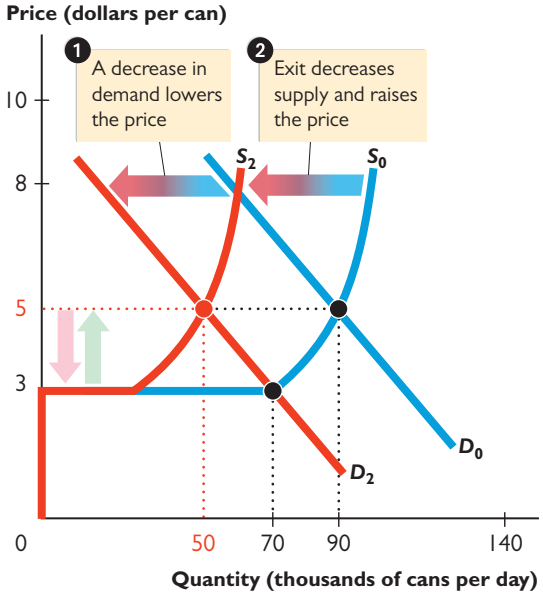
MyEconLab Animation

Starting in long-run equilibrium,

1. Market demand decreases and the market demand curve shifts from D_0 to D_2. The price of syrup falls from $5 to $3 a can.

Economic loss brings exit.

2. As some firms exit the market, the market supply curve shifts leftward, from S_0 to S_2. The equilibrium price rises from $3 to $5 a can, and the quantity produced decreases from 70,000 to 50,000 cans of syrup a day.



As some firms exit, the market supply curve shifts leftward to S_2, output decreases from 70,000 to 50,000 cans of syrup a day and the market price rises from $3 to $5 a can.

As the price rises, Dave and each other firm that remains in the market move up along their supply curves and increase output. That is, for each firm that remains in the market, the profit-maximizing output *increases.* As the price rises and each firm sells more, economic loss decreases. When the price rises to $5 a can, each firm makes zero economic profit. Dave earns normal profit (part of the firm's total cost) and he is happy that he can still make a living producing syrup.

You have just discovered a second key proposition:

Economic loss is an incentive for firms to exit a market, but as they do so, the price rises and the economic loss of each remaining firm decreases.

Change in Demand

Initially, a competitive market is in long-run equilibrium and the firms are making zero economic profit (and entrepreneurs are earning normal profit). Now market demand increases. The market price rises, firms increase production to keep marginal cost equal to price, and firms make an economic profit. The market is now in short-run equilibrium but not in long-run equilibrium.

Economic profit is an incentive for new firms to enter the market. As firms enter, market supply increases and the market price falls. With a lower price, firms decrease output to keep marginal cost equal to price. Notice that as firms enter the market, market output increases, but each firm's output decreases. Eventually, enough firms enter to eliminate economic profit and the market returns to long-run equilibrium.

The key difference between the initial long-run equilibrium and the new long-run equilibrium is the number of firms. A permanent increase in demand increases the number of firms. Each firm produces the same output in the new long-run equilibrium as initially and makes zero economic profit. In the process of moving from the initial equilibrium to the new one, firms make economic profit.

The demand for airline travel in the world economy increased during the 1990s, and the deregulation of the airlines freed up firms to seek profit opportunities. The result was a massive rate of entry of new airlines. The process of competition and change in the airline market were similar to what we have just studied.

A decrease in demand triggers a similar response, except in the opposite direction. The decrease in demand brings a lower price, economic loss, and exit. Exit decreases market supply, raises the price, and eliminates the economic loss.

Technological Change

New technologies lower cost, so as firms adopt a new technology, their cost curves shift downward. With lower costs, market supply increases and the price falls. Firms that use the new technology make an economic profit and firms that stick with the old technology incur economic losses. New-technology firms enter and old-technology firms exit. The price keeps falling until all the firms are using the new technology and economic profit is zero. The lower prices and better products that technological advances bring are permanent gains for consumers. *Eye on Record Stores* (on pp. 298–299) looks at the effects of technological change in the retail market for recorded music.



EYE on RECORD STORES

MyEconLab Critical Thinking Exercise

Where Have All the Record Stores Gone?

Beecker Street Records in New York City (see p. 279) describes its inventory as vintage and out-of-print LPs and CDs. No longer do record stores sell the latest singles and albums.

The world was very different in 1995, when more than 8,000 record stores traded in an almost perfectly competitive market.

Figure 1 illustrates the average total cost curve, *ATC*, marginal cost curve, *MC*, and marginal revenue curve, MR_0, for one of these 8,000 stores.

Competition was fierce in the record retail business and economic profit was hard to find. In Figure 1, the record store is earning zero economic profit and the market is in long-run equilibrium.

Although competition was fierce, it was about to notch up a gear. The dot-com boom had started.

The expansion of the Internet during the 1990s laid the foundation for many new ways of doing business. One of these was a new way of delivering recorded music.

Amazon was one of the first firms to take advantage of the technological advance made possible by the Internet when Amazon.com started trading in 1995.

At first, Amazon was an online bookstore. But entrepreneur Jeff



An Amazon server farm replaces hundreds of traditional record stores.

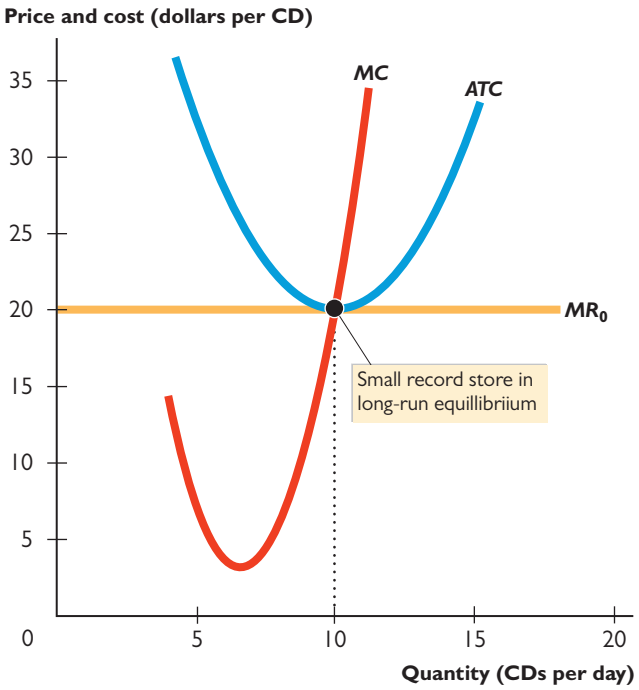


Figure 1 Small Independent Record Store Before Internet

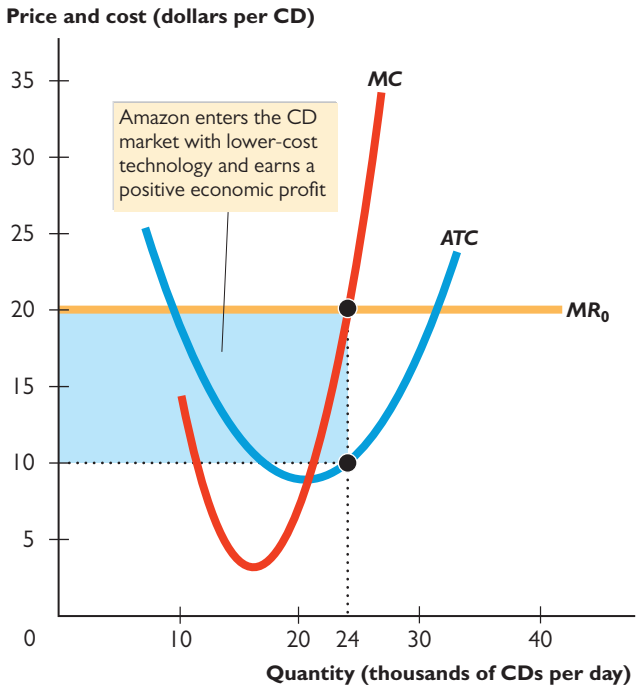


Figure 2 Amazon Enters CD Retail Market

Bezos quickly saw that the technologies being laid down for selling books could also be used to sell CDs (and just about anything).

This new technology also had much lower costs than traditional "bricks and mortar" retailing.

Figure 2 shows the average total cost curve and marginal cost curve using Amazon's lower-cost technology. The numbers are just examples, but first look carefully at the axes of Figures 1 and 2. Amazon can produce a larger output at a lower cost than the traditional record store can.

Online retailing wasn't profitable at first, but with its superior low-cost technology economic profit eventually rolled in. Figure 2 shows the economic profit available at the prices charged by traditional record stores applied to a store using the new technology.

Positive economic profit attracts new entry. And that's what happened in the online music business. The technology also kept advancing, with MP3 files replacing physical CDs. As Amazon, Apple's iTunes store, and others entered the market for MP3 downloads, the price of recorded music fell and firms' profits were trimmed.

Figure 3 shows where perfect competition among online music download stores drives the price and quantity. Price falls to make marginal revenue MR_1, a level at which economic profit has vanished in a new long-run equilibrium.

This lower price means hard times for small independent record stores. The fall in price is too big for these small stores to cover even their average variable cost, *AVC*, and with no prospect of prices rising again, the independent stores avoid the economic losses by exiting.

Figure 4 illustrates the economic loss incurred by a traditional independent record store facing competition from online retailers when marginal revenue has fallen to MR_1.

Faced with this loss, the store exits. That's where the record stores have gone. They've exited to avoid the losses created by online competition.



Sundance, in San Marcos, Texas, is one of 4,000 traditional record stores that exited.

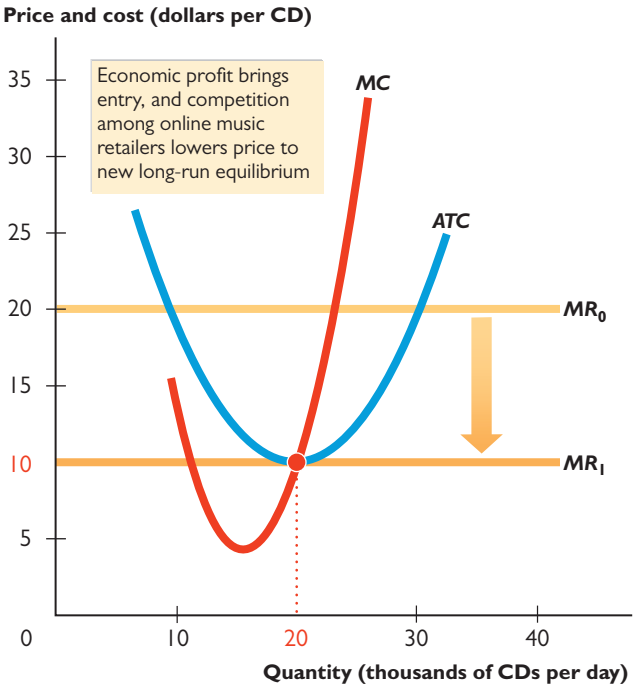


Figure 3 More Large Online Music Stores Enter and Compete

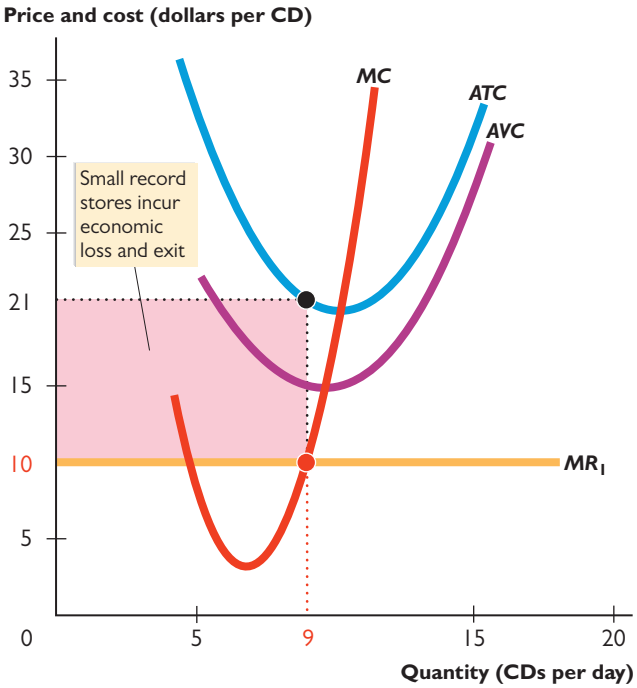


Figure 4 Small Independent Record Store Exits

Is Perfect Competition Efficient?

An efficient outcome is one in which scarce resources are allocated to their highest-value use. Perfect competition achieves such an outcome. It is efficient.

To see why, first recall the conditions for an efficient allocation of resources. Resources are used efficiently when it is not possible to get more of one good without giving up something that is valued more highly. When this outcome is achieved, marginal benefit equals marginal cost and total surplus (consumer surplus plus producer surplus) is maximized. That is the outcome achieved in perfect competition.

We derive a firm's supply curve in perfect competition from its marginal cost curve. The supply curve is the marginal cost curve at all points above the minimum of average variable cost (the shutdown price). Because the market supply curve is found by summing the quantities supplied by all the firms at each price, the market supply curve is the entire market's marginal cost curve.

The market demand curve is the marginal benefit curve. Because the market supply curve and market demand curve intersect at the equilibrium price, that price equals both marginal cost and marginal benefit.

Figure 11.13 illustrates the efficiency of perfect competition. We've labeled the market demand curve $D = MB$ and the market supply curve $S = MC$ to remind you that these curves are also the marginal benefit (MB) and marginal cost (MC) curves.

These demand and supply curves intersect at the equilibrium price and equilibrium quantity. The price equals marginal benefit and marginal cost, total surplus is maximized, and the equilibrium quantity is efficient. Any departure from this outcome is inferior to it and brings an avoidable deadweight loss.

FIGURE 11.13

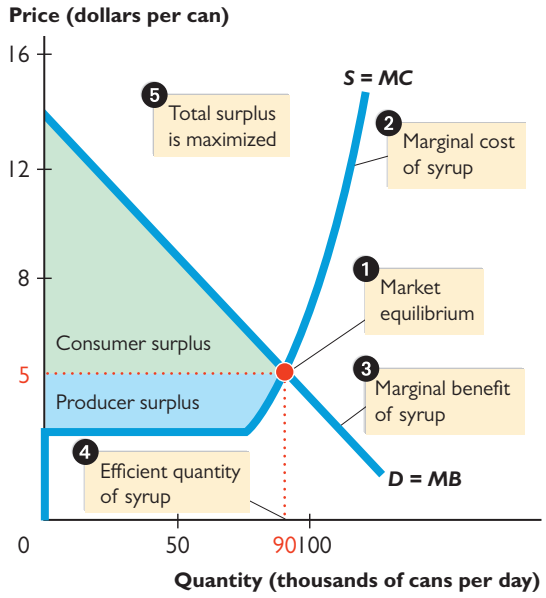
The Efficiency of Perfect Competition

MyEconLab Animation

1. Market equilibrium occurs at a price of $5 a can and a quantity of 90,000 cans of syrup a day.
2. The supply curve is also the marginal cost curve.
3. The demand curve is also the marginal benefit curve.

At the market equilibrium, marginal benefit equals marginal cost.

4. The efficient quantity of syrup is produced.
5. Total surplus, the sum of consumer surplus and producer surplus, is maximized.



Is Perfect Competition Fair?

You've seen many situations in which perfect competition brings gains and losses. When the demand for an item decreases, most producers incur at least a temporary loss and some of them go out of business. When a technological change lowers costs, entrepreneurs who are quick to adopt the technology gain and others who respond slowly lose. Is it fair that some entrepreneurs gain and others lose?

When a natural disaster such as extreme weather or an earthquake strikes, the prices of essential items sold in competitive markets shoot upward, bringing gains for sellers and pain for buyers. Is that type of outcome fair?

You studied the fairness of markets in Chapter 6 (pp. 161–163) and saw two views of what is fair: fair rules and a fair result. According to the fair-rules view, an outcome is fair if property rights are enforced and people acquire resources, goods, and services through voluntary exchange. According to the fair-result view, an outcome is fair if the poorest aren't too poor and the richest aren't too rich. Are the competitive market outcomes we've just described fair on these two views of fairness?

The situations we've described appear to be fair on both views. Perfect competition places no restrictions on anyone's actions, all trade is voluntary, consumers pay the lowest possible prices, and entrepreneurs earn only normal profit. But price hikes arising from shortages following a natural disaster might be exceptions. In such situations, large windfall gains for a few and high prices for essential items for many might be regarded as an unfair result. If it is considered unfair, it must be compared with the fairness of an alternative mechanism for allocating scarce resources.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

The Perfect Competition That You Encounter

Many of the markets that you encounter every day are highly competitive and almost perfectly competitive. While you don't run into perfect competition on a daily basis, you do have dealings in some perfectly competitive markets. Two of those markets are the Internet auctions organized by eBay and one of its subsidiaries, StubHub.

If you have a ticket for a game between the Giants and the Braves but can't use it, you can sell it on StubHub for the going market price (minus a commission). And if you're desperate to see the game but missed out on getting a ticket, you can buy one for the going price (plus a commission) on the same Web site.

StubHub takes a commission and makes a profit. But competition between StubHub, Ticketmaster, and other ticket brokers ensure that profits are competed away in the long run, with entrepreneurs earning normal profit.

Just about every good or service that you buy and take for granted, no matter where you buy it, is available because of the forces of competition. Your home, your food, your clothing, your books, your DVDs, your MP3 files, your computer, your bike, your car,…; the list is endless. No one organizes all the magic that enables you to buy this vast array of products. Competitive markets and entrepreneurs striving to make the largest possible profit make it happen.

When either demand or technology changes and makes the current allocation of resources the wrong one, the market swiftly and silently acts. It sends signals to entrepreneurs that bring entry and exit and a new and efficient use of scarce resources.

It is no exaggeration or hype to say that your entire life is influenced by and benefits immeasurably from the forces of competition. Adam Smith's invisible hand might be hidden from view, but it is enormously powerful.

MyEconLab Study Plan 11.3
Solutions Video

CHECKPOINT 11.3

Explain how output, price, and profit are determined in the long run and explain why perfect competition is efficient.

Practice Problems

Tulip growing is a perfectly competitive industry, and all tulip growers have the same cost curves. The market price of tulips is $15 a bunch, and each grower maximizes profit by producing 1,500 bunches a week. The average total cost of producing tulips is $21 a bunch. Minimum average variable cost is $12 a bunch, and the minimum average total cost is $18 a bunch.

1. What is a tulip grower's economic profit in the short run and how does the number of tulip growers change in the long run?
2. In the long run, what is the price and the tulip grower's economic profit?

In the News

California's commercial drone industry is taking off
Customers are finding ever more creative ways to use drones, and 3D Robotics Inc., America's largest producer of consumer drones, expects sales to soar.
Source: *Los Angeles Times*, June 13, 2015

Explain what is happening in the market for commercial drones. How would you expect the price of a drone to change in the short run and the long run? How would you expect the economic profit of a drone producer such as 3D Robotics to change in the short run and in the long run?

FIGURE 1

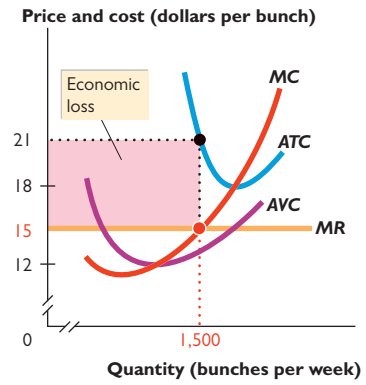
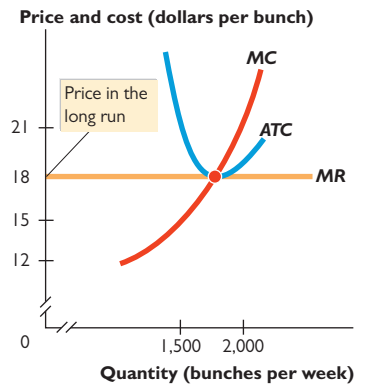


FIGURE 2



Solutions to Practice Problems

1. The price is less than average total cost, so the tulip grower is incurring an economic loss in the short run. Because the price exceeds minimum average variable cost, the tulip grower continues to produce. The economic loss equals the loss per bunch ($21 minus $15) multiplied by the number of bunches (1,500 per week), which equals $9,000 per week (Figure 1). Because tulip growers are incurring economic losses, some growers will exit in the long run. The number of tulip growers will decrease.
2. In the long run, the price will be such that economic profit is zero. That is, as growers exit, the price will rise until it equals minimum average total cost. In the long run, the price will be $18 a bunch (Figure 2) and a tulip grower will make zero economic profit because average total cost equals price.

Solution to In the News

With customers finding ever more creative ways to use drones, the demand for drones is increasing. In the short run, an increase in demand brings a rise in the price of a drone and an increase in the quantity of drones supplied. The higher price increases the economic profit of drone producers in the short run. Economic profit is an incentive for new firms to enter the market. In the long run, entry increases supply, which lowers the price and increases the quantity of drones demanded. As the price of a drone falls, economic profit decreases. In the new long-run equilibrium, the price of a drone is lower and drone producers make zero economic profit.

CHAPTER SUMMARY

Key Points

1. Explain a perfectly competitive firm's profit-maximizing choices and derive its supply curve.

- A perfectly competitive firm is a price taker.
- Marginal revenue equals price.
- The firm produces the output at which price equals marginal cost.
- If price is less than minimum average variable cost, the firm temporarily shuts down.
- A firm's supply curve is the upward-sloping part of its marginal cost curve at all prices at or above minimum average variable cost (the shutdown point) and the vertical axis at all prices below minimum average variable cost.

2. Explain how output, price, and profit are determined in the short run.

- Market demand and market supply determine price.
- Firms choose the quantity to produce that maximizes profit, which is the quantity at which marginal cost equals price.
- In short-run equilibrium, a firm can make a positive economic profit, make zero economic profit, or incur an economic loss.

3. Explain how output, price, and profit are determined in the long run and explain why perfect competition is efficient.

- Economic profit induces entry, which increases market supply and lowers price and profit. Economic loss induces exit, which decreases market supply, raises price, and lowers the losses.
- In the long run, economic profit is zero and there is no entry or exit.
- An increase in demand increases the number of firms and increases the equilibrium quantity.
- An advance in technology that lowers the cost of producing a good increases market supply, lowers the price, and increases the quantity.
- Perfect competition is efficient because it makes marginal benefit equal marginal cost, and it is fair because trade is voluntary, consumers pay the lowest possible prices, and entrepreneurs earn normal profit.

Key Terms

MyEconLab Key Terms Quiz

Marginal revenue, 281
Monopolistic competition, 280
Monopoly, 280
Oligopoly, 280
Perfect competition, 280
Price taker, 281
Shutdown point, 285

MyEconLab Chapter 11 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

LIST

- Wheat
- Jeans
- Printer cartridges
- Toothpaste
- Gym membership in a town with one gym

1. Look at the list to the left. In what type of market is each good or service in the list sold? Explain your answers.
2. Explain why in a perfectly competitive market, the firm is a price taker. Why can't the firm choose the price at which it sells its good?
3. Table 1 shows the demand schedule for Lin's Fortune Cookies. Calculate Lin's marginal revenue for each quantity demanded. Compare Lin's marginal revenue and price. In what type of market does Lin's Fortune Cookies operate?

Table 1 shows the demand schedule for Lin's Fortune Cookies. Table 2 shows some cost data for Lin's. Use this information to work Problems **4** to **7**. (Hint: Make a sketch of Lin's short-run cost curves.)

TABLE 1

Price (dollars per batch)	Quantity demanded (batches per day)
50	0
50	1
50	2
50	3
50	4
50	5
50	6

TABLE 2

Quantity (batches per day)	*AFC*	*AVC*	*ATC*	*MC*
	(dollars per batch)			
1	84.0	51.0	135	37
2	42.0	44.0	86	29
3	28.0	39.0	67	27
4	21.0	36.0	57	32
5	16.8	35.2	52	40
6	14.0	36.0	50	57
7	12.0	39.0	51	83
8	10.5	44.5	55	

4. At a market price of $50 a batch, what quantity does Lin's produce and what is the firm's economic profit in the short run?
5. At a market price of $35.20 a batch, what quantity does Lin's produce and what is the firm's economic profit in the short run?
6. Create Lin's short-run supply schedule and make a graph of Lin's short-run supply curve. Explain why only part of Lin's short-run supply curve is the same as its marginal cost curve.
7. At a market price of $83 a batch, what quantity does Lin's produce and what is the firm's economic profit in the short run? Do firms enter or exit the market and what is Lin's economic profit in the long run?

Use the following information to work Problems **8** to **10**.

Quebec losing hold over maple syrup industry to U.S. competition

The Federation of Quebec Maple Syrup Producers tries to limit production and stockpiles a "strategic reserve" to keep the price of syrup high. But Quebec producers are feeling increased competition from Vermont, New York, and Maine, where market share has increased and is expected to increase further in 2017 and 2018.

Source: *The Globe and Mail*, April 6, 2015

8. Draw a graph to describe the maple syrup market and the cost and revenue of one maple syrup producer in 2016, assuming that all producers are making a positive economic profit because of the actions of the Federation of Quebec Maple Syrup Producers.
9. Starting with the industry making a positive economic profit, explain how the maple syrup market and the profit of an individual producer will change in the long run.
10. If the demand for maple syrup increases, what will happen to price, quantity, and the economic profit of a producer in the short run and in the long run?
11. Read *Eye on Record Stores* on pp. 298–299 and explain how Internet retailing of recorded music changed the constraints faced by small traditional record stores. Why did many record stores exit rather than shut down temporarily?

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. Why did Amazon enter the market for recorded music and why did independent record stores exit?
2. How does competition among online music retailers influence economic profit?
3. Look at the list to the right. In what type of market is each of the goods and services in the list sold? Explain your answers.
4. Suppose that the restaurant industry is perfectly competitive. Joe's Diner is always packed in the evening but rarely has a customer at lunchtime. Why doesn't Joe's Diner close—temporarily shut down—at lunchtime?

LIST

- Breakfast cereals
- Smartphones
- The only restaurant in a small town
- Oranges
- Air travel in a town serviced by one airline

Use the following information to work Problems **5** to **7**.

Figure 1 shows the short-run cost curves of a toy producer. The market has 1,000 identical producers and Table 1 shows the market demand schedule for toys.

5. At a market price of $21 a toy, what quantity does the firm produce in the short run and does the firm make a positive economic profit, a zero economic profit, or an economic loss?
6. At a market price of $12 a toy, how many toys does the firm produce and what is its economic profit in the short run? How will the number of firms in the market change in the long run?
7. At what market prices would the firm shut down temporarily? What is the market price of a toy in long-run equilibrium? How many firms will be in the toy market in the long run? Explain your answer.

FIGURE 1

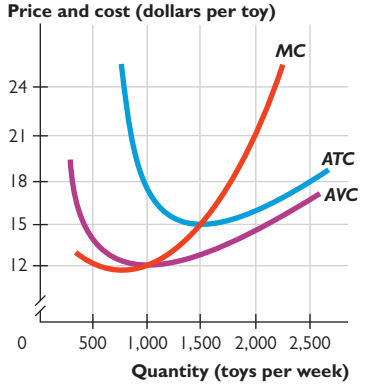


TABLE 1

Price (dollars per toy)	Quantity demanded (thousands of toys per week)
24	1,000
21	1,500
18	2,000
15	2,500
12	3,000

Use the following information to work Problems **8** and **9**.

California plans to crack down on the use of fumigants by growers of strawberries. The biggest burden will fall on Ventura County's growers, who produce about 90 percent of the nation's crop.

8. Draw graphs of the U.S. strawberry market in long-run equilibrium before the pollution crackdown: one of the U.S. market and one of a California grower. Now show the short-run effects of the pollution crackdown.
9. On the graph, show the long-run effects of the pollution crackdown.

Use the following information to work Problems **10** and **11**.

Grain, soybean prices fall

Grain and soybean prices tumbled on news that production would be greater than previously expected. The bigger-than-expected production forecasts come as grain farmers are wrestling with a decrease in overseas demand for grain.

Source: *The Wall Street Journal*, November 10, 2015

10. Why did soybean prices fall in 2015? Draw graphs to show the soybean market and the cost and revenue curves of a soybean farmer at the start and end of 2015. Show the change in the soybean farmer's economic profit.
11. Why did grain prices fall in 2015? Draw graphs to show the grain market and the cost and revenue curves of an individual grain farmer at the start and end of 2015. Show the change in the grain farmer's economic profit.

MyEconLab Chapter 11 Study Plan

Multiple Choice Quiz

1. In perfect competition, all the following situations arise *except* _____.

A. firms produce an identical good or service
B. each firm chooses the price at which to sell the good it produces
C. firms can sell any quantity they choose to produce at the market price
D. buyers know each seller's price

2. A firm that is producing the quantity at which marginal cost exceeds both average total cost and the market price will increase its economic profit by _____.

A. producing a larger quantity
B. raising the price to equal marginal cost
C. producing a smaller quantity
D. producing the quantity that minimizes average total cost

3. A firm will shut down in the short run if at the profit-maximizing quantity, _____.

A. total revenue is less than total cost
B. marginal revenue is less than average fixed cost
C. average total cost exceeds the market price
D. marginal revenue is less than average variable cost

4. At the shutdown point, the firm _____.

A. incurs an economic loss equal to total variable cost
B. makes zero economic profit
C. incurs a loss equal to total fixed cost
D. stops production to decrease its economic loss

5. In the short run, the profit-maximizing firm will _____.

A. break even if marginal revenue equals marginal cost
B. make an economic profit if marginal cost is less than average total cost
C. incur an economic loss if average fixed cost exceeds marginal revenue
D. incur an economic loss if average total cost exceeds marginal revenue

6. A firm's short-run supply curve is the same as _____ if it produces the good.

A. its marginal revenue curve
B. the upward-sloping part of its marginal cost curve
C. its marginal cost curve above minimum average variable cost
D. its marginal cost curve above minimum average total cost

7. A permanent increase in demand _____ economic profit in the short run and some firms will _____ in the long run.

A. does not change; exit the market
B. increases; enter the market
C. increases; raise their price
D. does not change; advertise their good

8. Perfect competition is efficient because all the following conditions hold *except* _____.

A. total product is maximized
B. firms maximize profit and produce on their supply curves
C. consumers get a real bargain and pay a price below the value of the good
D. firms minimize their average total cost of producing the good



Are Microsoft's prices too high?

12

Monopoly

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain how monopoly arises and distinguish between single-price monopoly and price-discriminating monopoly.
2. Explain how a single-price monopoly determines its output and price.
3. Compare the performance of a single-price monopoly with that of perfect competition.
4. Explain how price discrimination increases profit.
5. Explain why natural monopoly is regulated and the effects of regulation.

MyEconLab Big Picture Video

MyEconLab Concept Video

12.1 MONOPOLY AND HOW IT ARISES

Microsoft faces almost no competition in the market for PC operating systems. Does the absence of competition result in buyers paying too high a price for Windows? You will find the answer in this chapter.

Monopoly
A market in which one firm sells a good or service that has no close substitutes and a barrier blocks the entry of new firms.

The market for PC operating systems is an example of **monopoly**, a market in which one firm sells a good or service that has no close substitutes and in which a barrier to entry prevents competition from new firms.

No Close Substitute

If a good has a close substitute, even though only one firm produces it, that firm effectively faces competition from the producers of substitutes. An example of a good that does not have close substitutes is water supplied by a local public utility. While it does have a close substitute for drinking—bottled spring water—it has no substitutes for doing the laundry, taking a shower, or washing a car.

Technological change can create substitutes and weaken a monopoly. For example, Fedex, UPS, and e-mail are close substitutes for the services provided by the U.S. Postal Service and have weakened its monopoly.

The arrival of a new product can also create a monopoly. For example, the technologies of the information age have provided opportunities for Google and Microsoft to become near monopolies in their markets (See *Eye on the U.S. Economy* on p. 310).

Barrier to Entry

Barrier to entry
Any constraint that protects a firm from competitors.

Any constraint that protects a firm from facing new competitors is a **barrier to entry**. There are three types of barrier to entry:

- Natural
- Legal
- Ownership

Natural Barrier to Entry

Natural monopoly
A monopoly that arises because one firm can meet the entire market demand at a lower average total cost than two or more firms could.

When economies of scale enable a single firm to meet the entire market demand at a lower average total cost than two or more firms could, a natural barrier to entry creates a **natural monopoly**.

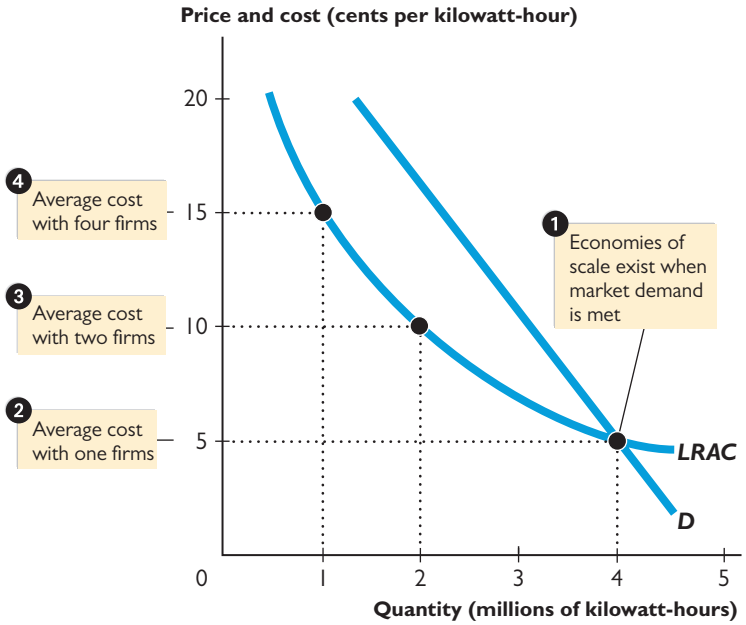
Figure 12.1 illustrates a natural monopoly in the distribution of electric power. Here, the demand curve for electric power is *D*, and the long-run average cost curve is *LRAC*. Economies of scale prevail over the entire length of this *LRAC* curve, indicated by the fact that the curve slopes downward. One firm can produce 4 million kilowatt-hours at 5¢ a kilowatt-hour. At this price, the quantity demanded is 4 million kilowatt-hours. So if the price was 5¢ a kilowatt-hour, one firm could supply the entire market. If two or more firms shared the market, average total cost would be higher.

To see why the situation shown in Figure 12.1 creates a barrier to entry, think about what would happen if a second firm tried to enter the market. Such a firm would find it impossible to make a profit. If it produced less than the original firm, it would have to charge a higher price and it would have no customers. If it produced the same quantity as the original firm, the price would fall below average total cost for both firms and one of them would be forced out of business. There is room for only one firm in this market.

FIGURE 12.1

Natural Monopoly

MyEconLab Animation



The demand curve for electric power is *D*, and the long-run average cost curve is *LRAC*.

❶ Economies of scale exist over the entire *LRAC* curve.

One firm can distribute 4 million kilowatt-hours at a ❷ cost of 5¢ a kilowatt-hour.

Two firms can distribute this same total output at a ❸ cost of 10¢ a kilowatt-hour.

Four firms can distribute this same total output at a ❹ cost of 15¢ a kilowatt-hour.

One firm can meet the market demand at a lower cost than two or more firms can, and the market is a natural monopoly.

Legal Barrier to Entry

A legal barrier to entry creates a legal monopoly. A **legal monopoly** is a market in which competition and entry are restricted by the granting of a public franchise, government license, patent, or copyright.

Legal monopoly
A market in which competition and entry are restricted by the granting of a public franchise, government license, patent, or copyright.

A *public franchise* is an exclusive right granted to a firm to supply a good or service, an example of which is the U.S. Postal Service's exclusive right to deliver first-class mail. A *government license* controls entry into particular occupations, professions, and industries. An example is Michael's Texaco in Charleston, Rhode Island, which is the only firm in the area licensed to test for vehicle emissions.

A *patent* is an exclusive right granted to the inventor of a product or service. A *copyright* is an exclusive right granted to the author or composer of a literary, musical, dramatic, or artistic work. Patents and copyrights are valid for a limited time period that varies from country to country. In the United States, a patent is valid for 20 years. Patents are designed to encourage the *invention* of new products and production methods. They also stimulate *innovation*—the use of new inventions—by encouraging inventors to publicize their discoveries and offer them for use under license. Patents have stimulated innovations in areas as diverse as soybean seeds, pharmaceuticals, memory chips, and video games.

Ownership Barrier to Entry

A monopoly can arise in a market in which competition and entry are restricted by a concentration of ownership. An example is the global wholesale market in sunglasses, which is controlled by Luxottica, an Italian firm, that almost certainly made your glasses, regardless of the brand and where you bought them.



The global wholesale market for designer sunglasses is close to being a monopoly.

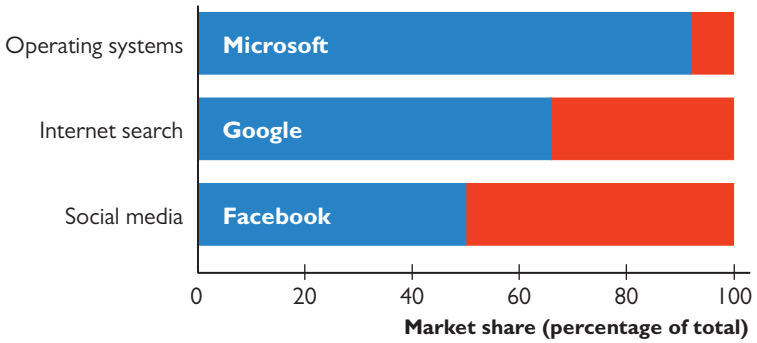


EYE on the U.S. ECONOMY

Information-Age Monopolies

Information-age technologies have created three big natural monopolies—firms with large fixed plant costs but almost zero marginal cost that experience economies of scale.

The operating system of 92 percent of personal computers is some version of Microsoft's Windows. Google performs 66 percent of all Internet searches. And Facebook gets 50 percent of all visits to social media sites.



Monopoly Price-Setting Strategies

A monopoly faces a tradeoff between price and the quantity sold. To sell a larger quantity, the monopoly must set a lower price. But there are two price-setting possibilities that create different tradeoffs:

- Single price
- Price discrimination

Single Price

Single-price monopoly
A monopoly that must sell each unit of its output for the same price to all its customers.

A **single-price monopoly** is a firm that must sell each unit of its output for the same price to all its customers. Luxottica sells sunglasses (of a given type and quality) for the same price to all its customers. Luxottica is a *single-price* monopoly because if it tried to sell at a higher price to some customers than to others, only the low-price customers would buy from Luxottica. The others would buy from Luxottica's low-price customers.

Price Discrimination

Price-discriminating monopoly
A monopoly that sells different units of a good or service for different prices not related to cost differences.

A **price-discriminating monopoly** is a firm that sells different units for different prices not related to cost differences. Many firms price discriminate. Airlines offer a dizzying array of different prices for the same trip. Pizza producers charge one price for a single pizza and almost give away a second one. Different customers might pay different prices (like airfares), or one customer might pay different prices for different quantities bought (like the bargain price for a second pizza).

When a firm price discriminates, it appears to be doing its customers a favor. In fact, the firm is charging each group of customers the highest price that it can get them to pay and it is increasing its profit.

Not all monopolies can price discriminate. The main obstacle to the practice of price discrimination is resale by the customers who buy for a low price. Because of resale possibilities, price discrimination is limited to monopolies that sell goods and services that cannot be resold.

CHECKPOINT 12.1

MyEconLab Study Plan 12.1
Key Terms Quiz
Solutions Video

Explain how monopoly arises and distinguish between single-price monopoly and price-discriminating monopoly.

Practice Problems

Use the information about the firms listed below to work Problems **1** and **2**.

- **a.** Coca-Cola cuts its price below that of Pepsi-Cola to increase profit.
- **b.** A single firm, protected by a barrier to entry, produces a personal service that has no close substitutes.
- **c.** A barrier to entry exists, but the good has some close substitutes.
- **d.** A museum offers discounts to students and seniors.
- **e.** A firm can sell any quantity it chooses at the going price.
- **f.** A firm experiences economies of scale even when it produces the quantity that meets the entire market demand.

1. Which of the six cases are monopolies or might give rise to monopoly?

2. Which are natural monopolies and which are legal monopolies? Can any of them price discriminate? If so, why?

In the News

Allegiant Air nonstop flights from Tulsa to Washington, D.C./Baltimore
From May 19 to August 16, Allegiant Air will enable Tulsa-area travelers to fly nonstop to Washington, D.C./Baltimore. The airline says the seasonal destination could become year-round if demand is sufficiently large.

Source: *Tulsa World*, January 13, 2016

Allegiant Air is the only airline flying nonstop on this route. What type of monopoly is Allegiant? What would be the barrier to entry?

Solutions to Practice Problems

1. Monopoly arises when a single firm produces a good or service that has no close substitutes and a barrier to entry exists. Monopoly arises in **b** and **f**. In **a**, there is more than one firm. In **c**, the good has close substitutes. In **d**, a monopoly might be able to price discriminate, but other types of firms (for example, pizza producers) price discriminate and they are not monopolies. In **e**, the demand for the firm's output is perfectly elastic and there is no limit to what it can sell. This firm operates in a perfectly competitive market.

2. Natural monopoly exists when one firm can meet the entire market demand at a lower price than two or more firms could: **f** is a natural monopoly, but **b** could be. Legal monopoly exists when the granting of a right creates a barrier to entry: **b** might be a legal monopoly. Because a personal service cannot be resold, **b** could price discriminate.

Solution to In the News

Allegiant Air is a natural monopoly on this nonstop route. Before Allegiant entered the market, demand on this route nonstop was too small for any firm to operate. Allegiant is exploring whether demand is large enough for one firm to be profitable. The barrier to entry is a natural barrier that arises from demand and cost.

MyEconLab Concept Video

12.2 SINGLE-PRICE MONOPOLY

To understand how a single-price monopoly makes its output and price decisions, we must first study the link between price and marginal revenue.

Price and Marginal Revenue

Because in a monopoly there is only one firm, the demand for the firm's output is the market demand. Let's look at Bobbie's Barbershop, the sole supplier of haircuts in Cairo, Nebraska. The table in Figure 12.2 shows the demand schedule for Bobbie's haircuts. For example, at $12, consumers demand 4 haircuts an hour (row *E*).

Total revenue is the price multiplied by the quantity sold. For example, in row *D*, Bobbie sells 3 haircuts at $14 each, so total revenue is $42. *Marginal revenue* is the change in total revenue resulting from a one-unit increase in the quantity sold. For example, if the price falls from $16 (row *C*) to $14 (row *D*), the quantity sold increases from 2 to 3 haircuts. Total revenue rises from $32 to $42, so the change in total revenue is $10. Because the quantity sold increases by 1 haircut, marginal revenue equals the change in total revenue and is $10. We place marginal revenue between the two rows to emphasize that marginal revenue relates to the *change* in the quantity sold.

Figure 12.2 shows the market demand curve and Bobbie's marginal revenue curve (*MR*) and also illustrates the calculation that we've just made. At each output, marginal revenue is less than price—the marginal revenue curve lies below the demand curve because a lower price is received on *all* units sold, not just on the marginal unit. For example, at a price of $16, Bobbie sells 2 haircuts (point *C*). If she lowers the price to $14 a haircut, she sells 3 haircuts and has a revenue gain

FIGURE 12.2

Demand and Marginal Revenue

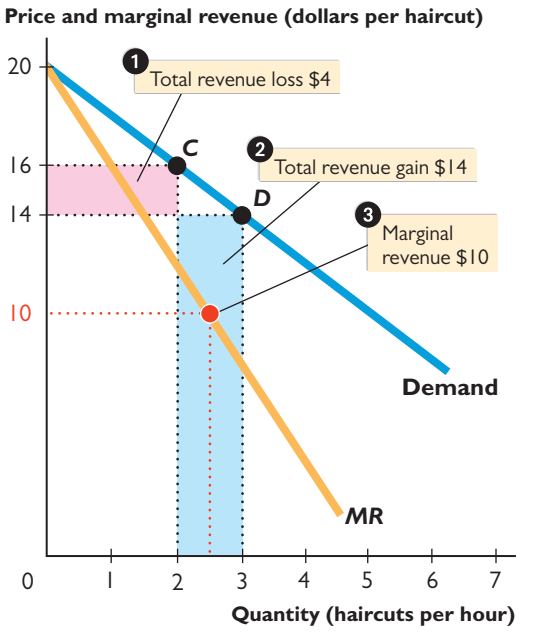
MyEconLab Animation

The table shows the market demand schedule for haircuts and Bobbie's total revenue and marginal revenue schedules.

If the price of a haircut falls from $16 to $14, the quantity sold increases from 2 to 3 haircuts.

❶ Total revenue lost on the first 2 haircuts is $4; ❷ total revenue gained on the third haircut is $14; so ❸ marginal revenue is $10.

	Price (dollars per haircut)	Quantity demanded (haircuts per hour)	Total revenue (dollars per hour)	Marginal revenue (dollars per haircut)
A	20	0	0	
				18
B	18	1	18	
				14
C	16	2	32	
				10
D	14	3	42	
				6
E	12	4	48	
				2
F	10	5	50	



of $14 on the third haircut. But she now receives only $14 a haircut on the first two—$2 a haircut less than before. So she loses $4 of revenue on the first 2 haircuts. To calculate marginal revenue, she must deduct this amount from the revenue gain of $14. So her marginal revenue is $10, which is less than the price $14.

Notice that the marginal revenue curve has *twice the slope* of the demand curve. A fall in price of $10 increases the quantity demanded by 5, but marginal revenue falls by $10 when the quantity increases by 2.5.

Marginal Revenue and Elasticity

In Chapter 5 (pp. 122–123), you learned about the *total revenue test* for the price elasticity of demand. If a *fall* in price *increases* total revenue, demand is elastic; and if a *fall* in price *decreases* total revenue, demand is inelastic.

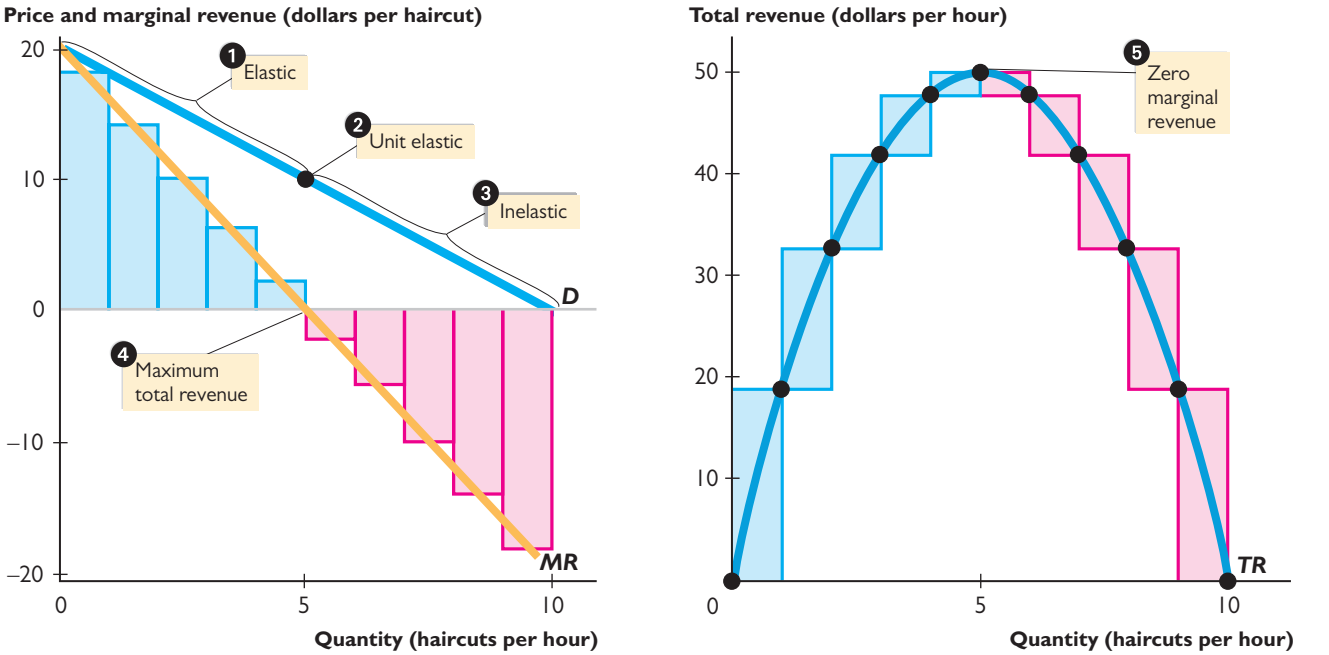
The total revenue test implies that when demand is elastic, marginal revenue is positive and when demand is inelastic, marginal revenue is negative. Figure 12.3 illustrates this relationship between elasticity and marginal revenue.

In part (a) as the price *falls* from $20 to $10, marginal revenue (shown by the blue bars) is *positive* and total revenue in part (b) *increases*, so demand is elastic. In part (a) as the price *falls* from $10 to zero, marginal revenue (the red bars) is *negative* and total revenue in part (b) *decreases*, so demand is *inelastic*. At a price of $10, total revenue is at a maximum, demand is unit elastic, and marginal revenue is zero.

FIGURE 12.3

Marginal Revenue and Elasticity

MyEconLab Animation



As the price falls, if marginal revenue is positive (the blue bars), ❶ demand is elastic; if marginal revenue is zero, ❷ demand is unit elastic; if marginal revenue is negative (the red bars), ❸ demand is inelastic. At zero marginal revenue in part (a), ❹ total revenue is maximized. And at maximum total revenue in part (b), ❺ marginal revenue is zero.

The relationship between marginal revenue and elasticity implies that a monopoly never profitably produces along the inelastic range of its demand curve. If a monopoly did produce along the inelastic range of its demand curve, it could increase total revenue by raising its price and selling a smaller quantity. Also, by producing less, the firm's total cost would fall and the firm's profit would increase. Let's look at a monopoly's output and price decision.

Output and Price Decision

To determine the output level and price that maximize a monopoly's profit, we study the behavior of both revenue and costs as output varies.

Table 12.1 summarizes the information we need about Bobbie's revenue, costs, and economic profit. Economic profit, which equals total revenue minus total cost, is maximized at $12 an hour when Bobbie sells 3 haircuts an hour for $14 each. If she sold 2 haircuts for $16 each, her economic profit would be only $9. And if she sold 4 haircuts for $12 each, her economic profit would be only $8.

You can see why 3 haircuts is Bobbie's profit-maximizing output by looking at the marginal revenue and marginal cost. When Bobbie increases output from 2 to 3 haircuts, her marginal revenue is $10 and her marginal cost is $7. Profit increases by the difference, $3 an hour. If Bobbie increases output yet further, from 3 to 4 haircuts, her marginal revenue is $6 and her marginal cost is $10. In this case, marginal cost exceeds marginal revenue by $4, so profit decreases by $4 an hour.

Figure 12.4 illustrates the information contained in Table 12.1. Part (a) shows Bobbie's total revenue curve (*TR*) and her total cost curve (*TC*). It also shows Bobbie's economic profit as the vertical distance between the *TR* and *TC* curves. Bobbie maximizes her profit at 3 haircuts an hour and earns an economic profit of $12 an hour ($42 of total revenue minus $30 of total cost).

Figure 12.4(b) shows the market demand curve (*D*) and Bobbie's marginal revenue curve (*MR*) along with her marginal cost curve (*MC*) and average total cost curve (*ATC*). Bobbie maximizes profit by producing the output at which marginal cost equals marginal revenue—3 haircuts an hour. But what price does she charge for a haircut? To set the price, the monopoly uses the demand curve and finds the highest price at which it can sell the profit-maximizing output. In Bobbie's case, the highest price at which she can sell 3 haircuts an hour is $14 a haircut.

TABLE 12.1

A Monopoly's Output and Price Decision

	Price (dollars per haircut)	Quantity demanded (haircuts per hour)	Total revenue (dollars per hour)	Marginal revenue (dollars per haircut)	Total cost (dollars per hour)	Marginal cost (dollars per haircut)	Profit (dollars per hour)
A	20	0	0		12		−12
				18		5	
B	18	1	18		17		1
				14		6	
C	16	2	32		23		9
				10		7	
D	14	3	42		30		12
				6		10	
E	12	4	48		40		8
				2		15	
F	10	5	50		55		−5

When Bobbie produces 3 haircuts an hour, her average total cost is $10 (read from the *ATC* curve at the quantity 3 haircuts) and her price is $14 (read from the *D* curve). Her profit per haircut is $4 ($14 minus $10). Bobbie's economic profit is shown by the blue rectangle, which equals the profit per haircut ($4) multiplied by the number of haircuts (3 an hour), for a total of $12 an hour.

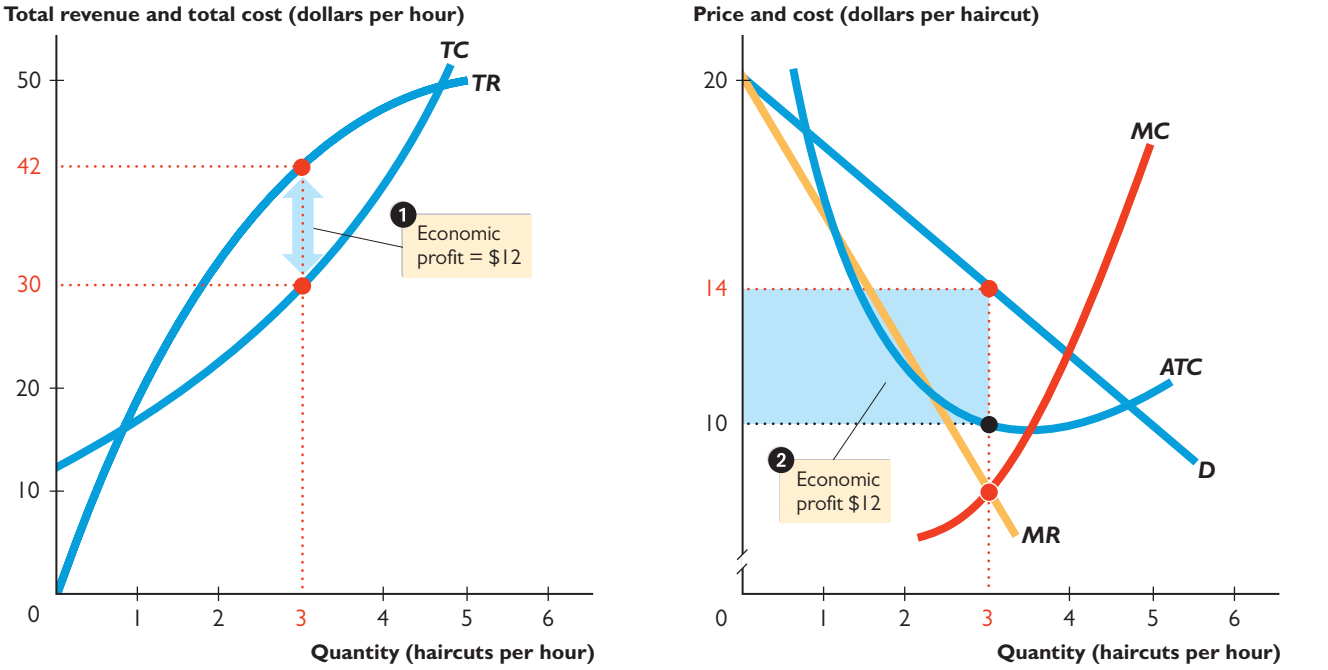
A positive economic profit is an incentive for firms to enter a market. But barriers to entry prevent that from happening in a monopoly. So in a monopoly, the firm can make a positive economic profit and continue to do so indefinitely.

A monopoly charges a price that exceeds marginal cost, but does it always make an economic profit? The answer is no. Bobbie makes a positive economic profit in Figure 12.4. But suppose that Bobbie's landlord increases the rent on her barbershop. If Bobbie pays an additional $12 an hour in shop rent, her fixed cost increases by that amount. Her marginal cost and marginal revenue don't change, so her profit-maximizing output remains at 3 haircuts an hour. Her profit decreases by the additional rent of $12 an hour to zero. If Bobbie pays more than an additional $12 an hour for rent, she incurs an economic loss. If this situation were permanent, Bobbie would go out of business. But monopoly entrepreneurs are creative, and Bobbie might find another shop at a lower rent.

FIGURE 12.4

A Monopoly's Profit-Maximizing Output and Price

MyEconLab Animation



(a) Total revenue and total cost

(b) Demand, marginal revenue, and marginal cost

In part (a), economic profit is maximized when total revenue (*TR*) minus total cost (*TC*) is greatest. ❶ Economic profit is the vertical distance between the *TR* and *TC* curves. The profit-maximizing output is 3 haircuts an hour and economic profit is $12 an hour.

In part (b), economic profit is maximized when marginal cost (*MC*) equals marginal revenue (*MR*). The price is determined by the demand curve (*D*) and is $14. ❷ Economic profit, the blue rectangle, is $12—the profit per haircut ($4) multiplied by 3 haircuts.

MyEconLab Study Plan 12.2
Solutions Video

CHECKPOINT 12.2

Explain how a single-price monopoly determines its output and price.

Practice Problems

Minnie's Mineral Springs is a single-price monopoly. Table 1 shows the demand schedule for Minnie's spring water (columns 1 and 2) and the firm's total cost schedule (columns 2 and 3).

1. Calculate Minnie's total revenue and marginal revenue schedules.
2. Draw the demand curve and Minnie's marginal revenue curve.
3. Calculate Minnie's profit-maximizing output, price, and economic profit.
4. If Minnie's is hit with a conservation tax of $14 an hour, what are Minnie's new profit-maximizing output, price, and economic profit?

TABLE 1

Price (dollars per bottle)	Quantity (bottles per hour)	Total cost (dollars per hour)
10	0	1
9	1	2
8	2	4
7	3	7
6	4	12
5	5	18

In the News

Macy's and Luxottica sign exclusive agreement
Macy's and Luxottica will add 500 LensCrafters locations to their current 670 locations of Sunglass Hut. Together, Macy's and Sunglass Hut have more than tripled the size of the sunglass business at Macy's in the past six years. Luxottica makes most of the eyewear sold in North America.

Source: *Business Wire*, November 11, 2015

How does Luxottica determine the price and quantity of eyeglasses to produce?

Solutions to Practice Problems

TABLE 2

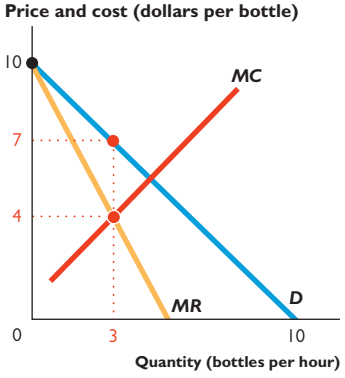
Quantity (bottles per hour)	Total revenue (dollars per hour)	Marginal revenue (dollars per bottle)
0	0	
		9
1	9	
		7
2	16	
		5
3	21	
		3
4	24	
		1
5	25	

TABLE 3

Quantity (bottles per hour)	Total cost (dollars per hour)	Marginal cost (dollars per bottle)
0	1	
		1
1	2	
		2
2	4	
		3
3	7	
		5
4	12	
		6
5	18	

1. Total revenue equals price multiplied by quantity sold. Marginal revenue equals the change in total revenue when the quantity increases by one unit (Table 2).
2. Figure 1 shows the demand curve and Minnie's marginal revenue curve, *MR*.
3. Marginal cost, *MC*, is the change in total cost when the quantity produced increases by 1 bottle (Table 3). Profit is maximized when $MR = MC$ by producing 3 bottles an hour (Figure 1). The price is $7 a bottle. Economic profit equals total revenue ($21) minus total cost ($7), which is $14 an hour.

FIGURE 1



4. The $14 tax increases Minnie's fixed cost but not its marginal cost, so the profit-maximizing output and price are unchanged. Economic profit is zero.

Solution to In the News

Luxottica is (almost) a monopoly and it sets the price of eyeglasses to maximize economic profit. Luxottica knows its total costs, so it calculates the marginal cost of a pair of glasses. The firm uses its market experience to estimate the demand for glasses and calculates marginal revenue. The firm produces the number of pairs of glasses that makes marginal revenue equal to marginal cost and sets the highest price that its customers are willing to pay for the profit-maximizing quantity.

12.3 MONOPOLY AND COMPETITION COMPARED

MyEconLab Concept Video

Imagine a market in which many small firms operate in perfect competition. Then suppose that a single firm buys out all these small firms and creates a monopoly. What happens in this market to the quantity produced, the price, and efficiency?

Output and Price

Figure 12.5 shows the market that we'll study. The market demand curve is D. Initially, with many small firms in the market, the market supply curve is S, which is the sum of the supply curves—and marginal cost curves—of the firms. The equilibrium price is P_C, which makes the quantity demanded equal the quantity supplied. The equilibrium quantity is Q_C. Each firm takes the price P_C and maximizes its profit by producing the output at which its own marginal cost equals the price.

A single firm now buys all the firms in this market. Consumers don't change, so the demand curve doesn't change. But the monopoly recognizes this demand curve as a constraint on its sales and knows that its marginal revenue curve is MR.

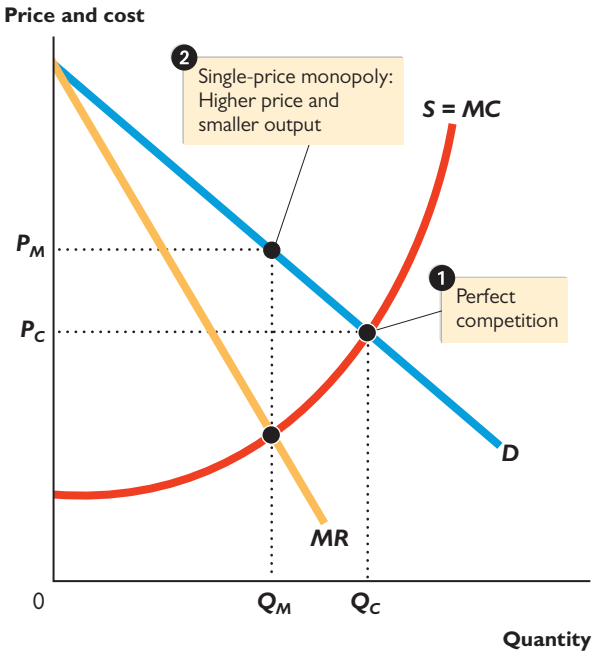
The market supply curve in perfect competition is the sum of the marginal cost curves of the firms in the industry. So the monopoly's marginal cost curve is the market supply curve of perfect competition—labeled $S = MC$. The monopoly maximizes profit by producing the quantity at which marginal revenue equals marginal cost, which is Q_M. This output is smaller than the competitive output, Q_C. The monopoly charges the price P_M, which is higher than P_C.

Compared to perfect competition, a single-price monopoly produces a smaller output and charges a higher price.

FIGURE 12.5

Monopoly's Smaller Output and Higher Price

MyEconLab Animation



1. A competitive industry produces the quantity Q_C at price P_C.
2. A single-price monopoly produces the quantity Q_M at which marginal revenue equals marginal cost and sells that quantity for the price P_M. Compared to perfect competition, a single-price monopoly produces a smaller output and raises the price.

Is Monopoly Efficient?

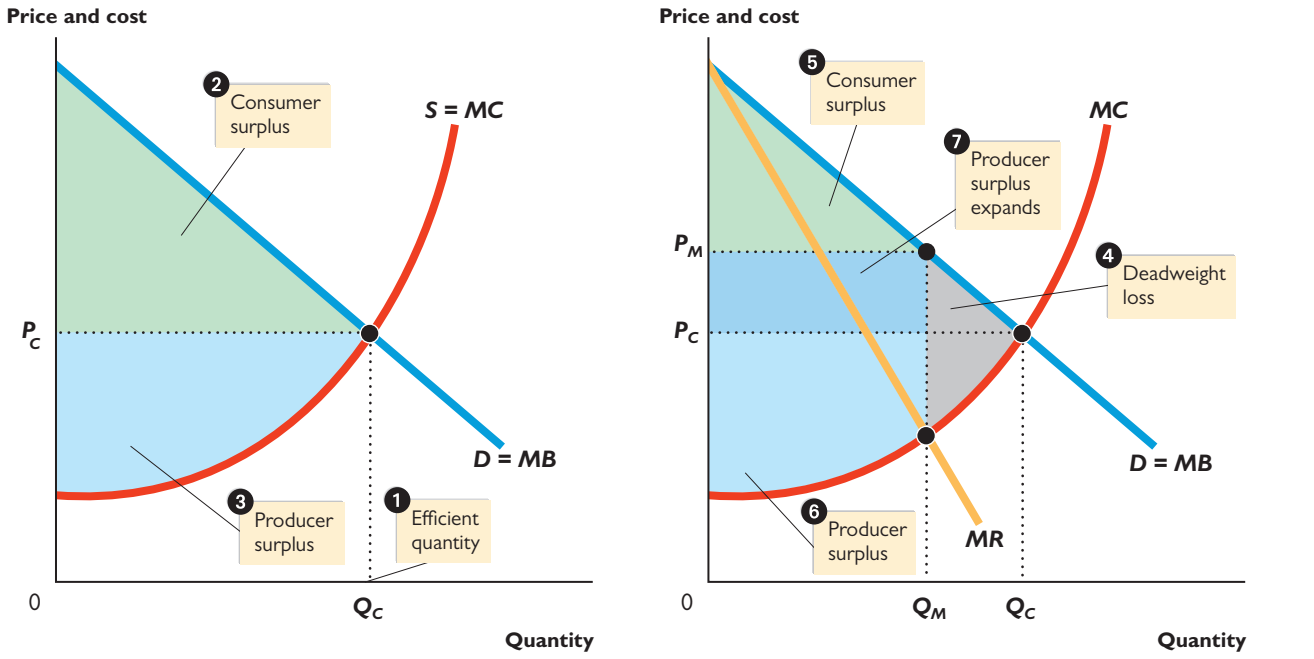
You learned in Chapter 6 that resources are used efficiently when marginal benefit equals marginal cost. Figure 12.6(a) shows that perfect competition achieves this efficient use of resources. The demand curve ($D = MB$) shows the marginal benefit to consumers. The supply curve ($S = MC$) shows the marginal cost (opportunity cost) to producers. At the competitive equilibrium, the price is P_C and the quantity is Q_C. Marginal benefit equals marginal cost, and resource use is efficient. Total surplus (Chapter 6, p. 155), the sum of *consumer surplus*, the green triangle, and *producer surplus*, the blue area, is maximized.

Figure 12.6(b) shows that monopoly is inefficient. Monopoly output is Q_M and price is P_M. Price (marginal benefit) exceeds marginal cost and the underproduction creates a *deadweight loss* (Chapter 6, p. 157), which is shown by the gray area. Consumers lose partly by getting less of the good, shown by the gray triangle above P_C, and partly by paying more for the good. Consumer surplus shrinks to the smaller green triangle. Producers lose by selling less of the good, shown by the part of the gray area below P_C, but gain by selling their output for a higher price, shown by the dark blue rectangle. Producer surplus expands and is larger in monopoly than in perfect competition.

FIGURE 12.6

The Inefficiency of Monopoly

MyEconLab Animation



(a) Perfect competition

In perfect competition, ❶ the equilibrium quantity is the efficient quantity, Q_C, because at that quantity the price, P_C, equals marginal benefit and marginal cost. The sum of ❷ consumer surplus and ❸ producer surplus is maximized.

(b) Monopoly

In a single-price monopoly, the equilibrium quantity, Q_M, is inefficient because the price, P_M, which equals marginal benefit, exceeds marginal cost. ❹ A deadweight loss arises. ❺ Consumer surplus shrinks, and ❻ producer surplus expands by the area ❼.

Is Monopoly Fair?

Monopoly is inefficient because it creates a deadweight loss. But monopoly also *redistributes* consumer surplus. The producer gains, and the consumers lose.

Figure 12.6 shows this redistribution. The monopoly gets the difference between the higher price, P_M, and the competitive price, P_C, on the quantity sold, Q_M. So the dark blue rectangle shows the part of the consumer surplus taken by the monopoly. This portion of the loss of consumer surplus is not a loss to society. It is redistribution from consumers to the monopoly producer.

Are the gain for the monopoly and the loss for consumers fair? You learned about two standards of fairness in Chapter 6: fair *rules* and a fair *result.* Redistribution from the rich to the poor is consistent with the fair-result view. So on this view of fairness, whether monopoly redistribution is fair or unfair depends on who is richer: the monopoly or the consumers of its product. It might be either. Whether the *rules* are fair depends on whether the monopoly has benefited from a protected position that is not available to anyone else. If everyone is free to acquire the monopoly, then the rules are fair. So monopoly is inefficient and it might be, but is not always, unfair.

The pursuit of monopoly profit leads to an additional costly activity that we'll now describe: rent seeking.

Rent Seeking

Rent seeking is the lobbying for special treatment from the government to create economic profit or to divert consumer surplus or producer surplus away from others. ("Rent" is a general term in economics that includes all forms of surplus such as consumer surplus, producer surplus, and economic profit.) Rent seeking does not always create a monopoly, but it always restricts competition and often creates a monopoly.

Rent seeking
The lobbying for special treatment from the government to create economic profit or to divert consumer surplus or producer surplus away from others.

Scarce resources can be used to produce the goods and services that people value or they can be used in rent seeking. Rent seeking is potentially profitable for the rent seeker but costly to society because it uses scarce resources purely to transfer wealth from one person or group to another person or group rather than to produce the things that people value.

To see why rent seeking occurs, think about the two ways in which a person might become the owner of a monopoly:

- Buy a monopoly.
- Create a monopoly.

Buy a Monopoly

A person might try to make a monopoly profit by buying a firm (or a right) that is protected by a barrier to entry. Buying a taxicab medallion in New York City is an example. The number of medallions is restricted, so their owners are protected from unlimited entry into the industry. A person who wants to operate a taxi must buy a medallion from someone who already has one.

But anyone is free to enter the bidding for a medallion. So competition among buyers drives the price up to the point at which they make only zero economic profit. For example, competition for the right to operate a taxi in New York City has led to a price of $600,000 for a taxi medallion, which is sufficiently high to eliminate economic profit for taxi operators and leave entrepreneurs with only normal profit.

Create a Monopoly

Because buying a monopoly means paying a price that soaks up the economic profit, creating a monopoly by rent seeking is an attractive alternative to buying one. Rent seeking is a political activity. It takes the form of lobbying and trying to influence the political process to get laws that create legal barriers to entry. Such influence might be sought by making campaign contributions in exchange for legislative support or by indirectly seeking to influence political outcomes through publicity in the media or by direct contact with politicians and bureaucrats. An example of a rent created in this way is the law that restricts the quantities of textiles that can be imported into the United States. Another is a law that limits the quantity of tomatoes that can be imported into the United States. These laws restrict competition, which decreases the quantity for sale and increases prices.

Rent-Seeking Equilibrium

Rent seeking is a competitive activity. If an economic profit is available, a rent seeker will try to get some of it. Competition among rent seekers pushes up the cost of rent seeking until it leaves the monopoly earning only a zero economic profit after paying the rent-seeking costs.

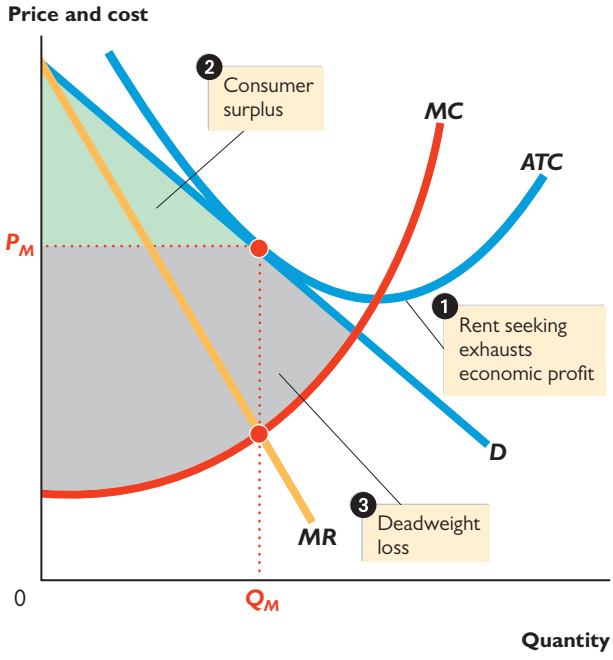
Figure 12.7 shows a rent-seeking equilibrium. The cost of rent seeking is a fixed cost that must be added to a monopoly's other costs. The average total cost curve, which includes the fixed cost of rent seeking, shifts upward until it just touches the demand curve. Consumer surplus is unaffected. But the deadweight loss of monopoly now includes the original deadweight loss plus the economic profit consumed by rent seeking, which the enlarged gray area shows.

FIGURE 12.7

Rent-Seeking Equilibrium

MyEconLab Animation

1. Rent-seeking costs exhaust economic profit. The firm's rent-seeking costs are fixed costs. They increase total fixed cost and average total cost. The *ATC* curve shifts upward until, at the profit-maximizing price, the firm breaks even.
2. Monopoly profit-maximization shrinks consumer surplus relative to its maximum level in perfect competition, but rent-seeking doesn't shrink consumer surplus any further.
3. The deadweight loss increases and now includes the original deadweight loss plus the economic profit consumed by rent seeking.



CHECKPOINT 12.3

MyEconLab Study Plan 12.3
Key Terms Quiz
Solutions Video

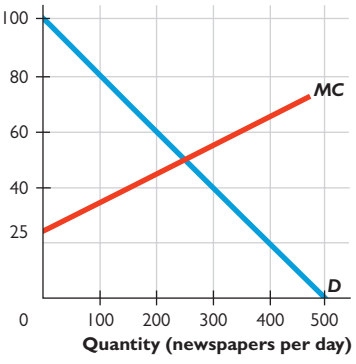
Compare the performance of a single-price monopoly with that of perfect competition.

Practice Problems

Township is a small isolated community served by one newspaper that can meet the market demand at a lower cost than two or more newspapers could. The *Township Gazette* is the only source of news. Figure 1 shows the marginal cost of printing the *Township Gazette* and the market demand for it. The *Township Gazette* is a profit-maximizing, single-price monopoly.

1. How many copies of the *Township Gazette* are printed each day and what is the price of the *Township Gazette*?
2. What is the efficient number of copies of the *Township Gazette* and what is the price at which the efficient number of copies could be sold?
3. Is the number of copies printed the efficient quantity? Explain your answer.
4. On the graph, show the consumer surplus that is redistributed from consumers to the *Township Gazette* and the deadweight loss that arises because the *Township Gazette* is a monopoly.

FIGURE 1



In the News

Ticketmaster's near monopoly challenged as technology changes

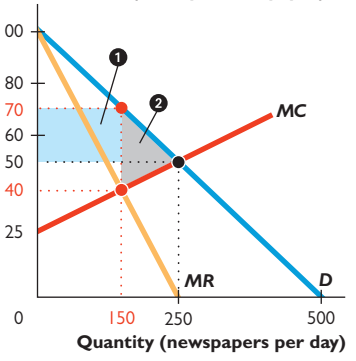
In the 1990s, to see Michael Jordan or Garth Brooks live you had to buy the ticket through Ticketmaster, or from a scalper. Today, Ticketmaster has merged with concert promoter Live Nation and now controls the sale of tickets to sports and music events. Competitors have entered the market, and event tickets are now sold through Internet auction markets.

How will the increased competition in the sale of tickets affect the service fee component of the price and the efficiency of the market? Will scalpers survive?

Solutions to Practice Problems

1. The profit-maximizing quantity of the *Township Gazette* is 150 a day, where marginal revenue equals marginal cost. The price is 70¢ a copy (Figure 2).
2. The efficient quantity is 250 copies, where quantity demanded (marginal benefit) equals marginal cost and the price would be 50¢ a copy (Figure 2).
3. The number of copies printed is not efficient because the marginal benefit of the 150th copy (70¢) exceeds its marginal cost (40¢) (Figure 2).
4. In Figure 2, the blue rectangle ❶ shows the consumer surplus transferred from the consumers to the *Township Gazette* and the gray triangle ❷ shows the deadweight loss created.

FIGURE 2

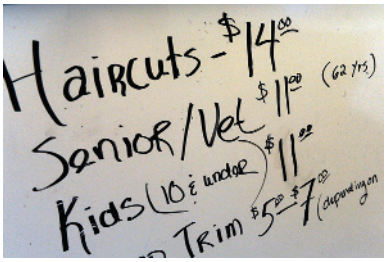


Solution to In the News

The price you pay for an event ticket is the sum of the price of the event plus a service fee. As a monopoly, Ticketmaster charges the profit-maximizing fee. The monopoly has weakened and competition has increased, but sellers still charge the profit-maximizing fee, although a lower fee. The ticket-selling market is more efficient, but scalpers now compete with resale auctions and appear to survive.

MyEconLab Concept Video

12.4 PRICE DISCRIMINATION



Why does a hairdresser charge seniors, veterans, and kids $3 less than other customers?

Price discrimination—selling a good or service at a number of different prices—is widespread. You encounter it when you travel, go to the movies, get your hair cut, buy pizza, or visit an art museum. At first sight, it appears that price discrimination contradicts the assumption of profit maximization. Why would a movie operator allow children to see movies at half price? Why would a hairdresser charge students and senior citizens less? Aren't these firms losing profit by being nice to their customers?

Deeper investigation shows that far from lowering profit, price discriminators make a bigger profit than they would otherwise. So a monopoly has an incentive to find ways of discriminating and charging each buyer the highest possible price. Some people pay less with price discrimination, but others pay more.

Most price discriminators are *not* monopolies, but monopolies do price discriminate when they can. To be able to price discriminate, a firm must

- Identify and separate different types of buyers.
- Sell a product that cannot be resold.

Price discrimination is charging different prices for a single good or service because the willingness to pay varies across buyers. Not all price *differences* are price *discrimination*. Some goods that are similar but not identical have different prices because they have different production costs. For example, the cost of producing electricity depends on time of day. If an electric power company charges a higher price for consumption between 7:00 and 9:00 in the morning and between 4:00 and 7:00 in the evening than it does at other times of the day, the company is not price discriminating.

Price Discrimination and Consumer Surplus

The key idea behind price discrimination is to convert consumer surplus into economic profit. To extract every dollar of consumer surplus from every buyer, the monopoly would have to offer each individual customer a separate price schedule based on that customer's own willingness to pay. Such price discrimination cannot be carried out in practice because a firm does not have enough information about each consumer's demand curve. But firms try to extract as much consumer surplus as possible, and to do so, they discriminate in two broad ways:

- Among groups of buyers
- Among units of a good

Discriminating Among Groups of Buyers

To price discriminate among groups of buyers, the firm offers different prices to different types of buyers, based on things such as age, employment status, or some other easily distinguished characteristic. This type of price discrimination works when each group has a different average willingness to pay for the good or service.

For example, a face-to-face sales meeting with a customer might bring a large and profitable order. For salespeople and other business travelers, the marginal benefit from an airplane trip is large and the price that such a traveler will pay for a trip is high. In contrast, for a vacation traveler, any of several different trips or even no vacation trip are options. So for vacation travelers, the marginal benefit of

a trip is small and the price that such a traveler will pay for a trip is low. Because business travelers are willing to pay more than vacation travelers are, it is possible for an airline to profit by price discriminating between these two groups.

Discriminating Among Units of a Good

To price discriminate among units of a good, the firm charges the same prices to all its customers but offers a lower price per unit for a larger number of units bought. When Pizza Hut charges $10 for one home-delivered pizza and $14 for two, it is using this type of price discrimination. In this example, the price of the second pizza is only $4.

Let's see how an airline exploits the differences in demand by business and vacation travelers and increases its profit by price discriminating.

Profiting by Price Discriminating

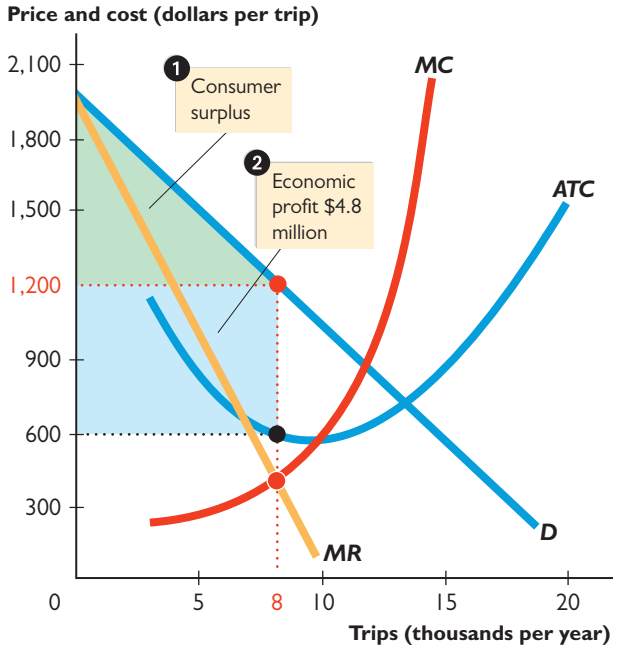
Global Air has a monopoly on an exotic route. Figure 12.8 shows the demand curve (*D*) for travel on this route and Global Air's marginal revenue curve (*MR*). It also shows Global Air's marginal cost (*MC*) and average total cost (*ATC*) curves.

Initially, Global is a single-price monopoly and maximizes its profit by producing 8,000 trips a year (the quantity at which *MR* equals *MC*). The price is $1,200 a trip. The average total cost of a trip is $600, so economic profit is $600 a trip. On 8,000 trips, Global's economic profit is $4.8 million a year, shown by the blue rectangle. Global's customers enjoy a consumer surplus shown by the green triangle.

FIGURE 12.8

A Single-Price Monopoly's Price and Economic Profit

MyEconLab Animation



Global Air has a monopoly on an air route. The demand curve for travel on this route is *D*, and Global's marginal revenue curve is *MR*. Its marginal cost curve is *MC*, and its average total cost curve is *ATC*.

As a single-price monopoly, Global maximizes profit by selling 8,000 trips a year at $1,200 a trip.

1. Global's customers enjoy a consumer surplus—the green triangle.
2. Global makes an economic profit of $4.8 million a year—the blue rectangle.

Global is struck by the fact that many of its customers are business travelers, and Global suspects that they are willing to pay more than $1,200 a trip. So Global does some market research, which tells Global that some business travelers are willing to pay as much as $1,800 a trip. Also, these customers almost always make their travel plans at the last moment. Another group of business travelers is willing to pay $1,600. These customers know a week ahead when they will travel, and prefer a flexible ticket. Yet another group is willing to pay up to $1,400. These travelers know two weeks ahead when they will travel, and they are happy to buy a restricted ticket.

So Global announces a new fare schedule: No restrictions, $1,800; 7-day advance purchase, flexible, $1,600; 14-day advance purchase, flexible, $1,400; 14-day advance purchase, must stay at least 7 days, $1,200.

Figure 12.9 shows the outcome with this new fare structure and also shows why Global is pleased with its new fares. It sells 2,000 trips at each of its four prices. Global's economic profit increases by the area of the blue steps in the figure. Its economic profit is now its original $4.8 million a year plus an additional $2.4 million from its new higher fares. Consumer surplus has shrunk to the sum of the smaller green triangles.

Perfect Price Discrimination

Perfect price discrimination
Price discrimination that extracts the entire consumer surplus by charging the highest price that consumers are willing to pay for each unit.

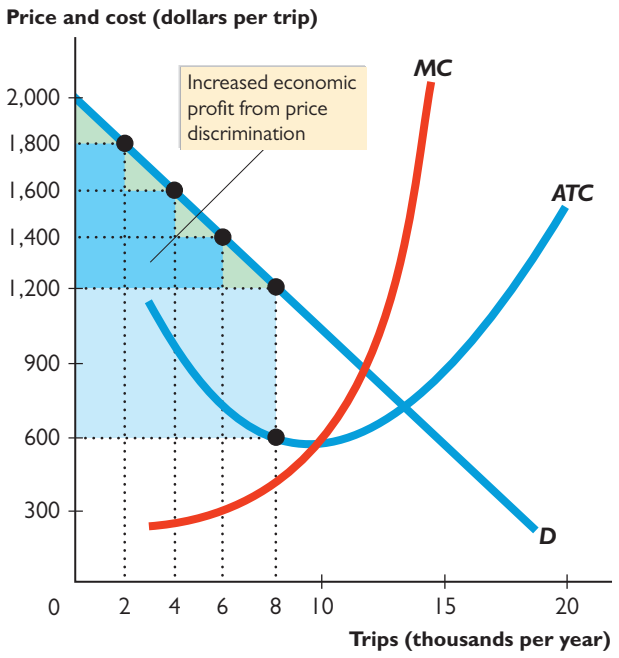
But Global thinks that it can do even better. It plans to achieve **perfect price discrimination**, which extracts the entire consumer surplus by charging the highest price that consumers are willing to pay for each unit. To do so, Global must get creative and come up with a host of additional business fares ranging between $2,000 and $1,200, each one of which appeals to a small segment of the business market.

FIGURE 12.9
Price Discrimination

MyEconLab Animation

Global revises its fare structure. It now offers no restrictions at $1,800; 7-day advance purchase, flexible at $1,600; 14-day advance purchase, flexible at $1,400; and 14-day advance purchase, must stay at least 7 days, at $1,200.

Global sells 2,000 units at each of its four new fares. Its economic profit increases by $2.4 million a year to $7.2 million a year, which is shown by the original profit (light blue rectangle) plus the blue steps. Global's customers' consumer surplus shrinks to the sum of the green areas.



Once Global is discriminating finely between different customers and getting from each customer the maximum he or she is willing to pay, something special happens to marginal revenue. Recall that for the single-price monopoly, marginal revenue is less than price. The reason is that when the price is cut to sell a larger quantity, the price is lower on all units sold. But with perfect price discrimination, Global sells only the marginal seat at the lower price. All the other customers continue to buy the trip at the highest price they are willing to pay. So for the perfect price discriminator, marginal revenue equals price and the demand curve becomes the marginal revenue curve.

With marginal revenue equal to price, Global can obtain yet greater profit by increasing output up to the point at which price (and marginal revenue) is equal to marginal cost.

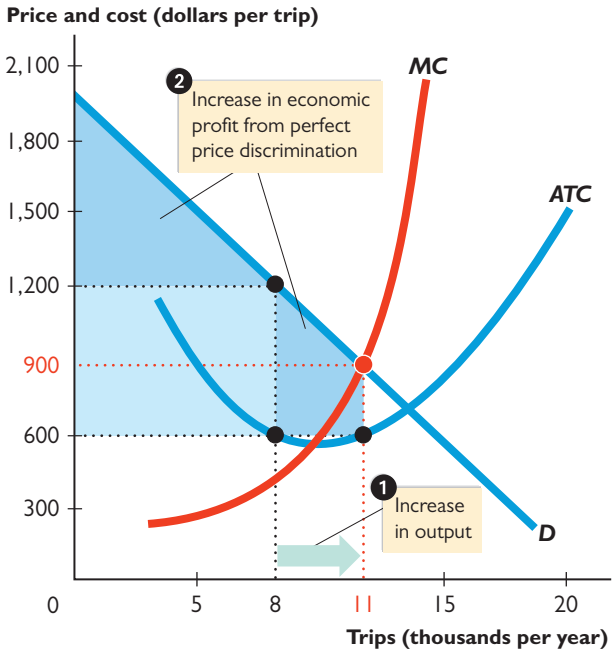
So Global now seeks additional travelers who will not pay as much as $1,200 a trip but who will pay more than marginal cost. More creative pricing comes up with vacation specials and other fares that have combinations of advance reservation, minimum stay, and other restrictions that make these fares unattractive to Global's existing customers but attractive to a further group of travelers. With all these fares and specials, Global extracts the entire consumer surplus and maximizes economic profit.

Figure 12.10 shows the outcome with perfect price discrimination. The dozens of fares paid by the original travelers who are willing to pay between $1,200 and $2,000 have extracted the entire consumer surplus from this group and converted it into economic profit for Global. The new fares between $900 and $1,200 have attracted 3,000 additional travelers but have taken their entire consumer surplus also. Global is making an economic profit of more than $9 million a year.

FIGURE 12.10

Perfect Price Discrimination

MyEconLab Animation



With perfect price discrimination, the demand curve becomes Global's marginal revenue curve. Economic profit is maximized when the lowest price equals marginal cost.

1. Global increases output to 11,000 trips a year.
2. Global's economic profit increases to $9.35 million a year.

EYE on the U.S. ECONOMY

Airline Price Discrimination

United Airlines' normal flexible economy fare from San Francisco to Washington, D.C., is $897, but it has a range of cheaper fares with its lowest-price ticket at $239. On a typical flight, passengers might be paying as many as 20 different fares.

The airlines sort their customers according to their willingness to pay by offering a variety of options that attract price-sensitive leisure travelers but don't get bought by business travelers.

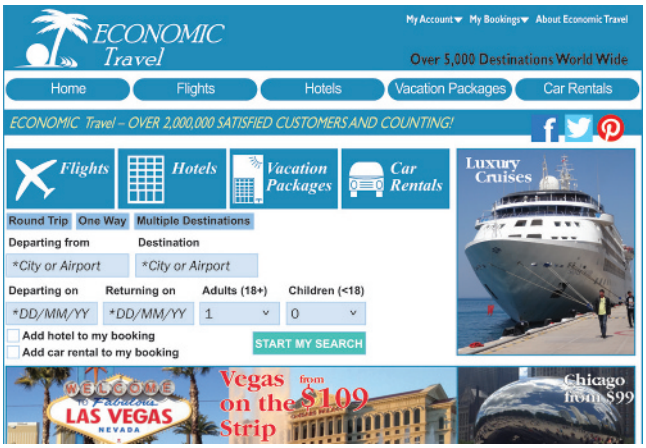
Despite the sophistication of the airlines' pricing schemes, almost 15 percent of seats fly empty. The marginal cost of filling an empty seat is close to zero, so a ticket sold at a few dollars would be profitable.

The airlines compete with online booking sites. Low fares are now feasible, thanks to dozens of online travel agents. Shopping around the airlines with bids from travelers, these travel agents broker thousands of tickets a day and obtain the lowest possible fares for their customers.



Would it bother you to hear how little I paid for this flight?

Credit: William Hamilton



Price Discrimination and Efficiency

With perfect price discrimination, the monopoly increases output to the point at which price equals marginal cost. This output is identical to that of perfect competition. Perfect price discrimination pushes consumer surplus to zero but increases producer surplus to equal the sum of consumer surplus and producer surplus in perfect competition. Deadweight loss with perfect price discrimination is zero. So perfect price discrimination produces the efficient quantity.

But there are two differences between perfect competition and perfect price discrimination. First, the distribution of the total surplus is different. It is shared by consumers and producers in perfect competition while the producer gets it all with perfect price discrimination. Second, because the producer grabs all the total surplus, rent seeking becomes profitable.

Rent seekers use resources in pursuit of monopoly, and the bigger the rents, the greater is the incentive to use resources to pursue those rents. With free entry into rent seeking, the long-run equilibrium outcome is that rent seekers use up the entire producer surplus.

CHECKPOINT 12.4

MyEconLab Study Plan 12.4
Key Terms Quiz
Solutions Video

Explain how price discrimination increases profit.

Practice Problems

Village, a small isolated town, has one doctor. For a 30-minute consultation, the doctor charges a rich person twice as much as a poor person.

1. Does the doctor practice price discrimination? Is the doctor using resources efficiently? Does the doctor's pricing scheme redistribute consumer surplus? If so, explain how.
2. If the doctor decided to charge everyone the maximum price that he or she would be willing to pay, what would be the consumer surplus? Would the market for medical service in Village be efficient?

In the News

Where to find the best travel deals

Travel discounts as high as 50 percent are available if you know where to look for them. Examples are companion and two-for-one sales on airlines and Amtrak, and second-, third-, fourth-, or fifth-night-free deals offered by hotels. A Southwest Airlines' senior fare can be up to 40 percent less than other discounted fares.

Source: *USA Today*, December 10, 2015

How do airlines, railroads, and hotels increase profit by price discriminating?

Solutions to Practice Problems

1. The doctor practices price discrimination because rich people and poor people pay a different price for the same service: a 30-minute consultation.
   The doctor provides the profit-maximizing number of consultations and charges rich people more than poor people. As a monopoly, the total number of consultations is less than that at which marginal benefit equals the marginal cost of providing the medical service. Because marginal benefit does not equal marginal cost, the doctor is not using resources efficiently.
   With price discrimination, some consumer surplus is redistributed to the doctor as profit.
2. The doctor decides to practice perfect price discrimination. If successful, with perfect price discrimination, marginal revenue equals price. To maximize economic profit, the doctor increases the number of consultations to make the lowest price charged equal to the marginal cost of providing the service. The doctor takes the entire consumer surplus, so consumer surplus is zero.
   Marginal benefit equals price, so resources are being used efficiently.

Solution to In the News

A trip by air or rail or a night in a hotel cannot be resold, so price discrimination is possible. Offering a discount is price discrimination. Price discrimination is profitable because marginal cost is lower than the single-price monopoly's profit-maximizing price. Selling additional units for a discountd price that is greater than marginal cost increases economic profit.

MyEconLab Concept Video

12.5 MONOPOLY REGULATION

Natural monopoly presents a dilemma. With economies of scale, a natural monopoly produces at the lowest possible cost. But with market power, the monopoly has an incentive to raise the price above the competitive price and produce too little—to operate in the self-interest of the monopoly and not in the social interest.

Regulation
Rules administered by a government agency to influence prices, quantities, entry, and other aspects of economic activity in a firm or industry.

Regulation—rules administered by a government agency to influence prices, quantities, entry, and other aspects of economic activity in a firm or industry—is a possible solution to this dilemma.

To implement regulation, the government establishes agencies to oversee and enforce the rules. For example, the Surface Transportation Board regulates prices on interstate railroads and some trucking and bus lines, and water and oil pipelines. By the 1970s, almost a quarter of the nation's output was produced by regulated industries (far more than just natural monopolies) and a process of deregulation began.

Deregulation
The process of removing regulation of prices, quantities, entry, and other aspects of economic activity in a firm or industry.

Deregulation is the process of removing regulation of prices, quantities, entry, and other aspects of economic activity in a firm or industry. During the past 30 years, deregulation has occurred in domestic air transportation, telephone service, interstate trucking, and banking and financial services. Cable TV was deregulated in 1984, re-regulated in 1992, and deregulated again in 1996.

Regulation is a *possible* solution to the dilemma presented by monopoly but not a sure-bet solution. There are two theories about how regulation actually works: the *social interest theory* and the *capture theory*.

Social interest theory
The theory that regulation achieves an efficient allocation of resources.

The **social interest theory** is that the political and regulatory process relentlessly seeks out inefficiency and introduces regulation that eliminates deadweight loss and allocates resources efficiently.

Capture theory
The theory that the regulation serves the self-interest of the producer and results in maximum profit, underproduction, and deadweight loss.

The **capture theory** is that the political and regulatory process gets captured by the regulated firm and ends up serving its self-interest, with maximum economic profit, underproduction, and deadweight loss. The regulator gets captured because the producer's gain is large and visible while each individual consumer's gain is small and invisible. No individual consumer has an incentive to oppose the regulation, but the producer has a big incentive to lobby for it.

Which theory of regulation best explains real-world regulations? Does regulation serve the social interest or the self-interest of monopoly producers?

Efficient Regulation of a Natural Monopoly

A cable TV company is a *natural monopoly* (pp. 308–309)—it can supply the entire market at a lower price than two or more competing firms can. Cox Communications, based in Atlanta, supplies cable TV to households in 16 states. It has invested heavily in satellite receiving dishes, cables, and control equipment and so has large fixed costs. These fixed costs are part of the company's average total cost. Its average total cost decreases as the number of households served increases because the fixed cost is spread over a larger number of households. Unregulated, Cox Communications serves the number of households that maximizes profit. Like all single-price monopolies, the profit-maximizing quantity is less than the efficient quantity and underproduction results in a deadweight loss (see Figure 12.6, p. 318).

Marginal cost pricing rule
A rule that sets price equal to marginal cost to achieve an efficient output.

How can Cox be regulated to produce the efficient quantity of cable TV service? The answer is by being regulated to set its price equal to marginal cost, known as the **marginal cost pricing rule**. The quantity demanded at a price equal

to marginal cost is the efficient quantity—the quantity at which marginal benefit equals marginal cost.

Figure 12.11 illustrates the marginal cost pricing rule. The demand curve for cable TV is *D*. Cox's marginal cost curve is *MC*. That marginal cost curve is (assumed to be) horizontal at $10 per household per month—that is, the cost of providing each additional household with a month of cable programming is $10. The efficient outcome occurs if the price is regulated at $10 per household per month with 8 million households served.

But there is a problem: Because average total cost exceeds marginal cost, a firm that follows the marginal cost pricing rule incurs an economic loss. So a cable TV company that is required to use a marginal cost pricing rule will not stay in business for long. How can the firm cover its costs and, at the same time, obey a marginal cost pricing rule?

One possibility is price discrimination (see pp. 322–326). Another possibility is to use a two-part price (called a *two-part tariff*). For example, local telephone companies charge consumers a monthly fee for being connected to the telephone system and then charge a price equal to marginal cost (zero) for each local call. A cable TV operator can charge a one-time connection fee that covers its fixed cost and then charge a monthly fee equal to marginal cost.

Second-Best Regulation of a Natural Monopoly

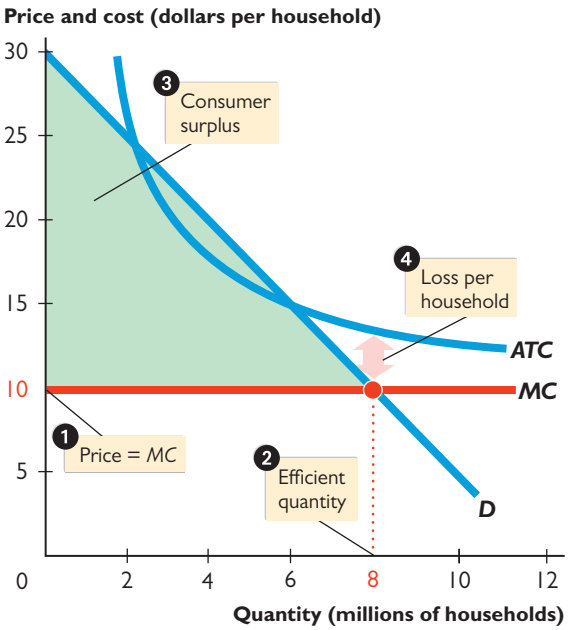
Regulation of a natural monopoly cannot always achieve an efficient outcome. Two possible ways of enabling a regulated monopoly to avoid an economic loss are

- Average cost pricing
- Government subsidy

FIGURE 12.11

Natural Monopoly: Marginal Cost Pricing

MyEconLab Animation



The market demand curve for cable TV is *D*. A cable TV operator's marginal cost *MC* is a constant $10 per household per month. Its fixed cost is large, and the average total cost curve, which includes average fixed cost, is *ATC*.

1. Price is set equal to marginal cost at $10 a month.
2. At this price, the efficient quantity (8 million households) is served.
3. Consumer surplus is maximized as shown by the green triangle.
4. The firm incurs a loss on each household served, shown by the red arrow.

Average cost pricing rule
A rule that sets price equal to average total cost to enable a regulated firm to avoid economic loss.

Average Cost Pricing

The **average cost pricing rule** sets price equal to average total cost. With this rule the firm produces the quantity at which the average total cost curve cuts the demand curve. This rule results in the firm making zero economic profit—breaking even. But because for a natural monopoly average total cost exceeds marginal cost, the quantity produced is less than the efficient quantity and a deadweight loss arises. Figure 12.12 illustrates the average cost pricing rule. The price is $15 a month and 6 million households buy cable TV. The gray triangle shows the deadweight loss.

Government Subsidy

A government subsidy is a direct payment to the firm equal to its economic loss. But to pay a subsidy, the government must raise the revenue by taxing some other activity. You saw in Chapter 7 that taxes themselves generate deadweight loss.

And the Second-Best Is...

Which is the better option, average cost pricing or marginal cost pricing with a government subsidy? The answer turns on the relative magnitudes of the two deadweight losses. Average cost pricing generates a deadweight loss in the market served by the natural monopoly. A subsidy generates deadweight losses in the markets for the items that are taxed to pay the subsidy. The smaller deadweight loss is the second-best solution to regulating a natural monopoly. Making this calculation in practice is too difficult and average cost pricing is generally preferred to a subsidy.

FIGURE 12.12
Natural Monopoly: Average Cost Pricing
MyEconLab Animation

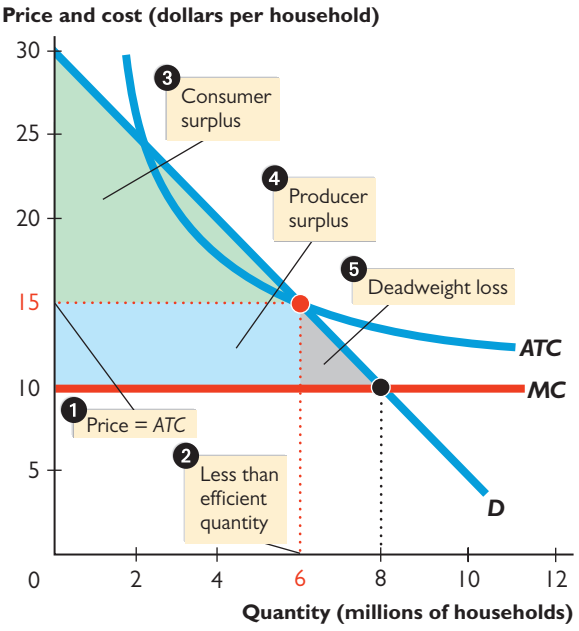
❶ Price is set equal to average total cost at $15 a month.

At this price, ❷ the quantity of households served (6 million) is less than the efficient quantity (8 million households).

❸ Consumer surplus shrinks to the smaller green triangle.

❹ A producer surplus enables the firm to pay its total fixed cost and break even.

❺ A deadweight loss, shown by the gray triangle, arises.





EYE on MICROSOFT

MyEconLab Critical Thinking Exercise

Are Microsoft's Prices Too High?

Microsoft's prices are too high in the sense that they exceed marginal cost and result in fewer copies sold of the Windows operating system and Office application than the efficient quantities.

Profit Maximization

The figure illustrates how Microsoft prices its products to maximize profit. The demand for copies of the Windows operating system is *D*. The marginal revenue curve is *MR*. The marginal cost of an additional copy is very small and we assume it to be zero, with marginal cost curve *MC*.

Profit is maximized by producing the quantity at which marginal revenue equals marginal cost. In the figure, that quantity is 4 million copies of Windows per month. The price is $300 per copy and Microsoft receives a producer surplus shown by the area of the blue rectangle.

Inefficiency

The efficient quantity is 8 million copies per month, where price and marginal benefit equal marginal cost. Because the actual quantity is smaller than the efficient quantity, a deadweight loss arises and the area of the gray triangle shows its magnitude. The area of the green triangle shows the consumer surplus.

Fixed Cost

The marginal cost of a copy of Windows might be close to zero, but the fixed cost of developing the software is large. Microsoft must earn at least enough revenue to pay these fixed costs.

Earning enough to pay the firm's fixed costs does not inevitably lead to inefficiency. Some firms with zero marginal cost and the market power to charge a high price do choose to provide the efficient quantity of their services at a zero price.

The Google Solution

Google is one such firm. The price of an Internet search on Google is zero. The quantity of searches is that at which the marginal benefit of a search equals the zero marginal cost, so the quantity of searches is the efficient quantity.

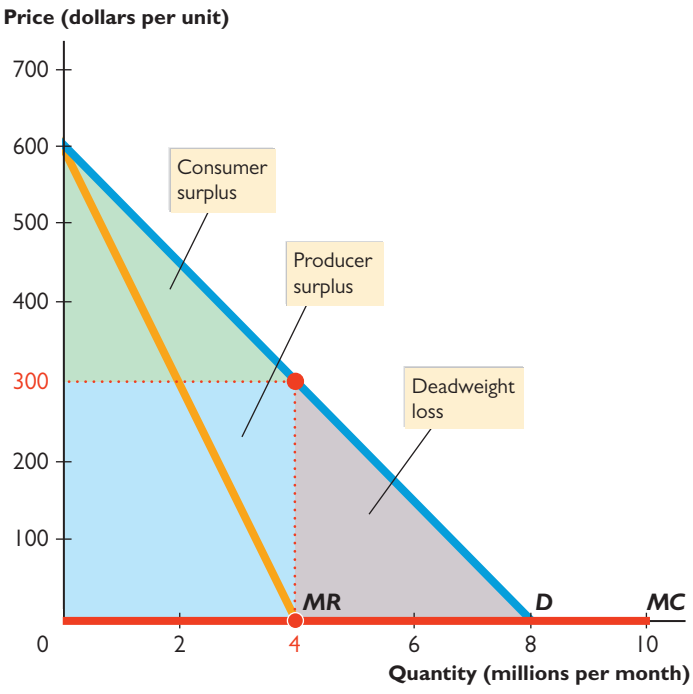
Google earns revenue, and a very large revenue, by selling advertising that more than pays its fixed operating costs.

Efficiency

Advertising on Google is more effective than a TV or poster advertisement because it is targeted at potential buyers of products based on the topics of their searches.

The Google solution delivers the efficient quantity of zero-marginal-cost Internet search activity.

The Google solution might also deliver the efficient quantity of advertising. It will do so if Google is able to achieve perfect price discrimination in the market for advertising.



Implementing average cost pricing presents the regulator with a challenge because it is not possible to be sure of a firm's costs. So regulators use one of two practical rules:

- Rate of return regulation
- Price cap regulation

Rate of Return Regulation

Rate of return regulation
A regulation that sets the price at a level that enables a firm to earn a specified target rate of return on its capital.

Under **rate of return regulation**, the price is set at a level that enables the firm to earn a specified target rate of return on its capital. This type of regulation can end up serving the self-interest of the firm rather than the social interest. The firm's managers have an incentive to inflate costs by spending on items such as private jets, free baseball tickets (disguised as public relations expenses), and lavish entertainment. Managers also have an incentive to use more capital than the efficient amount. The *rate* of return on capital is regulated but not the *total* return on capital, and the greater the amount of capital, the greater is the total return.



EYE on YOUR LIFE

Monopoly in Your Everyday Life

MyEconLab Critical Thinking Exercise

When Bill Gates decided to quit Harvard in 1975, he realized that PCs would need an operating system and applications programs to interact with the computer's hardware. He also knew that whoever owned the copyright on these programs would have a license to print money. And he wanted to be that person.

In less than 30 years, Bill Gates became the world's richest person. Such is the power of the right monopoly.



You, along with millions of other PC users, have willingly paid the monopoly price for Windows and Microsoft Office. Sure, the marginal cost of a copy of these programs is close to zero, so the quantity sold is way too few. There is a big deadweight loss.

Compared with the alternative of no Windows, you're better off. But are you better off than you would be if there were many alternatives to Windows competing for your attention? To answer this question, think about the applications—spreadsheets, word processing, and so on—that you need to make your computer useful. With lots of operating systems, what would happen to the cost of developing applications? Would you have more or less choice?

Price Cap Regulation

Price cap regulation
A rule that specifies the highest price that a firm is permitted to set—a price ceiling.

For the reason that we've just examined, rate of return regulation is increasingly being replaced by price cap regulation. A **price cap regulation** is a price ceiling—a rule that specifies the highest price the firm is permitted to set. This type of regulation lowers the price and gives the firm an incentive to minimize its costs. But what happens to the quantity produced?

Recall that in a competitive market, a price ceiling set below the equilibrium price decreases output and creates a shortage (see Chapter 7, pp. 176–177). In contrast, in natural monopoly a price ceiling increases output. The reason is that at the regulated price, the firm can sell any quantity it chooses up to the quantity demanded. So each additional unit sold brings in the same additional revenue: marginal revenue equals price. The regulated price exceeds marginal cost, so the profit-maximizing quantity becomes the quantity demanded at the price ceiling.

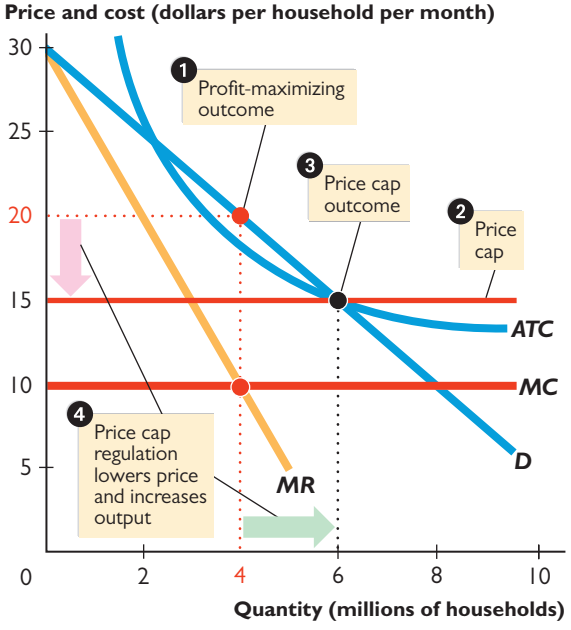
Figure 12.13 illustrates this outcome. Unregulated, a cable TV operator maximizes profit by serving 4 million households at a price of $20 a month. With a price cap set at $15 a month, the firm is permitted to sell any quantity it chooses at that price or at a lower price. The profit-maximizing quantity now increases to 6 million households. Serving fewer than 6 million households, the firm incurs a loss—average total cost exceeds the price cap. Serving more than 6 million households is possible but only by lowering the price along the demand curve. Again, average total cost exceeds price and the firm incurs a loss.

In Figure 12.13, the price cap delivers average cost pricing. In practice, the regulator might set the cap too high. For this reason, price cap regulation is often combined with *earnings sharing regulation*—a regulation that requires firms to make refunds to customers when profits rise above a target level.

FIGURE 12.13

Natural Monopoly: Price Cap Regulation

MyEconLab Animation



1. With no regulation, a cable TV operator serves 4 million households at a price of $20 a month.
2. A price cap regulation sets the maximum price at $15 a month.
3. Only when 6 million households are served can the firm break even. (When fewer than 6 million households are served or more than 6 million households are served, the firm incurs an economic loss.) The firm has an incentive to keep costs as low as possible and to produce the quantity demanded at the price cap.
4. The price cap regulation lowers the price and increases the number of households served.

MyEconLab Study Plan 12.5
Key Terms Quiz
Solutions Video

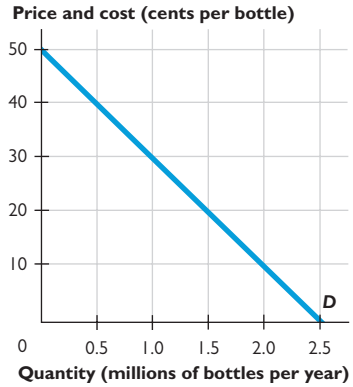
CHECKPOINT 12.5

Explain why natural monopoly is regulated and the effects of regulation.

Practice Problems

An unregulated natural monopoly bottles Elixir, a unique health product that has no substitutes. The monopoly's total fixed cost is $150,000, and its marginal cost is 10¢ a bottle. Figure 1 illustrates the demand for Elixir.

FIGURE 1



1. How many bottles of Elixir does the monopoly sell and what is the price of a bottle of Elixir? Is the monopoly's use of resources efficient?
2. Suppose that the government introduces a marginal cost pricing rule. What is the price of Elixir, the quantity sold, and the monopoly's economic profit?
3. Suppose that the government introduces an average cost pricing rule. What is the price of Elixir, the quantity sold, and the monopoly's economic profit?

In the News

Michigan's oversight of cable TV firms shuts off

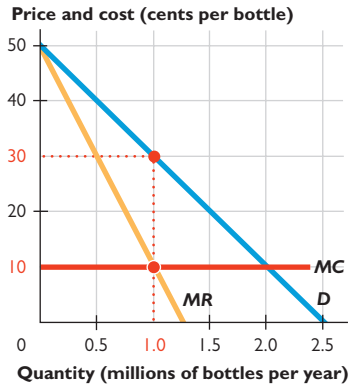
Michigan's cable TV subscribers have had to live with soaring monopoly fees, and on January 1, 2016, they became even more vulnerable as funds that regulators had used for cable TV oversight were cut off.

Source: *Detroit Free Press*, December 31, 2015

How could the Michigan regulators have protected cable TV subscribers from rising fees and why, most likely, didn't they?

Solutions to Practice Problems

FIGURE 2



1. The monopoly will produce 1 million bottles a year—the quantity at which marginal revenue equals marginal cost. The price is 30¢ a bottle—the highest price at which the monopoly can sell the 1 million bottles a year (Figure 2). The monopoly's use of resources is inefficient. If resource use were efficient, the monopoly would produce the quantity at which marginal benefit (price) equals marginal cost: 2 million bottles a year.
2. With a marginal cost pricing rule, the price is 10¢ a bottle and the monopoly produces 2 million bottles a year. The monopoly incurs an economic loss equal to its total fixed costs of $150,000 a year. The monopoly would need a subsidy from the government to keep it in business.
3. With an average cost pricing rule, the firm produces the quantity at which price equals average total cost. Average total cost equals average variable cost plus average fixed cost. Average variable cost equals marginal cost and is 10¢ a bottle. Average fixed cost is $150,000 divided by the quantity produced. For example, at 1 million bottles, average fixed cost is 15¢ and at 1.5 million bottles, average fixed cost is 10¢ a bottle. The average total cost of producing 1.5 million bottles is 20¢ a bottle and they can be sold for 20¢ a bottle. So the monopoly produces 1.5 million bottles a year and breaks even.

Solution to In the News

Rate of return regulation or price cap regulation might have been used to keep cable TV rates close to marginal cost or average total cost. Most likely cable TV prices are not regulated because the cable TV firms have captured the regulator.

CHAPTER SUMMARY

Key Points

1. Explain how monopoly arises and distinguish between single-price monopoly and price-discriminating monopoly.

- In monopoly, a single producer of a good or service that has no close substitutes operates behind a natural, legal, or ownership barrier to entry.
- A monopoly can price discriminate when there is no resale possibility.
- Where resale is possible, a firm charges a single price.

2. Explain how a single-price monopoly determines its output and price.

- The demand for a monopoly's output is the market demand, and a single-price monopoly's marginal revenue is less than price.
- A monopoly maximizes profit by producing the quantity at which marginal revenue equals marginal cost and by charging the maximum price that consumers are willing to pay for that quantity.

3. Compare the performance of a single-price monopoly with that of perfect competition.

- A single-price monopoly price is higher and quantity produced is smaller than in a perfectly competitive market and a deadweight loss arises.
- Monopoly imposes a loss on society that equals its deadweight loss plus the cost of the resources devoted to rent seeking.

4. Explain how price discrimination increases profit.

- Perfect price discrimination captures the entire consumer surplus. Prices are the highest that each consumer is willing to pay for each unit.
- With perfect price discrimination, the monopoly is efficient but rent seeking uses some or all of the producer surplus.

5. Explain why natural monopoly is regulated and the effects of regulation.

- Regulation might achieve an efficient use of resources or help the monopoly to maximize economic profit.
- A natural monopoly is efficient if its price equals marginal cost, but a second-best outcome is for price to equal average total cost.
- A price cap supported by earnings sharing regulation is the most effective practical method of regulating a natural monopoly.

Key Terms

MyEconLab Key Terms Quiz

Average cost pricing rule, 330
Barrier to entry, 308
Capture theory, 328
Deregulation, 328
Legal monopoly, 309
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Monopoly, 308
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Price-discriminating monopoly, 310
Rate of return regulation, 332
Regulation, 328
Rent seeking, 319
Single-price monopoly, 310
Social interest theory, 328

MyEconLab Chapter 12 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

Use the following information to work Problems **1** to **3**.

Elixir Spring produces a unique and highly prized mineral water. The firm's total fixed cost is $5,000 a day, and its marginal cost is zero. Table 1 shows the demand schedule for Elixir Spring water.

TABLE 1

Price (dollars per bottle)	Quantity (bottles per day)
10	0
8	2,000
6	4,000
4	6,000
2	8,000
0	10,000

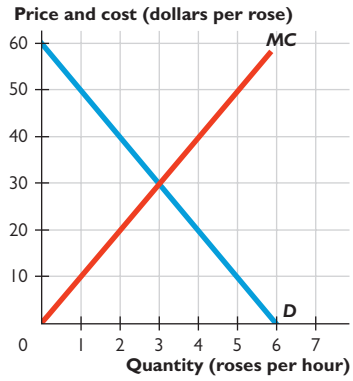
1. On a graph, show the demand curve for Elixir water and Elixir Spring's marginal revenue curve. What are Elixir's profit-maximizing price, output, and economic profit?

2. Compare Elixir's profit-maximizing price with the marginal cost of producing the profit-maximizing output. At the profit-maximizing price, is the demand for Elixir Spring water inelastic or elastic?

3. Suppose that there are 1,000 springs, all able to produce this water at zero marginal cost and with zero fixed costs. Compare the equilibrium price and quantity produced with Elixir Spring's price and quantity produced.

4. Blue Rose Inc. is the only flower grower to have cracked the secret of making a blue rose. Figure 1 shows the demand for blue roses and the marginal cost of producing a blue rose. What is Blue Rose's profit-maximizing output? What price does Blue Rose Inc. charge and is it efficient?

FIGURE 1



Hawaii Cable Television is a natural monopoly. Sketch a market demand curve and the firm's cost curves. Use your graph to work Problems **5** to **8**.

5. If Hawaii Cable is unregulated and maximizes profit, show in your graph the price, quantity, economic profit, consumer surplus, and deadweight loss.

6. If Hawaii Cable is unregulated and it gives householders a 50 percent discount for second and third connections, describe how its economic profit, consumer surplus, and deadweight loss would change.

7. If Hawaii Cable is regulated in the social interest, show in your graph the price, quantity, economic profit, consumer surplus, and deadweight loss.

8. If Hawaii Cable is subject to a price cap regulation that enables it to break even, show in your graph the price, quantity, economic profit, consumer surplus, and deadweight loss.

Use the following information to work Problems **9** and **10**.

Unfair postal competition

With the rise of e-mail, the volume of snail mail has fallen precipitously, and the U.S. Postal Service has been losing billions of dollars. It is an unjustified legal monopoly that is heavily subsidized and Congress should end it.

Source: The Cato Institute, January 8, 2016

9. Why is the U.S. Postal Service not a natural monopoly? Explain why it could be efficient to keep it in operation with a subsidy.

10. Draw a graph to illustrate the U.S. Postal Service's price, quantity produced, consumer surplus, producer surplus, and deadweight loss.

11. Read *Eye on Microsoft* on p. 331 and explain how Windows' price, quantity bought, consumer surplus, producer surplus, and deadweight loss would change if Microsoft were able to sell ads that appear every time a user opens a program. Illustrate your answer with a graph.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

Use the following information to work Problems **1** and **2**.

Microsoft: We're not gouging Europe on Windows 7 pricing
Regulators in the European Union have charged Microsoft with illegally tying Internet Explorer (IE) to Windows and mandated that a version of Windows be offered stripped of IE. A news report suggested that when Microsoft launches Windows 7, it will charge a higher price for the IE-stripped version than the price for a full version that includes IE. Microsoft denied this report but announced that it would offer the full version of Windows 7 at a lower upgrade price.

Source: computerworld.com

1. How does Microsoft set the price of Windows and would it be in the firm's self-interest to set a different price for a version stripped of IE?

2. Why might Microsoft offer the full version of Windows 7 to European customers at a lower upgrade price?

Use the following information to work Problems **3** and **4**.

Bobbie's Hair Care is a natural monopoly. Table 1 shows the demand schedule (the first two columns) and Bobbie's marginal cost schedule (the middle and third columns). Bobbie has done a survey and discovered that she has four types of customers each hour: one woman who is willing to pay $18, one senior who is willing to pay $16, one student who is willing to pay $14, and one boy who is willing to pay $12. Suppose that Bobbie's fixed costs are $20 an hour and Bobbie's price discriminates.

TABLE 1

Price (dollars per haircut)	Quantity (haircuts per hour)	Marginal cost (dollars per hour)
20	0	—
18	1	1
16	2	4
14	3	8
12	4	12
10	5	18

3. What is the price each type of customer is charged and how many haircuts an hour does Bobbie's sell? What is the increase in Bobbie's economic profit that results from price discrimination?

4. Who benefits from Bobbie's price discrimination? Is the quantity of haircuts efficient?

Use the following information to work Problems **5** to **10**.

Big Top is the only circus in the nation. Table 2 sets out the demand schedule for circus tickets and the cost schedule for producing the circus.

TABLE 2

Price (dollars per ticket)	Quantity (tickets per show)	Total cost (dollars per show)
20	0	1,000
18	100	1,600
16	200	2,200
14	300	2,800
12	400	3,400
10	500	4,000
8	600	4,600
6	700	5,200
4	800	5,800

5. Calculate Big Top's profit-maximizing price, output, and economic profit if it charges a single price for all tickets.

6. When Big Top maximizes profit, what is the consumer surplus and producer surplus and is the circus efficient? Explain why or why not.

7. At the market equilibrium price, no children under 10 years old attend the circus. Big Top offers children under 10 a discount of 50 percent. How will this discount change the consumer surplus and producer surplus? Will Big Top be more efficient by offering the discount to children?

8. If Big Top is regulated to produce the efficient output, what is the quantity of tickets sold, what is the price of a ticket, and what would be the consumer surplus?

9. If Big Top is regulated to charge a price equal to average total cost, what is the quantity of tickets sold, the price of a ticket, and economic profit?

10. Draw a graph to illustrate the circus market if regulators set a price cap that enables Big Top to break even. Show the deadweight loss in your graph.

MyEconLab Chapter 12 Study Plan

Multiple Choice Quiz

1. A firm is a natural monopoly if _____.

A. it can produce the good at a price below its competitor's price
B. it can produce a larger quantity of the good than other firms
C. the government grants it a public franchise or patent
D. it can satisfy the market demand at a lower average total cost than other firms

2. A monopoly _____.

A. can choose its price and output and always has the option of price discriminating
B. is a price taker and by offering a range of discounts can price discriminate
C. that produces a good that cannot be resold might choose to price discriminate
D. book store that offers a discount on Tuesdays is price discriminating

3. A single-price monopoly maximizes profit by producing the quantity at which _____.

A. its total revenue will be as large as possible
B. marginal revenue equals marginal cost and setting the price equal to marginal revenue
C. marginal revenue equals marginal cost and setting the price equal to marginal cost
D. marginal revenue equals marginal cost and setting the price equal to the most people are willing to pay for that quantity

4. A monopoly sets its price such that demand for the good produced is _____.

A. unit elastic
B. inelastic
C. elastic
D. either elastic or inelastic, but never unit elastic

5. A single-price monopoly is _____.

A. inefficient because it converts consumer surplus to producer surplus
B. inefficient because it produces too small an output and creates a dead-weight loss
C. efficient because buyers are paying a price equal to their willingness to pay
D. efficient because it is the only producer of the good

6. A monopoly that price discriminates _____.

A. benefits buyers because it offers the good at a variety of prices
B. gains because it converts consumer surplus to economic profit
C. uses resources more efficiently than would a competitive market
D. enables buyers to maximize their consumer surplus

7. Governments regulate natural monopoly by capping the price at _____.

A. marginal revenue and allowing the monopoly to maximize profit
B. marginal cost so that the monopoly is efficient and makes zero economic profit
C. average total cost, which allows the monopoly to be inefficient but make zero economic profit
D. the buyers' willingness to pay, which makes the monopoly operate efficiently





Which smartphone?
Which wireless service?

Monopolistic Competition and Oligopoly

13

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain how a firm in monopolistic competition determines its output and price.
2. Explain why firms develop new and improved products and incur large advertising costs.
3. Explain the dilemma faced by firms in oligopoly.
4. Use game theory to explain how output and price are determined in oligopoly.

MyEconLab Big Picture Video

MyEconLab Concept Video

13.1 MONOPOLISTIC COMPETITION: OUTPUT AND PRICE

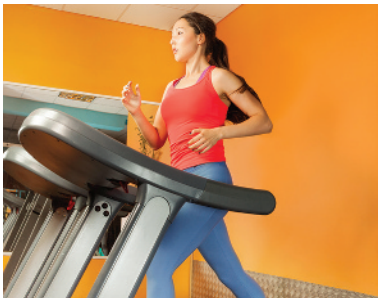
Samsung, HTC, Apple: Which smartphone will you choose? Smartphones are sold in *monopolistic competition*, a market that is neither perfect competition nor monopoly but that has features of both. You have lots of choice when you get a smartphone, but much less choice about your wireless plan provider. Four firms share the U.S. market for wireless service, which makes it an *oligopoly*. Firms in oligopoly might behave like firms in competition or like a monopoly.

Describing Monopolistic Competition

Monopolistic competition is a market structure in which

- A large number of firms compete.
- Each firm produces a differentiated product.
- Firms compete on price, product quality, and features.
- Firms advertise.
- Firms are free to enter and exit.

Large Number of Firms



About 20 firms, each with a small market share, produce a wide variety of treadmills.

In monopolistic competition, as in perfect competition, the industry consists of a large number of firms. The presence of a large number of firms has three implications for the firms in the industry.

Small Market Share Each firm supplies a small part of the market. Consequently, while each firm can influence the price of its own product, it has little power to influence the average market price.

No Market Dominance Each firm must be sensitive to the average market price of the product, but it does not pay attention to any one individual competitor. Because all the firms are relatively small, no single firm can dictate market conditions, so no one firm's actions directly affect the actions of the other firms.

Collusion Impossible Firms sometimes try to profit from illegal agreements—collusion—with other firms to fix prices and not undercut each other. Collusion is impossible when the market has a large number of firms, as it does in monopolistic competition.

Product Differentiation

Product differentiation
Making a product that is slightly different from the products of competing firms.

Product differentiation is making a product that is slightly different from the products of competing firms. A differentiated product has close substitutes but it does not have perfect substitutes. Some people will pay more for one variety of the product, so when its price rises, the quantity demanded decreases but it does not (necessarily) decrease to zero. For example, Adidas, Asics, Diadora, Etonic, Fila, New Balance, Nike, Puma, and Reebok all make differentiated running shoes. Other things remaining the same, if the price of Adidas running shoes rises and the prices of the other shoes remain constant, Adidas sells fewer shoes.

Competing on Price, Quality, and Features

Product differentiation enables a firm to compete with other firms in three areas: price, quality, and features.

Price Because of product differentiation, a firm in monopolistic competition faces a downward-sloping demand curve. So, like a monopoly, the firm can set both its output and price.

Quality The quality of a product includes its design and reliability, and its ease of use. Go to the J.D. Power Consumer Center at jdpower.com, and you'll see the many dimensions on which this rating agency describes the quality of autos, boats, financial services, travel and accommodation services, telecommunication services, and new homes—all examples of products that have a large range of quality variety. There is a tradeoff between the product's quality and its price. A higher quality product usually costs more to produce and sells for a higher price.

Features The features of a product include its physical characteristics, the way it works, and the things it can do. Differences in features are a key source of product differentiation. Think about the features of a car that make one brand or model different from another. Aside from the shape of its body, its engine design and size, transmission system, and safety features such as audio sensors and rear-view camera are all examples of features that differentiate cars. Just about every product and service that you can think of has differentiating features. Features and quality are related, and as with quality, there is a tradeoff between features and price. More elaborate features cost more to produce and raise the price.

Advertising

Because of product differentiation, a firm in monopolistic competition must advertise its product. A firm that produces a high-quality product wants to sell it for a suitably high price. To be able to do so, it must advertise its product in a way that convinces buyers that they are getting the higher quality for which they are paying. For example, drug companies advertise their brand-name drugs to persuade buyers that they are superior to the lower-priced generic alternatives. A low-quality producer uses advertising to persuade buyers that although the quality is low, the low price more than compensates for this fact.

Entry and Exit

In monopolistic competition, there are no barriers to entry. Consequently, a firm cannot make an economic profit in the long run. When firms make economic profits, new firms enter the industry. This entry lowers prices and eventually eliminates economic profits. When economic losses are incurred, some firms leave the industry. This exit increases prices and profits of the remaining firms and eventually eliminates the economic losses. In long-run equilibrium, firms neither enter nor leave the industry and the firms in the industry make zero economic profit.

Identifying Monopolistic Competition

To identify monopolistic competition and distinguish it from perfect competition on the one side and oligopoly and monopoly on the other side, we must determine whether a market has many competing firms or is dominated by a small number of firms. To measure this feature of markets, economists use two indexes called measures of concentration. These indexes are

- The four-firm concentration ratio
- The Herfindahl-Hirschman Index

Four-firm concentration ratio
The percentage of the total revenue in an industry accounted for by the four largest firms in the industry.

Herfindahl-Hirschman Index
The square of the percentage market share of each firm summed over the 50 largest firms (or all the firms if there are fewer than 50) in a market.

The **four-firm concentration ratio** is the percentage of the total revenue of the industry accounted for by the four largest firms in the industry. The range of the concentration ratio is from almost zero for perfect competition to 100 percent for monopoly. The boundary between monopolistic competition and oligopoly is generally regarded as being around 40 percent. A ratio of less than 40 percent is regarded as an indication of a competitive market—monopolistic competition.

The **Herfindahl-Hirschman Index**—also called the HHI—is the square of the percentage market share of each firm summed over the 50 largest firms (or all the firms if there are fewer than 50) in a market. For example, if there are 4 firms in a market and their market shares are 50 percent, 25 percent, 15 percent, and 10 percent, the Herfindahl-Hirschman Index is

$$HHI = 50^2 + 25^2 + 15^2 + 10^2 = 3{,}450.$$

In perfect competition, the HHI is small. For example, if each of the 50 largest firms has a market share of 0.1 percent, the HHI is $(0.1^2 \times 50)$, which equals 0.5. In a monopoly, the HHI is 10,000—the firm has 100 percent market share.

The HHI is one of the measures of the degree of competition used by the U.S. Department of Justice to classify markets and guide decisions on mergers. A market in which the HHI is less than 2,500 is regarded as being competitive. A market in which the HHI lies between 1,500 and 2,500 is regarded as being moderately competitive and an example of monopolistic competition. But a market in which the HHI exceeds 2,500 is regarded as being uncompetitive. The U.S. Justice Department scrutinizes any merger in a market in which the HHI exceeds 1,500.

A market with a high concentration ratio or HHI might nonetheless be competitive because the few firms in a market face competition from many firms that can easily enter the market and will do so if economic profits are available.

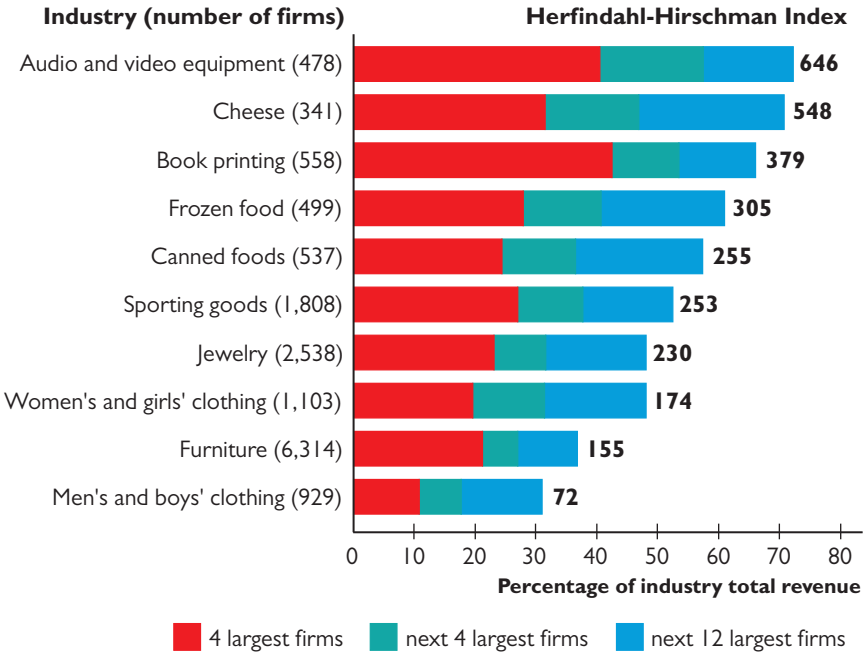


EYE on the U.S. ECONOMY

Examples of Monopolistic Competition

These ten industries operate in monopolistic competition. They have a large number of firms, shown in parentheses after the industry's name.

The red bars show the percentage of industry total revenue received by the 4 largest firms. The green bars show the percentage of industry total revenue received by the next 4 largest firms.The entire red, green, and blue bars show the percentage of industry total revenue received by the 20 largest firms.



SOURCE OF DATA: U.S. Census Bureau.

Output and Price in Monopolistic Competition

Think about the decisions that Lucky Brand must make about the jeans it produces. First, Lucky Brand must decide on the design and quality of its jeans and on its marketing program. We'll suppose that the firm has already made these decisions so that we can concentrate on the firm's output and pricing decision. But we'll study quality and marketing decisions in the next section.

Because Lucky Brand has chosen the quality of its jeans and the amount of marketing activity, it faces given costs and market demand. How, with these costs and market demand for its jeans, does the firm decide the *quantity* of jeans to produce and the *price* at which to sell them?

The Firm's Profit-Maximizing Decision

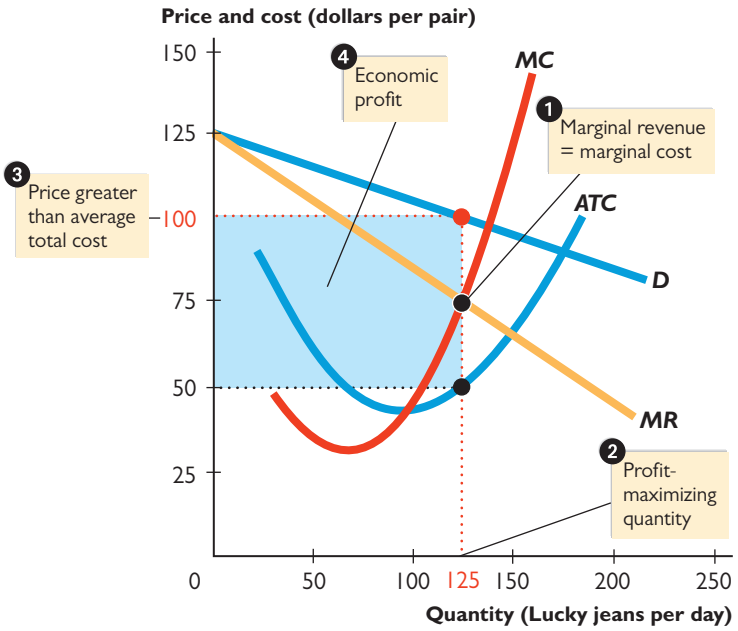
A firm in monopolistic competition makes its output and price decision just as a monopoly firm does. Lucky Brand maximizes profit by producing the quantity at which marginal revenue equals marginal cost and by charging the highest price that buyers are willing to pay for this quantity.

Figure 13.1 illustrates this decision for Lucky jeans. The demand curve for Lucky jeans is *D*. The *MR* curve shows the marginal revenue curve associated with this demand curve and is derived just like the marginal revenue curve of a single-price monopoly in Chapter 12. The *ATC* curve shows the average total cost of producing Lucky jeans, and *MC* is the marginal cost curve. Profit is maximized by producing 125 pairs of jeans a day and selling them at a price of $100 a pair. When the firm produces 125 pairs of jeans a day, average total cost is $50 a pair and economic profit is $6,250 a day ($50 a pair multiplied by 125 pairs a day). The blue rectangle shows Lucky Brand's economic profit.

FIGURE 13.1

Output and Price in Monopolistic Competition

MyEconLab Animation



1. Profit is maximized where marginal revenue equals marginal cost.
2. The profit-maximizing quantity is 125 pairs of Lucky jeans a day.
3. The profit-maximizing price is $100 a pair, which exceeds the average total cost of $50 a pair, so the firm makes an economic profit of $50 a pair.
4. The blue rectangle illustrates economic profit and its area, which equals $6,250 a day ($50 a pair multiplied by 125 pairs) measures economic profit.

So far, the firm in monopolistic competition looks like a single-price monopoly. It produces the quantity at which marginal revenue equals marginal cost and charges the price that buyers are willing to pay for that quantity. The key difference between monopoly and monopolistic competition lies in what happens next.

Long Run: Zero Economic Profit

In monopolistic competition there is no restriction on entry, so if firms in an industry are making economic profits, other firms have an incentive to enter that industry and each firm's economic profit falls. So in the long run, firms will enter until all firms are making zero economic profit.

Lucky Brand is making an economic profit, which is an incentive for Calvin Klein to start to make jeans similar to Lucky jeans. As they enter the jeans market, the demand for Lucky jeans decreases. At each point in time, the firm maximizes its profit by producing the quantity at which marginal revenue equals marginal cost and by charging the highest price that buyers are willing to pay for this quantity. But as demand decreases, marginal revenue decreases and the profit-maximizing quantity and price fall.

Figure 13.2 shows the long-run equilibrium. The demand curve for Lucky jeans and the marginal revenue curve have shifted leftward. The firm produces 75 pairs of jeans a day and sells them for $70 each. At this output level, average total cost is also $70 a pair. So Lucky Brand is making zero economic profit on its jeans. When all the firms in the industry are making zero economic profit, there is no incentive for new firms to enter.

If demand is so low relative to costs that firms incur economic losses, exit will occur. As firms leave an industry, the demand for the products of the remaining firms increases and their demand curves shift rightward. The exit process ends when all the firms in the industry are making zero economic profit.

FIGURE 13.2

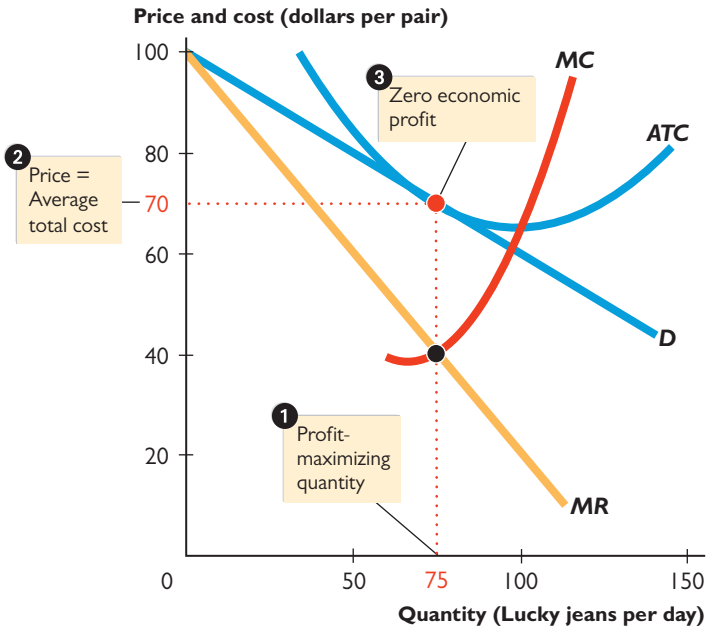
Output and Price in the Long Run

MyEconLab Animation

Economic profit encourages entry, which decreases the demand for each firm's product. Economic loss encourages exit, which increases the demand for each remaining firm's product.

When the demand curve touches the average total cost curve at the quantity at which marginal revenue equals marginal cost, the market is in long-run equilibrium.

1. The output that maximizes profit is 75 pairs of Lucky jeans a day.
2. The price, $70 a pair, equals average total cost.
3. Economic profit is zero.



Monopolistic Competition and Perfect Competition

Efficiency requires that the marginal benefit of the consumer equal the marginal cost of the producer. Price measures marginal benefit, so efficiency requires price to equal marginal cost. In monopolistic competition, price exceeds marginal revenue and marginal revenue equals marginal cost, so price exceeds marginal cost—a sign of inefficiency.

But this inefficiency arises from product differentiation—variety—that consumers value and for which they are willing to pay. So the loss that arises because marginal benefit exceeds marginal cost must be weighed against the gain that arises from greater product variety. It is almost inconceivable that consumers would be better off with no variety and price equal to marginal cost. So in a broader view of efficiency, monopolistic competition brings gains for consumers.

Another interesting feature of firms in monopolistic competition is that they always have excess capacity in long-run equilibrium.

Excess Capacity

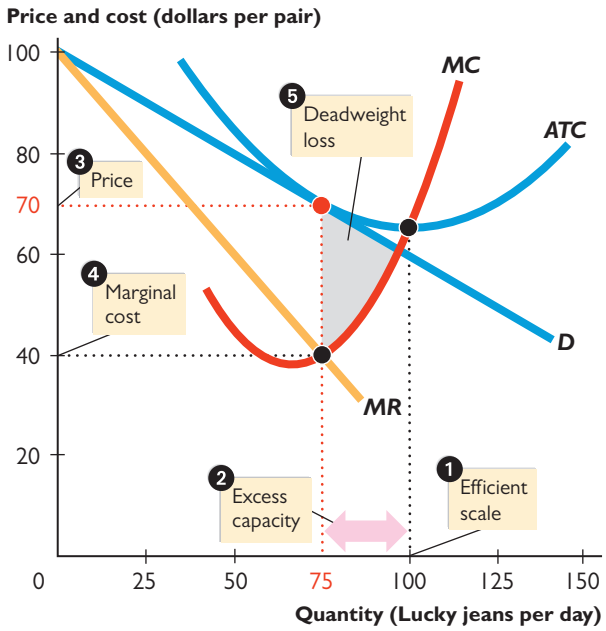
A firm's **efficient scale** is the quantity at which average total cost is a minimum—the quantity at the bottom of the U-shaped *ATC* curve. A firm's **excess capacity** is the amount by which its efficient scale exceeds the quantity that it produces. Figure 13.3 shows that in the long run Lucky Brand produces 75 pairs of jeans a day and has excess capacity of 25 pairs of jeans a day. That is, Lucky Brand produces a smaller output than that which minimizes average total cost. And because the demand curve slopes downward, the consumer pays a price that exceeds minimum average total cost. The demand curve slopes downward because of product differentiation. Product differentiation creates excess capacity.

Efficient scale
The quantity at which average total cost is a minimum.

Excess capacity
The amount by which the efficient scale exceeds the quantity that the firm produces.

FIGURE 13.3
Excess Capacity

MyEconLab Animation



1 The efficient scale (at minimum *ATC*) is 100 pairs a day.

In monopolistic competition in the long run, the firm produces 75 pairs of jeans a day and has 2 excess capacity of 25 pairs of jeans.

3 The consumer pays a price that exceeds 4 marginal cost, and 5 a deadweight loss arises.

MyEconLab Study Plan 13.1
Key Terms Quiz
Solutions Video

CHECKPOINT 13.1

Explain how a firm in monopolistic competition determines its output and price.

Practice Problems

Natti is a dot-com entrepreneur who has established a Web site at which people can design and buy awesome sunglasses. Natti pays $4,000 a month for her Web server and Internet connection. The sunglasses that her customers design are made to order by another firm, and Natti pays this firm $50 a pair. Natti has no other costs. Table 1 shows the demand schedule for Natti's sunglasses.

TABLE 1

Price (dollars per pair)	Quantity (pairs per month)
250	0
200	50
150	100
100	150
50	200
0	250

1. Calculate Natti's profit-maximizing output, price, and economic profit.
2. Do you expect other firms to enter the market and compete with Natti?
3. What happens to the demand for Natti's sunglasses in the long run? What happens to Natti's economic profit in the long run?

In the News

Blockbuster retail stores gone
In 2000, Blockbuster was at the top of the video rental market with solid profits, thousands of retail locations, and millions of customers eager to rent their movies and videogames. Unable to compete with Internet-based services, the last Blockbuster retail store closed in 2014.

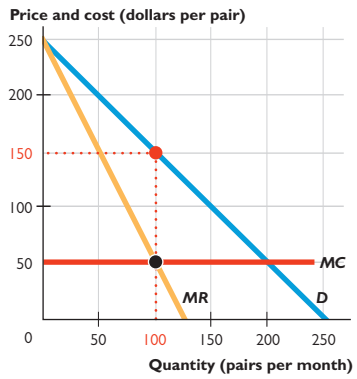
Source: *Fortune*, November 9, 2014

Explain why the switch to Internet-based services brought economic loss to Blockbuster and led to its exit.

Solutions to Practice Problems

1. Marginal cost, *MC*, is $50 a pair—the price that Natti pays her supplier of sunglasses. To find marginal revenue, calculate the change in total revenue when the quantity increases by 1 pair of sunglasses. Figure 1 shows the demand curve, the marginal revenue curve, and the marginal cost curve. Profit is maximized when $MR = MC$ and Natti sells 100 pairs a month. The price is $150, and average total cost, *ATC*, is $90—the sum of $50 marginal (and average variable) cost and $40 average fixed cost. Economic profit is $60 a pair on 100 pairs a month, so it is $6,000 a month.
2. Natti is making an economic profit, so firms have an incentive to enter the Web sunglasses market and will do so.
3. As firms enter the market, the demand for Natti's sunglasses decreases, the price of Natti's sunglasses falls, and Natti's economic profit decreases. In the long run, Natti's will make zero economic profit.

FIGURE 1



Solution to In the News

As people switched to Internet-based services, the demand for video rental decreased. Blockbuster's marginal revenue decreased and its *MR* curve shifted leftward. Eventually, with Blockbuster's average total cost exceeding price, the firm was incurring an economic loss. To limit the loss, Blockbuster retail stores were closed, and by 2014 they were all gone.

13.2 INNOVATION AND ADVERTISING

MyEconLab Concept Video

You've seen how a firm makes its output and price decisions for a product that is already designed and advertised. We're now going to study a firm's product design and quality and advertising decisions.

Design and Quality Decisions

Economic profit attracts entry, and entry erodes profit. To enjoy ongoing economic profit, a firm in monopolistic competition must continually innovate.

The decision to allocate resources to product innovation is made using the same profit-maximizing calculation that you've already studied. At a low level of innovation activity, the marginal revenue it brings in exceeds the marginal cost. At a high level of innovation activity, its marginal cost exceeds marginal revenue. When the marginal cost of innovation activity equals its marginal revenue, the firm is doing the profit-maximizing amount of innovation.

Think about Electronic Arts, which releases a new version of Madden NFL once a year. It could do so twice a year or every two years. Also, the firm could employ more coders and designers to make the game even better than it is, or employ fewer and make an inferior version of the game. For EA, the marginal revenue from a new version equals its marginal cost on a one-year revision cycle.



A new version of the game is released at an interval and with the features that generate a marginal revenue equal to marginal cost so that profit is maximized.

It is easy to list new designs and new products that transform the quality of life. Kitchen and other household appliances, computers, cars, smartphones, and apps are examples of products that keep getting better. But do we get enough innovation and product improvement? Do consumers get all the features and quality that they are willing to pay for?

The answer is perhaps not. The value to the consumer of a product improvement is its marginal benefit, which equals the amount the consumer is willing to pay. In other words, the value of a product improvement is the increase in price that the consumer is willing to pay. The marginal benefit to the producer is marginal revenue, which, when profit is maximized, equals marginal cost. Because price exceeds marginal cost in monopolistic competition, product improvement is not pushed to its efficient level.

Advertising

Firms that differentiate their products need to ensure that their customers and potential customers know the features, quality, and price of their products. Advertising is the means firms use to achieve this end. Advertising is itself a product—a service—that is traded in a monopolistic competition market. That is, the firms that produce advertising services are large in number, differentiate their advertising products, and compete on price, design, and quality.

You already know a lot about the advertising industry. You view its products every day. Some of the biggest producers of advertising services are Google, Facebook, Pinterest, and YouTube, with Snapchat and other specialized social media Web sites snapping at their heels. In 2016, expenditure on advertising exceeded $200 billion, with a third each spent on Internet advertising, TV commercials, and print (magazines and newspapers). This enormous scale of advertising occurs because it increases advertisers' profits and is profitable for its suppliers.

We'll first look at the demand for advertising and see how it increases the profits of advertisers and at the same time might benefit the buyers of advertised products. Then we'll take a look at the supply side of the advertising market.

The Demand for Advertising

The demand for advertising arises from its effects on a firm's cost, revenue, and economic profit. We'll look first at its effects on a firm's costs, and then at its effects on demand and revenue.

Advertising and Cost

The cost of advertising is a fixed cost: It does not vary with output. Expenditure on advertising increases a firm's average cost, but it also increases the quantity sold. If advertising increases the quantity sold by a large enough amount, average total cost can fall, profit can increase, and the consumer can enjoy a lower price.

Figure 13.4 shows how advertising expenditures change a firm's average total cost. The blue curve shows the average total cost of production. The red curve shows the firm's average total cost of production plus the average cost of advertising. The height of the shaded area between the two curves shows the average fixed cost of advertising. The total cost of advertising is fixed. But the average cost of advertising decreases as output increases.

In this example, if the quantity sold increases from 25 pairs of jeans a day with no advertising to 100 pairs of jeans a day with advertising, average total cost falls from $60 a pair to $40 a pair. The reason is that although the total fixed cost has increased, the greater fixed cost is spread over a greater output, so average total cost falls.

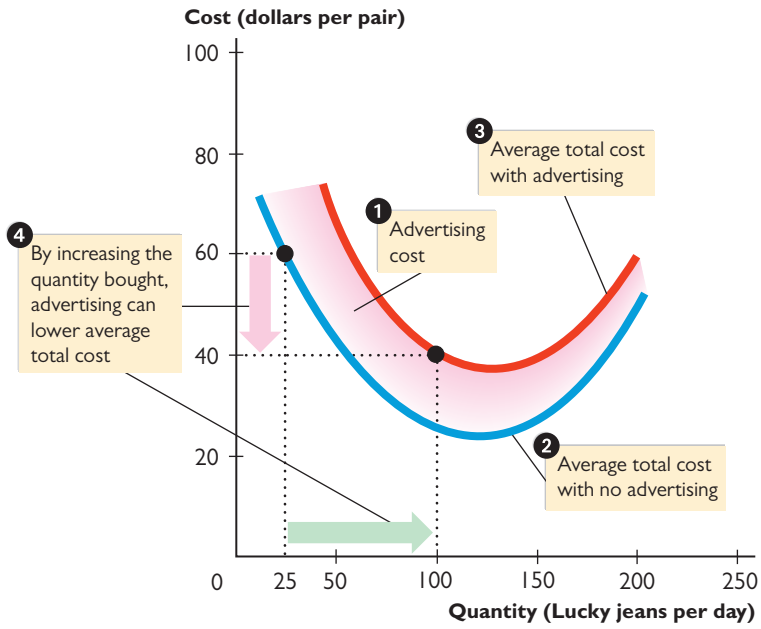
FIGURE 13.4

Selling Costs and Total Costs

MyEconLab Animation

Selling costs such as the cost of advertising are fixed costs.

1. When advertising costs are added to 2 the average total cost of production, 3 average total cost increases by more at small outputs than at large outputs.
4. If advertising enables the quantity sold to increase from 25 pairs of jeans a day to 100 pairs a day, it *lowers* average total cost from $60 a pair to $40 a pair.





EYE on SMARTPHONES

MyEconLab Critical Thinking Exercise

Which Smartphone?

There is a lot of product differentiation in smartphones: Samsung makes more than 60 varieties; so does HTC; LG makes 26; and Apple makes 13. In the three months from April through June 2016, dozens of new varieties of smartphones were introduced by the top 20 firms in this market. Why is there so much variety in smartphones?

The answer is that preferences are diverse and the cost of matching the diversity of preference is low.

Think about the ways in which smartphones differ: just a few of them are their dimensions, weight, navigation tools, talk time, standby time, screen, camera features, audio features, memory, connectivity, processor speed, storage, and network capability.

Each one of these features comes in dozens of varieties. If we combine only 10 of these features, each having 6 varieties, there are 1 million different possible smartphone designs.

Firms produce variety only when the marginal cost of doing so is less than the marginal benefit. The marginal cost of some smartphone variety is not large. Adding a feature to a camera, making the memory a bit bigger, and using a more economical battery are all relatively low-cost adjustments that phone designers can make.

But a technology exists for adding variety at almost zero cost that increases product differentiation to make each smartphone unique to the preferences of each individual. This technology is the app.

Apple has only 13 versions of the iPhone, but with the growing number of apps, each owner can customize their iPhone with the apps they want.

In long-run equilibrium, entry and innovation by each competitor will drive economic profit toward zero. Each smartphone maker will offer a degree of product differentiation that equates the marginal cost of variety with its marginal revenue. But the pursuit of economic profit will spur ever more innovation and consumers will be confronted with ever wider choice.

The Supply of Advertising

The firms that supply advertising do so jointly with the supply of some other service or good: TV stations with programming, Google with Internet search, Facebook with social media, and Sports Illustrated with news and feature articles.

Two-Sided Market

Because firms produce advertising jointly with something else, these firms trade in what has been called a "two-sided market." One side is for advertising and the other side is for the firm's product.

Competition for advertising among TV, social media, and print (magazines and newspapers) is fierce but entry into the market is difficult for TV and social media because startup costs are high and economies of scale reward large players with the lowest average cost. Entry is easier for print producers and a wide variety of niche magazines supply advertising.

When operating in a two-sided market, suppliers of advertising face two interdependent demand curves. The greater the number of users of the firm's product, the greater is the demand for its advertising services. For example, the more people who visit Facebook, the greater is the demand for Facebook advertising.

Profit-Maximizing Decisions

The profit-maximizing decision of Facebook and the other Internet firms is to offer their main product at a zero price to maximize the quantity demanded—maximize the number of users—to make the demand for its advertising services as large as possible. For the same reason, print suppliers of advertising sell the magazines and newspapers for a price close to marginal cost and below average cost. These firms then sell the profit-maximizing quantity of space for advertising.

EYE on YOUR LIFE

Some Selling Costs You Pay

MyEconLab Critical Thinking Exercise

When you buy a new pair of running shoes, you're buying materials that cost $9, paying the producer in Asia and the shipping company for production and transportation costs of $8, paying the U.S. government an import duty of $3, and paying advertisers, retailers, and others who provide sales and distribution services $50.

The table provides a breakdown of the cost of a pair of shoes. Notice the huge gap between the retailer's cost and the price that you pay. The retail markup is about 100 percent.

Running shoes are not unusual. Almost everything that you buy includes a selling cost component that exceeds one half of the total cost. Your clothing, food, electronic items, DVDs, magazines, and even your textbooks cost more to sell than they cost to produce.



Manufacturer (Asia)		Nike (Beaverton, Oregon)		Retailer (your town)	
Materials	$9.00				
Cost of labor	$2.75	Cost of shoe to Nike	$20.00	Cost of shoe to retailer	$35.50
Cost of capital	$3.00	Sales, distribution, and administration	$5.00	Sales clerk's wages	$9.50
Profit	$1.75	Advertising	$4.00	Shop rent	$9.00
Shipping	$0.50	Research & development	$0.25	Retailer's other costs	$7.00
Import duty	$3.00	Nike's profit	$6.25	Retailer's profit	$9.00
Nike's cost	**$20.00**	**Retailer's cost**	**$35.50**	**Price paid by you**	**$70.00**

They choose this quantity in the same way as all firms: the quantity that makes marginal revenue equal to marginal cost. They sell the space for the highest price that advertisers are willing to pay determined by the advertisers' demand curve.

Equilibrium and Efficiency in the Advertising Market

The quantity and quality of advertising is determined by the interaction of the demand by advertisers and the output and price decisions of the suppliers of advertising. Whether the advertising market produces the efficient quantity and quality is not well understood. To the extent that advertising provides consumers with information about the precise nature of product differences and product quality, they benefit the consumer and enable a better product choice to be made. And to the extent that advertising provides firms with the incentive to deliver consistent quality, they further benefit the consumer. But the opportunity cost of advertising must be weighed against the gain to the consumer.

The final verdict on the efficiency of monopolistic competition is ambiguous. In some cases, the gains from extra product variety and innovation more than offset the advertising costs and the deadweight loss arising from excess capacity. The smartphone, laptop and tablet computers, streaming video services, games and apps all make our lives easier and more fun. You can book a substitute for your snow-cancelled flight while standing in the checkout line at Target. In a few years from now, you will be able to ride in your driverless vehicle and use travel time for other activities. It seems obvious that gains like these more than offset a bit of deadweight loss from excess capacity and price exceeding marginal cost.

CHECKPOINT 13.2

MyEconLab Study Plan 13.2
Solutions Video

Explain why firms develop new and improved products and incur large advertising costs.

Practice Problems

Bianca bakes delicious cookies. Her total fixed cost is $40 a day, and her average variable cost is $1 a bag. Few people know about Bianca's Cookies, and she maximizes her profit by selling 10 bags a day for $5 a bag. Bianca thinks that if she spends $50 a day on advertising, she will sell 25 bags a day for $5 a bag.

1. If Bianca's belief about the effect of advertising is correct, can she increase her economic profit by advertising?
2. If Bianca advertises, will her average total cost increase or decrease at the quantity produced?
3. If Bianca advertises, will she continue to sell her cookies for $5 a bag or will she raise her price or lower her price?

In the News

Snapchat's daily mobile video views said to rival Facebook's
Snapchat is turning into a mobile-video juggernaut that delivers more than 7 billion video clips each day to rival the amount watched on Facebook, which has 15 times as many users. A stronghold in mobile video is good news for Snapchat's advertising dollars.

Source: Bloomberg, January 12, 2016

How does Snapchat help firms in monopolistic competition to maximize profit?

Solutions to Practice Problems

1. With no advertising, Bianca's total revenue is $50 (10 bags at $5 a bag) and her total cost is $50 ($40 total fixed cost plus $10 total variable cost). Bianca's economic profit is zero. With advertising expenditure of $50 a day, total revenue is $125 (25 bags at $5 a bag) and total cost is $115 ($90 total fixed cost plus $25 total variable cost). Bianca's economic profit with no price change is $10, so Bianca can increase her economic profit by advertising.
2. If Bianca advertises, her average total cost will decrease. With no advertising, her average total cost is $5 a bag. With advertising, her average total cost is $4.60 a bag.
3. We can't say if Bianca will sell her cookies for $5 a bag. Advertising changes the demand for her cookies. Although it increases fixed cost, marginal cost remains at $1 a bag. Bianca will sell the profit-maximizing quantity at the highest price she can charge for that quantity.

Solution to In the News

In monopolistic competition, entry keeps driving economic profit to zero. Innovation— the development of a new differentiated product—is necessary to boost economic profit. And advertising is necessary to bring new differentiated products to the attention of potential buyers. Snapchat enables advertising to reach a well-defined market of young smartphone users.

MyEconLab Concept Video

13.3 OLIGOPOLY

Another type of market that stands between the extremes of perfect competition and monopoly is oligopoly. *Oligopoly* is a market structure in which

- A small number of firms compete.
- Natural or legal barriers prevent the entry of new firms.

Oligopoly is a market with a small number of firms. Each firm has a large market share, the firms are interdependent, and they face the temptation to collude. In any market, the price depends on the total quantity supplied. In monopoly, one firm controls this quantity and so also controls the price. In perfect competition, no firm is big enough to influence the total quantity supplied, so no firm can influence the price. Oligopoly is unlike both of these cases. More than one firm controls the quantity supplied, so no *one* firm controls the price. But each firm is large, and the quantity produced by each firm influences the price.

Like monopoly, the firms in an oligopoly operate behind a barrier to entry. And also like monopoly, the barriers to entry can arise for either natural reasons or legal reasons. A natural oligopoly is a market in which economies of scale exist but the output of a few firms is required to meet the market demand at the lowest possible cost. One firm could not meet the market demand at as low a price as a few firms could, but economies of scale are sufficiently large that more than a few firms could not survive and earn a zero profit.

A legal oligopoly arises when a legal barrier to entry protects the small number of firms in a market. A city might license two taxi firms, or two bus companies, for example.

Firms in an oligopoly might produce identical or differentiated products.

The problem for a firm in oligopoly is that its own profit-maximizing actions might decrease the profits of its competitors. But if each firm's actions decrease the profits of the other firms, all the firms end up with a lower profit.

Collusion

Cartel
A group of firms acting together to limit output, raise price, and increase economic profit.

One possible way of avoiding a self-defeating outcome is for the firms in an oligopoly to form a cartel. A **cartel** is a group of firms acting together—in collusion—to limit output, raise price, and increase economic profit. Cartels are illegal in the United States (and in most other countries) and are undertaken in secret. Firms in an oligopoly would like to be able to agree with each other to fix the price at a level that maximizes their joint profit.

Duopoly
A market in which there are only two producers.

It turns out that collusion usually breaks down. To understand why, and to learn how output and price are determined in an oligopoly, we're going to study a special case called duopoly. **Duopoly** is a market in which there are only two producers. You can probably see some examples of duopoly where you live. Many cities have only two local newspapers, two taxi companies, two copy centers, or two college bookstores. In the global economy, there are only two major producers of commercial jet aircraft—Boeing in the United States and Airbus Industrie in Europe.

Although duopoly is common, the main reason for studying it is not its realism. We study it because it captures the essence of oligopoly and reveals the mutual interdependence of firms most effectively. Also, if collusion is difficult for a duopoly, it is even more difficult for an oligopoly with three or more firms.

Duopoly in Airplanes

Airbus and Boeing are the only makers of large commercial jet aircraft. Suppose that they have identical production costs. To keep things simple, we'll assume that the marginal cost of an airplane is $1 million and that total fixed cost is zero. Figure 13.5 shows the market for airplanes that Airbus and Boeing share.



Boeing and Airbus share the market for big passenger airplanes.

Competitive Outcome

If this industry was perfectly competitive, the marginal cost curve would be the industry supply curve. The equilibrium is where the industry supply curve intersects the demand curve—12 airplanes a week would be sold for $1 million each. Total cost would be $12 million and total revenue would also be $12 million, so economic profit would be zero—a long-run equilibrium in perfect competition.

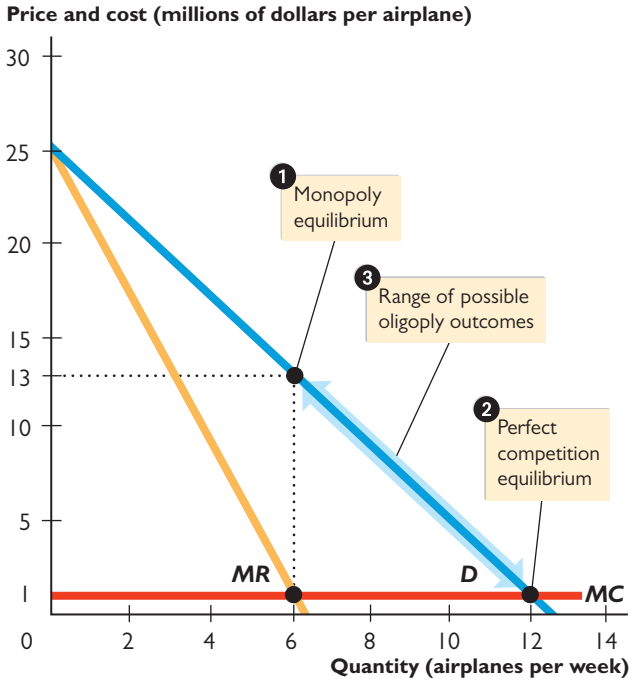
Monopoly Outcome

If this industry had only one firm, the firm would be a single-price monopoly because an airplane can be resold. The marginal revenue curve would be the one shown in Figure 13.5. The monopoly would produce 6 airplanes a week and sell them for $13 million each. Total cost would be $6 million and total revenue would be $78 million, so economic profit would be $72 million a week.

FIGURE 13.5

A Market for Airplanes

MyEconLab Animation



1. With market demand curve, *D*, marginal revenue curve, *MR*, and marginal cost curve, *MC*, a monopoly airplane maker maximizes profit by producing 6 airplanes a week and selling them at a price of $13 million an airplane.
2. With perfect competition among airplane makers, the market equilibrium quantity is 12 airplanes a week and the equilibrium price is $1 million an airplane.
3. A cartel might achieve the monopoly equilibrium, break down and result in the perfect competition equilibrium, or operate somewhere between these two extreme outcomes.

Range of Possible Oligopoly Outcomes

Oligopoly is a market structure between perfect competition and monopoly, so the maximum range of oligopoly outcome might lie within the extremes that we've just found. If Airbus and Boeing persistently cut their prices to increase their production and quantity sold, they might drive the price down all the way to the perfectly competitive price and end up with no economic profit. In contrast, if the two firms were able to collude and set the monopoly price, they could end up sharing the maximum available monopoly profit.

The Duopolists' Dilemma

You've just seen that if this industry had only one firm, 6 airplanes a week would be produced and the price of an airplane would be $13 million. Economic profit would be $72 million a week. If this same outcome could be achieved with two firms in the industry, Airbus and Boeing might each produce 3 airplanes a week and make an economic profit of $36 million each (see Table 13.1).

Because this outcome is the one that maximizes monopoly profit, we know that there is no better outcome for the two firms in total. That is, their joint profits cannot be any higher than the $72 million a week that a monopoly can achieve.

But can one firm make a larger profit than $36 million a week at the expense of the other firm? To answer this question, we need to see what happens if one of the firms increases output by 1 airplane a week. Because the two firms in this example are identical, we can explore this question with either Boeing or Airbus increasing production by 1 airplane a week and the other holding output at 3 a week. We'll suppose that Boeing increases output to 4 airplanes a week and Airbus at first continues to produce 3 airplanes a week.

TABLE 13.1 MONOPOLY OUTCOME

	Boeing	Airbus	Market total
Quantity (airplanes a week)	3	3	6
Price ($ million per airplane)	13	13	13
Total revenue ($ million)	39	39	78
Total cost ($ million)	3	3	6
Economic profit ($ million)	36	36	72

Boeing Increases Output to 4 Airplanes a Week

Table 13.2 shows what happens if Boeing produces 4 airplanes a week and Airbus produces 3 airplanes a week. To sell a total output of 7 airplanes a week, the price must fall. The market demand curve in Figure 13.5 tells us that the quantity demanded is 7 airplanes a week when the price is $11 million per airplane.

Market total revenue would now be $77 million, total cost would be $7 million, and economic profit would fall to $70 million. But the distribution of this economic profit is now unequal. Boeing would gain, and Airbus would lose.

Boeing would now receive $44 million a week in total revenue, have a total cost of $4 million, and earn an economic profit of $40 million. Airbus would receive $33 million a week in total revenue, incur a total cost of $3 million, and earn an economic profit of $30 million.

So by increasing its output by 1 airplane a week, Boeing can increase its economic profit by $4 million and cause the economic profit of Airbus to fall by $6 million.

This situation is better for Boeing, but would Airbus go along with it? Would it be in Airbus's interest to hold its output at 3 airplanes a week?

To answer this question, we need to compare the economic profit Airbus makes if it maintains its output at 3 airplanes a week with the profit it makes if

TABLE 13.2 BOEING INCREASES OUTPUT TO 4 AIRPLANES PER WEEK

	Boeing	Airbus	Market total
Quantity (airplanes a week)	4	3	7
Price ($ million per airplane)	11	11	11
Total revenue ($ million)	44	33	77
Total cost ($ million)	4	3	7
Economic profit ($ million)	40	30	70

it produces 4 airplanes a week. How much economic profit does Airbus make if it produces 4 airplanes a week with Boeing also producing 4 a week?

Airbus Increases Output to 4 Airplanes a Week

With both firms producing 4 airplanes a week, total output is 8 airplanes a week. To sell 8 airplanes a week, the price must fall further. The market demand curve in Figure 13.5 tells us that the quantity demanded is 8 airplanes a week when the price is $9 million an airplane.

Table 13.3 keeps track of the data. Market total revenue would now be $72 million, total cost would be $8 million, and economic profit would fall to $64 million. With both firms producing the same output, the distribution of this economic profit is now equal.

Both firms would now receive $36 million a week in total revenue, have a total cost of $4 million, and earn an economic profit of $32 million. For Airbus, this outcome is an improvement on the previous one by $2 million a week. For Boeing, this outcome is worse than the previous one by $8 million a week.

This situation is better for Airbus, but would Boeing go along with it? You know that Boeing would be worse off if it decreased its output to 3 airplanes a week because it would get the outcome that Airbus has in Table 13.2—an economic profit of only $30 million a week. But would Boeing be better off if it increased output to 5 airplanes a week?

TABLE 13.3 AIRBUS INCREASES OUTPUT TO 4 AIRPLANES PER WEEK

	Boeing	Airbus	Market total
Quantity (airplanes a week)	4	4	8
Price ($ million per airplane)	9	9	9
Total revenue ($ million)	36	36	72
Total cost ($ million)	4	4	8
Economic profit ($ million)	32	32	64

Boeing Increases Output to 5 Airplanes a Week

To answer the question we've just posed, we need to calculate Boeing's economic profit if Airbus maintains its output at 4 airplanes a week and Boeing increases output to 5 a week.

Table 13.4 keeps track of the data. Total output is now 9 airplanes a week. To sell this quantity, the price must fall to $7 million per airplane. Market total revenue is $63 million and total cost is $9 million, so economic profit for the two firms is $54 million. The distribution of this economic profit is again unequal. But now both firms would lose.

Boeing would now receive $35 million a week in total revenue, have a total cost of $5 million, and earn an economic profit of $30 million—$2 million less than if it maintained its output at 4 airplanes a week (in Table 13.3). Airbus would receive $28 million a week in total revenue, incur a total cost of $4 million, and earn an economic profit of $24 million—$8 million less than before.

So neither firm can gain by increasing output beyond 4 airplanes a week. But there is a dilemma. If both firms stick to the monopoly output, they both produce 3 airplanes and make $36 million. If they both increase production to 4 airplanes a week, they both make $32 million. If only one of them increases production to 4 airplanes a week, that firm makes an economic profit of $40 million while the one that keeps production constant at 3 airplanes makes a lower economic profit of $30 million. So what will the firms do?

We can speculate about what they will do. But to work out the answer, we need to use some game theory. We'll leave the question that we've just asked dangling and return to it after we've learned the basic ideas about game theory.

TABLE 13.4 BOEING INCREASES OUTPUT TO 5 AIRPLANES PER WEEK

	Boeing	Airbus	Market total
Quantity (airplanes a week)	5	4	9
Price ($ million per airplane)	7	7	7
Total revenue ($ million)	35	28	63
Total cost ($ million)	5	4	9
Economic profit ($ million)	30	24	54

MyEconLab Study Plan 13.3
Key Terms Quiz
Solutions Video

CHECKPOINT 13.3

Explain the dilemma faced by firms in oligopoly.

Practice Problems

Isolated Island has two natural gas wells, one owned by Tom and the other owned by Jerry. Each well has a valve that controls the flow of gas. The marginal cost of producing gas is zero. Table 1 gives the demand schedule for the gas.

TABLE 1

Price (dollars per unit)	Quantity demanded (units per day)
12	0
11	1
10	2
9	3
8	4
7	5
6	6
5	7
4	8
3	9
2	10
1	11
0	12

1. If Tom and Jerry form a cartel and maximize their joint profit, what will be the price of gas and the quantity produced?
2. If Tom and Jerry are forced to sell at the perfectly competitive price, what will be the price of gas and the total quantity produced?
3. If Tom and Jerry compete as duopolists, what will be the price of gas?

In the News

OPEC calls for co-operation to stem price collapse
OPEC (a world oil cartel) has asked the world's largest oil producers to help stop a price collapse. But OPEC member Saudi Arabia, the world's biggest oil exporter, wants to keep output high.

Source: *Financial Times*, January 25, 2016

Explain how an effective profit-maximizing oil producers' cartel would influence the global market for oil and the world price of oil. Why does Saudi Arabia want to keep output high?

Solutions to Practice Problems

TABLE 2

Quantity (units per day)	Total revenue (dollars per day)	Marginal revenue (dollars per unit)
0	0	
		11
1	11	
		9
2	20	
		7
3	27	
		5
4	32	
		3
5	35	
		1
6	36	
		−1
7	35	
		−3
8	32	
		−5
9	27	
		−7
10	20	
		−9
11	11	
		−11
12	0	

1. If Tom and Jerry form a cartel and maximize their joint profit, they will charge the monopoly price. This price is the highest price the market will bear when together they produce the quantity at which marginal revenue equals marginal cost. Marginal cost is zero, so we need to find the price at which marginal revenue is zero. Marginal revenue is zero when total revenue is a maximum, which occurs when output is 6 units a day (Table 2) and price is $6 a unit (see the demand schedule in Table 1).
2. If Tom and Jerry are forced to sell at the perfectly competitive price, the price will equal marginal cost. Marginal cost is zero, so in this case, the price will be zero and the total quantity produced will be 12 units a day.
3. If Tom and Jerry compete as duopolists, they will increase production to more than the monopoly quantity. The price will fall, but they will not drive the price down to zero.

Solution to In the News

A successful profit-maximizing oil cartel would operate as a monopoly. It would produce the quantity at which marginal revenue equals marginal cost and agree on production levels for each member of the cartel. With the quantity produced restricted to the monopoly level, the price would be high and would exceed marginal cost. A cartel fails because there is no incentive for each member to stick to its production quota. Because price exceeds marginal cost, each member of the cartel has an incentive to overproduce, like Saudi Arabia in the news clip.

13.4 GAME THEORY

MyEconLab Concept Video

Game theory is the tool that economists use to analyze *strategic behavior*—behavior that recognizes mutual interdependence and takes account of the expected behavior of others. John von Neumann invented game theory in 1937, and today it is a major research field in economics.

Game theory
The tool that economists use to analyze *strategic behavior*—behavior that recognizes mutual interdependence and takes account of the expected behavior of others.

Game theory helps us to understand oligopoly and many other forms of economic, political, social, and even biological rivalries. We will begin our study of game theory and its application to the behavior of firms by thinking about familiar games that we play for fun.

What Is a Game?

What is a game? At first thought, the question seems silly. After all, there are many different games. There are ball games and parlor games, games of chance and games of skill. But what is it about all these different activities that make them games? What do all these games have in common? All games share three features:

- Rules
- Strategies
- Payoffs

Let's see how these common features of games apply to a game called "the prisoners' dilemma." The **prisoners' dilemma** is a game between two prisoners that shows why it is hard to cooperate even when it would be beneficial to both players to do so. This game captures the essential feature of the duopolists' dilemma that we've just been studying. The prisoners' dilemma also provides a good illustration of how game theory works and how it generates predictions.

Prisoners' dilemma
A game between two prisoners that shows why it is hard to cooperate even when it would be beneficial to both players to do so.

The Prisoners' Dilemma

Art and Bob have been caught red-handed, stealing a car. During the district attorney's interviews with the prisoners, he begins to suspect that he has stumbled on the two people who committed a multimillion-dollar bank robbery some months earlier. But this is just a suspicion. The district attorney has no evidence on which he can convict them of the greater crime unless he can get them to confess. He makes the prisoners play a game with the following rules.

Rules

Each prisoner (player) is placed in a separate room and cannot communicate with the other player. Each is told that he is suspected of having carried out the bank robbery and that

- If both of them confess to the larger crime, each will receive a reduced sentence of 3 years for both crimes.
- If he alone confesses and his accomplice does not, he will receive an even shorter sentence of 1 year, while his accomplice will receive a 10-year sentence.
- If neither of them confesses to the larger crime, each will receive a 2-year sentence for car theft.

Strategies

Strategies
All the possible actions of each player in a game.

In game theory, **strategies** are all the possible actions of each player. Art and Bob each have two possible strategies:

- Confess to the bank robbery.
- Deny having committed the bank robbery.

Payoffs

Payoff matrix
A table that shows the payoffs for each player for every possible combination of actions by the players.

Because there are two players, each with two strategies, there are four possible outcomes:

- Both confess.
- Both deny.
- Art confesses and Bob denies.
- Bob confesses and Art denies.

Each prisoner can work out exactly what happens to him—his *payoff*—in each of these four situations. We can tabulate the four possible payoffs for each of the prisoners in what is called a payoff matrix for the game. A **payoff matrix** is a table that shows the payoffs for every possible action by each player given every possible action by the other player.

TABLE 13.5 PRISONERS' DILEMMA PAYOFF MATRIX

Bob's strategies \ Art's strategies	Confess	Deny
Confess	3 years / 3 years	10 years / 1 year
Deny	1 year / 10 years	2 years / 2 years

Each square shows the payoffs for the two players, Art and Bob, for each possible pair of actions. In each square, the red triangle shows Art's payoff and the blue triangle shows Bob's. For example, if both confess, the payoffs are in the top left square.

Table 13.5 shows a payoff matrix for Art and Bob. The squares show the payoffs for the two prisoners—the red triangle in each square shows Art's, and the blue triangle shows Bob's. If both prisoners confess (top left), each gets a prison term of 3 years. If Bob confesses but Art denies (top right), Art gets a 10-year sentence and Bob gets a 1-year sentence. If Art confesses and Bob denies (bottom left), Art gets a 1-year sentence and Bob gets a 10-year sentence. Finally, if both of them deny (bottom right), neither can be convicted of the bank robbery charge but both are sentenced for the car theft—a 2-year sentence.

Equilibrium

Nash equilibrium
An equilibrium in which each player takes the best possible action given the action of the other player.

The equilibrium of a game occurs when each player takes the best possible action given the action of the other player. This equilibrium concept is called **Nash equilibrium**. It is so named because John Nash of Princeton University, who received the Nobel Prize for Economic Science in 1994, proposed it. (The same John Nash was portrayed by Russell Crowe in *A Beautiful Mind*.)

In the case of the prisoners' dilemma, equilibrium occurs when Art makes his best choice given Bob's choice and when Bob makes his best choice given Art's choice. Let's find the equilibrium.

First, look at the situation from Art's point of view. If Bob confesses, it pays Art to confess because in that case, he is sentenced to 3 years rather than 10 years. If Bob does not confess, it still pays Art to confess because in that case, he receives 1 year rather than 2 years. So no matter what Bob does, Art's best action is to confess.

Second, look at the situation from Bob's point of view. If Art confesses, it pays Bob to confess because in that case, he is sentenced to 3 years rather than 10 years. If Art does not confess, it still pays Bob to confess because in that case, he receives 1 year rather than 2 years. So no matter what Art does, Bob's best action is to confess.

Because each player's best action is to confess, each does confess, each gets a 3-year prison term, and the district attorney has solved the bank robbery. This is the equilibrium of the game.

Not the Best Outcome

The equilibrium of the prisoners' dilemma game is not the best outcome for the prisoners. Isn't there some way in which they can cooperate and get the smaller 2-year prison term? There is not, because the players cannot communicate with each other. Each player can put himself in the other player's place and can figure out what the other will do. The prisoners are in a dilemma. Each knows that he can serve only 2 years if he can trust the other to deny. But each also knows that it is not in the best interest of the other to deny. So each prisoner knows that he must confess, thereby delivering a bad outcome for both.

Let's now see how we can use the ideas we've just developed to understand the behavior of firms in oligopoly. We'll start by returning to the duopolists' dilemma.

The Duopolists' Dilemma

The dilemma of Airbus and Boeing is similar to that of Art and Bob. Each firm has two strategies. It can produce airplanes at the rate of

- 3 airplanes a week
- 4 airplanes a week

Because each firm has two strategies, there are four possible combinations of actions for the two firms:

- Both firms produce 3 airplanes a week (monopoly outcome).
- Both firms produce 4 airplanes a week.
- Airbus produces 3 airplanes and Boeing produces 4 airplanes a week.
- Boeing produces 3 airplanes and Airbus produces 4 airplanes a week.

The Payoff Matrix

Table 13.6 sets out the payoff matrix for this game. It is constructed in exactly the same way as the payoff matrix for the prisoners' dilemma in Table 13.5. The squares show the payoffs for Airbus and Boeing. In this case, the payoffs are economic profits. (In the case of the prisoners' dilemma, the payoffs were losses.)

The table shows that if both firms produce 4 a week (top left), each firm makes an economic profit of $32 million. If both firms produce 3 a week (bottom right), they make the monopoly profit, and each firm makes an economic profit of $36 million. The top right and bottom left squares show what happens if one firm produces 4 a week while the other produces 3 a week. The firm that increases production makes an economic profit of $40 million, and the one that keeps production at the monopoly quantity makes an economic profit of $30 million.

Equilibrium of the Duopolists' Dilemma

What do the firms do? To answer this question, we must find the equilibrium of the duopoly game.

TABLE 13.6 DUOPOLISTS' DILEMMA PAYOFF MATRIX

Boeing's strategies \ Airbus's strategies	4 a week	3 a week
4 a week	$32m / $32m	$30m / $40m
3 a week	$40m / $30m	$36m / $36m

Each square shows the payoffs from a pair of actions. For example, if both firms produce 3 airplanes a week, the payoffs are recorded in the bottom right square. The red triangle shows Airbus's payoff, and the blue triangle shows Boeing's.

TABLE 13.7 THE NASH EQUILIBRIUM

Boeing's strategies \ Airbus's strategies	4 a week	3 a week
4 a week	$32m, $32m	$30m, $40m
3 a week	$40m, $30m	$36m, $36m

The Nash equilibrium is for each firm to produce 4 airplanes a week.

Using the information in Table 13.7, look at things from Airbus's point of view. Airbus reasons as follows: Suppose that Boeing produces 4 airplanes a week. If I, Airbus, produce 3 a week, I will make an economic profit of $30 million. If I also produce 4 a week, I will make an economic profit of $32 million. So I'm better off producing 4 airplanes a week. Airbus continues to reason: Now suppose Boeing produces 3 a week. If I produce 4 a week, I will make an economic profit of $40 million, and if I produce 3 a week, I will make an economic profit of $36 million. An economic profit of $40 million is better than an economic profit of $36 million, so I'm better off if I produce 4 airplanes a week. So regardless of whether Boeing produces 3 a week or 4 a week, it pays Airbus to produce 4 airplanes a week.

Because the two firms face identical situations, Boeing comes to the same conclusion as Airbus, so both firms produce 4 a week. The equilibrium of the duopoly game is that both firms produce 4 airplanes a week.

Collusion Is Profitable but Difficult to Achieve

In the duopolists' dilemma that you've just studied, Airbus and Boeing end up in a situation that is similar to that of the prisoners in the prisoners' dilemma game. They don't achieve the best joint outcome. Because each produces 4 airplanes a week, each makes an economic profit of $32 million a week.

If firms were able to collude, they would agree to limit their production to 3 airplanes a week each and they would each make the monopoly profit of $36 million a week.

The outcome of the duopolists' dilemma shows why it is difficult for firms to collude. Even if collusion were a legal activity, firms in duopoly would find it difficult to implement an agreement to restrict output. Like the players of the prisoners' dilemma game, the duopolists would reach a Nash equilibrium in which they produce more than the joint profit-maximizing quantity.

If two firms have difficulty maintaining a collusive agreement, oligopolies with more than two firms have an even harder time. The operation of the Organization of the Petroleum Exporting Countries (OPEC) illustrates this difficulty. To raise the price of oil, OPEC must limit global oil production. The members of this cartel meet from time to time and set a production limit for each member nation. Almost always, within a few months of a decision to restrict production, some (usually smaller) members of the cartel break their quotas, production increases, and the price sags below the cartel's desired target. The OPEC cartel plays an oligopoly dilemma game similar to the prisoners' dilemma. Only in 1973, 1979–1980, and 2005–2007 did OPEC manage to keep its members' production under control and raise the price of oil.

Advertising and Research Games in Oligopoly

Every month, Coke and Pepsi, Nike and Adidas, Procter & Gamble and Kimberly-Clark, Nokia and Motorola, and hundreds of other pairs of big firms locked in fierce competition spend millions of dollars on advertising campaigns and on research and development (R&D). They make decisions about whether to increase or cut the advertising budget or whether to undertake a large R&D effort aimed at lowering production costs or at making the product more reliable (usually, the more reliable a product, the more expensive it is to produce, but the more people are willing to pay for it). These choices can be analyzed as games. Let's look at some examples of these types of games.

Advertising Game

A key to success in the soft drink industry is to run huge advertising campaigns. These campaigns affect market share but are costly to run. Table 13.8 shows some hypothetical numbers for the advertising game that Pepsi and Coke play. Each firm has two strategies: Advertise or don't advertise. If neither firm advertises, they each make $50 million (bottom right of the payoff matrix). If each firm advertises, each firm's profit is lower by the amount spent on advertising (top left square of the payoff matrix). If Pepsi advertises but Coke does not, Pepsi gains and Coke loses (top right square of the payoff matrix). Finally, if Coke advertises and Pepsi does not, Coke gains and Pepsi loses (bottom left square).

Pepsi reasons as follows: Regardless of whether Coke advertises, we're better off advertising. Coke reasons similarly: Regardless of whether Pepsi advertises, we're better off advertising. Because advertising is the best strategy for both players, it is the Nash equilibrium. The outcome of this game is that both firms advertise and make less profit than they would if they could collude to achieve the cooperative outcome of no advertising.

TABLE 13.8 THE ADVERTISING GAME PAYOFF MATRIX

Pepsi's strategies \ Coke's strategies	Advertise	Don't advertise
Advertise	$20m / $20m	–$10m / $80m
Don't advertise	$80m / –$10m	$50m / $50m

For each pair of strategies, the red triangle shows Coke's payoff, and the blue triangle shows Pepsi's. If both firms advertise, they make less than if neither firm advertises. But each firm is better off advertising if the other doesn't advertise. The Nash equilibrium for this prisoners' dilemma advertising game is for both firms to advertise.

Research and Development Game

A key to success in the disposable diaper industry is to design a product that people value highly relative to the cost of producing it. The firm that develops the most highly valued product and also develops the least-cost technology for producing it gains a competitive edge. It can undercut the rest of the market, increase its market share, and increase its economic profit. But it is costly to undertake the R&D that can ultimately result in an improved product and increased profit. So the cost of R&D must be deducted from the increased profit. If no firm does R&D, every firm can be better off, but if one firm initiates the R&D activity, all firms must follow.

Table 13.9 illustrates the dilemma (with hypothetical numbers) for the R&D game that Kimberly-Clark and Procter & Gamble play. Each firm has two strategies: Do R&D or do no R&D. If neither firm does R&D, Kimberly-Clark makes $30 million and Procter & Gamble makes $70 million (bottom right of the payoff matrix). If each firm does R&D, each firm's profit is lower by the amount spent on R&D (top left square of the payoff matrix). If Kimberly-Clark does R&D but Procter & Gamble does not, Kimberly-Clark gains and Procter & Gamble loses (top right square of the payoff matrix). Finally, if Procter & Gamble conducts R&D and Kimberly-Clark does not, Procter & Gamble gains and Kimberly-Clark loses (bottom left square).

Kimberly-Clark reasons as follows: Regardless of whether Procter & Gamble undertakes R&D, we're better off doing R&D. Procter & Gamble reasons similarly: Regardless of whether Kimberly-Clark does R&D, we're better off doing R&D.

Because R&D is the best strategy for both players, it is the Nash equilibrium. The outcome of this game is that both firms conduct R&D. They make less profit than they would if they could collude to achieve the cooperative outcome of no R&D.

The real-world situation has more players than Kimberly-Clark and Procter & Gamble. A large number of other firms strive to capture market share from Procter & Gamble and Kimberly-Clark. So the R&D effort by these two firms not only serves the purpose of maintaining shares in their own battle but also helps to keep barriers to entry high enough to preserve their joint market share.

TABLE 13.9 THE R&D GAME PAYOFF MATRIX

Kimberly-Clark's strategies \ Procter & Gamble's strategies	R&D	No R&D
R&D	$45m / $5m	–$10m / $85m
No R&D	$85m / –$10m	$70m / $30m

For each pair of strategies, the red triangle shows Procter & Gamble's payoff, and the blue triangle shows Kimberly-Clark's. If both firms do R&D, they make less than if neither firm undertakes R&D. But each firm is better off doing R&D if the other does no R&D. The Nash equilibrium for this prisoners' dilemma R&D game is for both firms to do R&D.



EYE on YOUR LIFE

A Game You Might Play

MyEconLab Critical Thinking Exercise

The payoff matrix here describes a game that might be familiar to you. But it isn't a prisoners' dilemma. It's a lovers' dilemma.

Jane and Jim have more fun if they do something together than if they do things alone.

But Jane likes the movies more than the ball game, and Jim likes the ball game more than the movies.

The payoff matrix describes how much they like the various outcomes (measured in units of utility).

What do they do?

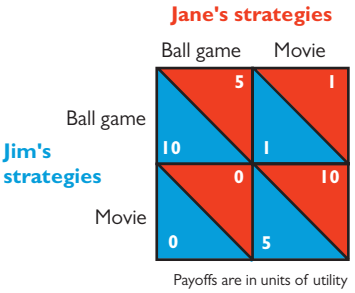
By comparing the utility numbers for different strategies, you can figure out that Jim never goes to the movies alone and Jane never goes to the ball game alone.

You can also figure out that Jim doesn't go to the ball game alone and Jane doesn't go to the movies alone.

They always go out together. But do they go to the movies or the ball game?

The answer is that we can't tell. This game has no unique equilibrium. The payoffs tell you that Jane and Jim might go to either the game or the movies.

In a repeated game, they'll probably alternate between the two and might even toss a coin to decide which to go to on any given evening.



Repeated Games

The games that we've studied are played just once. In contrast, most real-world games get played repeatedly. This fact suggests that real-world duopolists might find some way of learning to cooperate so that they can enjoy a monopoly profit. If a game is played repeatedly, one player has the opportunity to penalize the other player for previous "bad" behavior. If Airbus produces 4 airplanes this week, perhaps Boeing will produce 4 next week. Before Airbus produces 4 airplanes this week, won't it take account of the possibility of Boeing producing 4 next week? What is the equilibrium of this more complicated dilemma game when it is repeated indefinitely?

The monopoly equilibrium might occur if each firm knows that the other will punish overproduction with overproduction, "tit for tat." Let's see why.

Table 13.10 keeps track of the numbers. Suppose that Boeing contemplates producing 4 airplanes in week 1. This move will bring it an economic profit of $40 million and will cut the economic profit of Airbus to $30 million. In week 2, Airbus will punish Boeing and produce 4 airplanes. But Boeing must go back to 3 airplanes to induce Airbus to cooperate again in week 3. So in week 2, Airbus makes an economic profit of $40 million, and Boeing makes an economic profit of $30 million. Adding up the profits over these two weeks of play, Boeing would have made $72 million by cooperating compared with $70 million from producing 4 airplanes in week 1 and generating Airbus's tit-for-tat response.

What is true for Boeing is also true for Airbus. Because each firm makes a larger profit by sticking to the monopoly output, both firms do so and the monopoly price, quantity, and profit prevail.

In reality, whether a duopoly (or more generally an oligopoly) works like a one-play game or a repeated game depends primarily on the number of players and the ease of detecting and punishing overproduction. The larger the number of players, the harder it is to maintain the monopoly outcome.

TABLE 13.10 PAYOFFS WITH PUNISHMENT

Period of play	Cooperate		Overproduce	
	Boeing profit	Airbus profit	Boeing profit	Airbus profit
	(millions of dollars)			
1	36	36	40	30
2	36	36	30	40

MyEconLab Critical Thinking Exercise



EYE on the WIRELESS OLIGOPOLY

Which Wireless Service?

Your smartphone plan is almost certainly with one of four firms: Verizon, AT&T, Sprint, or T-Mobile. The pie chart in Figure 1 shows the four firms' market shares along with that of a token fifth firm, U.S. Cellular.

With a third of the market each, Verizon and AT&T are the dominant players, but sharing almost equally the other third, Sprint and T-Mobile are also significant participants in what is a wireless service oligopoly.

Does this market have enough firms? Is four too few? Would consumers be better served if more firms entered the market?

The number of firms that a market can support depends on the extent of its economies of scale and the market demand. We don't have data on the firms' long-run average cost curves that would tell us about the economies of scale, but we do have information about the firms' profits. We can use that profit information to get an indirect look at economies of scale.

The pie chart in Figure 2 shows the gross earnings of the four wireless firms. (Gross means before deducting depreciation.)

Because of economies of scale, the two larger firms have much bigger gross profits than the two smaller firms. But the two smaller firms are large enough to earn a profit. With the two smaller firms being profitable, and with each having about a one sixth market share, it seems likely that demand in the U.S. wireless market is large enough for more than four firms to profitably survive.

If more firms could operate profitably in this market, we should expect to see entry. And that is exactly what is happening. Google, in collaboration with Dish Network, is entering with a virtual wireless service. There might be room for even more firms.

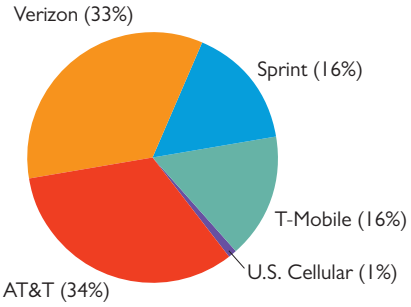


Figure 1 Wireless Subscriber Shares

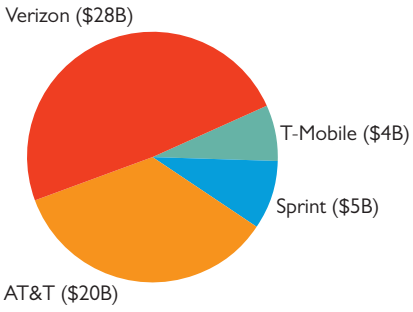


Figure 2 Wireless Gross Profits

SOURCES OF DATA: Statista.com and Forbes.com.

Is Oligopoly Efficient?

The quantity produced of any good or service is the efficient quantity if the price (which measures marginal benefit) equals marginal cost. Does oligopoly produce efficient quantities of goods and services?

You've seen that if firms in oligopoly play a repeated prisoners' dilemma game, they can end up restricting output to the monopoly level and making the same economic profit as a monopoly would make. You've also seen that even when the firms don't cooperate, they don't necessarily drive the price down to marginal cost. So generally, oligopoly is not efficient. It suffers from the same source of inefficiency as monopoly.

Also, firms in oligopoly might end up operating at a higher average total cost than the lowest attainable cost because their advertising and research budgets are higher than the socially efficient level.

Because oligopoly creates inefficiency and firms in oligopoly have an incentive to try to behave like a monopoly, the United States has established antitrust laws that seek to reduce market power and move the oligopoly outcome closer to that of competition and efficiency.

MyEconLab Study Plan 13.4
Key Terms Quiz
Solutions Video

CHECKPOINT 13.4

Use game theory to explain how output and price are determined in oligopoly.

Practice Problems

Bud and Wise are the only two producers of New Age beer, which is designed to displace root beer. Bud and Wise are trying to work out the quantity to produce. They know that if

- Both limit production to 10,000 gallons a day, they will make the maximum attainable joint profit of $200,000 a day—$100,000 a day each.
- One produces 20,000 gallons a day while the other produces 10,000 a day, the one that produces 20,000 gallons will make an economic profit of $150,000 and the one that sticks with 10,000 gallons will incur an economic loss of $50,000.
- Both produce 20,000 gallons a day, each will make zero economic profit.

1. Construct a payoff matrix for the game that Bud and Wise must play.
2. Find the Nash equilibrium of the game that Bud and Wise play.
3. What is the equilibrium of the game if Bud and Wise play it repeatedly?

In the News

T-Mobile launches campaign against "dark duopoly" of AT&T, Verizon
In a social media campaign, T-Mobile CEO John Legere urges wireless users to join him to defeat "the dark force" of AT&T and Verizon. He says they already control too much of the frequency bands used for wireless and that if they get more at the upcoming auction, wireless service will become a duopoly.

Source: *The Dallas Morning News*, June 23, 2015

What is the game that T-Mobile, AT&T, and Verizon are playing?

Solutions to Practice Problems

1. Table 1 shows the payoff matrix for the game that Bud and Wise must play.
2. The Nash equilibrium is for both to produce 20,000 gallons a day. To see why, notice that regardless of the quantity that Bud produces, Wise makes more profit by producing 20,000 gallons a day. The same is true for Bud. So Bud and Wise each produce 20,000 gallons a day.
3. If Bud and Wise play this game repeatedly, each produces 10,000 gallons a day and makes maximum economic profit. They can achieve this outcome by playing a tit-for-tat strategy.

TABLE 1

Wise's strategies \ Bud's strategies	10,000 gallons	20,000 gallons
10,000 gallons	100 / 100	150 / –50
20,000 gallons	–50 / 150	0 / 0

Payoffs are in thousands of dollars

Solution to In the News

T-Mobile, AT&T, and Verizon are playing a prisoners' dilemma game for control of a large share of the frequency bands used by smartphones. Each firm could bid a low price for the share that minimizes its cost, or bid a high price for more than it currently plans to use. The Nash equilibrium is for all three to bid too high a price for too much bandwidth. It is possible that AT&T and Verizon might outbid T-Mobile and become a duopoly.

CHAPTER SUMMARY

Key Points

1. Explain how a firm in monopolistic competition determines its output and price.

- The firm in monopolistic competition faces a downward-sloping demand curve and produces the quantity at which marginal revenue equals marginal cost.
- Entry and exit result in zero economic profit and excess capacity in long-run equilibrium.

2. Explain why firms develop new and improved products and incur large advertising costs.

- Firms in monopolistic competition innovate and develop new products to maintain economic profit.
- Advertising expenditures increase total cost, but they might lower average total cost if the quantity sold increases by enough.
- Advertising expenditures can lower average total cost and can increase competition and lower price.
- Whether monopolistic competition is inefficient depends on the value people place on product variety.

3. Explain the dilemma faced by firms in oligopoly.

- If firms in oligopoly act together to restrict output, they make the same economic profit as a monopoly, but each firm can make a larger profit by increasing production.
- The oligopoly dilemma is whether to restrict or expand output.

4. Use game theory to explain how output and price are determined in oligopoly.

- In the prisoners' dilemma game, two players acting in their own interests harm their joint interest. Oligopoly is a prisoners' dilemma game.
- If firms cooperated, they could earn the monopoly profit, but in a one-play game, they overproduce and can drive the price and economic profit to the levels of perfect competition.
- Advertising and research and development create a prisoners' dilemma for firms in oligopoly.
- In a repeated game, a punishment strategy can lead to monopoly output, price, and economic profit.
- Oligopoly is usually inefficient because the price (marginal benefit) exceeds marginal cost and cost might not be the lowest attainable.

Key Terms

MyEconLab Key Terms Quiz

Cartel, 352
Duopoly, 352
Efficient scale, 345
Excess capacity, 345
Four-firm concentration ratio, 342
Game theory, 357
Herfindahl-Hirschman Index, 342
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Payoff matrix, 358
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Product differentiation, 340
Strategies, 358

MyEconLab Chapter 13 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

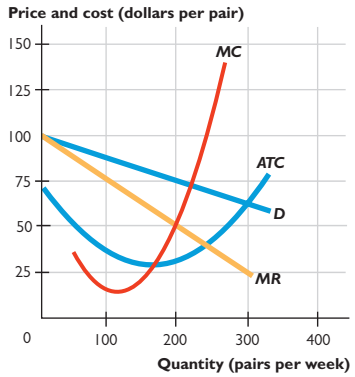
LIST 1

- Cable TV service
- Wheat
- Athletic shoes
- Soda
- Toothbrushes
- Ready-mix concrete

1. Which of the items in List 1 are sold by firms in monopolistic competition? Explain your selections.

Use Figure 1, which shows the demand curve, marginal revenue curve, and cost curves of Lite and Kool, Inc., a producer of running shoes in monopolistic competition, to work Problems **2** to **4**.

FIGURE 1



2. In the short run, what quantity does Lite and Kool produce, what price does it charge, and does it make an economic profit?

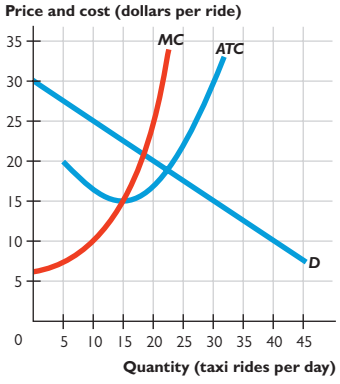
3. In the short run, does Lite and Kool have excess capacity and what is its markup?

4. Do you expect firms to enter the running shoes market or exit from that market in the long run? Explain your answer.

Use the following information to work Problems **5** and **6**.

Isolated Island has two taxi companies, one owned by Ann and the other owned by Zack. Figure 2 shows the demand curve for taxi rides, *D*, and the cost curves of one of the firms. Suppose that Ann and Zack have two strategies: Collude, fix the monopoly price, and limit the number of rides, or break the collusion, cut the price, and produce more rides.

FIGURE 2



5. Create a payoff matrix for the game that Ann and Zack play, and find the Nash equilibrium for this game if it is played just once. Do the people of Isolated Island get the efficient quantity of taxi rides?

6. If Ann and Zack play the game repeatedly, what additional strategies become available to them and how might the outcome change?

Use the following information to work Problems **7** and **8**.

Coke, Pepsi and the new front in the cola wars

The cola wars between Coca-Cola and PepsiCo may become even tougher as consumers seek out healthier alternatives to sugary soft drinks. But both Coke and Pepsi are getting higher prices for soda, thanks to new 8-ounce cans replacing the standard 12-ounce size.

Source: CBS News, February 12, 2015

7. Describe the cola wars that Coca-Cola and PepsiCo play as a game. What type of game is it? What are some of the strategies in the game?

8. With two strategies—8-ounce can and 12-ounce can—and with assumed payoffs, create a payoff matrix for the game if the equilibrium outcome is for both firms to choose 8-ounce cans.

9. Read *Eye on Smartphones* on p. 349 and explain why smartphone producers offer such a large variety of their products. Draw a graph of a firm's cost and revenue curves if all smartphones are identical. Use your graph to illustrate the effects of the firm introducing a new, differentiated smartphone.

10. Read *Eye on the Wireless Oligopoly* on p. 363 and then explain the effects of economies of scale on the market for smartphones.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. Washtenaw Dairy in Ann Arbor, Michigan, sells 63 flavors of Strohs Mooney's ice cream, and Ben and Jerry's Web site also lists 63 different flavors of ice cream. These numbers are similar to the varieties of smartphones sold by Samsung, Nokia, and Motorola. Toyota makes only 16 varieties of vehicle and Boeing makes 16 varieties of airplane. Why is there more variety in smartphones and ice cream than in automobiles and airplanes?

2. AT&T and Verizon have two pricing strategies: Set a high (monopoly) price or set a low (competitive) price. Suppose that if they both set a competitive price, economic profit for both is zero. If both set a monopoly price, AT&T makes an economic profit of $100 million and Verizon of $200 million. If AT&T sets a low price and Verizon sets a high price, AT&T makes an economic profit of $200 million and Verizon incurs an economic loss of $100 million; if AT&T sets a high price and Verizon sets a low price, AT&T incurs an economic loss of $50 million and Verizon makes an economic profit of $250 million.

- Create the payoff matrix for this game.
- What is the equilibrium of this game?
- Is the equilibrium efficient?
- Is this game a prisoners' dilemma?

Use Figure 1, which shows the demand, marginal revenue, and cost curves of La Bella Pizza, a firm in monopolistic competition, to work Problems **3** and **4**.

3. In the short run, what is the quantity that La Bella Pizza produces, the price it charges, and its excess capacity?

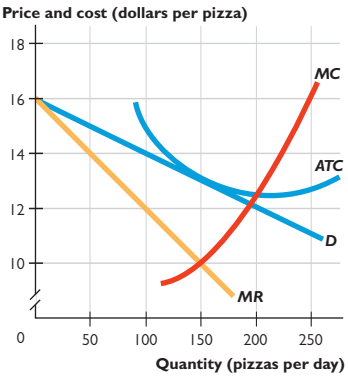
4. In the long run, how will the number of pizza producers change? What are the excess capacity and the deadweight loss created? Explain your answer.

5. Netflix profits slide
Netflix has hit a bump in the road on its quest to reach 60 million to 90 million subscribers in the United States and, by the end of 2016, become fully global. Netflix faces fierce competition from streaming rivals like Amazon, HBO, and Hulu and also competes against cable, satellite, YouTube, and DVDs.

Source: *The New York Times*, October 14, 2015

Explain why more firms have entered the streaming-video market and how the economic profit of firms in the market will likely change. What will each firm's economic profit be in the long run? Explain your answer.

FIGURE 1



Use the following information to work Problems **6** and **7**.

The United States claims that Canada subsidizes its softwood lumber production and that imports of Canadian lumber damage the interests of U.S. producers. The United States has levied a tariff on Canadian imports to counter the subsidy. Canada is thinking of retaliating by refusing to export water to California. Table 1 shows a payoff matrix for the game that the United States and Canada play.

TABLE 1

United States' strategies	Canada's strategies: Export	Canada's strategies: Don't export
No tariff	$100m, $100m	$25m, $50m
Tariff	$50m, $125m	$0m, $75m

6. What is the United States' best strategy? What is Canada's best strategy? What is the outcome of this game? Explain.

7. Is this game like a prisoners' dilemma or different in some crucial way? Explain. Which country would benefit more from a free trade agreement?

MyEconLab Chapter 13 Study Plan

Multiple Choice Quiz

1. Monopolistic competition differs from _____.

A. monopoly because firms cannot set their own price
B. oligopoly because firms produce differentiated goods or services
C. perfect competition because the goods or services produced are differentiated
D. monopoly because the good produced by each firm has no close substitute

2. A firm in monopolistic competition maximizes its profit by _____.

A. differentiating its good and producing the quantity at which price equals marginal revenue
B. producing the quantity at which marginal revenue equals marginal cost and then adding a markup
C. raising its price and producing so that it always has excess capacity
D. producing the quantity at which marginal cost equals marginal revenue and charging the highest price at which it can sell that quantity

3. A firm in monopolistic competition that is maximizing profit _____.

A. always makes a positive economic profit in the short run
B. never needs to shut down because its price always exceeds minimum average variable cost
C. might, in the short run, sell at a price that is less than average total cost
D. shuts down temporarily if it incurs a loss equal to total variable cost

4. If one firm advertises and other firms in the market don't, then _____.

A. the demand for the advertised good becomes more elastic
B. the profit-maximizing quantity of the advertised good decreases because total fixed costs increase
C. the average cost of producing a small quantity of the advertised good rises but the average total cost of producing a large quantity might fall
D. the economic profit made from the advertised good increases

5. The oligopoly dilemma is whether to _____.

A. act together to restrict output and raise the price
B. raise the price to the monopoly profit-maximizing price
C. cheat on others in the cartel to take advantage of profit opportunities
D. lower the price to the perfectly competitive price

6. In the prisoners' dilemma game, each player _____.

A. consults the other player to determine his best action
B. chooses the best outcome for the other player
C. chooses the best outcome for himself
D. chooses the best outcome for both players together

7. A Nash equilibrium _____.

A. is the outcome that delivers maximum economic profit
B. is the outcome in which each player takes the best action given the other player's action
C. changes each time the game is played
D. is the best possible outcome for the two players



How do we track economic booms and busts?

GDP: A Measure of Total Production and Income

14

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Define GDP and explain why the value of production, income, and expenditure are the same for an economy.
2. Describe how economic statisticians measure GDP and distinguish between nominal GDP and real GDP.
3. Describe the uses of real GDP and explain its limitations as a measure of the standard of living.

MyEconLab Big Picture Video

MyEconLab Concept Video

14.1 GDP, INCOME, AND EXPENDITURE

Where is the U.S. economy heading? Will it remain weak, begin to expand more rapidly, or sink into a recession?

Everyone wants to know the answers to these questions. The people who make business decisions—homebuilders, auto producers, wireless service providers, airlines, oil producers, airplane makers, farmers, and retailers—want to know the answers so they can plan their production to align with demand. Governments want the answers because the amount of tax revenue that they collect depends on how much people earn and spend, which in turn depends on the state of the economy. Governments and the Federal Reserve want to know because they might be able to take actions that avoid excessive bust or boom. Ordinary citizens want the answers to plan their big decisions such as how long to remain in school, whether to rent or buy a new home, and how much to save toward retirement.

To assess the state of the economy we measure gross domestic product, or GDP. You're about to discover that GDP measures the value of total production, total income, and total expenditure.

GDP Defined

Gross domestic product (GDP)
The market value of all the final goods and services produced within a country in a given time period.

We measure total production as **gross domestic product,** or **GDP**, which is the market value of all the final goods and services produced within a country in a given time period. This definition has four parts, which we'll examine in turn.

Value Produced

To measure total production, we must add together the production of apples and oranges, bats and balls. Just counting the items doesn't get us very far. Which is the greater total production: 100 apples and 50 oranges or 50 apples and 100 oranges?

GDP answers this question by valuing items at their *market value*—at the prices at which the items are traded in markets. If the price of an apple is 10 cents and the price of an orange is 20 cents, the market value of 100 apples plus 50 oranges is $20 and the market value of 50 apples and 100 oranges is $25. By using market prices to value production, we can add the apples and oranges together.

What Produced

Final good or service
A good or service that is produced for its final user and not as a component of another good or service.

Intermediate good or service
A good or service that is used as a component of a final good or service.

A **final good or service** is something that is produced for its final user and not as a component of another good or service. A final good or service contrasts with an **intermediate good or service**, which is used as a component of a final good or service. For example, a Ford car is a final good, but a Firestone tire that Ford buys and installs on the car is an intermediate good. In contrast, if you buy a replacement Firestone tire for your car, then that tire is a final good. The same good can be either final or intermediate depending on how it is used.

GDP does not count the value of everything that is produced. With one exception, it includes only those items that are traded in markets and does not include the value of goods and services that people produce for their own use. For example, if you buy a car wash, the value produced is included in GDP. But if you wash your own car, your production is not counted as part of GDP. The exception is the market value of homes that people own. GDP puts a rental value on these homes and pretends that the owners rent their homes to themselves.

Where Produced

Only goods and services that are produced *within a country* count as part of that country's GDP. Nike Corporation, a U.S. firm, produces sneakers in Vietnam, and the market value of those shoes is part of Vietnam's GDP, not part of U.S. GDP. Toyota, a Japanese firm, produces automobiles in Georgetown, Kentucky, and the value of this production is part of U.S. GDP, not part of Japan's GDP.

When Produced

GDP measures the value of production *during a given time period.* This time period is either a quarter of a year—called the quarterly GDP data—or a year—called the annual GDP data. The Federal Reserve and others use the quarterly GDP data to keep track of the short-term evolution of the economy, and economists use the annual GDP data to examine long-term trends.

GDP measures not only the value of total production but also total income and total expenditure. The circular flow model that you studied in Chapter 2 explains why.

Circular Flows in the U.S. Economy

Four groups buy the final goods and services produced: households, firms, governments, and the rest of the world. Four types of expenditure correspond to these groups:

- Consumption expenditure
- Investment
- Government expenditure on goods and services
- Net exports of goods and services

Consumption Expenditure

Consumption expenditure is the expenditure by households on consumption goods and services. It includes expenditures on *nondurable goods* such as orange juice and pizza, *durable goods* such as televisions and smartphones, and *services* such as rock concerts and haircuts. Consumption expenditure also includes house and apartment rents, including the rental value of owner-occupied housing.

Consumption expenditure
The expenditure by households on consumption goods and services.

Investment

Investment is the purchase of new *capital goods* (tools, instruments, machines, and buildings) and additions to inventories. Capital goods are *durable goods* produced by one firm and bought by another. Examples are PCs produced by HP and bought by Ford Motor Company, and airplanes produced by Boeing and bought by United Airlines. Investment also includes the purchase of new homes by households.

Investment
The purchase of new *capital goods* (tools, instruments, machines, buildings) and additions to inventories.

At the end of a year, some of a firm's output might remain unsold. For example, if Ford produces 4 million cars and sells 3.9 million of them, the other 0.1 million (100,000) cars remain unsold. In this case, Ford's inventory of cars increases by 100,000. When a firm adds unsold output to inventory, we count those items as part of investment.

It is important to note that investment does *not* include the purchase of stocks and bonds. In macroeconomics, we reserve the term "investment" for the purchase of new capital goods and the additions to inventories.

Government Expenditure on Goods and Services

Government expenditure on goods and services
The expenditure by all levels of government on goods and services.

Government expenditure on goods and services is expenditure by all levels of government on goods and services. For example, the U.S. Defense Department buys missiles and other weapons systems, the State Department buys travel services, the White House buys Internet services, and state and local governments buy cruisers for law enforcement officers.

Net Exports of Goods and Services

Net exports of goods and services
The value of exports of goods and services minus the value of imports of goods and services.

Exports of goods and services
Items that firms in the United States produce and sell to the rest of the world.

Imports of goods and services
Items that households, firms, and governments in the United States buy from the rest of the world.

Net exports of goods and services is the value of exports of goods and services minus the value of imports of goods and services. **Exports of goods and services** are items that firms in the United States produce and sell to the rest of the world. **Imports of goods and services** are items that households, firms, and governments in the United States buy from the rest of the world. Imports are produced in other countries, so expenditure on imports is not included in expenditure on U.S.-produced goods and services. If exports exceed imports, net exports are positive and expenditure on U.S.-produced goods and services increases. If imports exceed exports, net exports are negative and expenditure on U.S.-produced goods and services decreases.

Total Expenditure

Total expenditure on goods and services produced in the United States is the sum of the four items that you've just examined. We call consumption expenditure C, investment I, government expenditure on goods and services G, and net exports of goods and services NX. So total expenditure, which is also the total amount received by the producers of final goods and services, is

$$\text{Total expenditure} = C + I + G + NX.$$

Income

Labor earns wages, capital earns interest, land earns rent, and entrepreneurship earns profits. Households receive these incomes. Some part of total income, called *undistributed profit*, is a combination of interest and profit that firms retain and do not pay to households. But from an economic viewpoint, undistributed profit is income paid to households and then loaned to firms.

Expenditure Equals Income

Figure 14.1 shows the circular flows of income and expenditure that we've just described. The figure is based on Figures 2.4 and 2.5 (on p. 49 and p. 51), but it includes some more details and additional flows.

We call total income Y and show it by the blue flow from firms to households. When households receive their incomes, they pay some in taxes and save some. Some households receive benefits from governments. **Net taxes** equal taxes paid minus cash benefits received and are the green flow from households to governments labeled NT. **Saving** is the amount of income that is not paid in net taxes or spent on consumption goods and services. Saving flows from households to financial markets and is the green flow labeled S. These two green flows are not expenditures on goods and services. They are just flows of money. Because households allocate all their incomes after paying net taxes to consumption and saving,

Net taxes
Taxes paid minus cash benefits received from governments.

Saving
The amount of income that is not paid in net taxes or spent on consumption goods and services.

$$Y = C + S + NT.$$

The red flows show the four expenditure flows: consumption expenditure from households to firms, government expenditure from governments to firms, and net exports from the rest of the world to firms. Investment flows from the financial markets, where firms borrow, to the firms that produce capital goods.

Because firms pay out everything they receive as incomes to the factors of production, total expenditure equals total income. That is,

$$Y = C + I + G + NX.$$

From the viewpoint of firms, the value of production is the cost of production, which equals income. From the viewpoint of purchasers of goods and services, the value of production is the cost of buying it, which equals expenditure. So

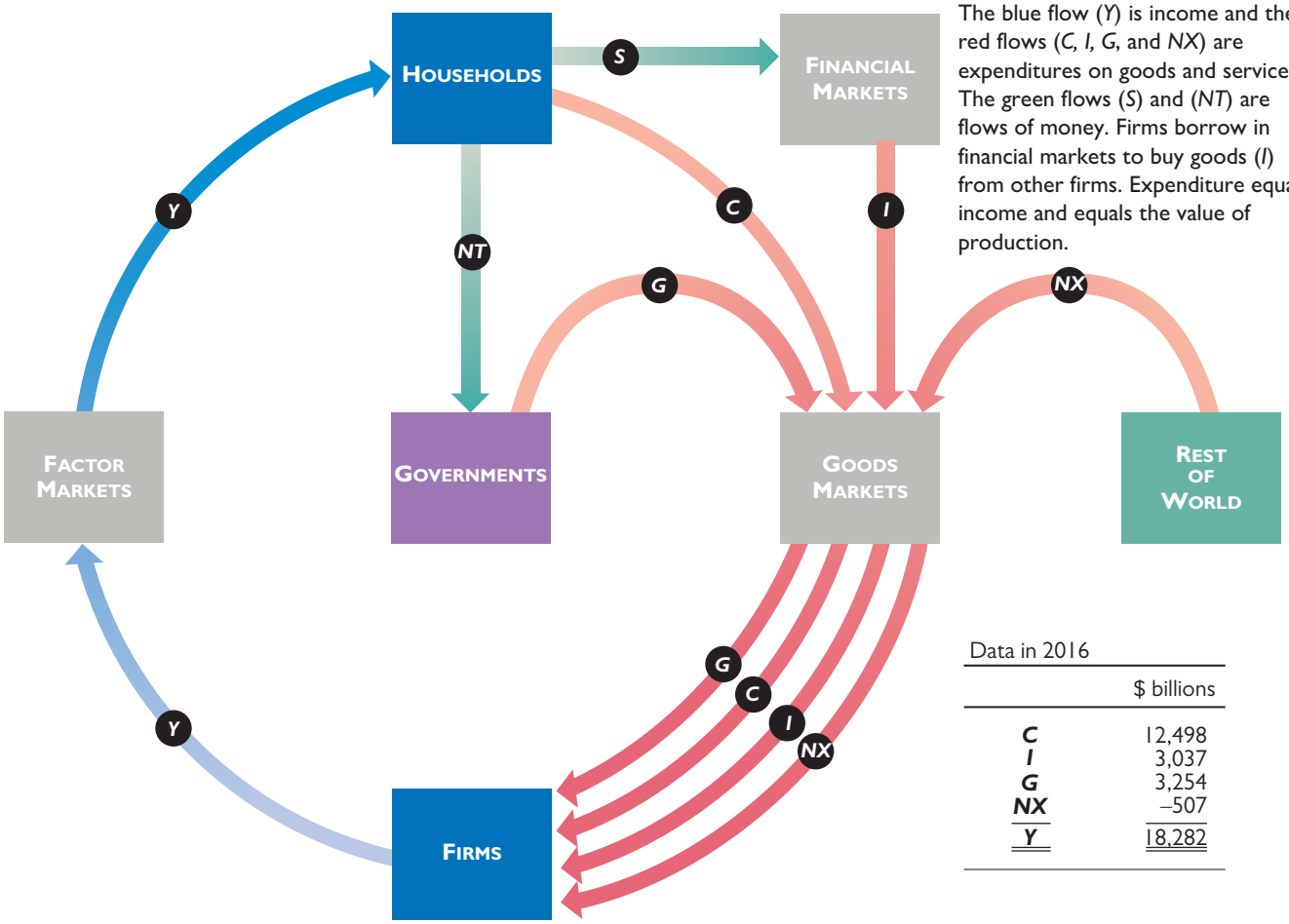
The value of production equals income equals expenditure.

The circular flow and the equality of income and expenditure provide two approaches to measuring GDP that we'll study in the next section.

FIGURE 14.1

The Circular Flow of Income and Expenditure

MyEconLab Animation



The blue flow (*Y*) is income and the red flows (*C*, *I*, *G*, and *NX*) are expenditures on goods and services. The green flows (*S*) and (*NT*) are flows of money. Firms borrow in financial markets to buy goods (*I*) from other firms. Expenditure equals income and equals the value of production.

Data in 2016

	$ billions
C	12,498
I	3,037
G	3,254
NX	–507
Y	18,282

MyEconLab Study Plan 14.1
Key Terms Quiz
Solutions Video

CHECKPOINT 14.1

Define GDP and explain why the value of production, income, and expenditure are the same for an economy.

Practice Problems

LIST 1

- Banking services bought by a student
- New cars bought by Hertz, the car rental firm
- Newsprint bought by *USA Today* from International Paper
- The purchase of a new aircraft for the vice president
- New house bought by Beyoncé

1. Classify each of the items in List 1 as a final good or service or as an intermediate good or service and identify which is a component of consumption expenditure, investment, or government expenditure on goods and services.
2. Figure 1 shows the flows of expenditure and income on Lotus Island. In 2016, *R* was $10 billion; *W* was $30 billion; *U* was $12 billion; *J* was $15 billion; and *Z* was $3 billion. Calculate total expenditure and total income.

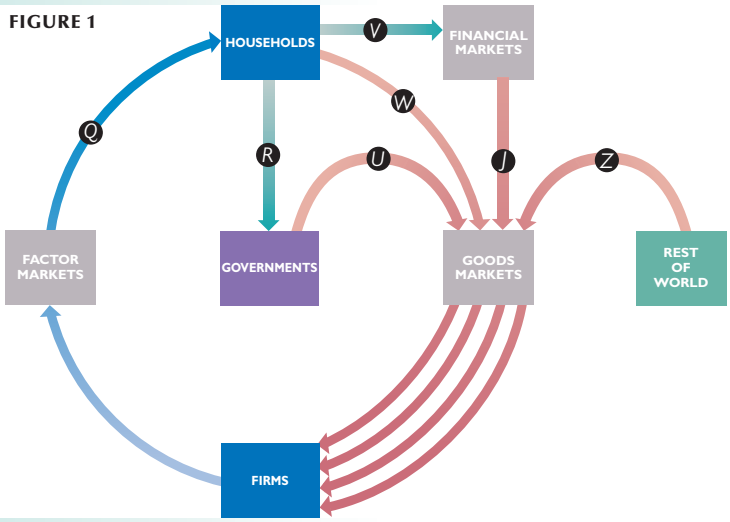
In the News

U.S. economy ended 2015 with slow growth

GDP increased at an annual rate of 0.7 percent in the final quarter of 2015. Government expenditure grew at the same 0.7 percent rate, but consumption expenditure grew at a rate of 2.2 percent. Investment and net exports shrank.

Source: BEA News Release, January 29, 2016

FIGURE 1



Use Figure 1 to indicate the flows in which the items in the news clip occur. How can GDP increase by 0.7 percent if consumption expenditure increased at a 2.2 percent rate?

Solutions to Practice Problems

1. The student's banking service is a final service and part of consumption expenditure. Hertz's new cars are additions to capital, so they are part of investment and final goods. Newsprint is an input into the newspaper, so it is an intermediate good and not a final expenditure. The new aircraft for the vice president is a final good and part of government expenditure. The new house is a final good and part of investment.
2. Total expenditure is the sum of *C*, *I*, *G*, and *NX*. In Figure 1, *C* is the flow *W*; *I* is the flow *J*; *G* is the flow *U*; and *NX* is the flow *Z*. So total expenditure equals $W + J + U + Z$, which is $60 billion. Total income is the blue flow, *Q*. But total income equals total expenditure, so total income is $60 billion.

Solution to In the News

GDP is the sum of flows *W*, *J*, *U*, and *Z*. Investment is *J*; consumption expenditure is *W*; government expenditure is *U*; and exports are part of *Z*.
$GDP = C + I + G + NX$. GDP grew at the same rate as *G* but GDP grew more slowly than *C* because $I + NX$ grew at a negative rate—they shrank.

14.2 MEASURING U.S. GDP

MyEconLab Concept Video

U.S. GDP is the market value of all the final goods and services produced within the United States during a year. In 2016, U.S. GDP was $18.3 trillion. The Bureau of Economic Analysis in the U.S. Department of Commerce measures GDP by using two approaches:

- Expenditure approach
- Income approach

The Expenditure Approach

The expenditure approach measures GDP by using data on consumption expenditure, investment, government expenditure on goods and services, and net exports. This approach is like attaching a meter to the circular flow diagram on all the flows running through the goods markets to firms and measuring the magnitudes of those flows. Table 14.1 shows this approach. The first column gives the terms used in the U.S. National Income and Product Accounts. The next column gives the symbols we used in the previous section.

Using the expenditure approach, GDP is the sum of consumption expenditure on goods and services (C), investment (I), government expenditure on goods and services (G), and net exports of goods and services (NX). The third column gives the expenditures in 2016. GDP measured by the expenditure approach was $18,282 billion in the first quarter of 2016, expressed at an annual rate.

Net exports were negative in 2016 because imports exceeded exports. Imports were $2,686 billion and exports were $2,179 billion, so net exports—exports minus imports—were –$507 billion as shown in the table.

The fourth column in Table 14.1 shows the relative magnitudes of the expenditures. Consumption expenditure is by far the largest component of total expenditure; investment and government expenditure are the next largest and they are a similar size; and net exports is the smallest component. In 2016, consumption expenditure was 68.4 percent, investment was 16.6 percent, government expenditure was 17.8 percent, and net exports were a negative 2.8 percent of GDP.

TABLE 14.1

GDP: The Expenditure Approach

MyEconLab Real-time data

Item	Symbol	Amount in 2016 (first quarter) (billions of dollars)	Percentage of GDP
Consumption expenditure	C	12,498	68.4
Investment	I	3,037	16.6
Government expenditure	G	3,254	17.8
Net exports	NX	−507	−2.8
GDP	Y	18,282	100.0

SOURCE OF DATA: U.S. Department of Commerce, Bureau of Economic Analysis.

The expenditure approach measures GDP by adding together consumption expenditure (C), investment (I), government expenditure (G), and net exports (NX).

In 2016, GDP measured by the expenditure approach was $18,282 billion.

Expenditures Not in GDP

Total expenditure (and GDP) does not include all the things that people and businesses buy. GDP is the value of *final goods and services*, so spending that is *not* on final goods and services is not part of GDP. Spending on intermediate goods and services is not part of GDP, although it is not always obvious whether an item is an intermediate good or a final good (see *Eye on the U.S. Economy* below). Also, we do not count as part of GDP spending on

- Used goods
- Financial assets

Used Goods Expenditure on used goods is not part of GDP because these goods were part of GDP in the period in which they were produced and during which time they were new goods. For example, a 2015 automobile was part of GDP in 2015. If the car is traded on the used car market in 2017, the amount paid for the car is not part of GDP in 2017.

Financial Assets When households buy financial assets such as bonds and stocks, they are making loans, not buying goods and services. The expenditure on newly produced capital goods is part of GDP, but the purchase of financial assets is not.



EYE on the U.S. ECONOMY

Is a Computer Program an Intermediate Good or a Final Good?

When American Airlines buys a new reservations software package, is that like General Motors buying tires? If it is, then software is an *intermediate good* and it is not counted as part of GDP. Airline ticket sales, like GM cars, are part of GDP, but the intermediate goods that are used to produce air transportation or cars are *not* part of GDP.

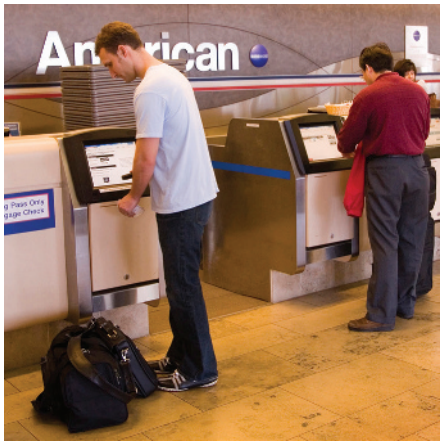
Or is American Airlines' purchase of new software like General Motors' purchase of a new assembly-line robot? If it is, then the software is a capital good and its purchase is the purchase of a final good. In this case, the software purchase is an *investment* and it *is* counted as part of GDP.

Brent Moulton worked as a government economist in the Bureau of Economic Analysis (BEA). Moulton's job was to oversee periodic adjustments to the GDP estimates to incorporate new data and new ideas about the economy.

The biggest change made was in how the purchase of computer software by firms is classified. Before 1999, it was regarded as an *intermediate good.* But since 1999, it has been treated as an *investment.*

How big a deal is this? When the BEA recalculated the 1996 GDP, the change increased the estimate of the 1996 GDP by $115 billion. That is a lot of money. To put it in perspective: GDP in 1996 was $7,662 billion. So the adjustment was 1.5 percent of GDP.

This change is a good example of the ongoing effort by the BEA to keep the GDP measure as accurate as possible.



The Income Approach

To measure GDP using the income approach, the Bureau of Economic Analysis uses income data collected by the Internal Revenue Service and other agencies. The BEA takes the incomes that firms pay households for the services of the factors of production they hire—wages for labor services, interest for the use of capital, rent for the use of land, and profits for entrepreneurship—and sums those incomes. This approach is like attaching a meter to the circular flow diagram on all the flows running through factor markets from firms to households and measuring the magnitudes of those flows. Let's see how the income approach works.

The U.S. National Income and Product Accounts divide incomes into two big categories:

- Wage income
- Interest, rent, and profit income

Wage Income

Wage income, called *compensation of employees* in the national accounts, is the total payment for labor services. It includes net wages and salaries plus fringe benefits paid by employers such as healthcare insurance, Social Security contributions, and pension fund contributions.

Interest, Rent, and Profit Income

Interest, rent, and profit income, called *net operating surplus* in the national accounts, is the total income earned by capital, land, and entrepreneurship.

Interest income is the interest that households receive on capital. A household's capital is equal to its net worth—its assets minus its borrowing.

Rent includes payments for the use of land and other rented factors of production. It includes payments for rented housing and imputed rent for owner-occupied housing. (Imputed rent is an estimate of what homeowners would pay to rent the housing they own and use themselves. By including this item in the national accounts, we measure the total value of housing services, whether they are owned or rented.)

Profit includes the profits of corporations and the incomes of proprietors who run their own businesses. These incomes are a mixture of interest and profit.

Table 14.2 shows the relative magnitudes of these components of incomes.

Net Domestic Product at Factor Cost

The sum of wages, interest, rent, and profit is *net domestic product at factor cost*. Net domestic product at factor cost is not GDP, and we must make two further adjustments to get to GDP: one from factor cost to market prices and another from net product to gross product.

From Factor Cost to Market Price

The expenditure approach values goods and services at market prices, and the income approach values them at factor cost—the cost of the factors of production used to produce them. Indirect taxes (such as sales taxes) and subsidies (payments by government to firms) make these two values differ. Sales taxes make market prices exceed factor cost, and subsidies make factor cost exceed market prices. To convert the value at factor cost to the value at market prices, we must add indirect taxes and subtract subsidies.

TABLE 14.2

GDP: The Income Approach

The sum of all incomes equals net domestic product at factor cost. The income approach measure of GDP equals net domestic product at factor cost plus indirect taxes less subsidies plus depreciation (capital consumption).

In 2016, GDP measured by the income approach was $18,550 billion. This amount is $268 billion more than GDP measured by the expenditure approach—a statistical discrepancy of –$268 billion.

Wages are by far the largest part of total income.

Item	Amount in 2016 (first quarter) (billions of dollars)	Percentage of GDP
Wages (compensation of employees)	9,908	54.2
Interest, rent, and profit (net operating surplus)	4,576	25.0
Net domestic product at factor cost	14,484	79.2
Indirect taxes less subsidies	1,192	6.5
Depreciation (capital consumption)	2,874	15.7
GDP (income approach)	18,550	101.4
Statistical discrepancy	−268	−1.4
GDP (expenditure approach)	18,282	100.0

SOURCE OF DATA: U.S. Department of Commerce, Bureau of Economic Analysis.

From Net Product to Gross Product

Depreciation
The decrease in the value of capital that results from its use and from obsolescence.

The income approach measures *net* product and the expenditure approach measures *gross* product. The difference is **depreciation**, which is the decrease in the value of capital that results from its use and from obsolescence. Firms' profits, which are included in the income approach, are net of depreciation, so the income approach gives a *net* measure. Investment, which is included in the expenditure approach, includes the purchase of capital to replace worn out or obsolete capital, so the expenditure approach gives a *gross* measure. To get *gross* domestic product from the income approach, we must *add* depreciation to total income.

Statistical Discrepancy

The expenditure approach and income approach do not deliver exactly the same estimate of GDP. If a taxi driver doesn't report all his tips, they get missed in the income approach, but they get caught by the expenditure approach when he spends his income. So the sum of expenditures might exceed the sum of incomes. But most income gets reported to the Internal Revenue Service on tax returns while many items of expenditure are not recorded and must be estimated. So the sum of incomes might exceed the sum of estimated expenditures.

The discrepancy between the expenditure approach and the income approach estimates of GDP is called the *statistical discrepancy*, and it is calculated as the GDP expenditure total minus the GDP income total.

The two measures of GDP provide a check on the accuracy of the numbers. If the two are wildly different, we will want to know what mistakes we've made. Have we omitted some item? Have we counted something twice? The fact that the two estimates are close gives some confidence that they are reasonably accurate. But the expenditure total is regarded as the more reliable estimate of GDP, so the discrepancy is added to or subtracted from income to reconcile the two estimates.

Table 14.2 summarizes the calculation of GDP using the income approach and its reconcilation with GDP using the expenditure approach. The table also shows the relative magnitudes of the components of the income measure.

GDP and Related Measures of Production and Income

Although GDP is the main measure of total production, you will sometimes encounter another: gross *national* product or GNP.

Gross National Product

A country's *gross national product*, or *GNP*, is the market value of all the final goods and services produced anywhere in the world in a given time period by the factors of production supplied by the residents of that country. For example, Nike's income from the capital that it supplies to its Vietnam shoe factory is part of U.S. GNP but not part of U.S. GDP. It is part of Vietnam's GDP. Similarly, Toyota's income on the capital it supplies to its Kentucky auto plant is part of U.S. GDP but not part of U.S. GNP. It is part of Japan's GNP.

GNP equals GDP plus net factor income received from or paid to other countries. The difference between U.S. GDP and GNP is small. But in an oil-rich Middle Eastern country such as Bahrain, where a large amount of capital is owned by foreigners, GNP is much smaller than GDP; and in a poor country such as Bangladesh, whose people work abroad and send income home, GNP is much larger than GDP.

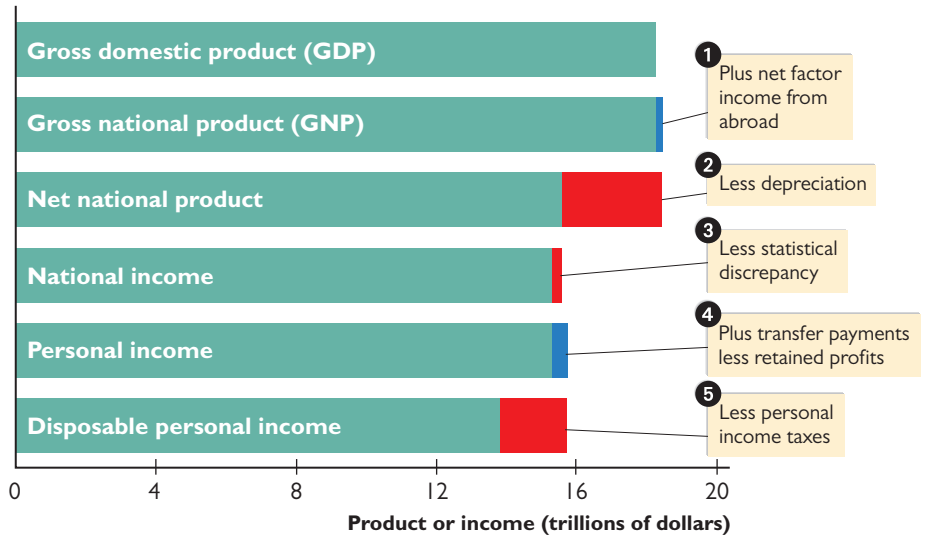
Disposable Personal Income

You've seen that consumption expenditure is the largest component of aggregate expenditure. The main influence on consumption expenditure is *disposable personal income*, which is the income received by households minus personal income taxes paid. Because disposable personal income plays an important role in influencing spending, the national accounts measure this item along with a number of intermediate totals that you can see in Figure 14.2. This figure shows how disposable personal income is calculated and how it relates to GDP and GNP.

FIGURE 14.2

GDP and Related Product and Income Measures

MyEconLab Animation



The bars show six related product and income measures and the relationship among them.

1. Add net factor income from abroad to GDP to get GNP.
2. Subtract depreciation from GNP to get net national product.
3. Subtract the statistical discrepancy between the expenditure and income measures to get national income.
4. Add transfer payments by governments less profits retained by firms to get personal income.
5. Finally, subtract personal income taxes to get disposable personal income.

SOURCE OF DATA: U.S. Department of Commerce, Bureau of Economic Analysis.

Real GDP and Nominal GDP

You've seen that GDP measures total expenditure on final goods and services in a given period. Suppose that we want to compare GDP in two periods, say 2009 and 2016. In 2009, GDP was $14,418 billion and by 2016, it was $18,282 billion—27 percent higher than in 2009. What does this 27 percent increase mean?

The answer is a combination of two things:

- We produced more goods and services.
- We paid higher prices for our goods and services.

Producing more goods and services contributes to an improvement in our standard of living. Paying higher prices means that our *cost of living* has increased but our standard of living has not. So it matters a great deal why GDP has increased. If the 27 percent increase is accounted for mainly by higher prices, our standard of living hasn't changed much. But if the 27 percent increase is accounted for mainly by the production of more goods and services, our standard of living might have increased a lot.

You're now going to see how economists at the Bureau of Economic Analysis isolate the effects on GDP of an increase in production. Their first step is to distinguish between two GDP concepts: real GDP and nominal GDP.

Real GDP
The value of the final goods and services produced in a given year expressed in terms of the prices in a *reference base year*.

Nominal GDP
The value of the final goods and services produced in a given year expressed in terms of the prices of that same year.

Real GDP is the value of the final goods and services produced in a given year expressed in terms of the prices in a *reference base year*. The *reference base year* is the year we choose against which to compare all other years. In the United States today, the *reference base year* is 2009.

Real GDP contrasts with **nominal GDP**, which is the value of the final goods and services produced in a given year expressed in terms of the prices of that same year. Nominal GDP is just a more precise name for GDP.

The method used to calculate real GDP has changed in recent years and is now a bit technical, but the essence of the calculation hasn't changed. Here, we describe the essence of the calculation. An appendix to this chapter describes the technical details of the method used by the Bureau of Economic Analysis.

Calculating Real GDP

The goal of calculating *real GDP* is to measure the extent to which total production has increased and remove from the nominal GDP numbers the influence of price changes. To focus on the principles and keep the numbers easy to work with, we'll calculate real GDP for an economy that produces only one good in each of the GDP categories: consumption expenditure (C), investment (I), and government expenditure (G). We'll ignore exports and imports by assuming that net exports (exports minus imports) is zero.

Table 14.3 shows the quantities produced and the prices in 2009 (the *base year*) and in 2016. In part (a), we calculate nominal GDP in 2009. For each item, we multiply the quantity produced by its price to find the total expenditure on the item. We then sum the expenditures to find nominal GDP, which in 2009 is $100 million. Because 2009 is the base year, real GDP and nominal GDP are equal in 2009.

In part (b) of Table 14.3, we calculate nominal GDP in 2016. Again, we calculate nominal GDP by multiplying the quantity of each item produced by its price to find the total expenditure on the item. We then sum the expenditures to find nominal GDP, which in 2016 is $300 million. Nominal GDP in 2016 is three times its value in 2009. But by how much has the quantity of final goods and services produced increased? That's what real GDP will tell us.

TABLE 14.3

Calculating Nominal GDP and Real GDP in 2009 and 2016

	Item	Quantity (millions of units)	Price (dollars per unit)	Expenditure (millions of dollars)
(a) In 2009				
C	T-shirts	10	5	50
I	Computer chips	3	10	30
G	Security services	1	20	20
Y	Real GDP and Nominal GDP in 2009			100
(b) In 2016				
C	T-shirts	4	5	20
I	Computer chips	2	20	40
G	Security services	6	40	240
Y	Nominal GDP in 2016			300
(c) Quantities of 2016 valued at prices of 2009				
C	T-shirts	4	5	20
I	Computer chips	2	10	20
G	Security services	6	20	120
Y	Real GDP in 2016			160

The base year is 2009, so real GDP and nominal GDP are equal in that year.

Between 2009 and 2016, the production of security services (*G*) increased, but the production of T-shirts (*C*) and computer chips (*I*) decreased. In the same period, the price of a T-shirt remained constant, but the other two prices doubled.

Nominal GDP increased from $100 million in 2009 in part (a) to $300 million in 2016 in part (b).

Real GDP in part (c), which is calculated by using the quantities of 2016 in part (b) and the prices of 2009 in part (a), increased from $100 million in 2009 to $160 million in 2016, a 60 percent increase.

In part (c) of Table 14.3, we calculate real GDP in 2016. You can see that the quantity of each good and service produced in part (c) is the same as that in part (b). They are the quantities of 2016. You can also see that the prices in part (c) are the same as those in part (a). They are the prices of the base year—2009.

For each item, we now multiply the quantity produced in 2016 by its price in 2009 to find what the total expenditure would have been in 2016 if prices had remained the same as they were in 2009. We then sum these expenditures to find real GDP in 2016, which is $160 million.

Nominal GDP in 2016 is three times its value in 2009, but real GDP in 2016 is only 1.6 times its 2009 value—a 60 percent increase in *real* GDP.

Using the Real GDP Numbers

In the example that we've just worked through, we found the value of real GDP in 2016 based on the prices of 2009. This number alone enables us to compare production in two years only. By repeating the calculation that we have done for 2016 using the data for each year between 2009 and 2016, we can calculate the *annual* percentage change of real GDP—the annual growth rate of real GDP. This is the most common use of the real GDP numbers. Also, by calculating real GDP every three months—known as *quarterly real GDP*—the Bureau of Economic Analysis is able to provide valuable information that is used to interpret the current state of the economy. This information is used to guide both government macroeconomic policy and business production and investment decisions.

MyEconLab Study Plan 14.2
Key Terms Quiz
Solutions Video

CHECKPOINT 14.2

Describe how economic statisticians measure GDP and distinguish between nominal GDP and real GDP.

Practice Problems

Table 1 shows some of the items in the U.S. National Income and Product Accounts in 2015. Use Table 1 to work Problems **1** to **3**.

TABLE 1

Item	Amount (trillions of dollars)
Consumption expenditure	12.1
Government expenditure	3.2
Indirect taxes less subsidies	1.2
Depreciation	2.8
Net factor income from abroad	0.2
Investment	3.0
Net exports	−0.5
Statistical discrepancy	−0.3

TABLE 2

(a) In 2015:

Item	Quantity	Price
Apples	60	$0.50
Oranges	80	$0.25

(b) In 2016:

Item	Quantity	Price
Apples	160	$1.00
Oranges	220	$2.00

1. Use the expenditure approach to calculate U.S. GDP in 2015.
2. What was U.S. GDP as measured by the income approach in 2015? What was net domestic product at factor cost in 2015?
3. Calculate U.S. GNP and U.S. national income in 2015.
4. Table 2 shows some data for an economy. If the base year is 2015, calculate the economy's nominal GDP and real GDP in 2016.

In the News

Facebook is the reason for the productivity slowdown, no, really
Facebook's WhatsApp is free and it sells no advertising. So WhatsApp's value of production in GDP is zero. Assume that WhatsApp's services are produced by 300 people all of whom earn $100,000 a year. By this measure, WhatsApp's value of production in GDP is $30 million.

Source: *Forbes*, February 13, 2016

What are the two approaches to measuring GDP described in the news clip? Why is one of these measures of the contribution of WhatsApp to GDP wrong?

Solutions to Practice Problems

1. GDP was $17.8 trillion. The expenditure approach sums the expenditure on final goods and services. That is, $Y = C + I + G + NX$.
   In 2015, U.S. GDP = $(12.1 + 3.0 + 3.2 − 0.5) trillion = $17.8 trillion.
2. GDP as measured by the income approach was $18.1 trillion. GDP (income approach) = GDP (expenditure approach) *minus* Statistical discrepancy. In 2015, GDP (income approach) = $17.8 trillion − (−$0.3 trillion), or $18.1 trillion. Net domestic product at factor cost plus indirect taxes less subsidies plus depreciation equals GDP (income approach), so net domestic product at factor cost equals $(18.1 − 1.2 − 2.8) trillion, or $14.1 trillion.
3. GNP = GDP + Net factor income from abroad. In 2015, GNP was $18.0 trillion ($17.8 trillion + $0.2 trillion). National income = GNP − Depreciation, which equals $18.0 trillion − $2.8 trillion, or $15.2 trillion.
4. In 2016, nominal GDP equals (160 apples × $1) + (220 oranges × $2), or $600.
   Real GDP equals (160 apples × $0.50) + (220 oranges × $0.25), or $135.

Solution to In the News

The two approaches to measuring GDP are the expenditure approach and the income approach. One of the measures in the news clip is wrong because the two approaches arrive at the same estimate of GDP. The news clip's income approach measure of $30 million is incorrect. The income approach measure is zero because Facebook incurs a a loss of $30 million when it pays its workers.

14.3 THE USES AND LIMITATIONS OF REAL GDP

MyEconLab Concept Video

We use estimates of real GDP for three main purposes:

- To compare the standard of living over time
- To track the course of the business cycle
- To compare the standard of living among countries

The Standard of Living Over Time

A nation's *standard of living* is measured by the value of goods and services that its people enjoy, *on average*. Income per person determines what people can afford to buy and real GDP is a measure of real income. So *real GDP per person*—real GDP divided by the population—is a commonly used measure for comparing the standard of living over time.

Real GDP per person tells us the value of goods and services that the average person can enjoy. By using *real* GDP, we remove any influence that rising prices and a rising cost of living might have had on our comparison.

A handy way of comparing real GDP per person over time is to express it as a ratio of its value in some reference year. Table 14.4 provides the numbers for the United States that compare 2016 with 56 years earlier, 1960. In 1960, real GDP per person was $17,217 and in 2016 it was $56,200, or 3.3 times its 1960 level. To the extent that real GDP per person measures the standard of living, people in 2016 were 3.3 times as well off as their grandparents had been in 1960.

Figure 14.3 shows the entire 56 years of real GDP per person from 1960 to 2016 and displays two features of our changing standard of living:

1. The growth of potential GDP per person
2. Fluctuations of real GDP per person around potential GDP

TABLE 14.4 REAL GDP PER PERSON IN 1960 AND 2016

Year	1960	2016
Real GDP (billions)	$3,106	$18,282
Population (millions)	180.4	325.3
Real GDP per person	$17,217	$56,200

Potential GDP
The value of real GDP when all the economy's factors of production—labor, capital, land, and entrepreneurial ability—are fully employed.

Potential GDP is the level of real GDP when all the economy's factors of production—labor, capital, land, and entrepreneurial ability—are fully employed. When some factors of production are *unemployed*, real GDP is *below* potential GDP. And when some factors of production are *overemployed* and working harder and for longer hours than can be maintained in the long run, real GDP *exceeds* potential GDP.

You've seen that real GDP per person in 2016 was 3.3 times that of 1960. But in 2016, some labor and other factors of production were unemployed and the economy was producing less than potential GDP. To measure the trend in the standard of living, we must remove the influence of short-term fluctuations and focus on the path of potential GDP.

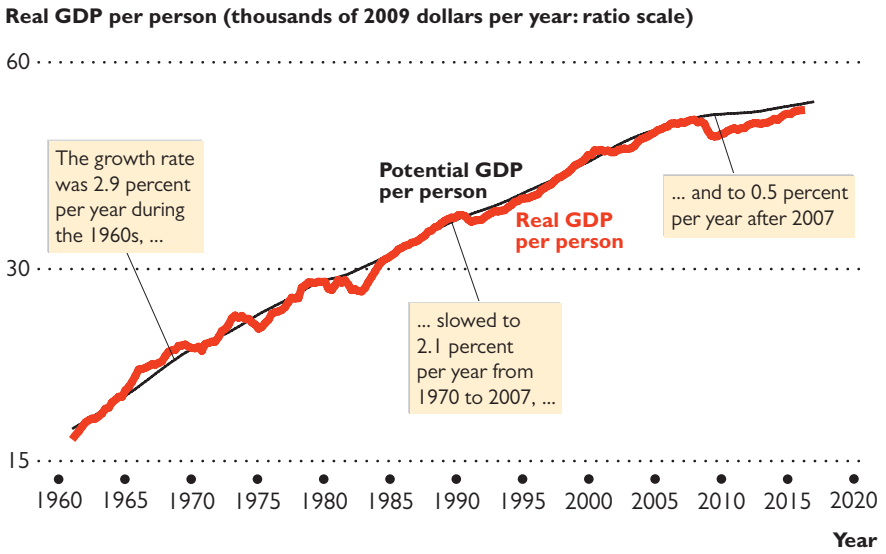
The growth rate of potential GDP fluctuates less than the growth rate of real GDP. During the 1960s, potential GDP per person grew at an average rate of 2.9 percent a year, but after 1970, its growth rate slowed to 2.1 percent a year. Then, after 2007, it slowed to 0.5 percent a year. This growth slowdown means that potential GDP is lower today (and lower by a large amount) than it would have been if the 1960s growth rate could have been maintained. If potential GDP had kept growing at the 1960s pace, potential GDP per person in 2016 would have been $36,000 more than it actually was. The cumulatively lost income from the growth slowdown of the 1970s is a staggering $509,000 per person (see Chapter 17, p. 448). Understanding the reasons for the growth slowdown is one of the major tasks of macroeconomists.

FIGURE 14.3

Real GDP and Potential GDP per Person in the United States: 1960–2016

MyEconLab Animation

Real GDP grows and fluctuates around the growth path of potential GDP. Potential GDP per person grew at an annual rate of 2.9 percent during the 1960s and slowed to 2.1 percent after 1970 and slowed again to 0.5 percent after 2007.



SOURCES OF DATA: Bureau of Economic Analysis and the Congressional Budget Office.

Tracking the Course of the Business Cycle

Business cycle
A periodic but irregular up-and-down movement of total production and other measures of economic activity.

We call the fluctuations in the pace of economic activity the business cycle. A **business cycle** is a periodic but irregular up-and-down movement of total production and other measures of economic activity such as employment and income. The business cycle isn't a regular, predictable, and repeating cycle like the phases of the moon. The timing and the intensity of the business cycle vary a lot, but every cycle has two phases:

1. Expansion
2. Recession

and two turning points:

1. Peak
2. Trough

Figure 14.4 shows these features of the most recent U.S. business cycle using real GDP as the measure of economic activity. An *expansion* is a period during which real GDP increases. In the early stage of an expansion, real GDP remains below potential GDP and as the expansion progresses, real GDP eventually exceeds potential GDP.

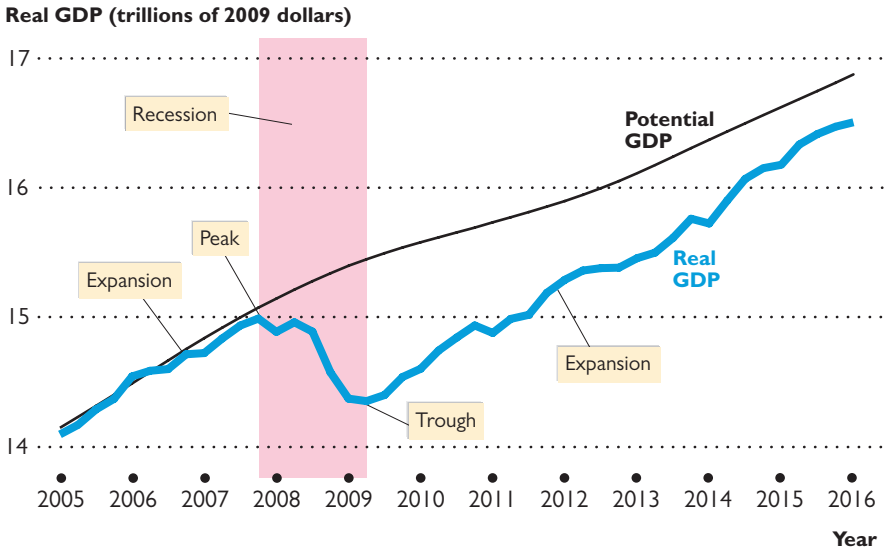
Recession
A period during which real GDP decreases for at least two successive quarters; or defined by the NBER as "a period of significant decline in total output, income, employment, and trade, usually lasting from six months to a year, and marked by contractions in many sectors of the economy."

A common definition of **recession** is a period during which real GDP decreases—its growth rate is negative—for at least two successive quarters. The National Bureau of Economic Research (NBER), which dates the U.S. business cycle phases and turning points, defines a recession more broadly as a significant decline in economic activity spread across the economy, lasting more than a few months,

FIGURE 14.4

The Most Recent U.S. Business Cycle

MyEconLab Real-time data



The most recent business cycle peak was in the fourth quarter of 2007 and the trough was in the second quarter of 2009 after which a new expansion began. Between the peak and the trough, the economy was in a recession. The recession was extremely deep and the expansion that followed was extremely weak—real GDP has remained a long way below potential GDP.

SOURCES OF DATA: Bureau of Economic Analysis, the Congressional Budget Office, and the National Bureau of Economic Research.

normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales. This definition means that sometimes the NBER declares a recession even though real GDP has not decreased for two successive quarters. A recession in 2001 was such a recession. An expansion ends and a recession begins at a business cycle peak. A peak is the highest level of real GDP that has been attained up to that time. A recession ends at a trough when real GDP reaches a low point and from which a new expansion begins.

The shaded bar in Figure 14.4 highlights the 2008–2009 recession. This recession was unusually severe. It lowered real GDP to its 2005 level. The end of a recession isn't the end of pain. When an expansion begins, real GDP is below potential GDP. And even after two years into the expansion that followed the 2008–2009 recession, real GDP had not returned to its previous peak level and the gap between real GDP and potential GDP was wide.

The period that began in 1991 following a severe recession and that ended with the global financial crisis of 2008 was so free from serious downturns in real GDP and other indicators of economic activity that it was called the *Great Moderation*, a name that contrasts it with the Great Depression. Some starry-eyed optimists even began to declare that the business cycle was dead. This long period of expansion also turned the attention of macroeconomists away from the business cycle and toward a focus on economic growth and the possibility of achieving faster growth.

But the 2008–2009 recession put the business cycle back on the agenda. Economists were criticized for not predicting it, and old divisions among economists that many thought were healed erupted in the pages of *The Economist* and *The New York Times* and online on a host of blogs.

We'll be examining the causes of recession and the alternative views among economists in greater detail as you progress through the rest of your study of macroeconomics.



EYE on BOOMS AND BUSTS

MyEconLab Critical Thinking Exercise

How Do We Track Economic Booms and Busts?

The National Bureau of Economic Research (NBER) Business Cycle Dating Committee determines the dates of U.S. business cycle turning points.

To identify the date of a business cycle peak, the NBER committee looks at data on industrial production, total employment, real GDP, and wholesale and retail sales.

Of these variables, real GDP is the most reliable measure of aggregate domestic production.

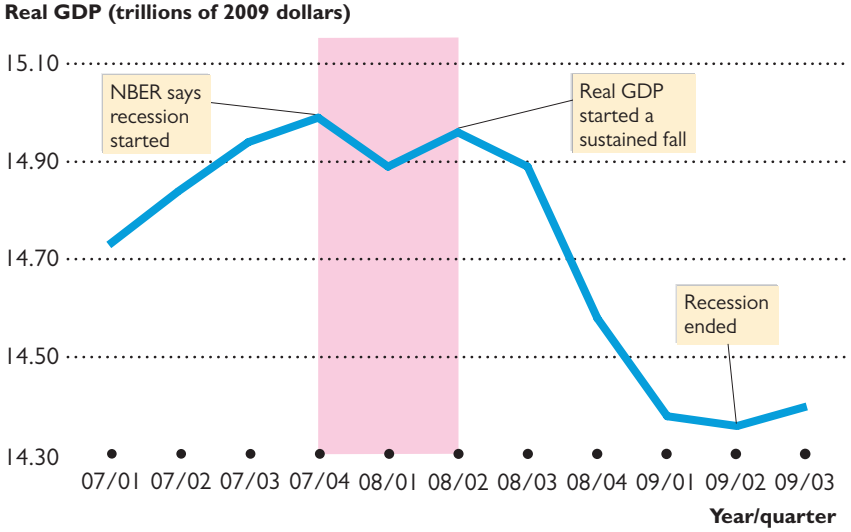
But when the NBER committee met in November 2008 to determine when the economy went into recession, the two measures of real GDP—the expenditure approach and the income approach—told conflicting stories.

For a few quarters in 2007 and 2008, because of the statistical discrepancy, the two estimates of real GDP did "not speak clearly about the date of a peak in activity."

So the NBER committee looked closely at the data on real personal income, real manufacturing, wholesale and retail sales, industrial production, and employment. All of these data peaked between November 2007 and June 2008. Weighing all the evidence, the committee decided that November 2007 was the peak.

But as the figure shows, real GDP didn't begin a sustained fall until the second quarter of 2008.

In contrast to the difficult task of dating the business cycle peak, the trough was clear. It occurred in the second quarter of 2009.



SOURCES OF DATA: Bureau of Economic Analysis and the National Bureau of Economic Research.

Let's now leave comparisons of the standard of living over time and business cycles and briefly see how we compare the standard of living among countries.

The Standard of Living Among Countries

To use real GDP per person to compare the standard of living among countries, we must convert the numbers for other countries into U.S. dollars. To calculate real GDP, we must also use a common set of prices—called *purchasing power parity prices*—for all countries. The International Monetary Fund performs these calculations and if you turn back to Figure 2.3 on p. 46 you can see some comparisons based on these data. They tell, for example, that an average American has a standard of living (income per person) almost 6 times that of an average person in China.

Real GDP provides an easy way of comparing living standards. But real GDP doesn't include *all* the goods and services produced. Also, real GDP has nothing to say about factors other than the goods and services that affect the standard of living. Let's explore these limitations of real GDP.

Goods and Services Omitted from GDP

GDP measures the value of goods and services that are bought in markets. GDP excludes

- Household production
- Underground production
- Leisure time
- Environment quality

Household Production

Household production is the production of goods and services (mainly services) in the home. Examples of this production are preparing meals, changing a light bulb, cutting grass, washing a car, and helping a student with homework. Because we don't buy these services in markets, they are not counted as part of GDP. The result is that GDP *underestimates* the value of the production.

Many items that were traditionally produced at home are now bought in the market. For example, more families now eat in fast-food restaurants—one of the fastest-growing industries in the United States—and use day-care services. These trends mean that food preparation and child-care services that were once part of household production are now measured as part of GDP. So real GDP grows more rapidly than does real GDP plus home production.

Underground Production

Underground production is the production of goods and services hidden from the view of government because people want to avoid taxes and regulations or their actions are illegal. Because underground production is unreported, it is omitted from GDP.

Examples of underground production are the distribution of illegal drugs, farm work that uses illegal workers who are paid less than the minimum wage, and jobs that are done for cash to avoid paying income taxes. This last category might be quite large and includes tips earned by cab drivers, hairdressers, and hotel and restaurant workers.

Edgar L. Feige, an economist at the University of Wisconsin, estimates that U.S. underground production was about 16 percent of GDP during the early 1990s. Underground production in many countries, especially in most developing countries, is estimated to be larger than that in the United States.

Leisure Time

Leisure time is an economic good that is not valued as part of GDP. Yet the marginal hour of leisure time must be at least as valuable to us as the wage we earn for working. If it were not, we would work instead. Over the years, leisure time has steadily increased as the workweek gets shorter, more people take early retirement, and the number of vacation days increases. These improvements in our standard of living are not measured in real GDP.

Environment Quality

Pollution is an economic *bad* (the opposite of a *good*). The more we pollute our environment, other things remaining the same, the lower is our standard of living. This lowering of our standard of living is not measured by real GDP.

Other Influences on the Standard of Living

The quantity of goods and services consumed is a major influence on the standard of living. But other influences are

- Health and life expectancy
- Political freedom and social justice

Health and Life Expectancy

Good health and a long life—the hopes of everyone—do not show up directly in real GDP. A higher real GDP enables us to spend more on medical research, healthcare, a good diet, and exercise equipment. As real GDP has increased, our life expectancy has lengthened. But we face new health and life expectancy problems every year. Drug abuse is taking young lives at a rate that causes serious concern. When we take these negative influences into account, real GDP growth might overstate the improvements in the standard of living.

Political Freedom and Social Justice

A country might have a very large real GDP per person but have limited political freedom and social justice. For example, a small elite might enjoy political liberty and extreme wealth while the majority of people have limited freedom and live in poverty. Such an economy would generally be regarded as having a lower standard of living than one that had the same amount of real GDP but in which everyone enjoyed political freedom.



EYE on YOUR LIFE

Making GDP Personal

MyEconLab Critical Thinking Exercise

As you read a newspaper or business magazine, watch a TV news show, or browse a news Web site, you often come across reports about GDP.

What do these reports mean for you? Where in the National Income and Product Accounts do *your* transactions appear? How can you use information about GDP in your life?

Your Contribution to GDP

Your own economic transactions show up in the National Income and Product Accounts on both the expenditure side and the income side—as part of the expenditure approach and part of the income approach to measuring GDP.

Most of your expenditure is part of Consumption Expenditure. If you were to buy a new home, that item would appear as part of Investment. Because much of what you buy is produced in another country, expenditure on these goods shows up as part of Imports.

If you have a job, your income appears in Compensation of Employees.

Because the GDP measure of the value of production includes only market transactions, some of your own production of goods and services is most likely not counted in GDP.

What are the nonmarket goods and services that you produce? How would you go about valuing them?

Making Sense of the Numbers

To use the GDP numbers in a news report, you must first check whether the reporter is referring to *nominal* GDP or *real* GDP.

Using U.S. real GDP per person, check how your income compares with the average income in the United States. When you see GDP numbers for other countries, compare your income with that of a person in France, or Canada, or China.

EYE on the GLOBAL ECONOMY

Which Country Has the Highest Standard of Living?

You've seen that as a measure of the standard of living, GDP has limitations. To compare the standard of living across countries, we must consider other factors in addition to GDP.

GDP measures only the market value of all the final goods and services produced and bought in markets. GDP omits some goods and services (those produced in the home and in the hidden economy). It omits the value of leisure time, of good health and long life expectancy, as well as of political freedom and social justice. It also omits the damage (negative value) that pollution does to the environment.

These limitations of GDP as a measure of the standard of living apply in every country. So to make international comparisons of the standard of living, we must look at real GDP and other indicators. Nonetheless, real GDP per person is a major component of international comparisons.

Many alternatives to GDP have been proposed. One, called Green GDP, subtracts from GDP an estimate of the cost of greenhouse gas emissions and other negative influences on the environment. Another measure, called the Happy Planet Index, or HPI, goes further and subtracts from GDP an estimate of the cost of depleting nonrenewable resources.

Neither the Green GDP nor the HPI are reliable measures because they rely on guesses about the costs of pollution and resource depletion that are subjective and unreliable.

Taking an approach that focuses on the quality of life factors, the United Nations (UN) has constructed a Human Development Index (HDI), which combines income (GDP), life expectancy and health, and education.

The figure shows the relationship between the HDI and income per person in 2014. (In the figure, each dot represents a country.) These two measures of the standard of living tell a similar but not identical story.

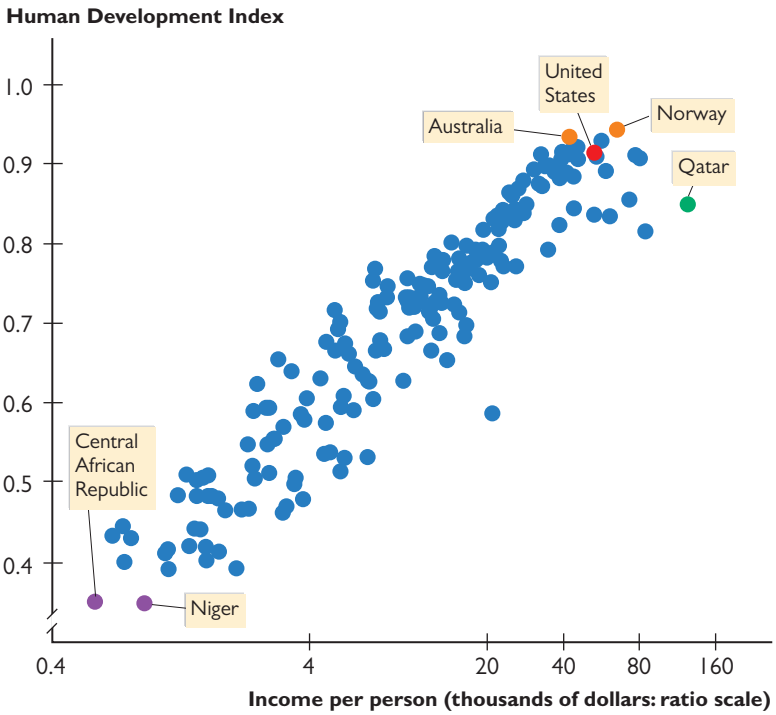
The United States has a high HDI and a high income per person, but it doesn't have the highest of either.

Qatar is an example of a handful of countries with a higher income per person.

Australia and Norway are two of the countries with a higher HDI. In these countries, people live longer than do people in the United States and have universal access to healthcare.

The HDI doesn't include political freedom and social justice. If it did, the United States would score highly on that component of the index.

The bottom line is that we don't know which country has the highest standard of living, but we do know that GDP per person alone does not provide the complete answer.



SOURCE OF DATA: *United Nations Human Development Report*, 2014.

MyEconLab Study Plan 14.3
Key Terms Quiz
Solutions Video

CHECKPOINT 14.3

Describe the uses of real GDP and explain its limitations as a measure of the standard of living.

Practice Problems

The United Nations Human Development Report gives the data for 2014 in Table 1. Other information suggests that household production is similar in Canada and the United States and smaller than in China and Russia. The underground economy is larger in Russia and China and a similar proportion of each of these economies. Canadians and Americans enjoy more leisure hours than do the Chinese and Russians. Canada and the United States spend significantly more on the environment than do China and Russia. Use this information and ignore any other influences to work Problems **1** and **2**.

TABLE 1

Country	Real GDP per person
China	$12,547
Russia	$22,352
United States	$52,947
Canada	$42,155

1. In which pair (or pairs) of countries is it easiest to compare the standard of living? And in which pair (or pairs) is it most difficult? Explain why.

2. Do the differences in real GDP per person correctly rank the standard of living in these four countries? What additional information would we need to be able to make an accurate assessment of the relative standard of living in these four countries?

In the News

Why GDP fails as a measure of well-being

There is a new reason why GDP is a poor measure of economic well-being: It doesn't measure the benefits we gain from free apps and lots of other free stuff on the Internet. And none of the other indexes deal with this problem.

Source: *CBS News*, January 27, 2016

What are the other reasons why GDP is a poor measure of economic well-being?

Solutions to Practice Problems

1. Two pairs—Canada and the United States, and China and Russia—are easy to compare because household production, the underground economy, leisure hours, and the environment are similar in the countries in each pair. The most difficult comparison is Canada and the United States with either China or Russia. Household production and the underground economy narrow the differences but leisure hours and the environment widen them.

2. Differences in real GDP per person probably correctly rank the standard of living because where the gap is small (Canada and the United States), other factors are similar, and where other factors differ, the gaps are huge. More information on the value of household production, the underground economy, the value of leisure, and the value of environmental differences is required to make an accurate assessment of relative living standards.

Solution to In the News

Because GDP measures production that is traded in markets, it does not include household production, leisure time, health and life expectancy, political freedom, and social justice. These contributors to economic well-being are what other indexes such as green GDP and the HDI are designed to deal with.

CHAPTER SUMMARY

Key Points

1. Define GDP and explain why the value of production, income, and expenditure are the same for an economy.

- GDP is the market value of all final goods and services produced within a country in a given time period.
- We can value goods and services either by what they cost to produce (incomes) or by what people are willing to pay (expenditures).
- The value of production equals income equals expenditure.

2. Describe how economic statisticians measure GDP and distinguish between nominal GDP and real GDP.

- BEA measures GDP by summing expenditures and by summing incomes. With no errors of measurement the two totals are the same, but in practice, a small statistical discrepancy arises.
- A country's GNP is similar to its GDP, but GNP is the value of production by factors of production supplied by the residents of a country.
- Nominal GDP is the value of production using the prices of the current year and the quantities produced in the current year.
- Real GDP is the value of production using the prices of a base year and the quantities produced in the current year.

3. Describe the uses of real GDP and explain its limitations as a measure of the standard of living.

- We use real GDP per person to compare the standard of living over time.
- We use real GDP to determine when the economy has reached a business cycle peak or trough.
- We use real GDP per person expressed in purchasing power parity dollars to compare the standard of living among countries.
- Real GDP omits some goods and services and ignores some factors that influence the standard of living.
- The Human Development Index takes some other factors into account.

Key Terms

MyEconLab Key Terms Quiz

Business cycle, 384
Consumption expenditure, 371
Depreciation, 378
Exports of goods and services, 372
Final good or service, 370
Government expenditure on goods and services, 372
Gross domestic product (GDP), 370
Imports of goods and services, 372
Intermediate good or service, 370
Investment, 371
Net exports of goods and services, 372
Net taxes, 372
Nominal GDP, 380
Potential GDP, 383
Real GDP, 380
Recession, 384
Saving, 372

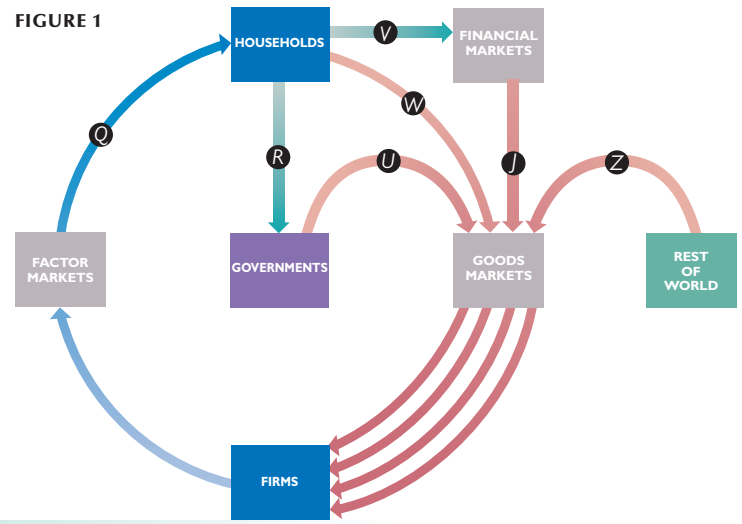
MyEconLab Chapter 14 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. Figure 1 shows the flows of income and expenditure in an economy. In 2013, *U* was $2 trillion, *V* was $1.5 trillion, *W* was $7 trillion, *J* was $1.5 trillion, and *Z* was zero. Calculate total income, net taxes, and GDP.

FIGURE 1



Use the following data to work Problems **2** and **3**.

The national accounts of Parchment Paradise are kept on (you guessed it) parchment. A fire in the statistics office destroys some accounts, leaving only the following data:

- GDP (income approach) $2,900
- Consumption expenditure $2,000
- Indirect taxes less subsidies $100
- Interest, rent, and profit $500
- Investment $800
- Government expenditure $400
- Wages $2,000
- Net factor income from abroad $50
- Net exports −$200

2. Calculate GDP (expenditure approach) and depreciation.

3. Calculate net domestic product at factor cost, the statistical discrepancy, and GNP.

Use the following information to work Problems **4** to **6**.

An economy produces only fun and food. Table 1 shows the prices and the quantities of fun and food produced in 2016 and 2017. The base year is 2016.

TABLE 1

(a) In 2016:

Item	Quantity	Price
Fun	40	$2
Food	60	$3

(b) In 2017:

Item	Quantity	Price
Fun	35	$3
Food	65	$2

4. Calculate nominal GDP in 2016 and 2017.

5. Calculate the percentage increase in real GDP in 2017.

6. If potential GDP was $270 in 2016 and it grew by 1 percent in 2017, in which phase of the business cycle is the economy? Explain.

Use the following information to work Problems **7** to **9**.

Uncertain outlook

The Commerce Department reported that in December 2015, retail sales rose by 0.2, net exports decreased, inventories held by businesses rose by 0.1 percent, and total sales by businesses fell by 0.6 percent.

Source: Commerce Department, February 2016

7. Which component of GDP changed because retail sales increased? Which component of GDP changed because business inventories increased?

8. Explain the effect of the fall in net exports on GDP.

9. Does the statement that total sales by businesses fell by 0.6 percent mean that GDP decreased by 0.6 percent? Explain your answer.

10. Read *Eye on Booms and Busts* on p. 386 and explain why the NBER reported that the 2008 recession began before real GDP had fallen for two successive quarters.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. In France, real GDP was the same in 2012 as it had been in 2011, but in the last quarter of 2012 and the first quarter of 2013, France's real GDP decreased. In the United States, real GDP increased in 2012, and in the first quarter of 2013, it was higher than in the last quarter of 2012.

Based on this information, which country was in a recession at the beginning of 2013? What features of the information provided led you to your conclusion?

2. Classify each of the items in List 1 as a final good or service or an intermediate good or service and identify it as a component of consumption expenditure, investment, or government expenditure on goods and services.

LIST 1

- Banking services bought by Target
- Security system bought by the White House
- Coffee beans bought by Starbucks
- New coffee machines bought by Starbucks
- Starbucks grande mocha frappuccino bought by a student
- New battle ship bought by the U.S. navy

Use the following information to work Problems **3** and **4**.

Mitsubishi Heavy Industries makes the wings of the new Boeing 787 Dreamliner in Japan. Toyota assembles cars for the U.S. market in Kentucky.

3. Explain where these activities appear in the National Income and Product Accounts of the United States.

4. Explain where these activities appear in the National Income and Product Accounts of Japan.

Use the data on the economy of Iberia in Table 1 to work Problems **5** and **6**.

TABLE 1

Item	Amount
Net taxes	$18 billion
Government expenditure	$20 billion
Saving	$15 billion
Consumption expenditure	$67 billion
Investment	$21 billion
Exports	$30 billion.

5. Calculate Iberia's GDP.

6. Calculate Iberia's imports of goods and services.

Use Table 2, which shows an economy's total production and the prices of the final goods it produced in 2016 and 2017, to work Problems **7** to **9**.

TABLE 2

(a) In 2016:

Item	Quantity	Price
Fish	100	$2
Berries	50	$6

(b) In 2017:

Item	Quantity	Price
Fish	75	$5
Berries	65	$10

7. Calculate nominal GDP in 2016 and 2017.

8. The base year is 2016. Calculate real GDP in 2016 and 2017.

9. Calculate the percentage increase in real GDP in 2017.

Use the following information to work Problems **10** and **11**.

New U.S. home sales surged

Purchases of new U.S. homes surged in December and 2015 was the best year for housing since 2007. Existing-home sales also increased in the best year since 2006. The inventory of existing homes on the market was smaller than demand.

Source: Bloomberg, January 28, 2016

10. Where do new-home sales appear in the circular flow of expenditure and income? Explain how a surge in new home sales affects real GDP.

11. Where do sales and inventories of existing homes appear in the circular flow of expenditure and income? Explain how an increase in sales of existing homes and a low inventory of existing homes affects real GDP.

12. **Worries about China's slowing growth**

China reported that its real GDP grew by 6.9 percent in 2015, down from 7.3 percent in 2014. Experts think that China has overstated its true growth rate and many fear that its growth will slow further.

Source: *The Economist*, January 19, 2016

How does China's real GDP growth compare with that of the United States? If China's growth slows further, would that mean it was in a recession?

MyEconLab Chapter 14 Study Plan

Multiple Choice Quiz

1. Gross domestic product is the market value of all the _____ in a given time period.

A. goods and services bought by Americans
B. goods and services produced by American companies in all countries
C. final goods and services produced by all firms located in the United States
D. U.S.-produced goods and services bought in the United States

2. A _____ is a final good and _____ is an intermediate good.

A. new car bought by a student; a used SUV bought by a dealer
B. new textbook; a used textbook
C. new iPhone bought by a student; a new computer bought by Walmart
D. tank of gasoline bought by you; jet fuel bought by Southwest Airlines

3. Saving equals _____.

A. income minus consumption expenditure minus net taxes
B. income minus net taxes
C. total income minus total expenditure
D. net taxes minus government expenditure

4. The expenditure approach to measuring U.S. GDP equals _____.

A. the sum of U.S. consumption expenditure and U.S. investment
B. U.S. government expenditure minus taxes paid by Americans
C. all expenditure on final goods and services produced in the United States in a given time period
D. all expenditure by Americans on goods and services produced in the United States in a given time period

5. When using the income approach to measure GDP at market prices, in addition to summing all factor incomes it is necessary to _____.

A. subtract depreciation because profit is not reported as net profit
B. add depreciation because capital depreciates when goods are manufactured
C. add indirect taxes less subsidies to convert aggregate income from factor cost to market prices
D. add a statistical discrepancy which is the sum of depreciation and indirect taxes less subsidies

6. The following statements about the business cycle are correct *except* _____.

A. it is a regular predictable cycle in real GDP around potential GDP
B. from the peak to the trough, the economy is in a recession
C. from the trough to the peak, the economy is in an expansion
D. it is a periodic movement in economic activity including employment

7. Real GDP per person is not an accurate measure of the standard of living because it _____.

A. includes the goods and services that governments buy
B. omits the goods and services that people produce for themselves
C. includes goods and services bought by firms
D. omits the goods and services imported from other countries

APPENDIX: MEASURING REAL GDP

This appendix explains the method used by the Bureau of Economic Analysis (BEA) to calculate real GDP using a measure called **chained-dollar real GDP**. We begin by explaining the problem that arises from using the prices of the base year (the method on pp. 380–381) and how the problem can be overcome.

Chained-dollar real GDP
The measure of real GDP calculated by the Bureau of Economic Analysis.

The Problem With Base Year Prices

When we calculated real GDP on pp. 380–381, we found that real GDP in 2016 was 60 percent greater than it was in 2009. But instead of using the prices of 2009 as the constant prices, we could have used the prices of 2016. In this case, we would have valued the quantities produced in 2009 at the prices of 2016. By comparing the values of real GDP in 2009 and 2016 at the constant prices of 2016, we get a different number for the percentage increase in production. If you use the numbers in Table 14.3 on p. 381 to value 2009 production at 2016 prices, you will get a real GDP in 2009 of $150 million (2016 dollars). Real GDP in 2016 at 2016 prices is $300 million. So by using the prices of 2016, production doubled—a 100 percent increase—from 2009 to 2016. Did production in fact increase by 60 percent or 100 percent?

The problem arises because to calculate real GDP, we weight the quantity of each item produced by its price. If all prices change by the same percentage, then the *relative* weight on each good or service doesn't change and the percentage change in real GDP from the first year to the second is the same regardless of which year's prices we use. But if prices change by different percentages, then the *relative* weight on each good or service *does* change and the percentage change in real GDP from the first year to the second depends on which prices we use. So which year's prices should we use: those of the first year or those of the second?

The answer given by the BEA method is to use the prices of both years. If we calculate the percentage change in real GDP twice, once using the prices of the first year and again using the prices of the second year, and then take the average of those two percentage changes, we get a unique measure of the change in real GDP and one that gives equal importance to the *relative* prices of both years.

To illustrate the calculation of the BEA measure of real GDP, we'll work through an example. The method has three steps:

- Value production in the prices of adjacent years.
- Find the average of two percentage changes.
- Link (chain) to the base year.

Value Production in the Prices of Adjacent Years

The first step is to value production in *adjacent* years at the prices of both years. We'll make these calculations for 2016, and its preceding year, 2015.

Table A14.1 shows the quantities produced and prices in the two years. Part (a) shows the nominal GDP calculation for 2015—the quantities produced in 2015 valued at the prices of 2015. Nominal GDP in 2015 is $145 million. Part (b) shows the nominal GDP calculation for 2016—the quantities produced in 2016 valued at the prices of 2016. Nominal GDP in 2016 is $172 million. Part (c) shows the value of the quantities produced in 2016 at the prices of 2015. This total is $160 million. Finally, part (d) shows the value of the quantities produced in 2015 at the prices of 2016. This total is $158 million.

TABLE A14.1

Real GDP Calculation Step 1: Value Production in Adjacent Years at Prices of Both Years

Step 1 is to value the production of adjacent years at the prices of both years.

Here, we value the production of 2015 and 2016 at the prices of both 2015 and 2016.

The value of 2015 production at 2015 prices, in part (a), is nominal GDP in 2015.

The value of 2016 production at 2016 prices, in part (b), is nominal GDP in 2016.

Part (c) calculates the value of 2016 production at 2015 prices, and part (d) calculates the value of 2015 production at 2016 prices.

We use these numbers in Step 2.

	Item	Quantity (millions of units)	Price (dollars per unit)	Expenditure (millions of dollars)
(a) In 2015				
C	T-shirts	3	5	15
I	Computer chips	3	10	30
G	Security services	5	20	100
Y	Nominal GDP in 2015			145
(b) In 2016				
C	T-shirts	4	4	16
I	Computer chips	2	12	24
G	Security services	6	22	132
Y	Nominal GDP in 2016			172
(c) Quantities of 2016 valued at prices of 2015				
C	T-shirts	4	5	20
I	Computer chips	2	10	20
G	Security services	6	20	120
Y	2016 production at 2015 prices			160
(d) Quantities of 2015 valued at prices of 2016				
C	T-shirts	3	4	12
I	Computer chips	3	12	36
G	Security services	5	22	110
Y	2015 production at 2016 prices			158

Find the Average of Two Percentage Changes

The second step is to find the percentage change in the value of production based on the prices in the two adjacent years. Table A14.2 summarizes these calculations.

Valued at the prices of 2015, production increased from $145 million in 2015 to $160 million in 2016, an increase of 10.3 percent. Valued at the prices of 2016, production increased from $158 million in 2015 to $172 million in 2016, an increase of 8.9 percent. The average of these two percentage changes in the value of production is 9.6. That is, $(10.3 + 8.9) \div 2 = 9.6$.

We've now found the *growth rate* of real GDP in 2016. But we also want to calculate the *level* of real GDP. This level depends on the *reference base year*. The simplest example is when the previous year (2015 in this case) is the base year. In 2015, real GDP equals nominal GDP, which is $145 million. Real GDP in 2016, valued in 2015 dollars is 9.6 percent higher than in 2015 and equals $159 million.

Although the real GDP of $159 million is expressed in 2015 dollars, the calculation uses the average of the *relative prices* of the final goods and services that make up GDP in 2015 and 2016.

When the base year is not the previous year, we need to link or chain the current year to the base year. Let's see how we do this linking.

TABLE A14.2

Real GDP Calculation Step 2: Find Average of Two Percentage Changes

Value of Production in Adjacent Years		Millions of dollars
2015 production at 2015 prices		145
2016 production at 2015 prices		160
Percentage change in production at 2015 prices	10.3	
2015 production at 2016 prices		158
2016 production at 2016 prices		172
Percentage change in production at 2016 prices	8.9	
Average of two percentage changes in production	9.6	

Using the numbers calculated in Step 1, we find the percentage change in production from 2015 to 2016 valued at 2015 prices, which is 10.3 percent.

We also find the percentage change in production from 2015 to 2016 valued at 2016 prices, which is 8.9 percent.

We then find the average of these two percentage changes, which is 9.6 percent.

Link (Chain) to the Base Year

To link to the base year, we repeat the calculation that we've just described to obtain the real GDP growth rate each year. Real GDP equals nominal GDP in the base year, which currently is 2009. By applying the calculated growth rates to each successive year, we can obtain *chained-dollar real GDP* in 2009 dollars.

Figure A14.1 shows an example with real GDP equal to nominal GDP at $62 million in the base year, 2009, and assumed growth rates of real GDP for each year between 2008 and 2016. The 2016 growth rate is the 9.6 percent that we calculated in Table A14.2 above.

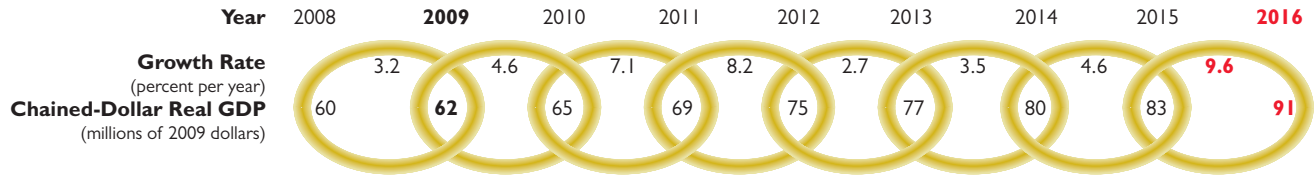
Starting with real GDP in the base year, we apply the calculated percentage change of 4.6 percent, so real GDP in 2010 was 4.6 percent higher than $62 million, which is $65 million. Repeating the calculation, real GDP in 2011 is 7.1 percent higher, which is $69 million, and in 2012, real GDP is 8.2 percent higher, which is $75 million. By 2015, real GDP has grown to $83 million. In 2016, real GDP is 9.6 percent higher than $83 million, which is $91 million.

The same method is used to chain-link the years before the base year. For example, real GDP in 2008 is 3.2 percent lower than in 2009 at $60 million.

FIGURE A14.1

Real GDP Calculation Step 3: Link (Chain) to the Base Year

MyEconLab Animation



The growth rate of real GDP from one year to the next is calculated for every pair of years and then linked to the base year. Suppose that real GDP was $62 million in the base year, 2009. By applying the growth rate between each pair of years, we find the chained-dollar real GDP for each year, expressed in terms of the value of the dollar in the base year. Here, the percentages for 2008 through to 2016 are assumed. By 2016, the chained-dollar real GDP has increased to $91 million in 2009 dollars.

MyEconLab Chapter 14 Study Plan

APPENDIX CHECKPOINT

Study Plan Problems

An island economy produces only bananas and coconuts. Table 1 gives the quantities produced and prices in 2015 and in 2016. The base year is 2015.

TABLE 1

(a) In 2015:

Item	Quantity	Price
Bananas	100	$10
Coconuts	50	$12

(b) In 2016:

Item	Quantity	Price
Bananas	110	$15
Coconuts	60	$10

1. Calculate nominal GDP in 2015 and nominal GDP in 2016.
2. Calculate the value of 2016 production in 2015 prices and the percentage increase in production when valued at 2015 prices.
3. Calculate the value of 2015 production in 2016 prices and the percentage increase in production when valued at 2016 prices.
4. Use the chained-dollar method to calculate real GDP in 2015 and 2016. In terms of what dollars is each of these two real GDPs measured?
5. Using the chained-dollar method, compare the growth rates of nominal GDP and real GDP in 2016.
6. If the base year is 2016, use the chained-dollar method to calculate real GDP in 2015 and 2016. In terms of what dollars is each of these two real GDPs measured?
7. If the base year is 2016, compare the growth rates of nominal GDP and real GDP in 2016.

MyEconLab Homework, Quiz, or Test if assigned by instructor

Instructor Assignable Problems

An economy produces only food and fun. Table 2 shows the quantities produced and prices in 2015 and 2016. The base year is 2016.

TABLE 2

(a) In 2015:

Item	Quantity	Price
Food	100	$2
Fun	50	$6

(b) In 2016:

Item	Quantity	Price
Food	75	$5
Fun	65	$10

1. Calculate nominal GDP in 2015 and nominal GDP in 2016.
2. Calculate the value of 2016 production in 2015 prices and the percentage increase in production when valued at 2015 prices.
3. Calculate the value of 2015 production in 2016 prices and the percentage increase in production when valued at 2016 prices.
4. Using the chained-dollar method, calculate real GDP in 2015 and 2016. In terms of what dollars is each of these two real GDPs measured?
5. Using the chained-dollar method, compare the growth rates of nominal GDP and real GDP in 2016.
6. If the base year is 2015, use the chained-dollar method to calculate real GDP in 2015 and 2016. In terms of what dollars is each of these two real GDPs measured?
7. If the base year is 2015, compare the growth rates of nominal GDP and real GDP in 2016.

MyEconLab Key Terms Quiz

Key Term

Chained-dollar real GDP, 395



Are we back at full employment?

15

Jobs and Unemployment

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Define the unemployment rate and other labor market indicators.
2. Describe the trends and fluctuations in the indicators of the state of the U.S. labor market.
3. Describe the types of unemployment, define full employment, and explain the link between unemployment and real GDP.

MyEconLab Big Picture Video

MyEconLab Concept Video

15.1 LABOR MARKET INDICATORS

Every month, 1,600 field interviewers and supervisors working on a joint project between the Bureau of Labor Statistics (or BLS) and the Bureau of the Census survey 60,000 households and ask a series of questions about the age and labor market status of their members. This survey is called the *Current Population Survey*. Let's look at the types of data collected by this survey.

Current Population Survey

Figure 15.1 shows the categories into which the BLS divides the population. It also shows the relationships among the categories. The first category divides the population into two groups: the working-age population and others. The **working-age population** is the total number of people aged 16 years and over who are not in jail, hospital, or some other form of institutional care or in the U.S. Armed Forces. In May 2016, the estimated population of the United States was 322.3 million, the working-age population was 252.9 million, and 69.4 million people were under 16 years of age, in the military, or living in institutions.

Working-age population
The total number of people aged 16 years and over who are not in jail, hospital, or some other form of institutional care or in the U.S. Armed Forces.

The second category divides the working-age population into two groups: those in the labor force and those not in the labor force. The **labor force** is the number of people employed plus the number unemployed. In May 2016, the U.S. labor force was 158.4 million and 94.5 million people were not in the labor force. Most of those not in the labor force were in school full time or had retired from work.

Labor force
The number of people employed plus the number unemployed.

The third category divides the labor force into two groups: the employed and the unemployed. In May 2016 in the United States, 151.0 million people were employed and 7.4 million people were unemployed.

Population Survey Criteria



To be counted as unemployed, a person must not only want a job but also have tried to find one.

The survey counts as *employed* all persons who, during the week before the survey, either

1. Worked at least 1 hour as paid employees or worked 15 hours or more as unpaid workers in their family business or
2. Were not working but had jobs or businesses from which they were temporarily absent.

The survey counts as *unemployed* all persons who, during the week before the survey,

1. Had no employment,
2. Were available for work,

and either

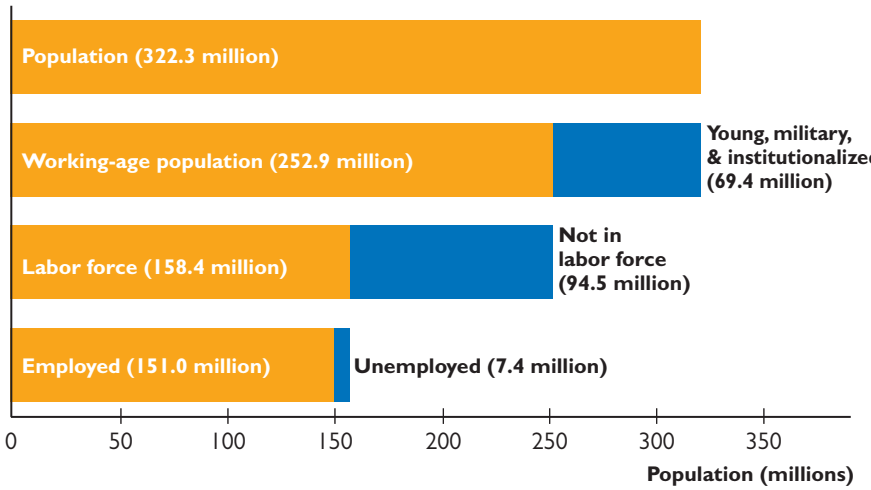
1. Had made specific efforts to find employment during the previous four weeks or
2. Were waiting to be recalled to a job from which they had been laid off.

People in the working-age population who by the above criteria are neither employed nor unemployed are classified as not in the labor force.

FIGURE 15.1

Population Labor Force Categories

MyEconLab Real-time data



The U.S. population is divided into the working-age population and the young, military, and institutionalized. The working-age population is divided into the labor force and those not in the labor force. The labor force is divided into those employed and those unemployed. The figure shows the data for May 2016.

SOURCE OF DATA: Bureau of Labor Statistics.

Three Labor Market Indicators

Using the numbers from the Current Population Survey, the BLS calculates several indicators of the state of the labor market. The three main labor market indicators are

- The unemployment rate
- The employment–population ratio
- The labor force participation rate

The Unemployment Rate

The amount of unemployment—the number of people who want jobs but can't find them—is an indicator of unused labor resources. The BLS reports the absolute number of people unemployed and the **unemployment rate**, which is the percentage of the people in the labor force who are unemployed. That is,

$$\text{Unemployment rate} = \frac{\text{Number of people unemployed}}{\text{Labor force}} \times 100.$$

Unemployment rate
The percentage of the people in the labor force who are unemployed.

Table 15.1 shows the number of people unemployed and the number in the labor force in May 2016 and uses the formula above to calculate the unemployment rate in that month.

TABLE 15.1 UNEMPLOYMENT RATE: MAY 2016

Unemployed	7.4 million
Labor force	158.4 million
Calculation	$\frac{7.4}{158.4} \times 100$
Unemployment rate	4.7 percent

The Employment–Population Ratio

The number of people of working age who have jobs is an indicator of both the availability of jobs and the degree of match between people's skills and the skills that employers demand. The BLS calculates the **employment–population ratio** as the percentage of the people of working age who are employed.

Employment–population ratio
The percentage of the people of working age who are employed.

TABLE 15.2 EMPLOYMENT–POPULATION RATIO: MAY 2016

Employed	151.0 million
Working-age population	252.9 million
Calculation	$\frac{151.0}{252.9} \times 100$
Employment–population ratio	59.7 percent

Labor force participation rate
The percentage of the working-age population in the labor force.

TABLE 15.3 LABOR FORCE PARTICIPATION RATE: MAY 2016

Labor force	158.4 million
Working-age population	252.9 million
Calculation	$\frac{158.4}{252.9} \times 100$
Labor force participation rate	62.6 percent

Marginally attached worker
A person who does not have a job, is available and willing to work, has not made specific efforts to find a job within the previous four weeks, but has looked for work sometime in the recent past.

Discouraged worker
A marginally attached worker who has not made specific efforts to find a job within the past four weeks because previous unsuccessful attempts to find a job were discouraging.

The BLS calculates the employment–population ratio using the formula:

$$\text{Employment–population ratio} = \frac{\text{Number of people employed}}{\text{Working-age population}} \times 100.$$

Table 15.2 uses this formula to calculate the employment–population ratio in May 2016.

The Labor Force Participation Rate

The number of people in the labor force is an indicator of the willingness of working-age people to take jobs. The **labor force participation rate** is the percentage of the working-age population in the labor force. That is,

$$\text{Labor force participation rate} = \frac{\text{Labor force}}{\text{Working–age population}} \times 100.$$

Table 15.3 uses this formula with data on the number of people in the labor force and the working-age population to calculate the labor force participation rate in May 2016.

Alternative Measures of Unemployment

The official definition of unemployment omits two types of underused labor:

- Marginally attached workers
- Part-time workers who want full-time work

Marginally Attached Workers

A **marginally attached worker** is a person who does not have a job, is available and willing to work, has not made specific efforts to find a job within the previous four weeks, but has looked for work sometime in the recent past. Marginally attached workers think of themselves as being in the labor force and unemployed. A **discouraged worker** is a person who is similar to an unemployed worker, but who has not made specific efforts to find a job within the previous four weeks because previous unsuccessful attempts were discouraging.

Other marginally attached workers differ from discouraged workers only in their reasons for not having looked for a job during the previous four weeks. For example, Martin doesn't have a job and is available for work, but he has not looked for work in the past four weeks because he was busy cleaning his home after a flood. He is a marginally attached worker but not a discouraged worker. Lena, Martin's wife, doesn't have a job and is available for work, but she hasn't looked for work in the past four weeks because she's been looking for six months and hasn't had a single job offer. She is a discouraged worker.

Neither the unemployment rate nor the labor force participation rate includes marginally attached workers. In May 2016, 538,000 people were discouraged workers. If we add them to both the number of people counted as unemployed and the labor force, the unemployment rate becomes 5.0 percent—a bit higher than the standard definition of the unemployment rate. Also in May 2016, 1,713,000 people were marginally attached workers. If we add them and the discouraged workers to both the number counted as unemployed and the labor force, the unemployment rate becomes 6.0 percent—1.3 percentage points higher than the standard definition.

EYE on the U.S. ECONOMY

The Current Population Survey

The Bureau of Labor Statistics and the Bureau of the Census go to great lengths to collect accurate labor force data. They constantly train and retrain around 1,600 field interviewers and supervisors. Each month, each field interviewer contacts 37 households and asks basic demographic questions about everyone living at the address and detailed labor force questions about those aged 16 or over.

Once a household has been selected for the survey, it is questioned for four consecutive months and then again for the same four months a year later. Each month, the addresses that have been in the panel eight times are removed and 6,250 new addresses are added. The rotation and overlap of households provide very reliable information about month-to-month and year-to-year changes in the labor market.

The first time that a household is in the panel, an interviewer, armed with a hand-held computer, visits it. If the household has a telephone, most of the subsequent interviews are conducted by phone, many of them from one of the three telephone interviewing centers in Hagerstown, Maryland; Jeffersonville, Indiana; and Tucson, Arizona.

For more information about the Current Population Survey, visit www.bls.gov/cps/cps_faq.htm.



Part-Time Workers Who Want Full-Time Work

The Current Population Survey measures the number of full-time workers and part-time workers. **Full-time workers** are those who usually work 35 hours or more a week. **Part-time workers** are those who usually work less than 35 hours a week. Part-time workers are divided into two groups: part time for economic reasons and part time for noneconomic reasons.

People who work **part time for economic reasons** (also called *involuntary part-time workers)* are people who work 1 to 34 hours but are looking for full-time work. These people are unable to find full-time work because of unfavorable business conditions or seasonal decreases in the availability of full-time work.

People who work part time for noneconomic reasons do not want full-time work and are not available for such work. This group includes people with health problems, family or personal responsibilities, or education commitments that limit their availability for work.

The Bureau of Labor Statistics uses the data on full-time and part-time status to measure the slack in the labor market that results from people being underemployed—employed but not able to find as much employment as they would like.

In May 2016, when employment was 151.0 million, full-time employment was 123.1 million and part-time employment was 27.9 million. An estimated 6.4 million people worked part time for economic reasons. When this number, along with marginally attached workers, is added to the number unemployed, the unemployment rate becomes 9.6 percent.

Full-time workers
People who usually work 35 hours or more a week.

Part-time workers
People who usually work less than 35 hours a week.

Part time for economic reasons
People who work 1 to 34 hours per week but are looking for full-time work and cannot find it because of unfavorable business conditions.

MyEconLab Study Plan 15.1
Key Terms Quiz
Solutions Video
Real-Time Data

CHECKPOINT 15.1

Define the unemployment rate and other labor market indicators.

Practice Problems

The BLS reported that in December 2015, the labor force was 157.8 million, employment was 149.9 million, and the working-age population was 252.0 million.

1. Calculate the unemployment rate and the labor force participation rate.
2. The BLS also reported that 18.3 percent of all employment in December 2015 was part time and that 6.0 million people worked part time for economic reasons. How many people worked part time for noneconomic reasons?

In the News

Summer 2015 youth labor market

From April to July 2015, the number of employed youth 16 to 24 years old rose by 2.1 million to 20.3 million and youth unemployment increased from 2.1 million to 2.8 million. In July, the youth labor force grew by 2.8 million to a total of 23.1 million and the youth population was 38.5 million.

Source: BLS Press Release, August 18, 2015

How did the youth unemployment rate change from April to July? Calculate the youth labor force participation rate in July.

Solutions to Practice Problems

1. The unemployment rate is 5.0 percent. The labor force equals employment plus unemployment. So unemployment equals the labor force minus employment, which equals (157.8 million − 149.9 million), or 7.9 million. The unemployment rate equals unemployment as a percentage of the labor force. Unemployment rate = (7.9 ÷ 157.8) × 100 or 5 percent. The labor force participation rate is 65.5 percent. The labor force participation rate equals the labor force as a percentage of the working-age population. Labor force participation rate = (157.8 ÷ 252.0) × 100, or 62.6 percent.
2. 21.4 million people worked part time for noneconomic reasons. Employment was 149.9 million. Part-time employment was 18.3 percent of 149.9 million, which equals 27.4 million. Given that 6.0 million worked part time for economic reasons, then 27.4 million minus 6.0 million, or 21.4 million, worked part time for noneconomic reasons.

Solution to In the News

The unemployment rate is the number unemployed as a percentage of the labor force. The April employment equals the July employment (20.3 million) minus the increase of 2.1 million from April to July, or 18.2 million. The labor force equals employed plus unemployed. The April labor force was (18.2 million + 2.1 million), or 20.3 million. In April, 2.1 million were unemployed, so the April unemployment rate was (2.1 ÷ 20.3) × 100, or 10.3 percent. In July, 2.8 million were unemployed and the labor force was 23.1 million, so the unemployment rate was 12.1 percent. From April to July, the unemployment rate rose from 10.3 percent to 12.1 percent. The July labor force participation rate equals the labor force (23.1 million) as a percentage of the youth population (38.5 million), or 60 percent.

15.2 LABOR MARKET TRENDS AND FLUCTUATIONS

MyEconLab Concept Video

What do we learn about the U.S. labor market from changes in the unemployment rate, the labor force participation rate, and the alternative measures of unemployment? Let's explore the trends and fluctuations in these indicators.

Unemployment Rate

Figure 15.2 shows the U.S. unemployment rate over the 88 years from 1929 to 2016. The most striking event visible in this figure is the **Great Depression**, a period of high unemployment, low incomes, and extreme economic hardship that lasted from 1929 to 1939. By 1933, the worst of the Great Depression years, real GDP had fallen by a huge 30 percent and as the figure shows, one in four of the people who wanted jobs couldn't find them. The horrors of the Great Depression led to the New Deal and shaped political attitudes that persist today.

Great Depression
A period of high unemployment, low incomes, and extreme economic hardship that lasted from 1929 to 1939.

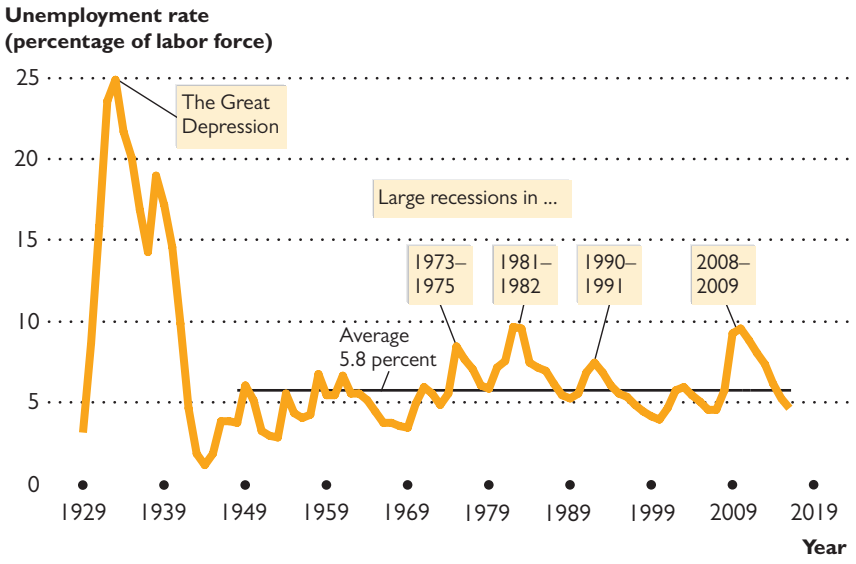
During the 1960s, the unemployment rate gradually fell to 3.5 percent. These years saw a rapid rate of job creation, partly from the demands placed on the economy by the growth of defense production during the Vietnam War and partly from an expansion of consumer spending encouraged by an expansion of social programs. Another burst of rapid job creation driven by the "new economy"—the high-technology sector driven by the expansion of the Internet—lowered the unemployment rate to below average from 1995 through the early 2000s.

During the recessions of 1973–1975, 1981–1982, 1990–1991, and 2008–2009, the unemployment rate increased. While the popular representation of the 2008–2009 recession compares it with the Great Depression, you can see in Figure 15.2 that 2010 is strikingly different from 1933, the year in which the unemployment rate peaked during the Great Depression.

FIGURE 15.2

The U.S. Unemployment Rate: 1929–2016

MyEconLab Real-time data



The average unemployment rate from 1948 to 2016 was 5.8 percent. The unemployment rate increases in recessions and decreases in expansions. Unemployment was at its lowest during World War II and the expansions of the 1950s, 1960s, and the 1990s and at its highest during the Great Depression and the recessions of 1981–1982 and 2008–2009.

SOURCE OF DATA: Bureau of Labor Statistics.

The Participation Rate

Figure 15.3 shows the labor force participation rate, which increased from 59 percent in 1960 to 67 percent at its peak in 1999. Why did the labor force participation rate increase? The main reason is an increase in the number of women who have entered the labor force.

Figure 15.3 shows that from 1960 to 1999, the participation rate of women increased from 37 percent to 60 percent. This increase is spread across women of all age groups and occurred for four main reasons. First, more women pursued a college education and so increased their earning power. Second, technological change in the workplace created a large number of white-collar jobs with flexible work hours that many women found attractive. Third, technological change in the home increased the time available for paid employment. And fourth, families looked increasingly to a second income to balance tight budgets.

Figure 15.3 also shows another remarkable trend in the U.S. labor force: The participation rate of men *decreased* from 83 percent in 1960 to 70 percent in 2016. Some of the decrease occurred as older men chose to retire earlier. But some arose from job loss at an age at which finding a new job is difficult. Decreased labor force participation of younger men occurred because more remained in school.

Downward Trend Since 2000

The downward trend in the labor force participation rate that began in 2000 might arise in part from a mismeasurement of unemployment. Recall that the labor force is the sum of the employed and the unemployed. If we don't count all the people who are unemployed, then we don't count all the people in the labor force. Some new measures provide a broader view of unemployment.

FIGURE 15.3

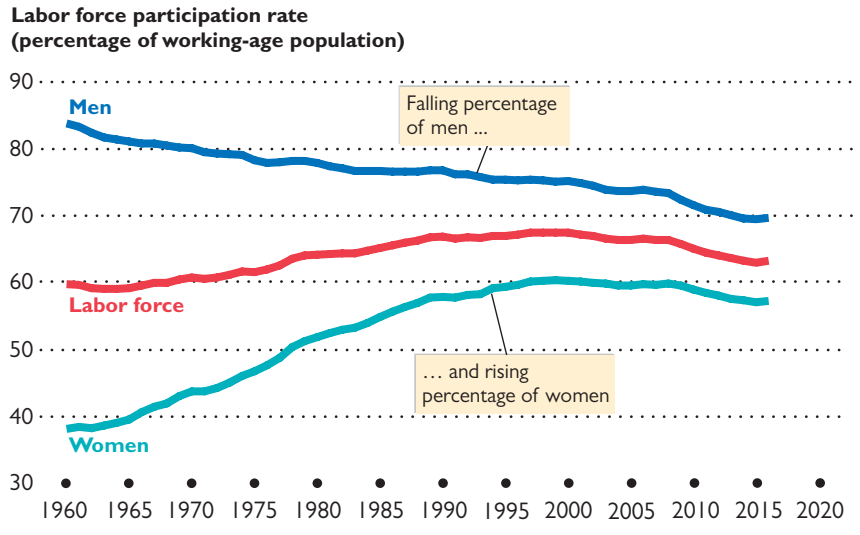
The Changing Face of the Labor Market: 1960–2016

MyEconLab Real-time data

The labor force participation rate increased from 1960 to 1999 but then decreased slightly.

The labor force participation rate of women has driven these trends, increasing strongly from 37 percent in 1960 to 60 percent in 1999.

The labor force participation rate of men has decreased steadily.



SOURCE OF DATA: Bureau of Labor Statistics.

EYE on the GLOBAL ECONOMY

Unemployment and Labor Force Participation

Unemployment

U.S. unemployment falls inside the range experienced by other countries. The highest unemployment rates have been in the United Kingdom, Canada, and the Eurozone; and the lowest have been in Japan and the newly industrializing Asian economies.

Differences in unemployment rates were large during the early1980s, narrowed through the 1990s and early 2000s, and widened after the 2008–2009 recession.

The Eurozone, with a higher average unemployment rate than the United States, also has higher unemployment benefits and more regulated labor markets.

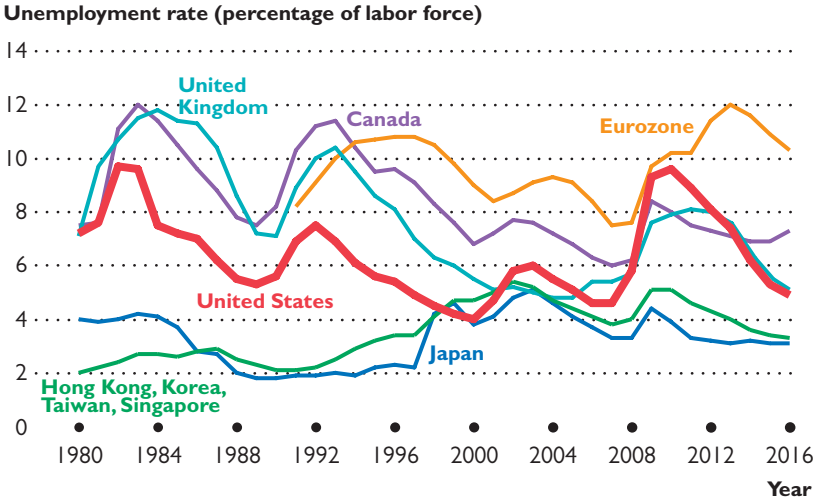


Figure 1 Unemployment

SOURCE OF DATA: International Monetary Fund, *World Economic Outlook,* April 2016.

Labor Force Participation

The labor force participation rate of women has increased in most advanced nations. But the participation rate of women in the labor force varies a great deal around the world. The figure compares eight other countries with the United States.

The U.S. rank is surprisingly low. Economists Francine D. Blau and Lawrence M. Kahn who have studied these data say that other countries have more "family-friendly" labor market policies. But they say these labor market policies encourage part-time work and U.S. women are more likely than women in other countries to have good full-time jobs as managers or professionals.

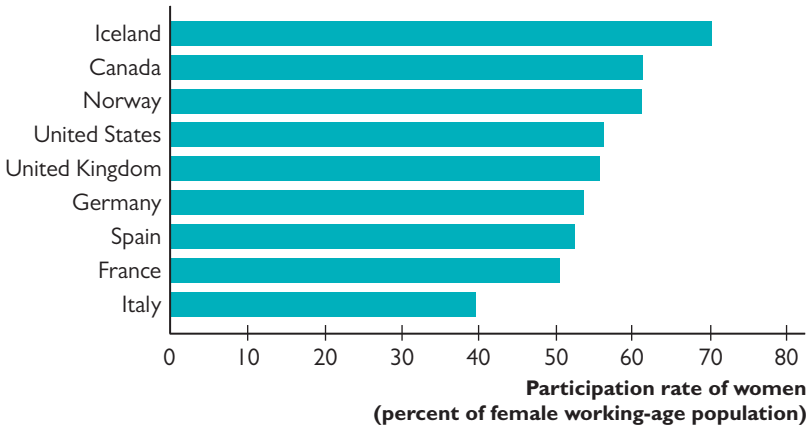


Figure 2 Women in the Labor Force

SOURCE OF DATA: OECD

Cultural factors play a central role in influencing national differences in women's work choices. But education, and particularly the percentage of women with a college degree, is the dominant source of international differences in women's and men's job market prospects.

Alternative Measures of Unemployment

You've seen that the official measure of unemployment does not include marginally attached workers and people who work part time for economic reasons. The Bureau of Labor Statistics (BLS) now provides three broader measures of the unemployment rate, known as U-4, U-5, and U-6, that include these wider groups of the jobless. The official unemployment rate (based on the standard definition of unemployment) is called U-3 and as these names imply, there are also U-1 and U-2 measures. The U-1 and U-2 measures of the unemployment rate are narrower than the official measure. U-1 is the percentage of the labor force that has been unemployed for 15 weeks or more and is a measure of long-term involuntary unemployment. U-2 is the percentage of the labor force that has been laid off and is another measure of involuntary unemployment.

Figure 15.4 shows the history of these six measures of unemployment since 1996. The relative magnitudes of the six measures are explained by what they include—the broader the measure, the higher the average. The gap between U-5 and U-6—part-time workers who want full-time work— is the largest. The six measures follow similar but not identical tracks: rising during recessions and falling in the expansion between recessions. But during the 2001 recession, U-1 barely rose while during the 2008–2009 recession, it more than doubled in less than a year.

Notice that the unemployment rate, on all six measures, keeps rising after a recession ends: It lags behind the business cycle. When an expansion begins, firms start hiring slowly. Some unemployed workers get jobs, but the labor force increases as marginally attached workers start to look for jobs. In the early stages of an expansion, the number of marginally attached workers looking for jobs exceeds the number of people hired and the unemployment rate increases.

FIGURE 15.4

Alternative Measures of Unemployment: 1996–2016

MyEconLab Real-time data

The alternative measures of unemployment are

U-1 People unemployed 15 weeks or longer

U-2 People laid off and others who completed a temporary job

U-3 Total unemployed (official measure)

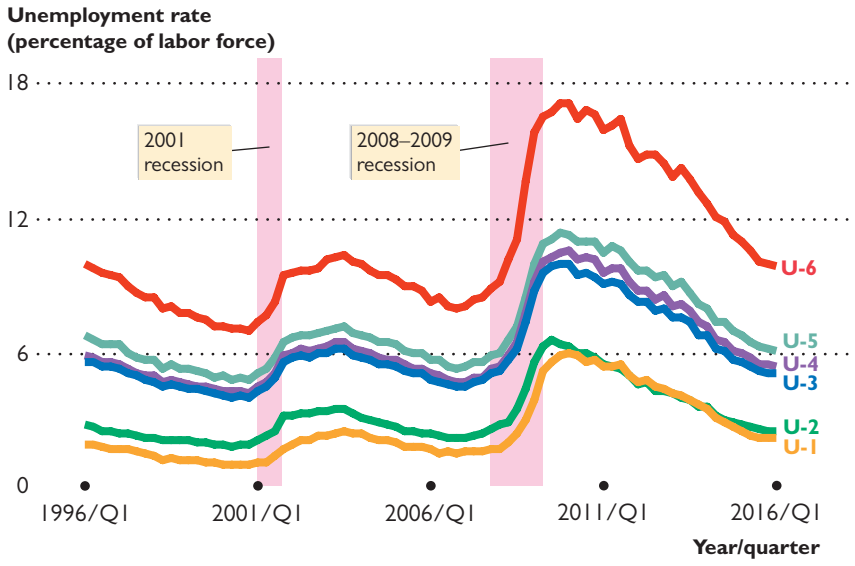
U-4 Total unemployed plus discouraged workers

U-5 U-4 plus other marginally attached workers

U-6 U-5 plus employed part time for economic reasons

U-1, U-2, and U-3 are percentages of the labor force.

U-4, U-5, and U-6 are percentages of the labor force plus the unemployed in the added category.



SOURCE OF DATA: Bureau of Labor Statistics.

CHECKPOINT 15.2

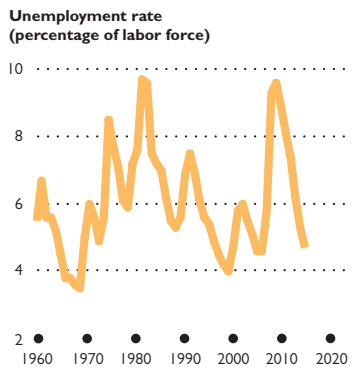
MyEconLab Study Plan 15.2
Key Terms Quiz
Solutions Video

Describe the trends and fluctuations in the indicators of the state of the U.S. labor market.

Practice Problems

1. Figure 1 shows the unemployment rate in the United States from 1960 to 2016. In which decade—the 1960s, 1970s, 1980s, 1990s, or 2000s—was the average unemployment rate the lowest and what brought low unemployment in that decade? In which decade was the average unemployment rate the highest and what brought high unemployment in that decade?
2. Describe the trends in the labor force participation rates of men, women, and all working-age people.

FIGURE 1



In the News

Blue in red states

Unemployment is 4.9 percent—less than half of the Great Recession peak—but Bernie Sanders got a big cheer when he dismissed the official unemployment rate as not reflecting those who are involuntarily working part time, or those who have become so discouraged they have given up looking for employment.

Source: *U.S. News & World Report*, February 12, 2016

1. Which of the alternative measures of unemployment does Bernie Sanders think is more relevant than the official unemployment rate and what was its level at the start of 2016?
2. By how much did the broadest measure of unemployment change from its 2008–2009 "Great Recession" peak?

Solutions to Practice Problems

1. Figure 1 shows that the unemployment rate was lowest during the 1960s when defense spending on the Vietnam War and expansion of social programs brought rapid expansions and lowered the unemployment rate.

   Figure 1 shows that the unemployment rate was highest during the 1980s. During the 1981–1982 recession it increased to almost 10 percent.
2. The labor force participation rate of women increased because (1) better-educated women earn more, (2) more white-collar jobs with flexible work hours were created, (3) people have more time for paid employment, and (4) families increasingly needed two incomes to balance their budgets. The labor force participation rate of men decreased because more men remained in school and some men took early retirement. The overall labor force participation rate increased.

Solutions to In the News

1. Bernie Sanders prefers the U-6 measure of unemployment, which includes discouraged workers, other marginally attached workers, and part-time workers for economic reasons. At the start of 2016, U-6 was 10 percent.
2. The broadest measure of unemployment, U-6, peaked at about 17 percent during the 2008–2009 recession, so at the start of 2016, it was about 60 percent of its peak.

MyEconLab Concept Video

15.3 UNEMPLOYMENT AND FULL EMPLOYMENT

There is always someone without a job who is searching for one, so there is always some unemployment. The key reason is that the labor market is constantly churning. New jobs are created and old jobs die; and some people move into the labor force and some move out of it. This churning creates unemployment.

We distinguish among three types of unemployment:

- Frictional unemployment
- Structural unemployment
- Cyclical unemployment

Frictional Unemployment

Frictional unemployment
The unemployment that arises from people entering and leaving the labor force, from quitting jobs to find better ones, and from the ongoing creation and destruction of jobs—from normal labor turnover.

Frictional unemployment is the unemployment that arises from people entering and leaving the labor force, from quitting jobs to find better ones, and from the ongoing creation and destruction of jobs—from normal labor turnover. Frictional unemployment is a permanent and healthy phenomenon in a dynamic, growing economy.



A new graduate interviews for a job.

There is an unending flow of people into and out of the labor force as people move through the stages of life—from being in school to finding a job, to working, perhaps to becoming unhappy with a job and looking for a new one, and finally, to retiring from full-time work.

There is also an unending process of job creation and job destruction as new firms are born, firms expand or contract, and some firms fail and go out of business.

The flows into and out of the labor force and the processes of job creation and job destruction create the need for people to search for jobs and for businesses to search for workers. Businesses don't usually hire the first person who applies for a job, and unemployed people don't usually take the first job that comes their way. Instead, both firms and workers spend time searching for what they believe will be the best available match. By this process of search, people can match their own skills and interests with the available jobs and find a satisfying job and a good income.

Structural Unemployment

Structural unemployment
The unemployment that arises when changes in technology or international competition change the skills needed to perform jobs or change the locations of jobs.

Structural unemployment is the unemployment that arises when changes in technology or international competition change the skills needed to perform jobs or change the locations of jobs. Structural unemployment usually lasts longer than frictional unemployment because workers must retrain and possibly relocate to find a job. For example, when banks introduced the automatic teller machine in the 1970s, many bank-teller jobs were destroyed. Meanwhile, new jobs for life-insurance salespeople and retail clerks were created. The former bank tellers remained unemployed for several months until they moved, retrained, and got one of these new jobs. Structural unemployment is painful, especially for older workers for whom the best available option might be to retire early but with a lower income than they had expected.



Bank tellers lost jobs to computer technology.

Sometimes, the amount of structural unemployment is small. At other times, it is large, and at such times, structural unemployment can become a serious long-term problem. It was especially large during the late 1970s and early 1980s.

Cyclical Unemployment

The fluctuating unemployment over the business cycle—the higher than normal unemployment at a business cycle trough and the lower than normal unemployment at a business cycle peak—is called **cyclical unemployment**. A worker who is laid off because the economy is in a recession and who gets rehired some months later when the expansion begins has experienced cyclical unemployment.

Cyclical unemployment
The fluctuating unemployment over the business cycle that increases during a recession and decreases during an expansion.

"Natural" Unemployment

Natural unemployment is the unemployment that arises from frictions and structural change—when all the unemployment is frictional and structural and there is no cyclical unemployment. Natural unemployment as a percentage of the labor force is called the **natural unemployment rate**.

Full employment is defined as a situation in which the unemployment rate equals the natural unemployment rate.

What determines the natural unemployment rate? Is it constant or does it change over time?

The natural unemployment rate is influenced by many factors, but the most important ones are

- The age distribution of the population
- The pace of structural change
- The real wage rate
- Unemployment benefits

Natural unemployment rate
The unemployment rate when all the unemployment is frictional and structural and there is no cyclical unemployment.

Full employment
When the unemployment rate equals the natural unemployment rate.

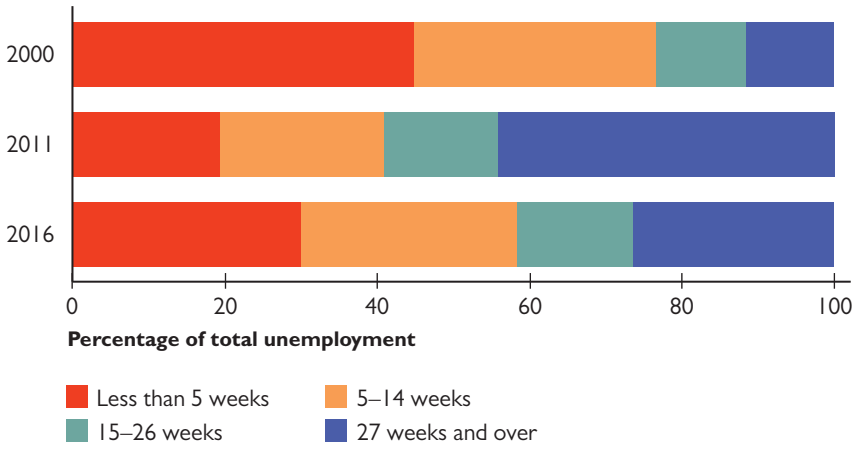


EYE on the U.S. ECONOMY

How Long Does it Take to Find a Job?

The duration of unemployment spells varies over the business cycle. In 2000 at the business cycle peak, the median time to find a job was 6 weeks; in 2011 at the start of a weak expansion, it was 21 weeks; and in 2016 after a long but weak expansion, it was 11 weeks.

The figure provides more information: It shows the percentage of the unemployed at four unemployment durations. You can see that long-term unemployment (27 weeks and over) was much greater in 2011 than it was at the business cycle peak in 2000. The 2016 data lie between the extremes of 2000 and 2011.



SOURCE OF DATA: Bureau of Labor Statistics.

The Age Distribution of the Population

An economy with a young population has lots of new job seekers every year and a high level of frictional unemployment. An economy with an aging population has fewer new job seekers and less frictional unemployment.

The Pace of Structural Change

The pace of structural change is sometimes slow, so the same jobs using the same machines remain in place for many years. But sometimes a technological upheaval sweeps aside the old ways, wipes out millions of jobs, and makes the skills once used to perform these jobs obsolete. The amount of structural unemployment fluctuates with the pace of technological change. The change is driven by fierce international competition, especially from fast-changing Asian economies. A high level of structural unemployment is present in some parts of the United States today.

The Real Wage Rate

The natural unemployment rate is influenced by the real wage rate. Anything that raises the real wage above the market equilibrium creates a surplus of labor and increases the natural unemployment rate. The real wage might exceed the market equilibrium for two reasons: a minimum wage and an efficiency wage. The federal minimum wage creates unemployment because it is set above the equilibrium wage of low-skilled young workers. An efficiency wage is a wage set by firms above the going market wage to attract the most productive workers, get them to work hard, and discourage them from quitting. When firms set efficiency wages, some workers would like to work for these firms but can't get jobs.



EYE on FULL EMPLOYMENT

MyEconLab Critical Thinking Exercise

Are We Back at Full Employment?

The U.S. economy has spent a long time away from full employment. In 2009, during a recession triggered by the Global Financial Crisis, the unemployment rate soared to 10 percent and the broader U-6 measure of underutilized labor hovered at almost 18 percent. The recovery from this recession was long and slow. And in mid-2016, policy makers wanted answers to the following questions: Is the recovery now complete? Are we back at full employment?

The answers to these questions are a major input into the decisions of the Federal Reserve on the pace at which to raise interest rates. (You will learn about these decisions and their effects in Chapters 18 and 20.)

We've defined full employment as a state in which the unemployment rate equals the natural unemployment rate. So the first way to find an answer is to compare the BLS measure of the unemployment rate and the CBO estimate of the natural unemployment rate.

In the first quarter of 2016, the actual and natural unemployment rates were equal at 4.9 percent. So based on these numbers, we're back at full employment.

But the natural unemployment rate is only an estimate. It varies over time and is influenced by many factors. Also, the employment–population ratio and the labor force participation rate data point to a different answer to the full-employment question. Both of these measures fell by 3 percentage points between 2007 and 2016. Three percent of the working-age population had disappeared from the labor force. Where did these people go? Did they represent hidden unemployment?

A way of answering this question has been suggested by economists at the Federal Reserve Bank of Atlanta. Their idea is to use an indicator they call the Z-Pop ratio, which is the percentage of the working-age population

Unemployment Benefits

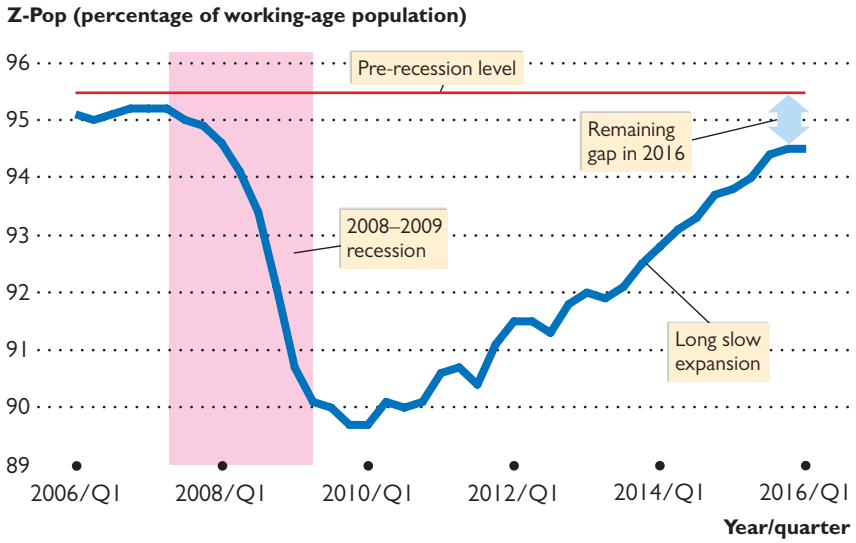
Unemployment benefits increase the natural unemployment rate by lowering the opportunity cost of job search. European countries have more generous unemployment benefits and higher natural unemployment rates than the United States. Extending unemployment benefits raises the natural unemployment rate.

There is no controversy about the existence of a natural unemployment rate. Nor is there disagreement that the natural unemployment rate changes. But economists don't know its exact size or the extent to which it fluctuates. The Congressional Budget Office estimates the natural unemployment rate and its estimate for 2016 was 4.9 percent—equal to the actual unemployment rate in that year.

Unemployment and Real GDP

Cyclical unemployment is the fluctuating unemployment over the business cycle—unemployment that increases during a recession and decreases during an expansion. At full employment, there is *no* cyclical unemployment. At a business cycle trough, cyclical unemployment is *positive* and at a business cycle peak, cyclical unemployment is *negative*.

Figure 15.5(a) shows the unemployment rate in the United States between 1980 and 2016. It also shows the natural unemployment rate and cyclical unemployment. The natural unemployment rate in this figure was estimated by the Congressional Budget Office (CBO).



SOURCE OF DATA: Bureau of Labor Statistics, formula proposed by the Federal Reserve Bank of Atlanta, and authors' calculations.

that is fully utilized. The people counted as fully utilized are those working full-time, those working part-time for a noneconomic reason, and those who say they don't want a job.

The figure shows the Z-Pop ratio. Before the 2008–2009 recession, 95.2 percent of the population was fully utilized by this definition. The number fell to 89.7 percent and then slowly climbed. In 2016, 94.5 percent of the population was fully utilized.

So the Z-Pop ratio gives almost the same answer as that by comparing the unemployment rate with the natural unemployment rate, but not quite. It shows a small amount of underused labor remaining in 2016.

FIGURE 15.5

The Relationship Between Unemployment and the Output Gap

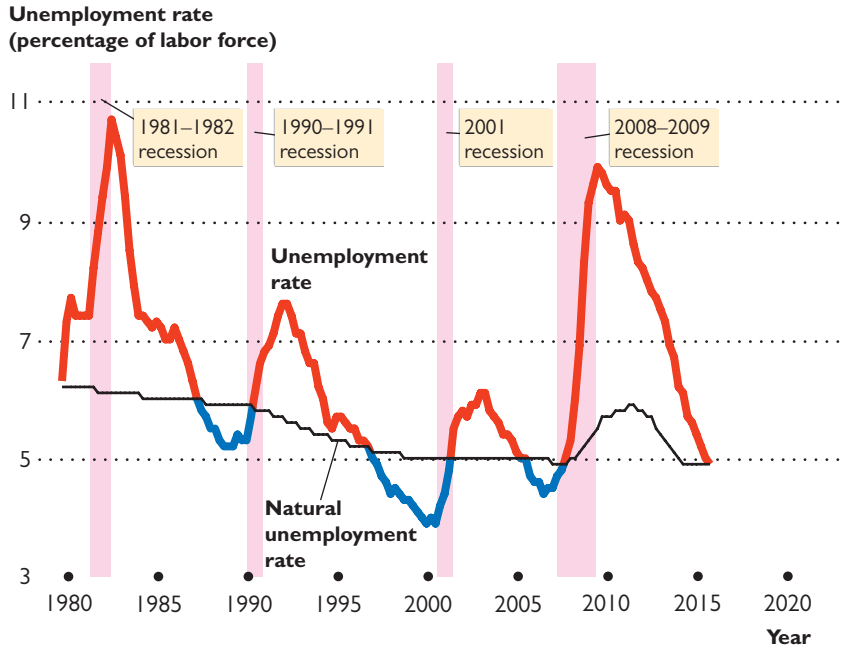
MyEconLab Real-time data

As the unemployment rate fluctuates around the natural unemployment rate in part (a), the output gap—real GDP minus potential GDP expressed as a percentage of potential GDP—fluctuates around a zero output gap in part (b).

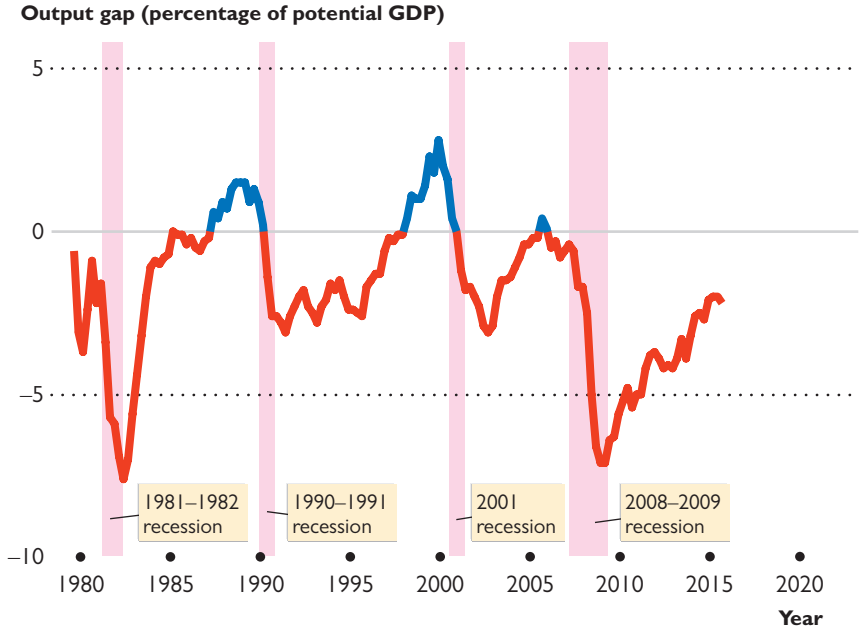
When the unemployment rate *exceeds* the natural unemployment rate, real GDP is below potential GDP and the output gap is negative (the red sections in both parts).

When the unemployment rate is *below* the natural unemployment rate, real GDP is above potential GDP and the output gap is positive (the blue sections in both parts).

The natural unemployment rate shown in the graph is the Congressional Budget Office's estimate. It might turn out to be an underestimate for the years since 2008.



(a) Cyclical and natural unemployment



(b) The output gap

SOURCES OF DATA: Bureau of Economic Analysis, Bureau of Labor Statistics, and Congressional Budget Office.

In Figure 15.5(a), you can see that during most of the 1980s, the early 1990s, early 2000s, and during 2008–2009, the unemployment rate was above the natural unemployment rate, so cyclical unemployment was positive (the red sections of the line). You can also see that during the late 1980s, from 1997 to 2001, and during 2005–2008 the unemployment rate was below the natural unemployment rate, so cyclical unemployment was negative (the blue sections of the line).

As the unemployment rate fluctuates around the natural unemployment rate, real GDP fluctuates around potential GDP. **Potential GDP** is the value of real GDP when the economy is at full employment—all the economy's factors of production (labor, capital, land, and entrepreneurial ability) are employed. Real GDP equals potential GDP when the economy is at full employment. Real GDP minus potential GDP expressed as a percentage of potential GDP is called the **output gap**.

Potential GDP
The value of real GDP when the economy is at full employment—all the economy's factors of production (labor, capital, land, and entrepreneurial ability) are employed.

Output gap
Real GDP minus potential GDP expressed as a percentage of potential GDP.

Figure 15.5(b) shows the U.S. *output gap* from 1980 to 2016. You can see that as the unemployment rate fluctuates around the natural unemployment rate, the output gap also fluctuates. Most of the time, when the unemployment rate is above the natural unemployment rate, in part (a), the output gap is negative (real GDP is below potential GDP), in part (b); when the unemployment rate is below the natural unemployment rate, the output gap is positive (real GDP is above potential GDP); and when the unemployment rate equals the natural unemployment rate, the output gap is zero (real GDP equals potential GDP).

The general tendency for unemployment to be above the natural rate when real GDP is below potential GDP did not describe the situation in 2016. In that year, the unemployment rate had fallen to equal the natural rate but the output gap was about 2 percent below potential GDP. This discrepancy might arise from errors in estimating the natural unemployment rate and potential GDP.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Your Labor Market Status and Activity

You are going to spend a lot of your life in the labor market. Most of the time, you'll be supplying labor services. But first, you must find a job. Most likely, one job will not last your entire working life. You will want to find a new job when you decide to quit or when changing economic conditions destroy your current job.

As you look for a job, get a job, quit a job, or get laid off and look for a new job, you will pass through many and possibly all of the population categories used in the Current Population Survey that you've learned about in this chapter.

Think about your current labor market status while you are studying economics.

- Are you in the labor force or not?
- If you are in the labor force, are you employed or unemployed?
- If you are employed, are you a part-time or a full-time worker?

Now think about someone you know who is unemployed or has been unemployed. Classify the unemployment experienced by this person as

- frictional,
- structural, or
- cyclical.

How can you tell the type of unemployment experienced by this person?

The labor market conditions that you face today or when you graduate and look for a job depend partly on general national economic conditions—on whether the economy is in recession or booming.

Labor market conditions also depend on where you live. Visit the Bureau of Labor Statistics' Web site at www.bls.gov. There you can find information on employment and unemployment for your state and metropolitan area or county. By comparing the labor market conditions in your own region with those in other areas, you can figure out where it might be easier to find work.

MyEconLab Study Plan 15.3
Key Terms Quiz
Solutions Video

CHECKPOINT 15.3

Describe the types of unemployment, define full employment, and explain the link between unemployment and real GDP.

Practice Problems

Recovery won't improve unemployment
Despite some optimism about the seeds of recovery, the Congressional Budget Office (CBO) sees joblessness rising. The CBO sees unemployment peaking at 10.4% next year from an average of 9.3% this year, before it falls to 9.1% in 2011.
Source: *Fortune*, August 25, 2009

Before the recession began, the U.S. unemployment rate was about 6 percent.

1. As a recession begins, firms quickly make layoffs. Is this rise in unemployment mostly a rise in frictional, structural, or cyclical unemployment?
2. Why does unemployment continue to rise as an expansion begins?

In the News

The small but serious threat of a U.S. recession
The unemployment rate is 4.9 percent, its level in 2008 before the recession. While it is unlikely that the United States will slip into recession this year, below-trend real GDP growth cannot be ruled out and some Wall Street economists say there is a 20 percent chance of recession in 2016.
Source: *The Financial Times*, February 5, 2016

1. Using the information in the news clip along with that in Figure 15.5 (p. 414), how would you describe the state of the U.S. economy through 2014 and 2015 and at the beginning of 2016?
2. How would "below-trend real GDP growth" change the unemployment rate and what type of unemployment would change?

Solutions to Practice Problems

1. When a recession starts, firms are quick to lay off workers. Most of the rise in unemployment is cyclical—related to the state of the economy. The unemployment rate rises quickly as the number of layoffs increases.
2. The unemployment rate lags behind the business cycle. When an expansion begins, firms start hiring slowly. Some unemployed workers get jobs, but the labor force increases as marginally attached workers start to look for jobs. In the early stages of an expansion, the number of marginally attached workers looking for jobs exceeds the number of people hired and unemployment increases.

Solutions to In the News

1. In 2014 and 2015, the U.S. economy was recovering from the 2008–2009 recession. The unemployment rate was falling and the output gap was shrinking slowly. At the start of 2016, the unemployment rate was below its long-term average and the economy was close to full employment
2. Below-trend real GDP growth would increase the unemployment rate and cyclical unemployment would increase.

CHAPTER SUMMARY

Key Points

1. Define the unemployment rate and other labor market indicators.

- The unemployment rate is the number of people unemployed as a percentage of the labor force, and the labor force is the sum of the number of people employed and the number unemployed.
- The labor force participation rate is the labor force as a percentage of the working-age population.

2. Describe the trends and fluctuations in the indicators of the state of the U.S. labor market.

- The unemployment rate fluctuates with the business cycle, increasing in recessions and decreasing in expansions.
- The labor force participation rate of women has increased, and the labor force participation rate of men has decreased.

3. Describe the types of unemployment, define full employment, and explain the link between unemployment and real GDP.

- Unemployment can be frictional, structural, or cyclical.
- Full employment occurs when there is no cyclical unemployment and at full employment, the unemployment rate equals the natural unemployment rate.
- Potential GDP is the real GDP produced when the economy is at full employment.
- As the unemployment rate fluctuates around the natural unemployment rate, real GDP fluctuates around potential GDP and the output gap fluctuates between negative and positive values.

Key Terms

MyEconLab Key Terms Quiz

Cyclical unemployment, 411
Discouraged worker, 402
Employment–population ratio, 401
Frictional unemployment, 410
Full employment, 411
Full-time workers, 403
Great Depression, 405
Labor force, 400
Labor force participation rate, 402
Marginally attached worker, 402
Natural unemployment rate, 411
Output gap, 415
Part time for economic reasons, 403
Part-time workers, 403
Potential GDP, 415
Structural unemployment, 410
Unemployment rate, 401
Working-age population, 400

MyEconLab Chapter 15 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

Use the following information gathered by a BLS labor market survey of four households to work Problems **1** and **2**.

- Household 1: Candy worked 20 hours last week setting up her Internet shopping business. The rest of the week, she completed application forms and attended two job interviews. Husband Jerry worked 40 hours at his job at GM. Daughter Meg, a student, worked 10 hours at her weekend job at Starbucks.
- Household 2: Joey, a full-time bank clerk, was on vacation. Wife, Serena, who wants a full-time job, worked 10 hours as a part-time checkout clerk.
- Household 3: Ari had no work last week but was going to be recalled to his regular job in two weeks. Partner Kosta, after months of searching for a job and not being able to find one, has stopped looking and will go back to school.
- Household 4: Mimi and Henry are retired. Son Hank is a professional artist, who painted for 12 hours last week and sold one picture.

1. Classify each of the 10 people into the labor market category used by the BLS. Who are part-time workers and who are full-time workers? Of the part-time workers, who works part time for economic reasons?

2. Calculate the unemployment rate and the labor force participation rate, and compare these rates with those in the United States in 2016.

3. Describe two examples of people who work part time for economic reasons and two examples of people who work part time for noneconomic reasons.

4. Explain the relationship between the percentage of employed workers who have part-time jobs and the business cycle.

5. Distinguish among the three types of unemployment: frictional, structural, and cyclical. Provide an example of each type of unemployment in the United States today.

6. Describe the relationship between the unemployment rate and the natural unemployment rate as the output gap fluctuates between being positive and being negative.

Use the following information to work Problems **7** and **8**.

Unemployment falls to 4.9 percent, lowest in 8 years
U.S. unemployment of 4.9 percent is full employment. Only 151,000 jobs were created in January, down from 262,000 in December. With falling oil prices, 7,000 energy jobs were lost in January but 29,000 manufacturing jobs were added.

Source: CNN Money, February 5, 2016

7. Using the information provided in the news clip, which types of unemployment were present in the U.S. economy in January 2016?

8. How would you expect a shrinking energy sector and an expanding manufacturing sector to influence the actual and natural unemployment rates?

9. Read *Eye on Full Employment* on pp. 412–413. In which year, 2000 or 2016, was real GDP below potential GDP? How can you tell from the graph on p. 414?

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

Real-Time Data

1. In the United States,

- Compare the duration of unemployment in 2016 with that in 2000 and explain whether the difference was most likely the result of frictions, structural change, or the business cycle.
- How does the unemployment of marginally attached workers influence the duration of unemployment in 2016 compared with that in 2000?

2. The Bureau of Labor Statistics reported that in the second quarter of 2008 the working-age population was 233,410,000, the labor force was 154,294,000, and employment was 146,089,000. Calculate for that quarter the labor force participation rate and the unemployment rate.

3. In July 2016, in the economy of Sandy Island, 10,000 people were employed and 1,000 were unemployed. During August 2016, 80 people lost their jobs and didn't look for new ones, 20 people quit their jobs and retired, 150 people who had looked for work were hired, 50 people became discouraged workers, and 40 new graduates looked for work. Calculate the change in the unemployment rate from July 2016 to August 2016.

4. The BLS survey reported the following data in a community of 320 people: 200 worked at least 1 hour as paid employees; 20 did not work but were temporarily absent from their jobs; 40 did not have jobs and didn't want to work; 10 were available for work and last week they had looked for work; and 6 were available for work and were waiting to be recalled to their previous job. Calculate the unemployment rate and the labor force participation rate.

5. Describe the trends and fluctuations in the unemployment rate in the United States from 1949 through 2016. In which periods was the unemployment rate above average and in which periods was it below average?

6. Describe how the labor force participation rate in the United States changed between 1960 and 2016. Contrast and explain the different trends in the labor force participation rates of women and men.

7. Explain why the natural unemployment rate is not zero and why the unemployment rate fluctuates around the natural unemployment rate.

Use the following information to work Problems **8** and **9**.

The metro areas with the lowest and highest unemployment

In December 2015, Ames, Iowa, had the lowest unemployment in the United States at 2.2 percent of the workforce. At the other end of the scale was El Centro, California, with 19.6 percent of its workforce unemployed.

Source: *Forbes*, February 9, 2016

In the depth of the 2008–2009 recession, the unemployment rate in Ames peaked at 5.7 percent. In El Centro, it peaked at 30.3 percent.

8. Use the information provided to estimate how much of the unemployment in Ames and El Centro in 2009 was cyclical and how much was natural. Explain your assumptions in arriving at your estimates.

9. How would you explain the difference in the unemployment rates in Ames and El Centro in December 2015? Why is the difference almost certainly not explained by different cyclical unemployment rates?

MyEconLab Chapter 15 Study Plan

Multiple Choice Quiz

1. The BLS counts Jody as being unemployed if she _____.

A. had a job last month but not this month
B. doesn't have a job because the U.S. factory where she worked cannot compete with cheap Chinese imports
C. wants a job and looked for a job last year but has now stopped looking
D. wants a job and is willing to take a job but after searching last week cannot find a job

2. A marginally attached worker is a person who _____.

A. works part time for economic reasons
B. works part time for noneconomic reasons
C. doesn't work, is available and willing to work, but hasn't looked for a job recently
D. has no job but would like one and has gone back to school to retrain

3. If the BLS included all marginally attached workers as being unemployed, the _____ would be _____.

A. unemployment rate; higher
B. labor force; unchanged
C. labor force participation rate; lower
D. unemployment rate; lower

4. When the economy goes into recession, the biggest increase in unemployment is _____.

A. structural because jobs are lost in most states
B. cyclical because jobs are lost in many industries as they cut production
C. frictional because the creation of jobs slows
D. the combination of structural and frictional as few new jobs are created

5. The economy is at full employment when all unemployment is _____.

A. structural
B. cyclical
C. structural and cyclical
D. structural and frictional

6. Potential GDP is the value of real GDP when _____.

A. the unemployment rate equals the natural unemployment rate
B. there is no frictional unemployment
C. there is no structural unemployment
D. the unemployment rate is zero

7. When the unemployment rate_____ the natural unemployment rate, real GDP is _____ potential GDP and the output gap is _____.

A. exceeds; below; negative
B. is below; below; negative
C. exceeds; above; positive
D. is below; above; negative



Which movie *really* was the biggest box office hit?

The CPI and the Cost of Living

16

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain what the Consumer Price Index (CPI) is and how it is calculated.
2. Explain the limitations of the CPI and describe other measures of the price level.
3. Adjust money values for inflation and calculate real wage rates and real interest rates.

MyEconLab Big Picture Video

MyEconLab Concept Video

16.1 THE CONSUMER PRICE INDEX

Consumer Price Index
A measure of the average of the prices paid by urban consumers for a fixed market basket of consumption goods and services.

To see which movie was the biggest box office hit, we need a way of comparing prices in different periods. That's what the Consumer Price Index or CPI enables us to do. The **Consumer Price Index** is a measure of the average of the prices paid by urban consumers for a fixed market basket of consumption goods and services. The Bureau of Labor Statistics (BLS) calculates the CPI every month, and we can use these numbers to compare what the fixed market basket costs this month with what it cost in some previous month or other period.

Reading the CPI Numbers

Reference base period
A period for which the CPI is defined to equal 100. Currently, the reference base period is 1982–1984.

The CPI is defined to equal 100 for a period called the **reference base period**. Currently, the reference base period is 1982–1984. That is, the CPI equals 100 on the average over the 36 months from January 1982 through December 1984.

In May 2016, the CPI was 240.2. This number tells us that the average of the prices paid by urban consumers for a fixed market basket of consumption goods and services was 140.2 percent higher in May 2016 than it was on the average during 1982–1984.

In April 2016, the CPI was 239.3. Comparing the CPI in May 2016 with the CPI in April 2016 tells us that the average of the prices paid by urban consumers for a fixed market basket of consumption goods and services *increased* by 0.9 percentage points in May 2016.

Constructing the CPI

Constructing the CPI is a huge operation that costs millions of dollars and involves three stages:

- Selecting the CPI market basket
- Conducting the monthly price survey
- Calculating the CPI

The CPI Market Basket

The first stage in constructing the CPI is to determine the *CPI market basket*. This "basket" contains the goods and services represented in the index and the relative importance, or weight, attached to each of them. The idea is to make the weight of the items in the CPI basket the same as in the budget of an average urban household. For example, if the average household spends 2 percent of its income on public transportation, then the CPI places a weight of 2 percent on the prices of bus, subway, and other transit system rides.

Although the CPI is calculated every month, the CPI market basket isn't updated every month. The information used to determine the CPI market basket comes from a survey, called the *Consumer Expenditure Survey*, that discovers what people actually buy. This survey is an ongoing activity, and the CPI market basket is being refreshed with increasing frequency. An astonishing 88,000 individuals and families contribute information.

The reference base period for the CPI has been fixed at 1982–1984 for more than 20 years and doesn't change when a new Consumer Expenditure Survey is used to update the market basket.

Figure 16.1 shows the CPI market basket in May 2016. The basket contains around 80,000 goods and services arranged in the eight large groups shown in the figure. The most important item in a household's budget is housing, which accounts for 42.1 percent of total expenditure. Transportation comes next at 15.4 percent. Third in relative importance is food and beverages at 14.8 percent. These three groups account for almost three quarters of the average household budget. Medical care takes 8.4 percent, education and communication takes 7.1 percent, recreation takes 5.8 percent, and apparel (clothing and footwear) takes 3.2 percent. Another 3.2 percent is spent on other goods and services.

The BLS breaks down each of these categories into smaller ones. For example, education and communication breaks down into textbooks and supplies, tuition, telephone services, and personal computer services.

As you look at these numbers, remember that they apply to the average household. Each individual household is spread around the average. Think about your own expenditure and compare it with the average.

The Monthly Price Survey

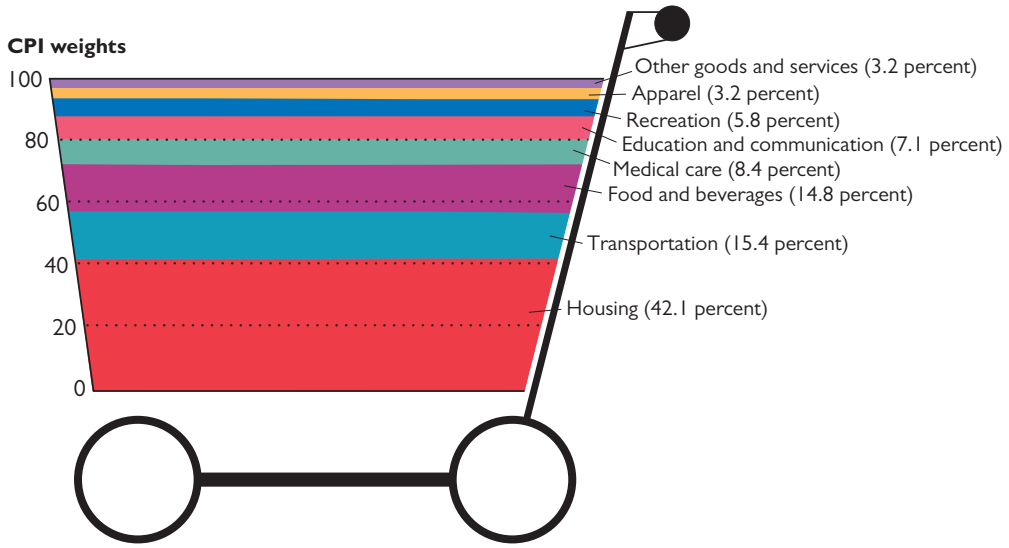
Each month, BLS employees check the prices of the 80,000 goods and services in the CPI market basket in 30 metropolitan areas. Because the CPI aims to measure price changes, it is important that the prices recorded each month refer to exactly the same items. For example, suppose the price of a box of jelly beans has increased but a box now contains more beans. Has the price of a jelly bean increased? The BLS employee must record the details of changes in quality, size, weight, or packaging so that price changes can be isolated from other changes.

Once the raw price data are in hand, the next task is to calculate the CPI.

FIGURE 16.1

The CPI Market Basket

MyEconLab Animation



This shopping cart is filled with the items that an average urban household buys. Housing (42.1 percent), transportation (15.4 percent), and food and beverages (14.8 percent) take almost three quarters of household income.

SOURCE OF DATA: Bureau of Labor Statistics.

Calculating the CPI

The CPI calculation has three steps:

- Find the cost of the CPI market basket at reference base period prices.
- Find the cost of the CPI market basket at current period prices.
- Calculate the CPI for the reference base period and the current period.

We'll work through these three steps for a simple example. Suppose the CPI market basket contains only two goods and services: oranges and haircuts. We'll construct an annual CPI rather than a monthly CPI with the reference base period 2010 and the current period 2016.

Table 16.1 shows the quantities in the CPI market basket and the prices in the base period and the current period. Part (a) contains the data for the base period. In that period, consumers bought 10 oranges at $1 each and 5 haircuts at $8 each. To find the cost of the CPI market basket in the base period prices, multiply the quantities in the CPI market basket by the base period prices. The cost of oranges is $10 (10 at $1 each), and the cost of haircuts is $40 (5 at $8 each). So total expenditure in the base period on the CPI market basket is $50 ($10 + $40).

Part (b) contains the price data for the current period. The price of an orange increased from $1 to $2, which is a 100 percent increase ($1 ÷ $1 × 100 = 100 percent). The price of a haircut increased from $8 to $10, which is a 25 percent increase ($2 ÷ $8 × 100 = 25 percent).

The CPI provides a way of averaging these price increases by comparing the cost of the basket rather than the price of each item. To find the cost of the CPI market basket in the current period, 2016, multiply the quantities in the basket by their 2016 prices. The cost of oranges is $20 (10 at $2 each), and the cost of haircuts is $50 (5 at $10 each). So total expenditure on the fixed CPI market basket at current period prices is $70 ($20 + $50).

TABLE 16.1

The Consumer Price Index: A Simplified CPI Calculation

(a) The cost of the CPI market basket at base period prices: 2010

	CPI market basket		
Item	Quantity	Price	Cost of CPI basket
Oranges	10	$1 each	$10
Haircuts	5	$8 each	$40
		Cost of CPI market basket at base period prices	$50

(b) The cost of the CPI market basket at current period prices: 2016

	CPI market basket		
Item	Quantity	Price	Cost of CPI basket
Oranges	10	$2 each	$20
Haircuts	5	$10 each	$50
		Cost of CPI market basket at current period prices	$70

You've now taken the first two steps toward calculating the CPI. The third step uses the numbers you've just calculated to find the CPI for 2010 and 2016. The formula for the CPI is

$$\text{CPI} = \frac{\text{Cost of CPI basket at current period prices}}{\text{Cost of CPI basket at base period prices}} \times 100.$$

In Table 16.1, you established that the cost of the CPI market basket was $50 in 2010 and $70 in 2016. If we use these numbers in the CPI formula, we can find the CPI for 2010 and 2016. The base period is 2010, so

$$\text{CPI in 2010} = \frac{\$50}{\$50} \times 100 = 100.$$

$$\text{CPI in 2016} = \frac{\$70}{\$50} \times 100 = 140.$$

The principles that you've applied in this simplified CPI calculation apply to the more complex calculations performed every month by the BLS.

Measuring Inflation and Deflation

The CPI is a measure of the **price level**, an average of the *level* of prices during a given period. The **inflation rate** is a measure of the percentage *change* in the price level from one period to the next. To calculate the annual inflation rate using the CPI measure of the price level, we use the formula

Price level
An average of the *level* of prices during a given period.

Inflation rate
The percentage *change* in the price level from one period to the next.

$$\text{Inflation rate} = \frac{(\text{CPI in current year} - \text{CPI in previous year})}{\text{CPI in previous year}} \times 100.$$

Suppose that the current year is 2016 and the CPI for 2016 was 140. And suppose that in the previous year, 2015, the CPI was 120. Then in 2016,

$$\text{Inflation rate} = \frac{(140 - 120)}{120} \times 100 = 16.7 \text{ percent.}$$

If the inflation rate is *negative*, the CPI is *falling* and we have **deflation**. The United States has rarely experienced deflation, but 2009 was one of those rare years. You can check the latest data by visiting the BLS Web site. In July 2009, the CPI was 215.4, and in July 2008, it was 220.0. So during the year to July 2009,

Deflation
A situation in which the CPI is *falling* and the inflation rate is *negative*.

$$\text{Inflation rate} = \frac{(215.4 - 220.0)}{220.0} \times 100 = -2.1 \text{ percent.}$$

The Price Level, Inflation, and Deflation in the United States

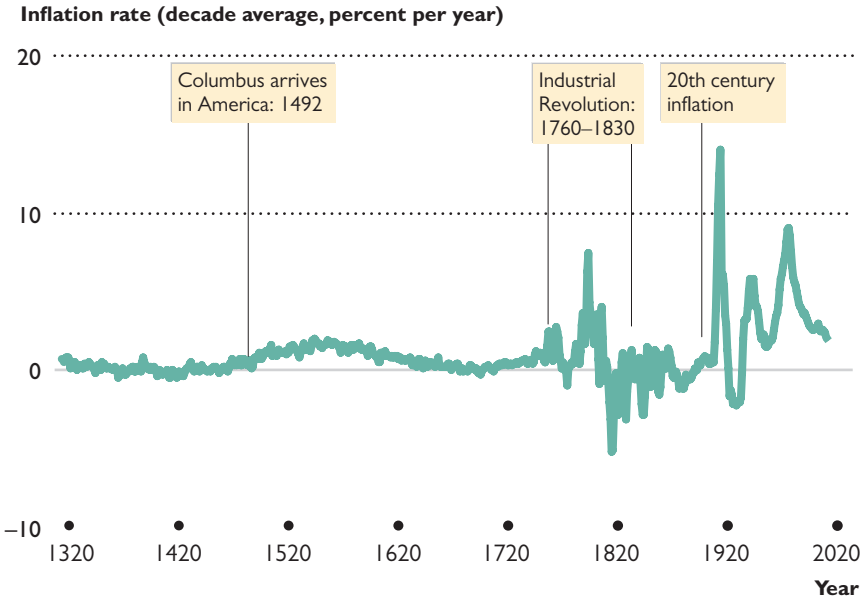
Figure 16.2(a) on p. 426 shows the U.S. price level measured by the CPI between 1976 and 2016. The price level increased every year during this period until 2009 when it fell slightly. During the late 1970s and in 1980, the price level was increasing rapidly, but since the early 1980s, the rate of increase has slowed.

Figure 16.2(b) shows the U.S. inflation rate. When the price level rises rapidly, the inflation rate is high; when the price level rises slowly, the inflation rate is low; and when the price level is falling, the inflation rate is negative.

EYE on the PAST

700 Years of Inflation and Deflation

These extraordinary data show that inflation became a persistent problem only after 1900. During the preceding 600 years, inflation was almost unknown. Inflation increased slightly during the sixteenth century after Europeans discovered gold in America. But this inflation barely reached 2 percent a year—less than we have today—and eventually subsided. The Industrial Revolution saw a temporary burst of inflation followed by a period of deflation.

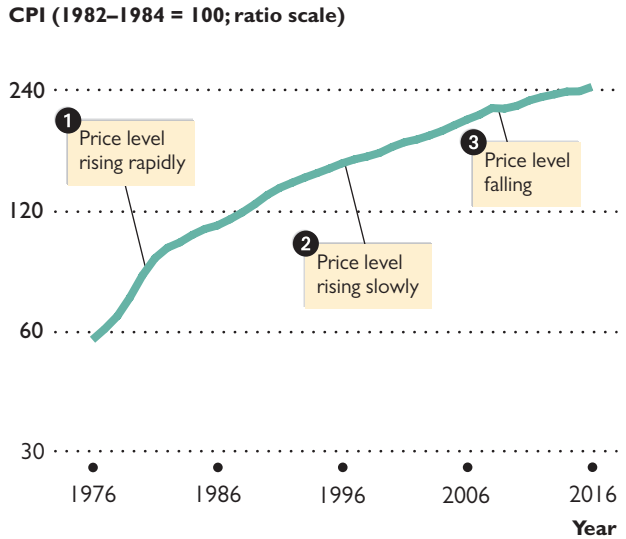


Sources of data: E.H. Phelps Brown and Sheila V. Hopkins, *Economica*, 1955, and Robert Sahr, http://oregonstate.edu/dept/pol_sci/fac/sahr/sahr.htm.

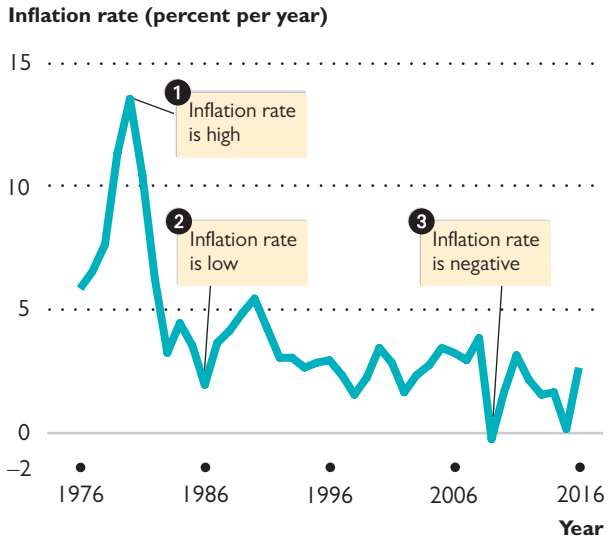
FIGURE 16.2

The CPI and the Inflation Rate: 1976–2016

MyEconLab Real-time data



(a) CPI: 1976–2016



(b) CPI inflation rate: 1976–2016

Source of data: Bureau of Labor Statistics.

❶ The price level in part (a) was rising rapidly during the 1970s and 1980s and the inflation rate in part (b) was high.
❷ The price level was rising slowly during the 1990s and 2000s and the inflation rate was low.
❸ In 2009, the price level fell and the inflation rate was negative.

CHECKPOINT 16.1

MyEconLab Study Plan 16.1
Key Terms Quiz
Solutions Video

Explain what the Consumer Price Index (CPI) is and how it is calculated.

Practice Problems

A Consumer Expenditure Survey in Sparta shows that people buy only juice and cloth. In 2015, the year of the Consumer Expenditure Survey and also the reference base year, the average household spent $40 on juice and $25 on cloth. Table 1 sets out the prices of juice and cloth in 2015 and 2016.

TABLE 1 PRICES

	2015	2016
Juice	$4 a bottle	$4 a bottle
Cloth	$5 a yard	$6 a yard

1. Calculate the CPI market basket and the percentage of the average household budget spent on juice in the reference base year.
2. Calculate the CPI in 2016 and the inflation rate between 2015 and 2016.
3. Table 2 shows the CPI in Sparta. Calculate the inflation rates in 2015 and 2016. Did the CPI rise in 2016? Did the inflation rate increase in 2016?

TABLE 2

Year	CPI
2014	200
2015	219
2016	237

In the News

U.S. Consumer Price Index down 0.1 percent

The U.S. CPI fell 0.1 percent in December 2015. The price of gasoline fell by 3.9 percent. Rents increased 0.2 percent, and medical care costs increased 0.1 percent.

Source: CNBC, Wednesday, January 20, 2016

Did the United States experience inflation or deflation in December 2015? Which of the items mentioned in the news clip has the highest weight in the CPI and which has the lowest weight?

Solutions to Practice Problems

1. The CPI market basket is the quantities bought during the Consumer Expenditure Survey year, 2015. The average household spent $40 on juice at $4 a bottle, so it bought 10 bottles of juice. The average household spent $25 on cloth at $5 a yard, so it bought 5 yards of cloth. The CPI market basket is made up of 10 bottles of juice and 5 yards of cloth.
   In the reference base year, the average household spent $40 on juice and $25 on cloth, so the household budget was $65. Expenditure on juice was 61.5 percent of the household budget: ($40 ÷ $65) × 100 = 61.5 percent.
2. To calculate the CPI in 2016, find the cost of the CPI market basket in 2015 and 2016. In 2015, the CPI basket costs $65 ($40 for juice + $25 for cloth). In 2016, the CPI market basket costs $70 (10 bottles of juice at $4 a bottle + 5 yards of cloth at $6 a yard). The CPI in 2016 is ($70 ÷ $65) × 100 = 107.7. The inflation rate is [(107.7 − 100) ÷ 100] × 100 = 7.7 percent.
3. The inflation rate in 2015 is [(219 − 200) ÷ 200] × 100 = 9.5 percent. The inflation rate in 2016 is [(237 − 219) ÷ 219] × 100 = 8.2 percent. In 2016, the CPI increased, but the inflation rate decreased.

Solution to In the News

Deflation occurs when the CPI falls. The CPI fell by 0.1 percent in December 2015 so the United States experienced deflation. The weight in the CPI is highest on rents, which are part of housing (42.1 percent of CPI market basket). The weight on gasoline is part of transportation, the second largest category in the CPI market basket (15.4 percent). The smallest weight is on medical care (8.4 percent).

MyEconLab Concept Video

16.2 THE CPI AND OTHER PRICE LEVEL MEASURES

Cost of living index
A measure of the change in the amount of money that people need to spend to achieve a given standard of living.

The CPI is one of several alternative *price level* measures. Its purpose is to measure the cost of living or what amounts to the same thing, the *value of money*. The CPI is sometimes called a **cost of living index** —a measure of the change in the amount of money that people need to spend to achieve a given standard of living. The CPI is not a perfect measure of the cost of living (value of money) for two broad reasons.

First, the CPI does not try to measure all the changes in the cost of living. For example, the cost of living rises in a severe winter as people buy more natural gas and electricity to heat their homes. A rise in the prices of these items increases the CPI. But the increased quantities of natural gas and electricity bought don't change the CPI because the CPI market basket is fixed. So part of this increase in spending—the increase in the cost of maintaining a given standard of living—doesn't show up as an increase in the CPI.

Second, even those components of the cost of living that are measured by the CPI are not always measured accurately. The result is that the CPI is possibly a biased measure of changes in the cost of living.

Let's look at some of the sources of bias in the CPI and the ways the BLS tries to overcome them.

Sources of Bias in the CPI

The potential sources of bias in the CPI are

- New goods bias
- Quality change bias
- Commodity substitution bias
- Outlet substitution bias



To measure the CPI, the BLS must compare the price of today's smartphone with that of the 1970s Walkman and 1980s Discman.

New Goods Bias

Every year, some new goods become available and some old goods disappear. Make a short list of items that you take for granted today that were not available 10 or 20 years ago. This list includes smartphones; tablet computers; and flat-panel, large-screen television sets. A list of items no longer available or rarely bought includes audiocassette players, vinyl records, photographic film, and typewriters.

When we want to compare the cost of living in 2016 with that in 2006, 1996, or 1986, we must do so by comparing the prices of different baskets of goods. We can't compare the same baskets because today's basket wasn't available 10 years ago and the basket of 10 years ago isn't available today.

To make comparisons, the BLS tries to measure the price of the service performed by yesterday's goods and today's goods. It tries to compare, for example, the price of listening to recorded music, regardless of the technology that delivers that service. But the comparison is hard to make. Today's smartphone delivers an improved quality of sound and level of convenience compared to yesterday's Walkman and Discman.

How much of a new product represents an increase in quantity and quality and how much represents a higher price? The BLS does its best to answer this question, but there is no sure way of making the necessary adjustment. It is believed that the arrival of new goods puts an upward bias into the CPI and its measure of the inflation rate.

Quality Change Bias

Cars, smartphones, laptops, and many other items get better every year. For example, central locking, airbags, and antilock braking systems all add to the quality of a car. But they also add to the cost. Is the improvement in quality greater than the increase in cost? Or do car prices rise by more than can be accounted for by quality improvements? To the extent that a price rise is a payment for improved quality, it is not inflation. Again, the BLS does the best job it can to estimate the effects of quality improvements on price changes. But the CPI probably counts too much of any price rise as inflation and so overstates inflation.



To compare the price of today's cars with those of earlier years, the BLS must value the improvements in features and quality.

Commodity Substitution Bias

Changes in relative prices lead consumers to change the items they buy. People cut back on items that become relatively more costly and increase their consumption of items that become relatively less costly. For example, suppose the price of carrots rises while the price of broccoli remains constant. Now that carrots are more costly relative to broccoli, you might decide to buy more broccoli and fewer carrots. Suppose that you switch from carrots to broccoli, spend the same amount on vegetables as before, and get the same enjoyment as before. Your cost of vegetables has not changed. The CPI says that the price of vegetables has increased because it ignores your substitution between goods in the CPI market basket.



When consumers substitute lower priced broccoli for higher priced carrots, the CPI overstates the rise in the price of vegetables.

Outlet Substitution Bias

When confronted with higher prices, people use discount stores more frequently and convenience stores less frequently. This phenomenon is called *outlet substitution.* Suppose, for example, that gas prices rise by 10¢ a gallon. Instead of buying from your nearby gas station for $4.599 a gallon, you now drive farther to a gas station that charges $4.499 a gallon. Your cost of gas has increased because you must factor in the cost of your time and the gas that you use driving several blocks down the road. But your cost has not increased by as much as the 10¢ a gallon increase in the pump price. However, the CPI says that the price of gas has increased by 10¢ a gallon because the CPI does not measure outlet substitution.

The growth of online shopping in recent years has provided an alternative to discount stores that makes outlet substitution even easier and potentially makes this source of bias more serious.



As consumers shop around for the lowest prices, outlet substitution occurs and the CPI overstates the rise in prices actually paid.

The Magnitude of the Bias

You have reviewed the sources of bias in the CPI. But how big is the bias? When this question was tackled in 1996 by a Congressional Advisory Commission chaired by Michael Boskin, an economics professor at Stanford University, the answer was that the CPI overstated inflation by 1.1 percentage points a year. That is, if the CPI reports that inflation is 3.1 percent a year, most likely inflation is actually 2 percent a year.

In the period since the Boskin Commission reported, the BLS has taken steps to reduce the CPI bias. The more frequent Consumer Expenditure Survey that we described earlier in this chapter is one of these steps. Beyond that, the BLS uses ever more sophisticated models and methods to try to eliminate the sources of bias and make the CPI as accurate as possible.

Two Consequences of the CPI Bias

A bias in the CPI has two main undesirable consequences: It leads to

- Distortion of private contracts
- Increases in government outlays and decreases in taxes

Distortion of Private Contracts

Suppose the United Automobile Workers union (UAW) and Ford Motor Company agree to a three-year wage deal to pay $30 an hour in the first year with increases equal to the percentage change in the CPI in the following years. If the CPI increases by 5 percent each year, the wage rate will increase to $31.50 in the second year and $33.08 in the third year.

Now suppose that the CPI is biased and the true increase in the cost of living is 3 percent a year. In the second year, $30.90 rather than $31.50, and in the third year, $31.83, not $33.08, compensates workers for the higher cost of living. So in the second year, the workers gain 60¢ an hour, or $21 for a 35-hour workweek. And in the third year, they gain $1.25 an hour, or $43.75 for a 35-hour workweek.

The workers' gain is Ford's loss. With a work force of a few thousand, the loss amounts to several thousand dollars a week and a few million dollars over the life of a 3-year wage contract.

Increases in Government Outlays and Decreases in Taxes

The CPI is used to adjust the incomes of the 54 million Social Security beneficiaries, 47 million food stamp recipients, and 4 million retired former military personnel and federal civil servants (and their surviving spouses), and the budget for 3 million school lunches. Close to a third of federal government outlays are linked directly to the CPI. A bias in the CPI would increase all of these expenditures by more than required to compensate for the fall in the buying power of the dollar. Even a 1 percent bias would accumulate over a decade to almost a trillion dollars.

The CPI is also used to adjust the income levels at which higher tax rates apply. The tax rates on large incomes are higher than those on small incomes so, as incomes rise, if these adjustments were not made, the burden of taxes would rise relentlessly. To the extent that the CPI is biased upward, the tax adjustments over-compensate for rising prices and decrease the amount paid in taxes.

Alternative Consumer Price Indexes

Three alternative measures of the price level that we'll describe here aim to improve on the CPI. These measures are the

- Chained Consumer Price Index (C-CPI)
- Personal Consumption Expenditures Price Index (PCEPI)
- PCEPI Excluding Food and Energy

Chained Consumer Price Index (C-CPI)

Chained Consumer Price Index
A measure of the price level calculated using current month and previous month prices and expenditures.

The **Chained Consumer Price Index (C-CPI)** is measure of the price level calculated using current month and previous month prices and expenditures. It is called a "chained" CPI because the inflation rate calculated for the current month is linked back, like the links in a chain, to a reference base month. (See Chapter 14, pp. 395–397 for a description of chain linking). Because it uses current period

expenditures that are updated every month, the C-CPI avoids the bias in the CPI. It takes account of new goods, quality change, and substitution effects. The only weakness of the C-CPI is that it gets revised several times as the data on recent expenditures get revised.

Personal Consumption Expenditures Price Index (PCEPI)

The **Personal Consumption Expenditures Price Index (PCEPI)** is an average of the current prices of the goods and services included in the consumption expenditure component of GDP expressed as a percentage of base year prices. The PCEPI uses current quantities so, like the C-CPI, it avoids the sources of bias in the CPI.

PCEPI
An average of the current prices of the goods and services included in the consumption expenditure component of GDP expressed as a percentage of base year prices.

PCEPI Excluding Food and Energy

Food and energy prices fluctuate much more than other prices and their changes can obscure the underlying trend in the price level. By excluding these highly variable items, the underlying price level and inflation rate can be seen more clearly. The percentage change in the PCEPI excluding food and energy is called the **core inflation rate**.

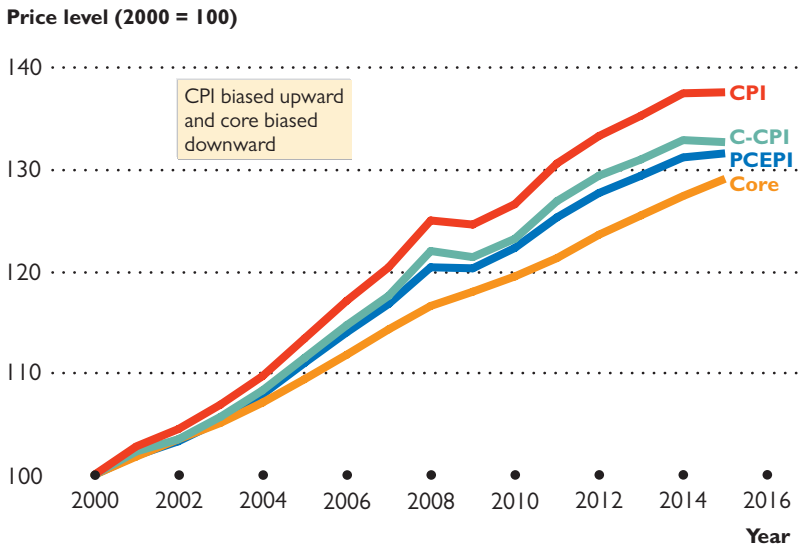
Core inflation rate
The annual percentage change in the PCEPI excluding the prices of food and energy.

Figure 16.3 shows the three alternative measures of the price level alongside the CPI since 2000. The two measures that use current period expenditures, the C-CPI and the PCEPI, are similar. They imply that the price level in 2015 was 132 percent higher than in 2000, which represents an annual inflation rate of 1.9 percent. The CPI rises above these two measures at an average annual inflation rate of 2.2 percent, which is an upward bias of 0.3 percentage points. The PCEPI excluding food and energy, the index used to calculate the core inflation rate, rises more slowly than the other measures. It is biased downward because, on average, food and energy prices rise faster than other prices. *Eye on the U.S. Economy* (on p. 432) looks at another way of identifying the underlying inflation rate.

FIGURE 16.3

Four Measures of Consumer Prices

MyEconLab Real-time data



These four measures of the *price level* rise together.

The Chained Consumer Price Index, C-CPI, and the Personal Consumption Expenditures Price Index, PCEPI, provide the most accurate measure of the price level and inflation rate.

The CPI rises fastest reflecting its upward bias and the PCEPI excluding food and energy, the core inflation measure, rises the slowest reflecting its downward bias.

SOURCES OF DATA: Bureau of Labor Statistics and Bureau of Economic Analysis.

EYE on the U.S. ECONOMY

Measuring and Forecasting Inflation: The Sticky-Price CPI

The *sticky-price CPI* is a price index constructed from the items in the CPI whose prices change infrequently—whose prices are "sticky." These items contrast with the ones whose prices change frequently—whose prices are "flexible."

The table provides some examples. Among the 30 percent of the items in the CPI with flexible prices, the price of motor fuel changes most frequently—on average every 3 weeks. At the other extreme, among the 70 percent of items with sticky prices, the price of medical care services changes least frequently. It remains fixed for more than one year.

The figure shows the CPI inflation rate broken into its sticky-price and flexible-price components. The sticky prices respond to expectations about future market conditions and have small fluctuations. The flexible prices respond to current market conditions and fluctuate a lot.

The sticky-price inflation rate provides information about how expectations of future inflation are changing. Over the five years from 2011 to 2016, when the flexible-price inflation rate was falling, the sticky-price rate was rising. And in 2016, when flexible prices were *falling*, the sticky-price inflation rate exceeded 2 percent per year.

The sticky-price CPI solves three problems with other measures of the price level and inflation rate.

The first problem is volatility and the challenge of probing the underlying inflation rate and predicting its future level. The CPI inflation rate bounces around so much from month to month that it is hard to say what the current inflation rate is.

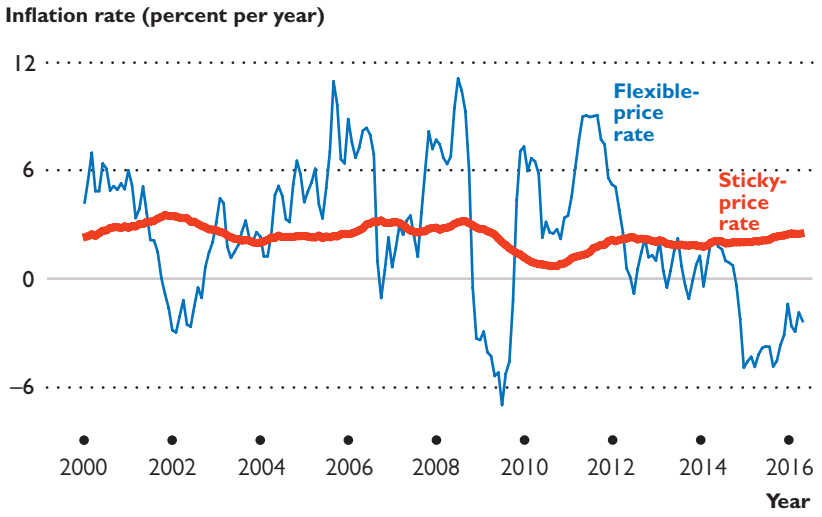
The core inflation rate measures the underlying inflation rate by excluding volatile food and energy prices, which leads to the second problem, bias. The CPI *overstates* the inflation rate and core inflation *understates* it.

The sticky-price CPI shares the small bias of the CPI because the average sticky-price and flexible-price inflation rates are equal. But it is a less biased measure of underlying inflation than the core inflation rate.

The third problem is timing. The Chained CPI (C-CPI) overcomes the problem of bias but, along with the PCEPI, it measures the inflation rate with a delay as more information becomes available on consumer spending. In contrast, the sticky-price CPI is reported just hours after the BLS announces the CPI.

Examples of Flexible-Price and Sticky-Price Items

Flexible-price items (30 percent of total)	Frequency of adjustment (weeks)	Sticky-price items (70 percent of total)	Frequency of adjustment (weeks)
Motor fuel	3	Recreation	34
Meats, poultry, fish, and eggs	8	Communication	36
New vehicles	9	Public transportation	41
Used cars and trucks	9	Rent of primary residence	48
Women's and girls' apparel	10	Education	48
Cereals and bakery products	14	Medical care services	61



Flexible-price and sticky-price inflation rates

SOURCE OF DATA: Federal Reserve Bank of Atlanta.

CHECKPOINT 16.2

MyEconLab Study Plan 16.2
Key Terms Quiz
Solutions Video

Explain the limitations of the CPI and describe other measures of the price level.

Practice Problems

Economists in the Statistics Bureau decide to check the CPI substitution bias. To do so, they conduct a Consumer Expenditure Survey in both 2015 and 2016. Table 1 shows the results of the survey. It shows the items that consumers buy and their prices. The Statistics Bureau fixes the reference base year as 2015.

1. Calculate the CPI in 2016 if the CPI basket contains the 2015 quantities.
2. Calculate the CPI in 2016 if the CPI basket contains the 2016 quantities.
3. Is there any substitution bias in the CPI that uses the 2015 basket? Explain.

TABLE 1

	2015		2016	
Item	Quantity	Price	Quantity	Price
Broccoli	10	$3.00	15	$3.00
Carrots	15	$2.00	10	$4.00

In the News

News releases

In 2015, the CPI increased by 0.7 percent, the C-CPI increased by 0.3 percent, and the PCEPI increased by 0.4 percent.

Sources: Bureau of Economic Analysis and Bureau of Labor Statistics, February, 2016

Why do these three measures of the price level give different inflation rates?

Solutions to Practice Problems

1. Table 2 shows the calculation of the CPI in 2016 when the CPI basket is made of the 2015 quantities. The cost of the 2015 basket at 2015 prices is $60 and the cost of the 2015 basket at 2016 prices is $90. So the CPI in 2016 using the 2015 basket is ($90 ÷ $60) × 100 = 150.
2. Table 3 shows the calculation of the CPI in 2016 when the CPI basket is made of the 2016 quantities. The cost of the 2016 basket at 2015 prices is $65, and the cost of the 2016 basket at 2016 prices is $85. So the CPI in 2016 using the 2016 basket is ($85 ÷ $65) × 100 = 131.
3. The CPI that uses the 2015 basket displays some bias. With the price of broccoli constant and the price of carrots rising, consumers buy fewer carrots and more broccoli and they spend $85 on vegetables. But they would have spent $90 if they had not substituted broccoli for some carrots. The price of vegetables does not rise by 50 percent as shown by the CPI. Because of substitution, the price of vegetables rises by only 42 percent ($85 is 42 percent greater than $60). Using the 2016 basket, the price of vegetables rises by only 31 percent ($85 compared with $65). A CPI substitution bias exists.

TABLE 2

Item	2015 basket at 2015 prices	2015 basket at 2016 prices
Broccoli	$30	$30
Carrots	$30	$60
Total	$60	$90

TABLE 3

Item	2016 basket at 2015 prices	2016 basket at 2016 prices
Broccoli	$45	$45
Carrots	$20	$40
Total	$65	$85

Solution to In the News

These three measures of the price level are based on the prices of different baskets of goods and services. The CPI basket contains only the goods and services that urban consumers buy in the year of the most recent consumer expenditure survey. The basket of the C-CPI contains the goods and services that urban consumers buy in the two most recent years. The basket of the PCEPI contains the goods and services in GDP that households buy in the two most recent years.

MyEconLab Concept Video



Which postage stamp has the higher real price: the 2¢ stamp of 1916 or today's 47¢ stamp?

16.3 NOMINAL AND REAL VALUES

In 2016, it cost 47 cents to mail a first-class letter. One hundred years earlier, in 1916, that same letter would have cost 2 cents to mail. Does it *really* cost you 23.5 times the amount that it cost your great-great-grandmother to mail a letter?

You know that it does not. You know that a dollar today buys less than what a dollar bought in 1916, so the cost of a stamp has not really increased to 23.5 times its 1916 level. But has it increased at all? Did it really cost you any more to mail a letter in 2016 than it cost your great-great-grandmother in 1916?

The CPI can be used to answer questions like these. In fact, that is one of the main reasons for constructing a price index. Let's see how we can compare the price of a stamp in 1916 and the price of a stamp in 2016.

Dollars and Cents at Different Dates

To compare dollar amounts at different dates, we need to know the CPI at those dates. Currently, the CPI equals 100 for reference base period 1982–1984. That is, the average of the CPI in 1982, 1983, and 1984 is 100. (The numbers for the three years are 96.4, 99.6, and 103.9, respectively. Calculate the average of these numbers and check that it is indeed 100.)

In 2016, the CPI was 240.2, and in 1916, it was 10.9. By using these two numbers, we can calculate the relative value of the dollar in 1916 and 2016. To do so, we divide the 2016 CPI by the 1916 CPI. That ratio is 240.2 divided by 10.9, or 22. That is, prices on average were 22 times higher in 2016 than in 1916.

We can use this ratio to convert the price of a 2-cent stamp in 1916 into its 2016 equivalent. The formula for this calculation is

$$\text{Price of stamp in 2016 dollars} = \text{Price of stamp in 1916 dollars} \times \frac{\text{CPI in 2016}}{\text{CPI in 1916}}$$

$$= 2 \text{ cents} \times \frac{240.2}{10.9} = 44 \text{ cents.}$$

So your great-great-grandmother did pay less than you pay! It really cost her 3 cents less to mail that first-class letter than it cost you in 2016. She paid the equivalent of 44 cents in 2016 money, and you paid 47 cents.

We've just converted the 1916 price of a stamp to its 2016 equivalent. We can do a similar calculation the other way around—converting the 2016 price to its 1916 equivalent. The formula for this alternative calculation is

$$\text{Price of stamp in 1916 dollars} = \text{Price of stamp in 2016 dollars} \times \frac{\text{CPI in 1916}}{\text{CPI in 2016}}$$

$$= 47 \text{ cents} \times \frac{10.9}{240.2} = 2.13 \text{ cents.}$$

The interpretation of this number is that you pay the *equivalent* of 2.13 cents in 1916 dollars. Your *real* price of a stamp is 2.13 cents expressed in 1916 dollars.

The calculations that we've just done are examples of converting a *nominal* value into a *real* value. A nominal value is one that is expressed in current dollars. A real value is one that is expressed in the dollars of a given year. We're now going to see how we convert other nominal macroeconomic variables into real variables using a similar method.

Nominal and Real Values in Macroeconomics

Macroeconomics makes a big issue of the distinction between the nominal value and the real value of a variable. Three nominal and real variables occupy a central position in macroeconomics. They are

- Nominal GDP and real GDP
- The nominal wage rate and the real wage rate
- The nominal interest rate and the real interest rate

We begin our examination of real and nominal variables in macroeconomics by reviewing what you've already learned about the distinction between nominal GDP and real GDP and interpreting that distinction in a new way.

Nominal GDP and Real GDP

When we calculated real GDP in 2016 in terms of 2009 dollars in Chapter 14 (pp. 380–381), we expressed the values of the goods and services produced in 2016 in terms of the prices that prevailed in 2009. We calculated real GDP directly. We didn't multiply nominal GDP in 2016 by the ratio of a price index in the two years.

But we can *interpret* real GDP in 2016 as nominal GDP in 2016 multiplied by the ratio of a price index in 2009 to its value in 2016. The price index that we would use is the **GDP price index**, which is an average of the current prices of all the goods and services included in GDP expressed as a percentage of the base year prices.

GDP price index
An average of the current prices of all the goods and services included in GDP expressed as a percentage of base year prices.

The GDP price index in 2009 (the base year) is defined to be 100, so we can interpret real GDP in any year as nominal GDP divided by the GDP price index in



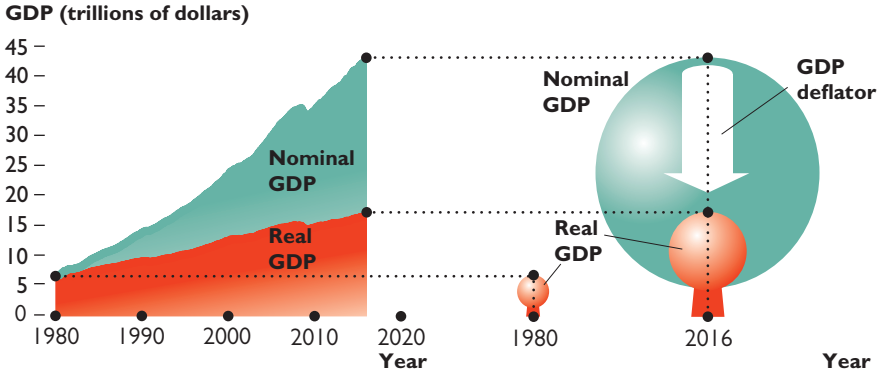
EYE on the U.S. ECONOMY

Deflating the GDP Balloon

Nominal GDP increased every year between 1980 and 2016 except for 2009. Part of the increase reflects increased production, and part of it reflects rising prices.

You can think of GDP as a balloon that is blown up by growing production and rising prices. In the figure, the GDP price index or *GDP deflator* lets the inflation air—the contribution of rising prices—out of the nominal GDP balloon so that we can see what has happened to real GDP.

The small red balloon for 1980 shows real GDP in that year. The green balloon shows nominal GDP in 2016, and the red balloon for 2016 shows real GDP for that year.



SOURCE OF DATA: Bureau of Economic Analysis.

To see real GDP in 2016, we use the GDP price index to deflate nominal GDP. With the inflation air removed, we can see by how much real GDP grew from 1980 to 2016.

that year multiplied by 100. We don't calculate real GDP this way, but we can interpret it this way.

The GDP price index, or the CPI, or another price index might be used to convert a nominal variable to a real variable.

Nominal Wage Rate and Real Wage Rate

Nominal wage rate
The average hourly wage rate measured in current dollars.

Real wage rate
The average hourly wage rate measured in the dollars of a given reference base year.

The price of labor services is the wage rate—the income that an hour of labor earns. In macroeconomics, we are interested in economy-wide performance, so we focus on the *average* hourly wage rate. The **nominal wage rate** is the average hourly wage rate measured in *current* dollars. The **real wage rate** is the average hourly wage rate measured in the dollars of a given reference base year.

To calculate the real wage rate relevant to a consumer, we divide the nominal wage rate by the CPI and multiply by 100. That is,

$$\text{Real wage rate in 2015} = \frac{\text{Nominal wage rate in 2015}}{\text{CPI in 2015}} \times 100.$$

In 2015, the nominal wage rate (average hourly wage rate) of production workers was $21.04 and the CPI was 237, so

$$\text{Real wage rate in 2015} = \frac{\$21.04}{237} \times 100 = \$8.88.$$

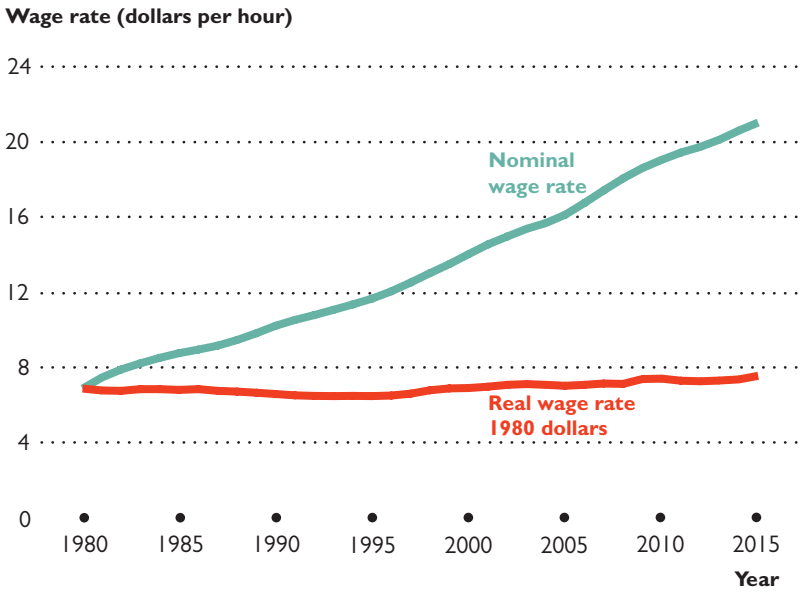
Because we measure the real wage rate in constant base period dollars, a change in the real wage rate measures the change in the quantity of goods and

FIGURE 16.4

Nominal and Real Wage Rates: 1980–2015

MyEconLab Real-time data

The nominal wage rate has increased every year since 1980. The real wage rate decreased slightly from 1985 through the mid-1990s, after which it increased slightly. Over the entire 35-year period, the real wage rate remained steady.



SOURCE OF DATA: Bureau of Labor Statistics.

services that an hour's work can buy. In contrast, a change in the nominal wage rate measures a combination of a change in the quantity of goods and services that an hour's work can buy and a change in the price level. So the real wage rate removes the effects of inflation from the changes in the nominal wage rate.

The real wage rate is a significant economic variable because it measures the real reward for labor services, which is a major determinant of the standard of living. The real wage rate is also significant because it measures the real cost of labor services, which influences the quantity of labor that firms are willing to hire.

Figure 16.4 shows what has happened to the nominal wage rate and the real wage rate in the United States between 1980 and 2015. The nominal wage rate is the average hourly earnings of production workers. This measure is just one of several different measures of average hourly earnings that we might have used.

The nominal wage rate increased from $6.85 an hour in 1980 to $21.04 an hour in 2015, but the real wage rate barely changed. In 1980 dollars, the real wage rate in 2015 was only $8.88 an hour.

The real wage rate barely changed as the nominal wage rate increased because the nominal wage rate grew at a rate almost equal to the inflation rate. When the effects of inflation are removed from the nominal wage rate, we can see what is happening to the buying power of the average wage rate.

You can also see that the real wage rate has fluctuated a little. It decreased slightly until the mid-1990s, after which it increased slightly.

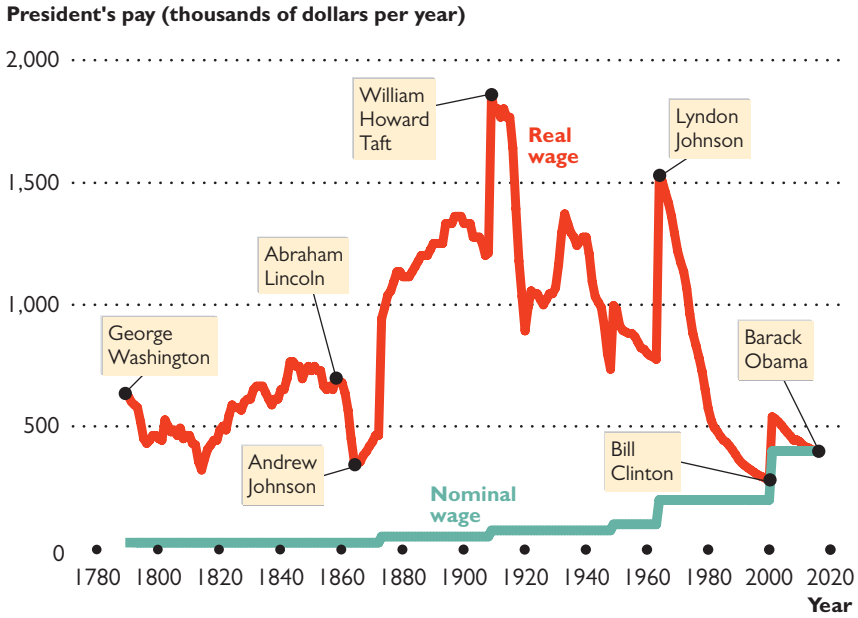


EYE on the PAST

The Nominal and Real Wage Rates of Presidents of the United States

Who earned more, Barack Obama in 2016, or George Washington in 1788? George Washington's pay was $25,000 (on the green line), but in 2016 dollars it was $619,000 (on the red line). Barack Obama was paid $400,000 in 2016.

But presidential accommodations are more comfortable today, and presidential travel arrangements are a breeze compared to earlier times. So adding in the perks of the job, Barack Obama didn't get such a raw deal.



SOURCE OF DATA:
Robert Sahr, Oregon State University, http://oregonstate.edu/cla/polisci/sahr/sahr.

Nominal Interest Rate and Real Interest Rate

Nominal interest rate
The dollar amount of interest expressed as a percentage of the amount loaned.

Real interest rate
The goods and services forgone in interest expressed as a percentage of the amount loaned and calculated as the nominal interest rate minus the inflation rate.

You've just seen that we can calculate real values from nominal values by deflating them using the CPI. And you've seen that to make this calculation, we *divide* the nominal value by a price index. Converting a nominal interest rate to a real interest rate is a bit different. To see why, we'll start with their definitions.

A **nominal interest rate** is the dollar amount of interest expressed as a percentage of the amount loaned. For example, suppose that you have $1,000 in a bank deposit—a loan by you to a bank—on which you receive interest of $50 a year. The nominal interest rate is $50 as a percentage of $1,000, which is 5 percent a year.

A **real interest rate** is the goods and services forgone in interest expressed as a percentage of the amount loaned. Continuing with the above example, at the end of one year your bank deposit has increased to $1,050—the original $1,000 plus the $50 interest. Suppose that during the year prices increased by 3 percent, so now you need $1,030 to buy what $1,000 would have bought a year earlier. How much interest did you *really* receive? The answer is $20, or a real interest rate of 2 percent a year.

To convert a nominal interest rate to a real interest rate, we *subtract* the *inflation rate.* That is,

$$\text{Real interest rate} = \text{Nominal interest rate} - \text{Inflation rate.}$$

Put your numbers into this formula. Your nominal interest rate is 5 percent a year, and the inflation rate is 3 percent a year, so your real interest rate is 5 percent minus 3 percent, which equals 2 percent a year.

Figure 16.5 shows the nominal and the real interest rates in the United States between 1976 and 2016. When the inflation rate is high, the gap between the real interest rate and nominal interest rate is large. Sometimes, the real interest rate is negative (as it was during the late 1970s) and the lender pays the borrower!



EYE on BOX OFFICE HITS

MyEconLab Critical Thinking Exercise

Which Movie *Really* Was the Biggest Box Office Hit?

Gone with the Wind is the answer to the question that we posed at the beginning of this chapter.

To get this answer, Box Office Mojo (www.boxofficemojo.com) calculates the amount that a movie *really* earns by converting the dollars earned to their equivalent in current year dollars. But rather than use the CPI, it uses the average prices of movie tickets as its price index.

Gone with the Wind was made in 1939. Looking only at its performance in the United States, the movie was rereleased in nine subsequent years and by 2015 it had earned a total box office revenue of almost $200 million.

Star Wars: The Force Awakens, released in 2015, earned $937 million. So the 2015 *Star Wars: The Force Awakens* earned almost five times the dollars earned by *Gone with the Wind.*

To convert the *Gone with the Wind* revenues into 2015 dollars, Box Office Mojo multiplies the dollars received each year by the 2015 ticket price and divides by the ticket price for the year in which the dollars were earned.

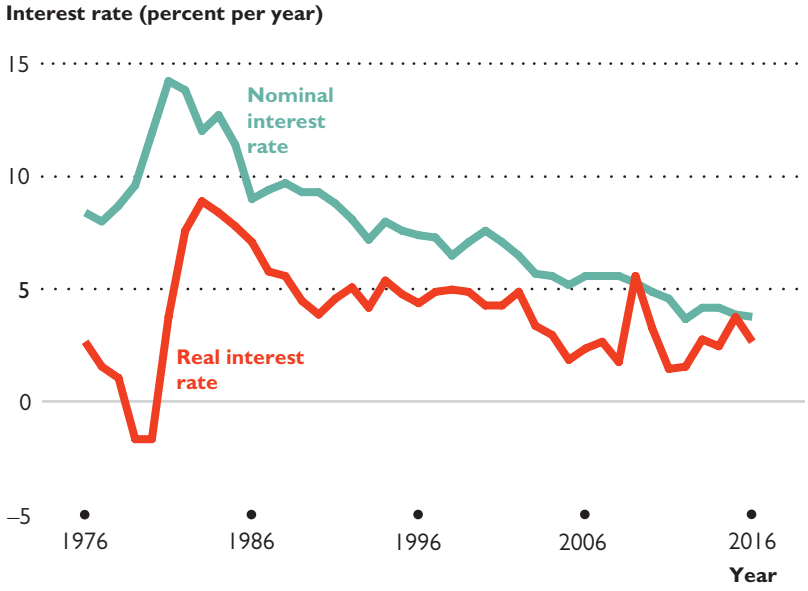
Valuing the tickets for *Gone with the Wind* at 2015 movie-ticket prices, it has earned $1,733 million, almost double *Star Wars: The Force Awakens* revenue.

Because Box Office Mojo uses average ticket prices, the real variable that it compares is the number of tickets sold. The average ticket price in 2015 was $8.43, which means 206 million have seen *Gone with the Wind* and 111 million have seen *Star Wars: The Force Awakens*. *Gone with the Wind* was the biggest hit because it was seen by the greatest number of people.

FIGURE 16.5

Nominal and Real Interest Rates: 1976–2016

MyEconLab Real-time data



The interest rate shown here is that paid by the safest large corporations on long-term bonds (known as Moody's AAA).

The real interest rate equals the nominal interest rate minus the inflation rate, so the vertical gap between the nominal interest rate and the real interest rate is the inflation rate. The real interest rate is usually positive, but during the late 1970s, it became negative.

SOURCES OF DATA: Federal Reserve and Bureau of Labor Statistics.



EYE on YOUR LIFE

A Student's CPI

MyEconLab Critical Thinking Exercise

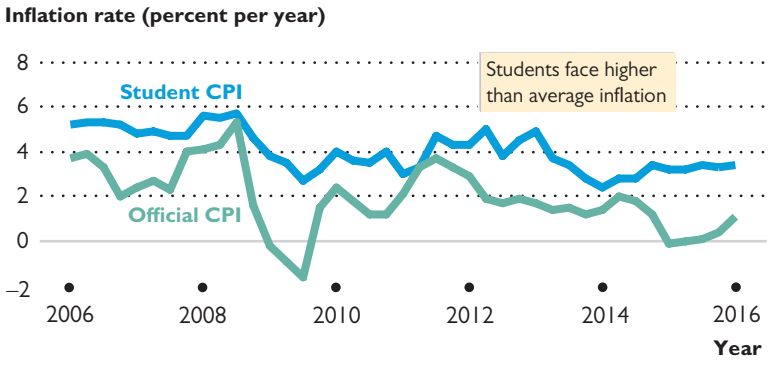
The CPI measures the percentage change in the average prices paid for the basket of goods and services bought by a typical urban household.

A student is not a typical household. How have the prices of a student's basket of goods and services changed? The answer is by a lot more than those of an average household.

Suppose that a student spends 25 percent of her income on rent, 25 percent on tuition, 25 percent on books and study supplies, 10 percent on food, 10 percent on transportation, and 5 percent on clothing.

We can use these weights and the data collected by the BLS on individual price categories to find the student's CPI and the inflation rate that it implies.

The graph shows this student's inflation rate compared to that of the official CPI. Between 2006 and 2016, the student's CPI rose 34 percent above the official CPI. Rent, textbooks, and tuition are the main items whose prices rose faster than average.



SOURCE OF DATA: Bureau of Labor Statistics.

MyEconLab Study Plan 16.3
Key Terms Quiz
Solutions Video

CHECKPOINT 16.3

Adjust money values for inflation and calculate real wage rates and real interest rates.

Practice Problems

TABLE 1

Year	Price of gasoline (cents per gallon)	CPI
1985	112	107.6
1995	115	152.4
2005	230	195.3
2015	245	237.0

1. Table 1 shows the price of gasoline and the CPI for four years. The reference base period is 1982–1984. Calculate the real price of gasoline each year. In which year was this real price highest and in which year was it lowest?
2. Ford says it cut its labor costs by 35 percent between 2006 and 2011. Ford's wage rate, including benefits, was $80 an hour in 2006 and $58 an hour in 2011. The CPI was 202 in 2006 and 218 in 2011. Did the real wage rate fall by more or less than 35 percent?
3. Sally worked all year and put her savings into a mutual fund that paid a nominal interest rate of 7 percent a year. During the year, the CPI increased from 165 to 177. What was the real interest rate that Sally earned?

In the News

Negative interest rates

The Federal Reserve has held interest rates close to zero percent for the past seven years. Even with low inflation, "real" interest rates have been negative.

Source: *San Diego Union Tribune*, February 5, 2016

Explain why with a zero interest rate, even low inflation makes the real interest rate negative. Can the real interest rate exceed the nominal interest rate?

Solutions to Practice Problems

TABLE 2

Year	Price of gasoline (cents per gallon)	CPI	Price of gasoline (1982–1984 cents per gallon)
1985	112	107.6	104
1995	115	152.4	75
2005	230	195.3	118
2015	245	237.0	103

1. To calculate the real price, divide the nominal price by the CPI and multiply by 100. Table 2 shows the calculations. The real price was highest in 2005, when it was 118 cents (1982–1984 cents) per gallon. The real price was lowest in 1995, when it was 75 cents (1982–1984 cents) per gallon.
2. The real wage rate in 2006, expressed in dollars of the reference base year, equals ($80 ÷ 202) × 100, or $39.60 an hour. The real wage rate in 2011, expressed in dollars of the reference base year, equals ($58 ÷ 218) × 100, or $26.61 an hour. The real wage rate of these workers fell by 32.8 percent.
3. The inflation rate during the year equals [(177 − 165) ÷ 165] × 100, which is 7.3 percent. The real interest rate that Sally earned equals the nominal interest rate minus the inflation rate, which is 7.0 − 7.3, or −0.3 percent. Sally's real interest rate was negative. (If Sally had kept her savings in cash, her nominal interest rate would have been zero, and her real interest rate would have been −7.3 percent. She would have been worse off.)

Solution to In the News

The real interest rate equals the nominal interest rate minus the inflation rate. So if the nominal interest rate equals zero, the real interest rate equals the negative of the inflation rate. If the inflation rate is 1 percent, the real interest rate is *minus* 1 percent, a negative number. The real interest rate exceeds the nominal interest rate if the inflation rate is negative (if there is deflation).

CHAPTER SUMMARY

Key Points

1. Explain what the Consumer Price Index (CPI) is and how it is calculated.

- The Consumer Price Index (CPI) is a measure of the average of the prices of the goods and services that an average urban household buys.
- The CPI is calculated by dividing the cost of the CPI market basket in the current period by its cost in the base period and then multiplying by 100.

2. Explain the limitations of the CPI and describe other measures of the price level.

- The CPI does not include all the items that contribute to the cost of living.
- The CPI cannot provide an accurate measure of price changes because of new goods, quality improvements, and substitutions that consumers make when relative prices change.
- Other measures of the price level include the Chained Consumer Price Index (C-CPI), the Personal Consumption Expenditures Price Index (PCEPI), and the PCEPI Excluding Food and Energy.
- Both the C-CPI and the PCEPI use current information on quantities and to some degree overcome the sources of bias in the CPI.
- The PCEPI excluding food and energy is used to calculate the core inflation rate, which shows the inflation trend.

3. Adjust money values for inflation and calculate real wage rates and real interest rates.

- To adjust a money value (also called a nominal value) for inflation, we express the value in terms of the dollars of a given year.
- To convert a dollar value of year *B* to the dollars of year *A*, multiply the value in year *B* by the price level in year *A* and divide by the price level in year *B*.
- The real wage rate equals the nominal wage rate divided by the CPI and multiplied by 100.
- The real interest rate equals the nominal interest rate minus the inflation rate.

Key Terms

MyEconLab Key Terms Quiz

Chained Consumer Price Index, 430
Consumer Price Index, 422
Core inflation rate, 431
Cost of living index, 428
Deflation, 425
GDP price index, 435
Inflation rate, 425
Nominal interest rate, 438
Nominal wage rate, 436
PCEPI, 431
Price level, 425
Real interest rate, 438
Real wage rate, 436
Reference base period, 422

MyEconLab Chapter 16 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

TABLE 1 DATA FOR WEEK 1

Item	Quantity	Price (per unit)
Coffee	11 cups	$3.25
DVDs	1	$25.00
Gasoline	15 gallons	$2.50

TABLE 2 DATA FOR WEEK 2

Item	Quantity	Price (per unit)
Coffee	11 cups	$3.25
DVDs	3	$12.50
Gasoline	5 gallons	$3.00
Concert	1 ticket	$95.00

TABLE 3

Item	Price in June (dollars per unit)	Price in July (dollars per unit)
Steak	4.11	4.01
Bread	3.25	3.12
Bacon	3.62	3.64
Milk	2.62	2.62
Tomatoes	1.60	1.62
Apples	1.18	1.19
Bananas	0.62	0.66
Chicken	1.28	1.26
Lettuce	1.64	1.68

1. In Canada, the reference base period for the CPI is 2002. By 2014, prices had risen by 25.2 percent since the base period. The inflation rate in Canada in 2015 was 1.1 percent. Calculate the CPI in Canada in 2015.

2. In Brazil, the reference base period for the CPI is 2000. By 2005, prices had risen by 51 percent since the base period. The inflation rate in Brazil in 2006 was 10 percent, and in 2007, the inflation rate was 9 percent. Calculate the CPI in Brazil in 2006 and 2007. Brazil's CPI in 2008 was 173. Did Brazil's cost of living increase or decrease in 2008?

3. Tables 1 and 2 show the quantities of the goods that Suzie bought and the prices she paid during two consecutive weeks. Suzie's CPI market basket contains the goods she bought in Week 1. Calculate the cost of Suzie's CPI market basket in Week 1 and in Week 2. What percentage of the CPI market basket is gasoline? Calculate the value of Suzie's CPI in Week 2 and her inflation rate in Week 2.

Use the following information to work Problems **4** and **5**.

The GDP price index in the United States in 2008 was about 99, and real GDP in 2008 was $14.8 trillion (2009 dollars). The GDP price index in 2013 was about 107, and real GDP in 2013 was $15.5 trillion (2009 dollars).

4. Calculate nominal GDP in 2008 and in 2013 and the percentage increase in nominal GDP between 2008 and 2013.

5. What was the percentage increase in production between 2008 and 2013, and by what percentage did the price level rise between 2008 and 2013?

6. Table 3 shows the prices that Terry paid for some of his expenditures in June and July 2016. Explain and discuss why these prices might have led to commodity substitution or outlet substitution.

7. In 2015, Annie, an 80-year-old, is telling her granddaughter Mary about the good old days. Annie says that in 1935, you could buy a nice house for $15,000 and a jacket for $5. Mary says that in 2015 such a house cost $220,000 and such a jacket cost $70. The CPI in 1935 was 16.7 and in 2015 it was 218.1. Which house has the lower real price? Which jacket has the lower real price?

Use the following information to work Problems **8** and **9**.

Consumer prices drop as falling oil costs push inflation lower

Falling oil prices pushed the CPI down 0.1 percent in December 2015. Energy prices fell 2.4 percent and the price of gasoline fell by 3.9 percent.

Source: *Los Angeles Times*, January 20, 2016

8. Given the further information that the weight on energy prices in the CPI is 8 percent, by how much would the CPI have changed in December 2015 if energy prices had not changed?

9. By what percentage did the prices of other items in the CPI basket change?

10. Read *Eye on Box Office Hits* on p. 438 and using BLS data for the CPI in 1982 and 1997, determine which movie had the greater *real* box office revenues, *E.T.: The Extra-Terrestrial*, which earned $435 million in 1982 or *Titanic*, which earned $601 million in 1997.

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. Compare the method used by Box Office Mojo on p. 438 to calculate real box office receipts with the method used on p. 434 to calculate the real price of a postage stamp. Compare and contrast the real variables that each method calculates.
2. Pete is a student who spends 10 percent of his expenditure on books and supplies, 30 percent on tuition, 30 percent on rent, 10 percent on food and drink, 10 percent on transportation, and the rest on clothing. The price index for each item was 100 in 2006. Table 1 shows the prices in 2016.
   What is Pete's CPI in 2016? (Hint: The contribution of each item to the CPI is its price weighted by its share of total expenditure.) Did Pete experience a higher or lower inflation rate between 2006 and 2016 than the student whose CPI is shown on p. 439?
3. The people on Coral Island buy only juice and cloth. The CPI market basket contains the quantities bought in 2016. The average household spent $60 on juice and $30 on cloth in 2016 when the price of juice was $2 a bottle and the price of cloth was $5 a yard. In the current year, 2017, juice is $4 a bottle and cloth is $6 a yard. Calculate the CPI and the inflation rate in 2017.
4. Tables 2 and 3 show the quantities of the goods that Harry bought and the prices he paid during two consecutive weeks. Harry's CPI market basket contains the goods he bought in Week 1. Calculate Harry's CPI in Week 2. What was his inflation rate in Week 2?

TABLE 1

Item	Price in 2016
Books and supplies	172.6
Tuition	169.0
Rent	159.0
Food and drink	129.8
Transportation	115.4
Clothing	92.9

TABLE 2 DATA FOR WEEK 1

Item	Quantity	Price (per unit)
Coffee	5 cups	$3.00
iTunes songs	5	$1.00
Gasoline	10 gallons	$2.00

TABLE 3 DATA FOR WEEK 2

Item	Quantity	Price (per unit)
Coffee	4 cups	$3.25
iTunes songs	10	$1.00
Gasoline	10 gallons	$3.00

Use the following information to work Problems **5** and **6**.

The base year is 2012. Real GDP in 2012 was $15 trillion. The GDP price index in 2012 was 105, and real GDP in 2015 was $16 trillion.

5. Calculate nominal GDP in 2012 and in 2015 and the percentage increase in nominal GDP from 2012 to 2015.
6. What was the percentage increase in production from 2012 to 2015, and by what percentage did the price level rise from 2012 to 2015?
7. In 1988, the average wage rate was $9.45 an hour and in 2008 the average wage rate was $18.00 an hour. The CPI in 1988 was 118.3 and in 2008 it was 215.3. In which year was the real wage rate higher?
8. Imagine that you are given $1,000 to spend and told that you must spend it all buying items from a Sears catalog. But you do have a choice of catalog. You may select from the 1903 catalog or from Sears.com today. You will pay the prices quoted in the catalog that you choose.

   Which catalog will you choose and why? Refer to any biases in the CPI that might be relevant to your choice.

Use the following information to work Problems **9** and **10**.

Brazil keeps interest rates on hold

Brazil's inflation rate climbed to 10.7 percent at the end of 2015 and the country's Monetary Policy Committee kept its benchmark interest rate at 14.25 percent.

Source: *The Financial Times*, January 20, 2016

9. Calculate the real interest rate in Brazil.
10. To maintain this real interest rate, how must the nominal interest rate change if the inflation rate falls to 4.5 percent a year?

MyEconLab Chapter 16 Study Plan

Multiple Choice Quiz

1. The CPI measures the average prices paid by _____ for _____.

A. urban consumers; a fixed basket of consumption goods and services
B. urban consumers; the average basket of goods and services they buy
C. all consumers; housing, transportation, and food
D. everyone who earns an income; the necessities of life

2. The BLS reported that the CPI in July 2010 was 226. This news tells you that _____.

A. consumer prices during July were 226 percent higher than they were during the base year
B. the CPI inflation rate in July was 26 percent a year
C. consumer prices rose by 26 percent during the month of July
D. the prices of consumption goods and services have risen, on average, by 126 percent since the base year

3. When the price level _____ the inflation rate _____.

A. rises rapidly; increases
B. rises rapidly; is high
C. falls; is zero
D. rises slowly; falls

4. The CPI bias arises from all of the following items *except* _____.

A. the introduction of new goods and services
B. the improved quality of goods
C. the goods and services bought by poor people
D. consumers' responses to price changes

5. Of the alternative measures of the price level, the _____ overcomes the bias of the CPI and is a better measure of the inflation rate because it _____.

A. GDP price index; uses a current basket
B. PCEPI; uses a current basket of all consumption goods
C. PCEPI excluding food and energy; is less volatile
D. GDP price index; includes all goods and services bought by Americans

6. If nominal GDP increases by 5 percent a year and the GDP price index rises by 2 percent a year, then real GDP increases by _____.

A. 7 percent a year
B. 3 percent a year
C. 2.5 percent a year
D. 10 percent a year

7. When the CPI increases from 200 in 2016 to 210 in 2017 and the nominal wage rate is constant at $10 an hour, the real wage rate _____.

A. increases by 10 percent
B. increases to $15 an hour
C. decreases by 5 percent
D. is $10 an hour

8. When the price level is rising at _____ and the real interest rate is 1 percent a year, the nominal interest rate is 3 percent a year.

A. 4 percent a year
B. 3 percent a year
C. 2 percent a year
D. 1 percent a year





Why are some nations rich and others poor?

Potential GDP and Economic Growth

17

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Explain what determines potential GDP.
2. Define and calculate the economic growth rate, and explain the implications of sustained growth.
3. Explain the sources of labor productivity growth.
4. Describe policies that speed economic growth.

MyEconLab Big Picture Video

MyEconLab Concept Video

MACROECONOMIC APPROACHES AND PATHWAYS

In the three previous chapters, you learned how economists define and measure real GDP, employment and unemployment, the price level, and the inflation rate—the key variables that *describe* macroeconomic performance. Your task in this chapter and those that follow is to learn the *macroeconomic theory* that *explains* macroeconomic performance and provides the basis for *policies* that might improve it.

The macroeconomic theory that we present is today's consensus view on how the economy works. But it isn't the view of all macroeconomists. Today's consensus is a merger of three earlier schools of thought that have sharply contrasting views about the causes of recessions and the best policies for dealing with them. Some economists continue to identify with these schools of thought, and the severity of the 2008–2009 recession and slow recovery intensified debate and gave economists of all shades of opinion a platform from which to present their views.

We begin with an overview of the three schools of thought from which today's consensus has emerged.

The Three Main Schools of Thought

The three main schools of macroeconomic thought are

- Classical macroeconomics
- Keynesian macroeconomics
- Monetarist macroeconomics

Classical Macroeconomics

Classical macroeconomics
The view that the market economy works well, that aggregate fluctuations are a natural consequence of an expanding economy, and that government intervention cannot improve the efficiency of the market economy.

According to **classical macroeconomics**, markets work well and deliver the best available macroeconomic performance. Aggregate fluctuations are a natural consequence of an expanding economy with rising living standards, and government intervention can only hinder the ability of the market to allocate resources efficiently. The first classical macroeconomists included Adam Smith, David Ricardo, and John Stuart Mill, all of whom worked in the 18th and 19th centuries. Modern day classical economists include the 2004 Nobel Laureates Edward C. Prescott of the University of Arizona and Finn E. Kydland of Carnegie-Mellon University and the University of California at Santa Barbara.

Classical macroeconomics fell into disrepute during the Great Depression of the 1930s, a time when many people believed that *capitalism*, the political system of private ownership, free markets, and democratic political institutions, could not survive and began to advocate *socialism*, a political system based on state ownership of capital and central economic planning.

Classical macroeconomics predicted that the Great Depression would eventually end but offered no method for ending it more quickly.

Keynesian Macroeconomics

Keynesian macroeconomics
The view that the market economy is inherently unstable and needs active government intervention to achieve full employment and sustained economic growth.

According to **Keynesian macroeconomics**, the market economy is inherently unstable and requires active government intervention to achieve full employment and sustained economic growth. One person, John Maynard Keynes, and his book *The General Theory of Employment, Interest, and Money*, published in 1936, began this school of thought. Keynes' theory was that depression and high unemployment occur when households don't spend enough on consumption goods and services

and businesses don't spend enough investing in new capital. That is, too little *private* spending is the cause of depression (and recession). To counter the problem of too little private spending, *government* spending must rise.

This Keynesian view picked up many followers and by the 1950s it was the mainstream, but it lost popularity during the inflationary 1970s when it seemed ever more remote from the problems of that decade. The global recession of 2008–2009 and the fear of another great depression revived interest in Keynesian ideas and brought a new wave of attacks on classical macroeconomics with Nobel Laureate Paul Krugman leading the charge in the columns of the *New York Times*.

Monetarist Macroeconomics

According to **monetarist macroeconomics**, the *classical* view of the world is broadly correct but in addition to fluctuations that arise from the normal functioning of an expanding economy, fluctuations in the quantity of money generate the business cycle. A slowdown in the growth rate of money brings recession and a large decrease in the quantity of money brought the Great Depression.

Monetarist macroeconomics
The view that the market economy works well, that aggregate fluctuations are a natural consequence of an expanding economy, but that fluctuations in the quantity of money generate the business cycle.

Milton Friedman, intellectual leader of the Chicago School of economists during the 1960s and 1970s, was the most prominent monetarist. The view that monetary contractions are the sole source of recessions and depressions is held by few economists today. But the view that the quantity of money plays a role in economic fluctuations is accepted by all economists and is part of today's consensus.

Today's Consensus

Each of the earlier schools provides insights and ingredients that survive in today's consensus. *Classical* macroeconomics provides the story of the economy at or close to full employment. But the classical approach doesn't explain how the economy performs in the face of a major slump in spending.

Keynesian macroeconomics takes up the story in a recession or depression. When spending is cut and the demand for most goods and services and the demand for labor all decrease, prices and wage rates don't fall but the quantity of goods and services sold and the quantity of labor employed do fall and the economy goes into recession. In a recession, an increase in spending by governments, or a tax cut that leaves people with more of their earnings to spend, can help to restore full employment.

Monetarist macroeconomics elaborates the Keynesian story by emphasizing that a contraction in the quantity of money brings higher interest rates and borrowing costs, which are a major source of cuts in spending that bring recession. Increasing the quantity of money and lowering the interest rate in a recession can help to restore full employment. And keeping the quantity of money growing steadily in line with the expansion of the economy's production possibilities can help to keep inflation in check and can also help to moderate the severity of a recession.

Another component of today's consensus is the view that the *long-term* problem of economic growth is more important than the *short-term* problem of recessions. Take a look at *Eye on the U.S. Economy*, on p. 448, and you will see why. Even a small slowdown in economic growth brings a huge cost in terms of a permanently lower level of income per person. This cost is much larger than that arising from the income lost during recessions. But the costs of recessions are serious because they are concentrated on those who are unemployed.



EYE on the U.S. ECONOMY

The Lucas Wedge and the Okun Gap

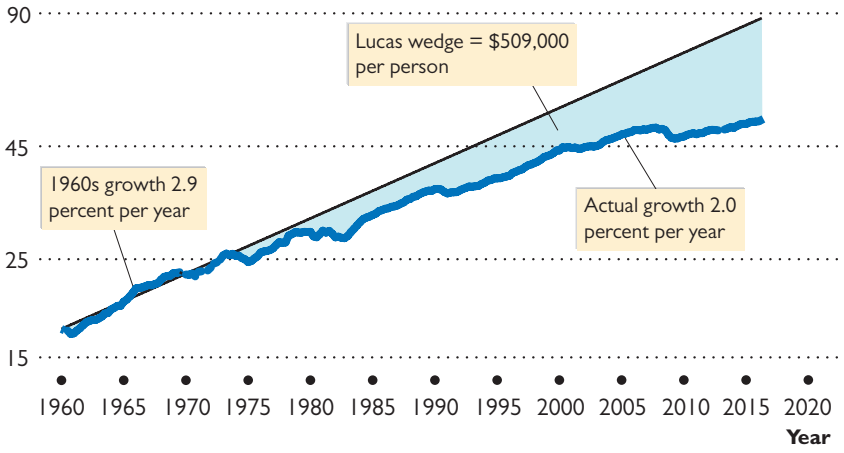
During the 1960s, U.S. real GDP per person grew at a rate of 2.9 percent a year. The black line in part (a) shows the path that would have been followed if this growth rate had been maintained. After 1970, growth slowed to 2.0 percent per year and the blue line shows the path that real GDP per person followed. University of Chicago economist Robert E. Lucas, Jr. pointed out the large output loss that resulted from this growth slowdown. Part (a) shows this loss as the *Lucas wedge*, which is equivalent to a staggering $509,000 per person or 10 years' income.

Real GDP fluctuates around potential GDP and when the output gap is negative, output is lost. Brookings Institution economist Arthur B. Okun drew attention to this loss. Part (b) shows this loss as the *Okun gap*, which is equivalent to $34,000 per person or about 8 months' income.

Smoothing the business cycle and eliminating the Okun gap has a big payoff. But finding ways of restoring real GDP growth to its 1960s rate has a vastly bigger payoff.

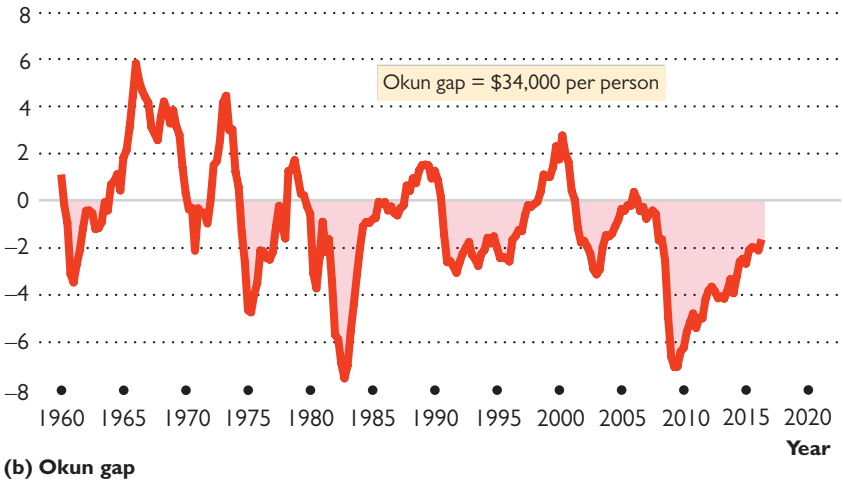
SOURCES OF DATA: Bureau of Economic Analysis, the Congressional Budget Office, and authors' assumptions and calculations.

Real GDP per person (thousands of 2009 dollars; ratio scale)



(a) Lucas wedge

Output gap (percentage of potential GDP)



(b) Okun gap

The Road Ahead

This book bases your tour of macroeconomics on the new consensus. We begin in this chapter by explaining what determines potential GDP and the pace at which it grows. We then study money and explain what brings inflation. Finally, we explain how real and monetary forces interact to bring about the business cycle. We also explain the policy tools available to governments and central banks to improve macroeconomic performance.

17.1 POTENTIAL GDP

MyEconLab Concept Video

Potential GDP
The value of real GDP when all the economy's factors of production—labor, capital, land, and entrepreneurial ability—are fully employed.

Potential GDP is the value of real GDP when all the economy's factors of production—labor, capital, land, and entrepreneurial ability—are fully employed. It is vital to understand the forces that determine potential GDP for three reasons. First, when the economy is *at* full employment, real GDP equals potential GDP; so actual real GDP is determined by the same factors that determine potential GDP. Second, real GDP can exceed potential GDP only temporarily as it approaches and then recedes from a business cycle peak. So potential GDP is the *sustainable* upper limit of production. Third, real GDP fluctuates around potential GDP, which means that on the average over the business cycle, real GDP equals potential GDP.

We produce the goods and services that make up real GDP by using the *factors of production:* labor and human capital, physical capital, land (and natural resources), and entrepreneurship. At any given time, the quantities of capital, land, and entrepreneurship and the state of technology are fixed. But the quantity of labor is not fixed. It depends on the choices that people make about the allocation of time between work and leisure. So with fixed quantities of capital, land, and entrepreneurship and fixed technology, real GDP depends on the quantity of labor employed. To describe this relationship between real GDP and the quantity of labor employed, we use a relationship that is similar to the production possibilities frontier, which is called the production function.



EYE on the GLOBAL ECONOMY

Potential GDP in the United States and European Union

In 2015, real GDP in the United States was $65 per hour worked. In the 28 countries of the European Union, real GDP averaged only $50 per hour worked—a gap of 25 percent. (Both numbers are measured in 2015 U.S. dollars.) Part (a) of the figure shows this difference.

Not only do Americans produce more per hour than Europeans, they work longer hours too. In 2015, Americans worked an average of almost 40 hours per week while Europeans worked an average of only 35 hours per week—a difference of 12.5 percent. Part (b) of the figure shows this difference.

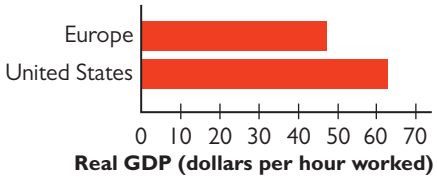
Europeans achieve their shorter work hours by taking longer vacations and having more sick days than Americans.

The combination of greater production per hour and longer work hours translates into a substantially larger real GDP per worker in the United States than in Europe.

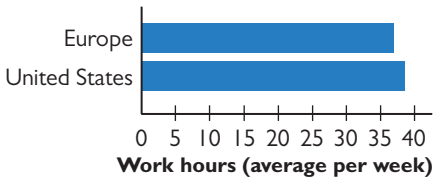
In 2015, real GDP per worker in the United States was $120,000 while in Europe it was only $75,000—a gap of almost 40 percent.

This chapter enables you to understand the sources of these differences in wage rates, work hours, and production.

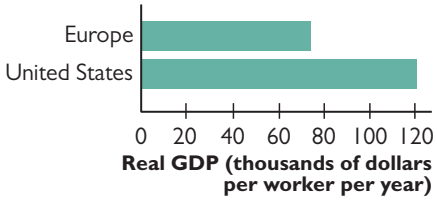
SOURCE OF DATA: Organization for Economic Cooperation and Development.



(a) Real GDP per hour worked



(b) Average weekly hours



(c) Real GDP per worker

The Production Function

Production function
A relationship that shows the maximum quantity of real GDP that can be produced as the quantity of labor employed changes and all other influences on production remain the same.

The **production function** is a relationship that shows the maximum quantity of real GDP that can be produced as the quantity of labor employed changes and all other influences on production remain the same. Figure 17.1 shows a production function, which is the curve labeled *PF*.

In Figure 17.1, 100 billion labor hours can produce a real GDP of $11 trillion (at point *A*); 200 billion hours can produce a real GDP of $16 trillion (at point *B*); and 300 billion hours can produce a real GDP of $20 trillion (at point *C*).

The production function shares a feature of the *production possibilities frontier* that you studied in Chapter 3 (p. 62). Like the *PPF*, the production function is a boundary between the attainable and the unattainable. It is possible to produce at any point along the production function and beneath it in the shaded area. But it is not possible to produce at points above the production function. Those points are unattainable.

Diminishing returns
The tendency for each additional hour of labor employed to produce a successively smaller additional amount of real GDP.

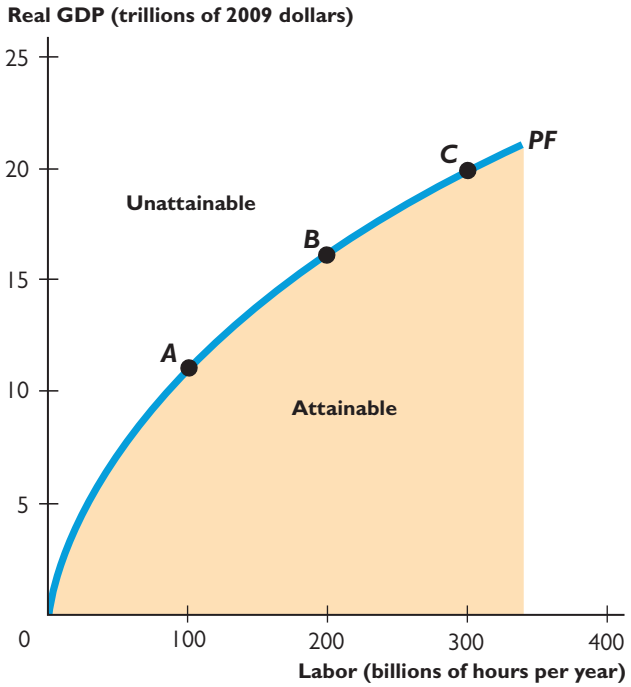
The production function displays **diminishing returns**—each additional hour of labor employed produces a successively smaller additional amount of real GDP. The first 100 billion hours of labor produces $11 trillion of real GDP. The second 100 billion hours of labor increases real GDP from $11 trillion to $16 trillion, so the

FIGURE 17.1
The Production Function

MyEconLab Animation

The production function shows the maximum quantity of real GDP that can be produced as the quantity of labor employed changes and all other influences on production remain the same. In this example, 100 billion hours of labor can produce $11 trillion of real GDP at point *A*, 200 billion hours of labor can produce $16 trillion of real GDP at point *B*, and 300 billion hours of labor can produce $20 trillion of real GDP at point *C*.

The production function separates attainable combinations of labor hours and real GDP from unattainable combinations and displays diminishing returns: Each additional hour of labor produces a successively smaller additional amount of real GDP.



Labor (billions of hours per year)	100	200	300
Real GDP (trillions of 2009 dollars)	11	16	20
	A	*B*	*C*

second 100 billion hours produces only an additional $5 trillion of real GDP. The third 100 billion hours of labor increases real GDP from $16 trillion to $20 trillion, so the third 100 billion hours produces only an additional $4 trillion of real GDP.

Diminishing returns arise because the quantity of capital (and other factors of production) is fixed. As more labor is hired, the additional output produced decreases because the extra workers have less capital with which to work. For example, a forest service has three chain saws and an axe and hires three workers to clear roads and trails of fallen trees and debris during the spring thaw. Hiring a fourth worker will contribute less to the amount cleared than the amount that the third worker added, and hiring a fifth worker will add even less.

Because real GDP depends on the quantity of labor employed, potential GDP depends on the production function and the quantity of labor employed. To find potential GDP, we must understand what determines the quantity of labor employed.

The Labor Market

You've already studied the tool that we use to determine the quantity of labor employed: demand and supply. In macroeconomics, we apply the concepts of demand, supply, and market equilibrium to the economy-wide labor market.

The quantity of labor employed depends on firms' decisions about how much labor to hire (the demand for labor). It also depends on households' decisions about how to allocate time between employment and other activities (the supply of labor). And it depends on how the labor market coordinates the decisions of firms and households (labor market equilibrium). So we will study

- The demand for labor
- The supply of labor
- Labor market equilibrium

The Demand for Labor

The **quantity of labor demanded** is the total labor hours that all the firms in the economy plan to hire during a given time period at a given real wage rate. The **demand for labor** is the relationship between the quantity of labor demanded and the real wage rate when all other influences on firms' hiring plans remain the same. The lower the real wage rate, the greater is the quantity of labor demanded.

Quantity of labor demanded
The total labor hours that all the firms in the economy plan to hire during a given time period at a given real wage rate.

Demand for labor
The relationship between the quantity of labor demanded and the real wage rate when all other influences on firms' hiring plans remain the same.

The Demand for Labor in a Soda Factory You might understand the aggregate demand for labor better by thinking about a single firm rather than the economy as a whole. Suppose that the money wage rate is $15 an hour and that the price of a bottle of soda is $1.50. For the soda factory, the real wage rate is a number of bottles of soda. To find the soda factory's real wage rate, divide the money wage rate by the price of its output—$15 an hour ÷ $1.50 a bottle. The real wage rate is 10 bottles of soda an hour. It costs the soda factory 10 bottles of soda to hire an hour of labor. As long as the soda factory can hire labor that produces more than 10 additional bottles of soda an hour, it is profitable to hire more labor. Only when the extra output produced by an extra hour of labor falls to 10 bottles an hour has the factory reached the profit-maximizing quantity of labor.

The Supply of Labor

The **quantity of labor supplied** is the number of labor hours that all the households in the economy plan to work during a given time period at a given real wage rate.

Quantity of labor supplied
The number of labor hours that all the households in the economy plan to work during a given time period at a given real wage rate.

Supply of labor
The relationship between the quantity of labor supplied and the real wage rate when all other influences on work plans remain the same.

The **supply of labor** is the relationship between the quantity of labor supplied and the real wage rate when all other influences on work plans remain the same.

The real wage rate influences the quantity of labor supplied because what matters to people is not the number of dollars they earn but what those dollars will buy. The quantity of labor supplied increases as the real wage rate increases for two reasons:

- Hours per person increase.
- Labor force participation increases.

Hours per Person The real wage rate is the opportunity cost of taking leisure and not working. As the opportunity cost of taking leisure rises, other things remaining the same, households choose to work more. But other things don't remain the same. A higher real wage rate brings a higher income, which increases the demand for leisure and encourages less work.

So a rise in the real wage rate has two opposing effects. But for most households, the opportunity cost effect is stronger than the income effect, so a rise in the real wage rate brings an increase in the quantity of labor supplied.

Labor Force Participation Most people have productive opportunities outside the labor force and choose to work only if the real wage rate exceeds the value of other productive activities. For example, a parent might spend time caring for her or his child. The alternative is day care. The parent will choose to work only if he or she can earn enough per hour to pay the cost of day care and have enough left to make the work effort worthwhile. The higher the real wage rate, the more likely it is that a parent will choose to work and so the greater is the labor force participation rate.

Let's now see how the labor market determines employment, the real wage rate, and potential GDP.

Labor Market Equilibrium

The forces of supply and demand operate in labor markets just as they do in the markets for goods and services. The price of labor services is the real wage rate. A rise in the real wage rate eliminates a shortage of labor by decreasing the quantity demanded and increasing the quantity supplied. A fall in the real wage rate eliminates a surplus of labor by increasing the quantity demanded and decreasing the quantity supplied. If there is neither a shortage nor a surplus, the labor market is in equilibrium.

Figure 17.2(a) shows the labor market equilibrium. The demand curve, *LD*, shows that the quantity of labor demanded is greater, the lower is the real wage rate. And the supply of labor curve, *LS*, shows that the quantity of labor supplied is greater, the higher is the real wage rate.

Looking at the demand and supply curves for labor in Figure 17.2(a), you can see that if the real wage rate is less than $50 an hour, the quantity of labor demanded exceeds the quantity supplied and there is a shortage of labor. In this situation, the real wage rate rises.

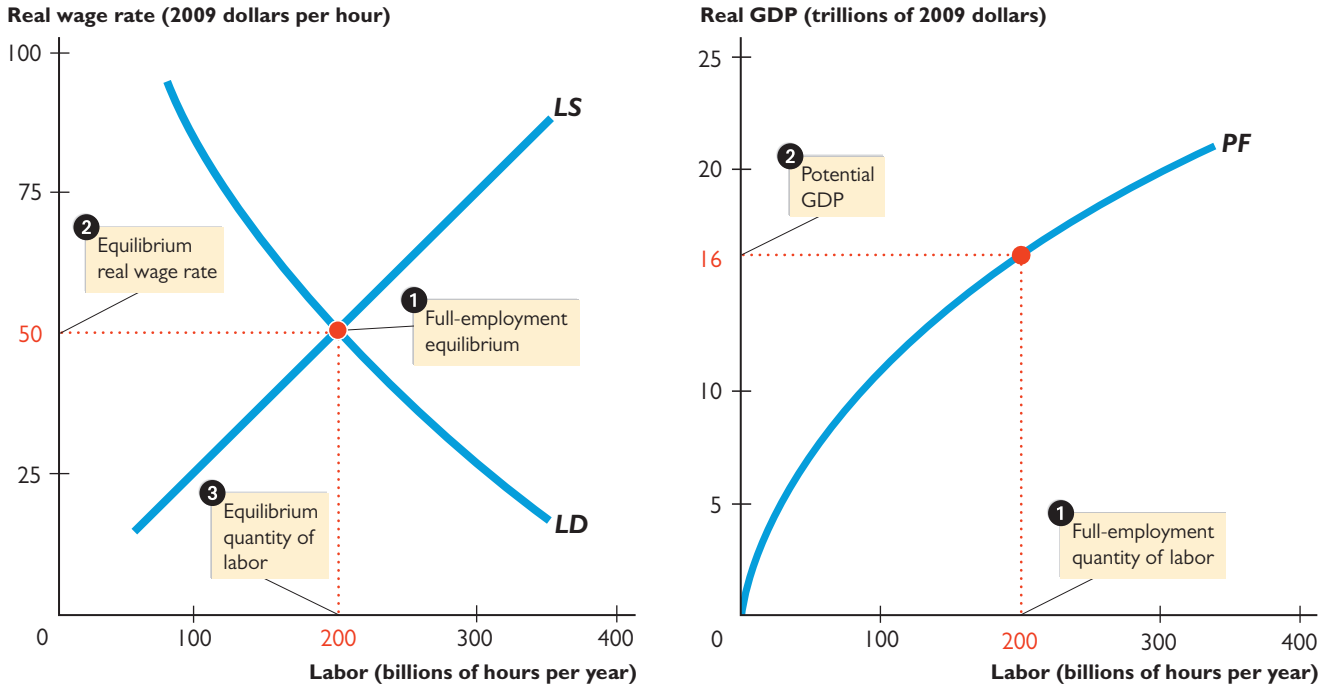
You can also see that if the real wage rate exceeds $50 an hour, the quantity of labor supplied exceeds the quantity demanded and there is a surplus of labor. In this situation, the real wage rate falls.

But when the real wage rate equals $50 an hour, the quantity of labor demanded equals the quantity of labor supplied and there is neither a shortage nor a surplus of labor. In this situation, the labor market is in equilibrium and the

FIGURE 17.2

Labor Market Equilibrium and Potential GDP

MyEconLab Animation



❶ Full employment occurs when the quantity of labor demanded equals the quantity of labor supplied. ❷ The equilibrium real wage rate is $50 an hour, and ❸ the equilibrium quantity of labor employed is 200 billion hours a year.

Potential GDP is the real GDP produced on the production function by the full-employment quantity of labor. ❶ The full-employment quantity of labor, 200 billion hours a year, produces a ❷ potential GDP of $16 trillion.

real wage rate remains constant. The equilibrium quantity of labor is 200 billion hours a year. When the equilibrium quantity of labor is employed, the economy is at full employment. So the full-employment quantity of labor is 200 billion hours a year.

Full Employment and Potential GDP

When the labor market is in equilibrium, the economy is at full employment and real GDP equals potential GDP.

You've seen that the quantity of real GDP depends on the quantity of labor employed. The production function tells us how much real GDP a given amount of employment can produce. Now that we've determined the full-employment quantity of labor, we can find potential GDP.

Figure 17.2(b) shows the relationship between the labor market equilibrium and potential GDP. The equilibrium quantity of labor employed in Figure 17.2(a) is 200 billion hours. The production function in Figure 17.2(b) tells us that 200 billion hours of labor produces $16 trillion of real GDP. This quantity of real GDP is potential GDP.



EYE on the U.S. ECONOMY

Why Do Americans Earn More and Produce More Than Europeans?

The quantity of capital per worker is greater in the United States than in Europe, and U.S. technology, on the average, is more productive than European technology.

These differences between the United States and Europe mean that U.S. labor is more productive than European labor.

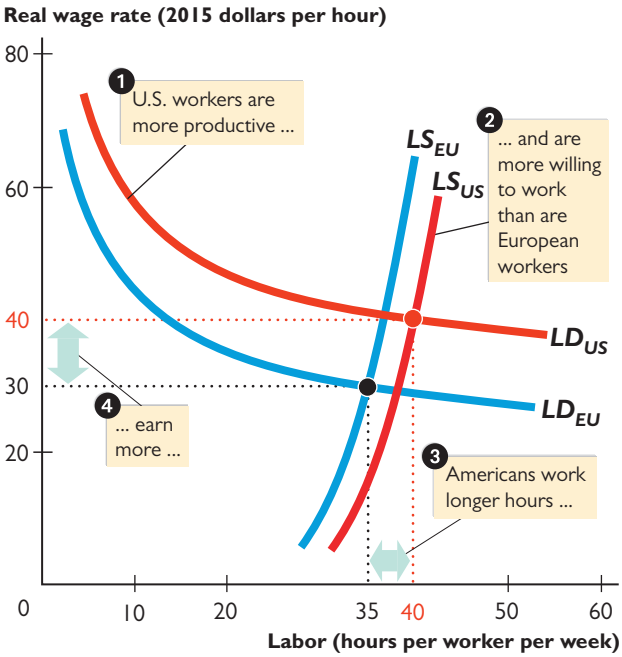
Because U.S. labor is more productive than European labor, U.S. employers are willing to pay more for a given quantity of labor than European employers are. So the demand for labor curve in the United States, LD_{US}, lies to the right of the European demand for labor curve, LD_{EU}, in part (a) of the figure.

This difference in the productivity of labor also means that the U.S. production function, PF_{US}, lies above the European production function, PF_{EU}, in part (b) of the figure.

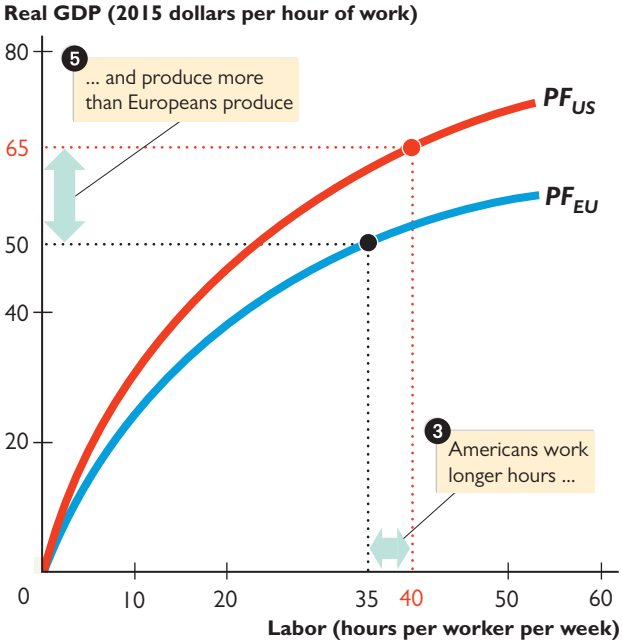
Higher income taxes and unemployment benefits in Europe mean that to induce a person to take a job, a firm in Europe must offer a higher wage rate than a firm in the United States has to offer. So the European labor supply curve, LS_{EU}, lies to the left of the U.S. labor supply curve, LS_{US}.

Equilibrium employment is higher in the United States than in Europe—Americans work longer hours—and the equilibrium real wage rate is higher in the United States than in Europe.

Potential GDP is higher in the United States than in Europe for two reasons: U.S. workers are more productive per hour of work and they work longer hours than Europeans.



(a) Labor market in Europe and in the United States



(b) Production function in Europe and in the United States

CHECKPOINT 17.1

MyEconLab Study Plan 17.1
Key Terms Quiz
Solutions Video

Explain what determines potential GDP.

Practice Problem

1. Table 1 describes an economy's production function and demand for labor.

TABLE 1

Quantity of labor demanded (billions of hours per year)	0	1	2	3	4
Real GDP (billions of 2009 dollars)	0	40	70	90	100
Real wage rate (2009 dollars per hour)	50	40	30	20	10

Table 2 describes the supply of labor in this economy.

TABLE 2

Quantity of labor supplied (billions of hours per year)	0	1	2	3	4
Real wage rate (2009 dollars per hour)	10	20	30	40	50

Use the data to make graphs of the labor market and production function. What are the equilibrium real wage rate, employment, and potential GDP?

In the News

Tesla is recruiting

Electric car maker Tesla is recruiting Nevadans with a high school diploma or equivalent to work in the battery gigafactory the company is building.

Source: *Reno Gazette Journal*, July 1, 2016

Explain how Tesla's huge project will influence potential GDP, employment, and the real wage rate in the United States.

Solution to Practice Problem

1. The demand for labor is a graph of the first and last row of Table 1 and the supply of labor is a graph of the data in Table 2 (Figure 1). The production function is a graph of the first two rows of Table 1 (Figure 2).

Labor market equilibrium occurs when the real wage rate is $30 an hour and 2 billion hours of labor are employed (Figure 1). Potential GDP is the real GDP produced by the equilibrium quantity of labor (2 billion hours in Figure 1). Potential GDP is $70 billion (Figure 2).

FIGURE 1

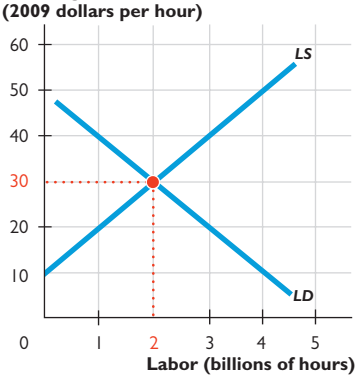
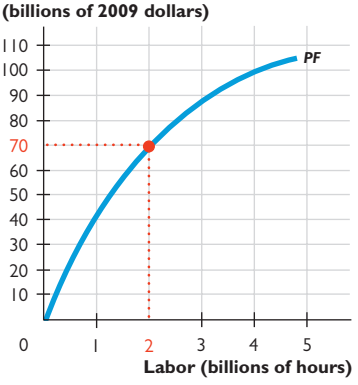


FIGURE 2



Solution to In the News

Potential GDP will increase. With increased capital equipment to manufacture batteries, the U.S. production function will shift upward. With no change in employment, potential GDP would increase. But Tesla's gigafactory project will increase labor productivity and increase the demand for labor. The increase in the demand for labor, with no change in the supply of labor, will increase the real wage rate. As the real wage rate rises, the quantity of labor supplied increases. The full-employment quantity of labor increases. Potential GDP, employment, and the real wage rate all increase.

MyEconLab Concept Video

17.2 THE BASICS OF ECONOMIC GROWTH

Economic growth
A sustained expansion of production possibilities.

Economic growth is a sustained expansion of production possibilities. Maintained over decades, rapid economic growth can transform a poor nation into a rich one. Such has been the experience of Hong Kong, South Korea, Taiwan, and some other Asian economies. Slow economic growth or the absence of growth can condemn a nation to devastating poverty. Such has been the fate of Sierra Leone, Somalia, Zambia, and much of the rest of Africa.

Economic growth is different from the rise in incomes that occurs during the recovery from a recession. Economic growth is a sustained trend, not a temporary cyclical expansion.

Calculating Growth Rates

Economic growth rate
The annual percentage change of real GDP.

We express the **economic growth rate** as the annual percentage change of real GDP. To calculate this growth rate, we use the formula:

$$\text{Growth rate of real GDP} = \frac{\text{Real GDP in current year} - \text{Real GDP in previous year}}{\text{Real GDP in previous year}} \times 100.$$

For example, if real GDP in the current year is $8.4 trillion and if real GDP in the previous year was $8.0 trillion, then

$$\text{Growth rate of real GDP} = \frac{\$8.4 \text{ trillion} - \$8.0 \text{ trillion}}{\$8.0 \text{ trillion}} \times 100 = 5 \text{ percent}.$$

The growth rate of real GDP tells us how rapidly the total economy is expanding. This measure is useful for telling us about potential changes in the balance of economic power among nations, but it does not tell us about changes in the standard of living.

The standard of living depends on *real GDP per person* (also called *per capita real GDP*), which is real GDP divided by the population. So the contribution of real GDP growth to the change in the *standard of living* depends on the growth rate of real GDP per person. We use the above formula to calculate this growth rate, replacing real GDP with real GDP per person.

Suppose, for example, that in the current year, when real GDP is $8.4 trillion, the population is 202 million. Then real GDP per person in the current year is $8.4 trillion divided by 202 million, which equals $41,584. And suppose that in the previous year, when real GDP was $8.0 trillion, the population was 200 million. Then real GDP per person in that year was $8.0 trillion divided by 200 million, which equals $40,000.

Use these two values of real GDP per person with the growth formula to calculate the growth rate of real GDP per person. That is,

$$\text{Growth rate of real GDP per person} = \frac{\$41{,}584 - \$40{,}000}{\$40{,}000} \times 100 = 4 \text{ percent}.$$

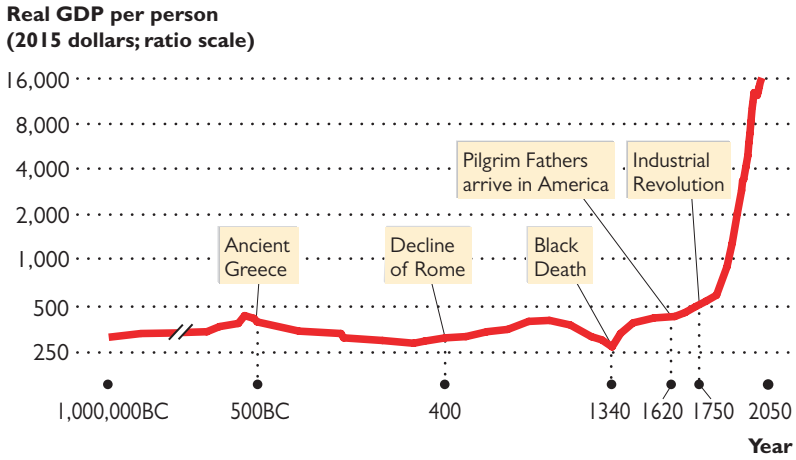


EYE on the PAST

How Fast Has Real GDP per Person Grown?

If you're a middle-class American, you know what life is like in a household that spends (at least) $150 a day. Try to imagine life with only $1 a day to spend. That is the amount that a billion people in today's world struggle to live on. It is also the amount that our ancestors lived on for the first million years of human existence.

The figure shows estimates of incomes (real GDP per person) over more than a million years expressed in the value of the dollar in 2015. Real GDP per person averaged $330 a year—a bit less than $1 a day—until 1620! It rose to $400 a year when Aristotle and Plato were teaching in Athens, but slipped back during the next thousand years to $275 as the Roman Empire collapsed. When the Black Death gripped Europe in the 1340s, incomes fell to a 1-million-year low, and even when the Pilgrim Fathers began to arrive in America in the 1620s, incomes were still the same as those of Ancient Greece.



SOURCE OF DATA: J. Bradford DeLong, *"Estimating World GDP, One Million B.C.–Present"* updated and converted to 2015 dollars.

Beginning around 1750, first in England and then in Europe and the United States, an astonishing change known as the Industrial Revolution occurred. Real GDP per person exploded. By 1850, it was twice its 1650 level. By 1950, it was more than five times its 1850 level, and by 2015, it was more than three times its 1950 level. This chapter explores the story of economic growth—of its causes and its effects.

We can also calculate the growth rate of real GDP per person by using the formula:

$$\text{Growth rate of real GDP per person} = \text{Growth rate of real GDP} - \text{Growth rate of population.}$$

In the example you've just worked through, the growth rate of real GDP is 5 percent. The population changes from 200 million to 202 million, so

$$\text{Growth rate of population} = \frac{202 \text{ million} - 200 \text{ million}}{200 \text{ million}} \times 100 = 1 \text{ percent.}$$

and

$$\text{Growth rate of real GDP per person} = 5 \text{ percent} - 1 \text{ percent} = 4 \text{ percent.}$$

This formula makes it clear that real GDP per person grows only if real GDP grows faster than the population grows. If the growth rate of the population exceeds the growth of real GDP, then real GDP per person falls.

The Magic of Sustained Growth

Sustained growth of real GDP per person can transform a poor society into a wealthy one. The reason is that economic growth is like compound interest. If you put $100 in the bank and earn 5 percent a year interest on it, after one year, you have $105. If you leave that money in the bank for another year, you earn 5 percent interest on the original $100 and on the $5 interest that you earned last year. You are now earning interest on interest! The next year, things get even better. Then you earn 5 percent on the original $100 and on the interest earned in the first year and the second year. Your money in the bank is *growing* at a rate of 5 percent a year. Before too many years have passed, you'll have $200 in the bank. But after *how many* years?

Rule of 70
The number of years it takes for the level of any variable to double is approximately 70 divided by the annual percentage growth rate of the variable.

The answer is provided by a formula known as the **Rule of 70**, which states that the number of years it takes for the level of any variable to double is approximately 70 divided by the annual percentage growth rate of the variable. Using the Rule of 70, you can now calculate how many years it takes your $100 to become $200. It is 70 divided by 5, which is 14 years.

Table 17.1 shows the time it takes for real GDP per person to double at various growth rates. Growing at 1 percent a year, real GDP per person doubles in 70 years—an average human life span. But real GDP per person doubles in 35 years if its growth rate is 2 percent a year and in 10 years if its growth rate is 7 percent a year.

TABLE 17.1 GROWTH RATES

Growth rate (percent per year)	Years for level to double
1	70
2	35
5	14
7	10
10	7

We can use the Rule of 70 to answer other questions about economic growth. For example, in 2015, U.S. real GDP per person was approximately 4 times that of China. China's recent growth rate of real GDP per person was 7 percent a year. If this growth rate were maintained, how long would it take China's real GDP per person to reach that of the United States in 2015? The answer, provided by the Rule of 70, is 20 years. China's real GDP per person doubles in 10 years and doubles again to 4 times its current level in another 10 years.



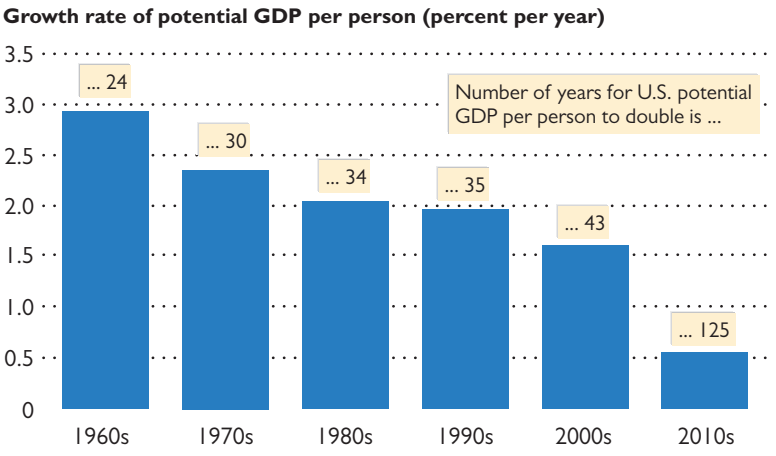
EYE on the U.S. ECONOMY

U.S. Growth Is Slowing

To achieve its transformative effects on the standard of living, the economic growth rate must be high and maintained over many years. You can see in the graph that the U.S. growth has not been maintained at a high rate.

The growth rate of potential GDP per person has slowed every decade since the 1960s with the consequence that the doubling period has blown out from 24 years in the 1960s to 125 years in the 2010s.

Why U.S. growth has slowed is not fully understood, but we will explore possible reasons in this chapter.



SOURCES OF DATA: Congressional Budget Office and authors' calculations.

CHECKPOINT 17.2

MyEconLab Study Plan 17.2
Key Terms Quiz
Solutions Video

Define and calculate the economic growth rate, and explain the implications of sustained growth.

Practice Problems

1. Mexico's real GDP was 8,762 billion pesos in 2010 and 9,105 billion pesos in 2011. Mexico's population growth rate in 2011 was 1 percent. Calculate Mexico's economic growth rate in 2011 and the growth rate of real GDP per person in Mexico in 2011.
2. Calculate the approximate number of years it will take for real GDP per person to double if an economy maintains an economic growth rate of 12 percent a year and a population growth rate of 2 percent a year.
3. Calculate the change in the number of years it will take for real GDP per person in India to double if the growth rate of real GDP per person increases from 8 percent a year to 10 percent a year.

In the News

China's economic growth in 2015 is slowest in 25 years
China's growth rate slowed to an annual rate of 6.8 percent in the fourth quarter of 2015, down from 7.3 percent in 2014.

Source: *The Wall Street Journal*, January 19, 2016

If China's growth rate has slowed from 9 percent a year and remains at 6.8 percent a year, how many additional years will it take for China's real GDP to double?

Solutions to Practice Problems

1. Mexico's economic growth rate in 2011 was 3.9 percent. The economic growth rate equals the percentage change in real GDP:
   [(Real GDP in 2011 − Real GDP in 2010) ÷ Real GDP in 2010] × 100, which is
   [(9,105 billion − 8,762 billion) ÷ 8,762 billion] × 100, or 3.9 percent.
   The growth rate of real GDP per person equals 2.9 percent.
   Growth rate of real GDP per person equals (Growth rate of real GDP − Population growth rate) which is (3.9 percent − 1 percent), or 2.9 percent.
2. It will take 7 years for real GDP per person to double. The growth rate of real GDP per person equals the economic growth rate minus the population growth rate. Real GDP per person grows at 12 percent minus 2 percent, which is 10 percent a year. The Rule of 70 tells us that the level of a variable that grows at 10 percent a year will double in 70 ÷ 10 years, or 7 years.
3. Two years. The Rule of 70 tells us that a variable that grows at 8 percent a year will double in 70 ÷ 8 years, which is approximately 9 years. By increasing its growth rate to 10 percent a year, the variable will double in 7 years.

Solution to In the News

With a growth rate of 9 percent a year, real GDP per person will double in 8 years (70 ÷ 9). If the growth rate is maintained at 6.8 percent a year, real GDP per person will double in 10 years (70 ÷ 6.8)—taking an additional 2 years.

MyEconLab Concept Video

17.3 LABOR PRODUCTIVITY GROWTH

Real GDP grows when the quantities of the factors of production grow or when persistent advances in technology make them increasingly productive. To understand what determines the growth rate of real GDP, we must understand what determines the growth rates of the factors of production and the rate of increase in their productivity. You're going to see how saving and investment determine the growth rate of physical capital and how the growth of physical capital and human capital and advances in technology interact to determine the economic growth rate.

We are interested in real GDP growth because it contributes to improvements in our standard of living. But our standard of living improves only if we produce more goods and services with each hour of labor. So our main concern is to understand the forces that make our labor more productive. Let's start by defining labor productivity.

Labor Productivity

Labor productivity
The quantity of real GDP produced by one hour of labor.

Labor productivity is the quantity of real GDP produced by one hour of labor. It is calculated by using the formula:

$$\text{Labor productivity} = \frac{\text{Real GDP}}{\text{Aggregate hours}}.$$

For example, if real GDP is $8,000 billion and if aggregate hours are 200 billion, then we can calculate labor productivity as

$$\text{Labor productivity} = \frac{\$8{,}000 \text{ billion}}{200 \text{ billion hours}} = \$40 \text{ per hour}.$$

When labor productivity grows, real GDP per person grows. So the growth in labor productivity is the basis of the rising standard of living. What makes labor productivity grow? We'll answer this question by considering the influences on labor productivity growth under two broad headings:

- Saving and investment in physical capital
- Expansion of human capital and discovery of new technologies

These two broad influences on labor productivity growth interact and are the sources of the extraordinary growth in productivity during the past 200 years. Although they interact, we'll begin by looking at each on its own.

Saving and Investment in Physical Capital

Saving and investment in physical capital increase the amount of capital per worker and increase labor productivity. Labor productivity took a dramatic upturn when the amount of capital per worker increased during the Industrial Revolution. Production processes that use hand tools can create beautiful objects, but production methods that use large amounts of capital per worker, such as auto plant assembly lines, enable workers to be much more productive. The accumulation of capital on farms and building sites; in textile factories, iron foundries and steel mills, coal mines, chemical plants, and auto plants; and at banks and insurance companies added incredibly to the productivity of our labor.

A strong and experienced farm worker of 1830, using a scythe, could harvest 3 acres of wheat a day. A farm worker of 1831, using a mechanical reaper, could harvest 15 acres a day. And a farm worker of today, using a combine harvester, can harvest and thresh hundreds of acres a day.

The next time you see a movie set in the old West, look carefully at how little capital there is. Try to imagine how productive you would be in such circumstances compared with your productivity today.

Capital Accumulation and Diminishing Marginal Returns

Although saving and investment in additional capital is a source of labor productivity growth, without the expansion of human capital and technological change, it would not bring sustained economic growth. Eventually growth would slow and most likely stop. The reason is a fundamental fact about capital known as the **law of diminishing marginal returns**, which states that

> **If the quantity of capital is small, an increase in capital brings a large increase in production; and if the quantity of capital is large, an increase in capital brings a small increase in production.**

This law applies to all factors of production, not only to capital, and is the reason why the demand for labor curve slopes downward (see p. 453).

You can see why the law of diminishing marginal returns applies to capital by thinking about how your own productivity is influenced by the capital you own. When you got your first computer, your small quantity of capital increased and your productivity increased enormously. You most likely don't have two computers, but if you do, the productivity boost from your second computer was much smaller than that from the first. If you don't have two computers, one of the reasons is that you doubt it would be worth the expense because it would contribute such a small amount to your labor productivity



Farm labor productivity increased from harvesting 3 acres per day in 1830 …



to harvesting hundreds of acres per day in the twenty-first century.

Productivity curve
The relationship that shows how real GDP per hour of labor changes as the quantity of capital per hour of labor changes.

Illustrating the Law of Diminishing Marginal Returns

Figure 17.3 illustrates the relationship between capital and productivity. The curve *PC* is a **productivity curve**, which shows how real GDP per hour of labor changes as the quantity of capital per hour of labor changes.

In Figure 17.3, when the quantity of capital (measured in real dollars) increases from $40 to $80 per hour of labor, real GDP per hour of labor increases from $30 to $50, a $20 or 67 percent increase. But when the quantity of capital increases from $180 to $220 per hour of labor, the same $40 increase as before, real GDP per hour of labor increases from $80 to $84, only a $4 or 5 percent increase. If capital per hour of labor keeps increasing, labor productivity increases by ever smaller amounts and eventually stops rising.

Expansion of Human Capital and Discovery of New Technologies

The expansion of human capital and the discovery of new technologies have a profoundly different effect on labor productivity than capital accumulation has. They don't display diminishing marginal returns.

Expansion of Human Capital Human capital—the accumulated skill and knowledge of people—comes from three sources:

1. Education and training
2. Job experience
3. Health and diet

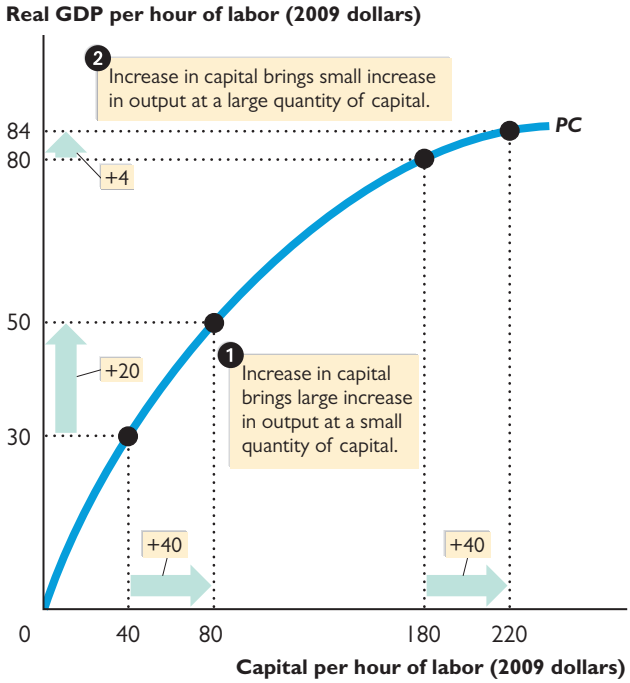
FIGURE 17.3
The Effects of an Increase in Capital
MyEconLab Animation

When workers are equipped with more capital, they become more productive. The productivity curve *PC* shows how an increase in capital per hour of labor increases real GDP per hour of labor.

❶ When the quantity of capital per hour of labor increases from a low $40 to $80, real GDP per hour of labor increases by $20.

❷ When the quantity of capital per hour of labor increases from a high $180 to $220, real GDP per hour of labor increases by $4.

An equal-size increase in capital per hour of labor brings a diminishing increase in output, the greater is the quantity of capital.



A hundred years ago, most people attended school for around eight years. A hundred years before that, most people had no formal education at all. Today, 90 percent of Americans complete high school and more than 60 percent go to college or university. Our ability to read, write, and communicate effectively contributes enormously to our productivity.

The education of thousands of scientists, engineers, mathematicians, biologists, computer programmers, and people equipped with a host of other specialist skills has made huge contributions to labor productivity and to the advance in technology.

While formal education is productive, school is not the only place where people acquire human capital. We also learn from on-the-job experience—from *learning by doing*. One carefully studied example illustrates the importance of learning by doing. Between 1941 and 1944 (during World War II), U.S. shipyards produced 2,500 Liberty Ships—cargo ships built to a standardized design. In 1941, it took 1.2 million person-hours to build a ship. By 1942, it took 600,000, and by 1943, it took only 500,000. Not much change occurred in the physical capital employed during these years, but an enormous amount of human capital was accumulated. Thousands of workers and managers learned from experience and their productivity more than doubled in two years.

Strong, healthy, well-nourished workers are much more productive than those who lack good nutrition, healthcare, and opportunties to exercise. This fact creates a virtuous circle. Improved healthcare, diet, and exercise increase labor productivity; and increased labor productivity brings the increased incomes that make these health improvements possible.

The expansion of human capital is the most fundamental source of economic growth because it directly increases labor productivity and is the source of the discovery of new technologies.



Production using 1950s technology.



Production using 2015 technology.

Discovery of New Technologies The growth of physical capital and the expansion of human capital have made large contributions to economic growth, but the discovery of new technologies has made an even greater contribution.

The development of writing, one of the most basic human skills, was the source of some of the earliest productivity gains. The ability to keep written records made it possible to reap ever-larger gains from specialization and trade. Imagine how hard it would be to do any kind of business if all the accounts, invoices, and agreements existed only in people's memories.

Later, the development of mathematics laid the foundation for the eventual extension of knowledge in physics, chemistry, and biology. This base of scientific knowledge was the foundation for the technological advances of the Industrial Revolution 200 years ago and of today's Information Revolution.

Since the Industrial Revolution, technological change has become a part of everyday life. Firms routinely conduct research to develop technologies that are more productive, and partnerships between business and the universities are commonplace in fields such as biotechnology and electronics.

Illustrating the Effects of Human Capital and Technological Change

Figure 17.4 illustrates the effects of the expansion of human capital and the discovery of new technologies and labor productivity: They shift the *productivity curve* upward. In the figure, these influences shift the productivity curve from PC_0 to PC_1. Imagine that PC_0 is the productivity curve in 1960 and PC_1 is the productivity curve for 2010. With capital of $180 per hour of labor, workers could

FIGURE 17.4

The Effects of Human Capital and Technological Change

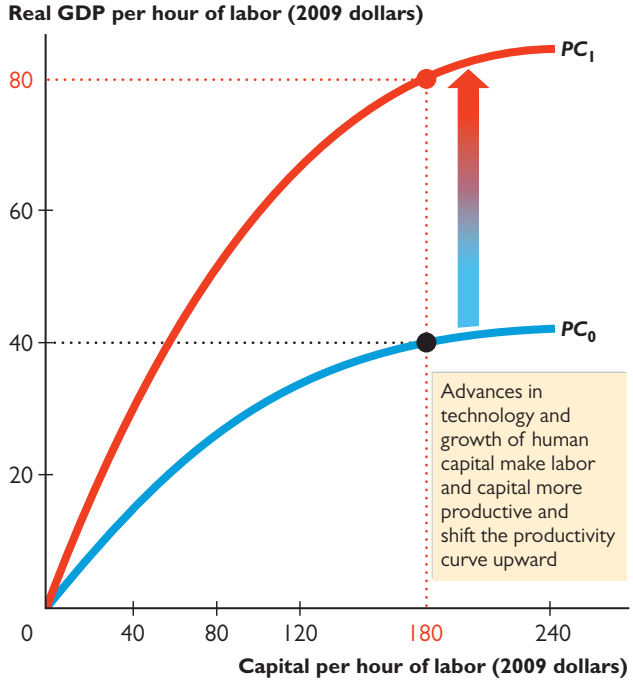
MyEconLab Animation

When human capital expands or technology advances, labor becomes more productive—a given amount of capital per hour of labor can produce more real GDP per hour of labor.

Here, with 1960's technology on PC_0, $180 of capital per hour of labor can produce $40 of goods and services—real GDP per hour of labor.

With 2010's technology on PC_1, the same $180 of capital per hour of labor can produce $80 of goods and services—real GDP per hour of labor.

The expansion of human capital and the discovery of new technologies shift the productivity curve upward and are not subject to diminishing marginal returns.



produce $80 of real GDP per hour of labor in 2010. If workers had been equipped with the same amount of capital but with the technology of 1960, they would have produced only $40 of real GDP per hour of labor. The upward shift of the productivity curve illustrates the fact that labor and capital become more productive at each quantity of capital per hour of labor. Capital is still subject to diminishing marginal returns but the overall level of productivity is higher with expanded human capital and more productive technologies.

Combined Influences Bring Labor Productivity Growth

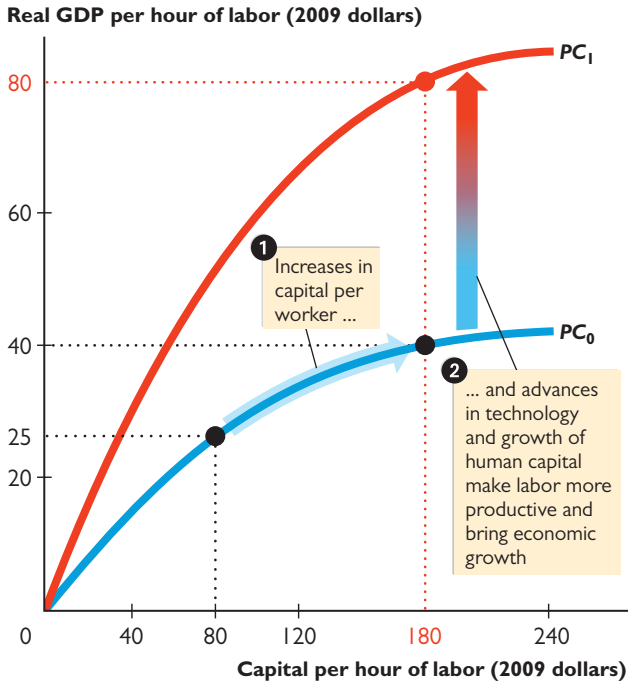
To reap the benefits of technological change—to use new technologies to make labor productivity grow—capital must increase. Some of the most powerful and far-reaching technologies are embodied in human capital—for example, language, writing, mathematics, physics, biology, and engineering. But most technologies are embodied in physical capital. For example, to increase the productivity of transportation workers by using the discovery of the internal combustion engine, millions of horse-drawn carriages had to be replaced by automobiles and trucks; more recently, to increase the labor productivity of office workers by using the discovery of computerized word processing, millions of typewriters had to be replaced by computers and printers.

Figure 17.5 shows how the combined effects of capital accumulation, the expansion of human capital, and the discovery of new technologies bring labor productivity growth. In 1960, the productivity curve is PC_0, workers have $80 of capital per hour and produce $25 of real GDP per hour. By 2010, capital has increased to $180 per hour. With no expansion of human capital or technological advance,

FIGURE 17.5

How Labor Productivity Grows

MyEconLab Animation



In 1960, workers had $80 of capital per hour of labor and produced real GDP per hour of $25 on PC_0.

❶ When the quantity of capital increased from $80 per hour of labor in 1960 to $180 per hour of labor in 2010, real GDP per hour of labor increased from $25 to $40 along PC_0.

❷ The expansion of human capital and discovery of new technologies shifted the productivity curve upward to PC_1 and increased real GDP per hour of labor from $40 to $80.

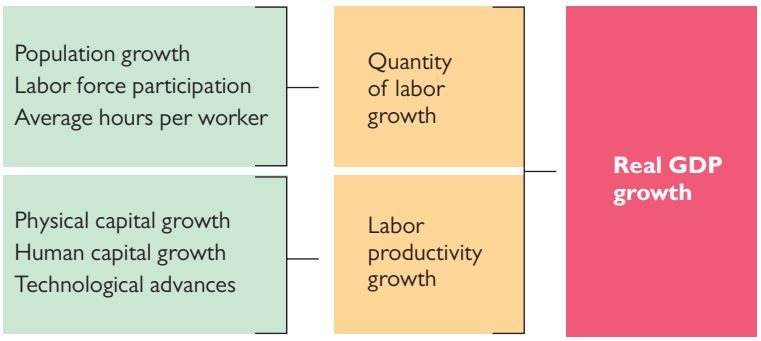
real GDP per hour of labor would have increased to $40. But with the human capital and technology of 2010, output per hour increases to $80.

You've now seen what makes labor productivity grow. *Eye on the U.S. Economy* on p. 466 looks at the quantitative importance of the sources of growth since 1960. Real GDP grows because labor becomes more productive and also because the *quantity of labor* increases. Figure 17.6 summarizes the sources of economic growth and shows how the growth in labor productivity together with the growth in the quantity of labor bring real GDP growth.

FIGURE 17.6

The Sources of Economic Growth

MyEconLab Animation



Real GDP depends on the quantity of labor and labor productivity.

The quantity of labor depends on the population, the labor force participation rate, and the average hours per worker.

Labor productivity depends on the amounts of physical capital and human capital and the state of technology.

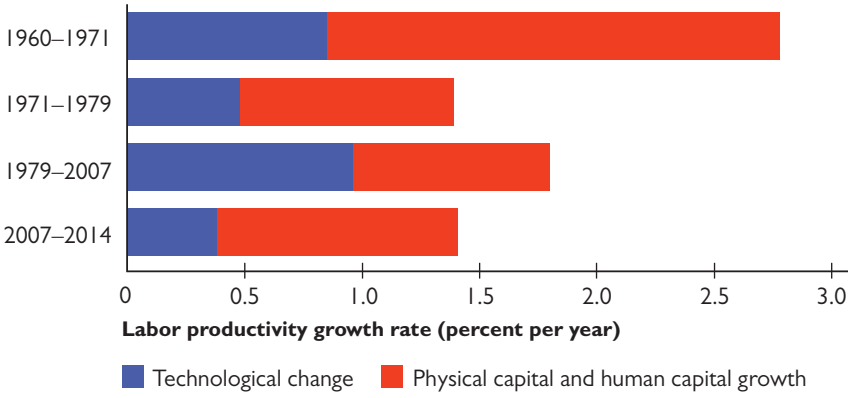
Growth in the quantity of labor and growth in labor productivity bring real GDP growth.

EYE on the U.S. ECONOMY

U.S. Labor Productivity Growth Since 1960

The figure shows how labor productivity has grown since 1960. It also shows the contributions to productivity growth of advances in technology (the blue bars) and increases in physical capital and human capital (the red bars).

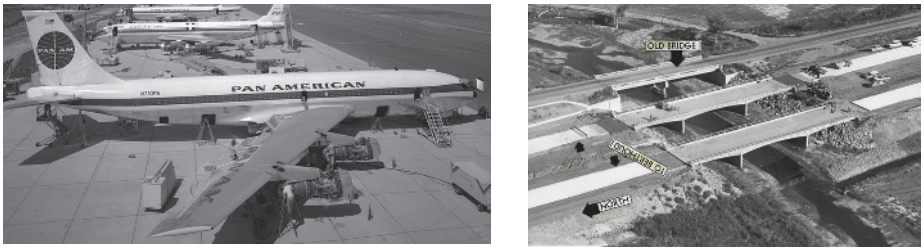
You can see that labor productivity growth during the 1960s was around double its later rate. Growth picked up a bit in the 1980s and 1990s and slowed again after 2007.



SOURCES OF DATA: Penn World Table 8.1 by Robert C. Feenstra, Robert Inklaar, and Marcel P. Timmer; Congressional Budget Office; and authors' calculations.

The Booming Sixties

Plastics, the laser, the computer, the transistor, the space race, the interstate highway system, the shopping mall, and the passenger jet were among the technological advances that brought extraordinary labor productivity growth during the 1960s.



Passenger jets and the construction of thousands of miles of interstate highways were among the technological advances that increased labor productivity during the 1960s.

The Stagnant Seventies

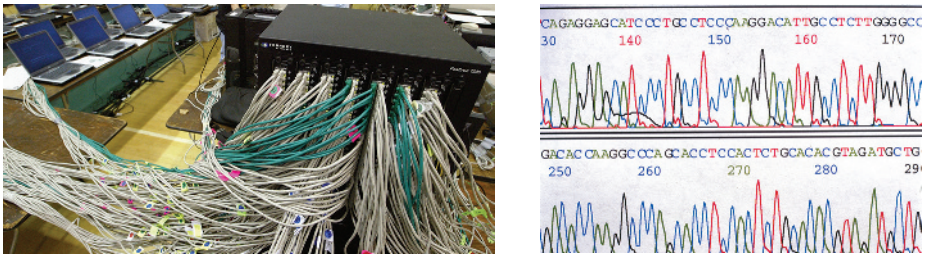
An oil price hike and oil embargo as well as higher taxes and expanded regulation slowed productivity growth during the 1970s and the higher cost of energy diverted the focus of technological change toward saving energy rather than increasing labor productivity.



An embargo on oil exports to the United States and a higher cost of energy as well as tax hikes contributed to the productivity growth slowdown of the 1970s.

The Information Age

The Internet has transformed our lives and unlocking the human genome has opened the possibility of dramatic advances in healthcare. But the information age increase in labor productivity is lower than that of the 1960s; and after 2007, global financial turmoil lowered its rate to that of the stagnant 1970s.



Advances in information technologies and biotechnologies increased productivity during the 1990s and 2000s but not by as much as the technological advances of the 1960s did.

What Keeps Labor Productivity Growing?

Labor productivity keeps growing because of the choices people make in the pursuit of profit. Paul Romer of Stanford University developed this growth theory during the 1980s, building on ideas developed by Joseph Schumpeter during the 1930s and 1940s. Romer's theory emphasizes three facts about market economies: Human capital expands because of choices; discoveries result from choices; and discoveries bring profit and competition destroys profit, bringing the incentive to keep discovering new technologies.

Human Capital Expansion and Choices People decide how long to remain in school, what to study, and how hard to study. And when they graduate from school, people make more choices about job training and on-the-job learning. All these choices govern the speed at which human capital expands.

Discoveries and Choices When people discover a new product or technique, they consider themselves lucky. They are right, but chance does not determine the pace at which new discoveries are made—and at which technology advances. It depends on how many people are looking for a new technology and how intensively they are looking.

Discoveries and Profits Profit is the spur to technological change. The forces of competition squeeze profits, so to increase profit, people constantly seek either lower-cost methods of production or new and better products for which people are willing to pay a higher price. Inventors can maintain a profit for several years by taking out a patent or copyright, but eventually a new discovery is copied and profits disappear.

Two other facts play a key role in the new growth theory: Many people can use discoveries at the same time, and physical activities can be replicated.

Discoveries Used by All Once a profitable new discovery has been made, everyone can use it. For example, when Marc Andreeson created Mosaic, the Web browser that led to the creation of Netscape Navigator and Microsoft's Internet Explorer, everyone who was interested in navigating the Internet had access to a new and more efficient tool. One person's use of a Web browser does not prevent others from using it. This fact means that as the benefits of a new discovery spread, free resources become available. These resources are free because nothing is given up when an additional person uses them.

Replicating Activities Production activities can be replicated. For example, there might be 2, 3, or 53 identical firms making fiber-optic cable by using an identical assembly line and production technique. If one firm increases its capital and output, that *firm* experiences diminishing returns. But the economy can increase its capital and output by adding another identical fiber cable factory, and the *economy* does not experience diminishing returns.

Because the combination of capital accumulation and technological change avoid diminishing returns, labor productivity grows indefinitely as long as people devote resources to expanding human capital and introducing new technologies.

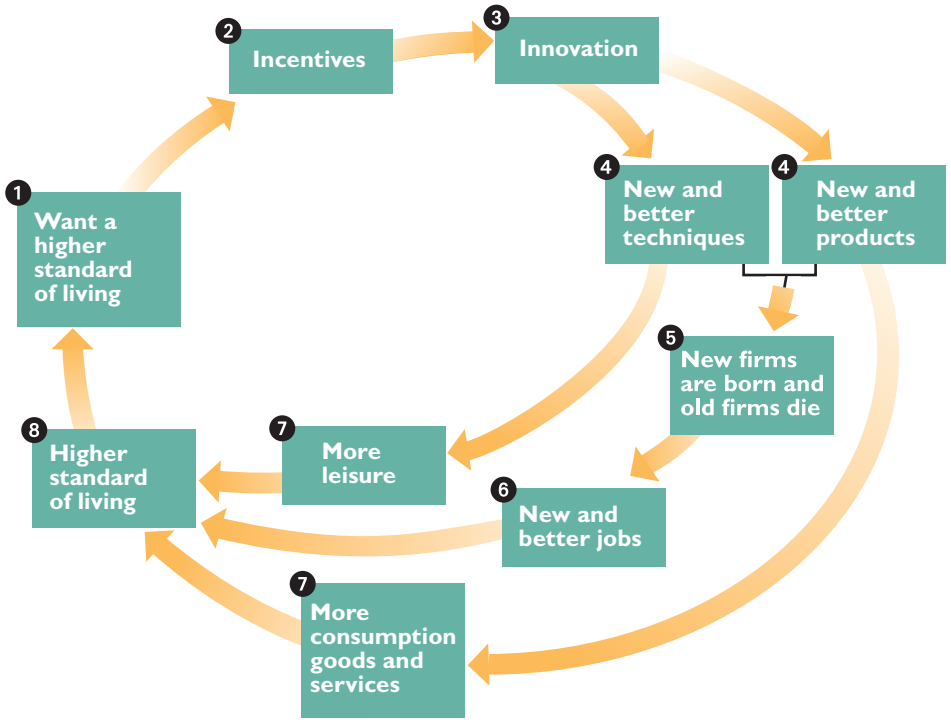
Economic growth is like the perpetual motion machine in Figure 17.7. Growth is driven by insatiable wants that lead us to pursue profit and innovate. The economic growth rate depends on the ability and the incentive to innovate.

FIGURE 17.7

A Perpetual Motion Machine

MyEconLab Animation

❶ People want a higher standard of living and are spurred by ❷ profit incentives to make the ❸ innovations that lead to ❹ new and better techniques and new and better products, which in turn lead to ❺ the birth of new firms and the death of some old firms, ❻ new and better jobs, and ❼ more leisure and more consumption goods and services. The result is ❽ a higher standard of living. But people want a yet higher standard of living, and the growth process continues.



Based on a similar figure in *These Are the Good Old Days: A Report on U.S. Living Standards,* Federal Reserve Bank of Dallas 1993 Annual Report.

Economic Growth and the Distribution of Income

Does the gap between high and low incomes widen or narrow as real GDP grows? And what determines the long-term level and trends of income inequality? Economist Simon Kuznets posed these questions in the 1950s. He remarked that getting the answers was hampered by a scarcity of data and strongly held opinions. Over the years since the 1950s, more data have become available, but strongly held opinions continue to get in the way of clear thinking.

The Data

Starting in the early 1980s, income inequality increased in a process that has been called the Great Divergence. The share of total income received by the top 1 percent of Americans moved up from 8 percent in 1980 to 18 percent in 2014. A similar trend is found in many other developed economies. Correspondingly, the income shares of lower income groups decreased.

The Great Divergence is the reverse of the Great Compression that preceded it. From 1913 to 1980, the income share of the top 1 percent *decreased* from 18 percent to 8 percent. Falling income inequality was the only trend known to Kuznets. His data showed that between 1880 and 1950, the share of total income going to the top 5 percent shrank from 31 percent to 20 percent in America and from 46 percent to 24 percent in Britain.

Eye on the U.S. Economy on p. 469 provides a striking perspective on these two contrasting episodes.

EYE on the U.S. ECONOMY

The Changing Shares in the Gains from Economic Growth

A common cry in recent years is that the economy is failing middle-class America. The rich are getting richer and the rest are standing still. Is this description accurate? If it is, the gains from economic growth have gone mainly to the rich.

To check this claim, we need to look at the incomes of the richest and poorest people and see how they have changed over the years. That's what the two figures do. They show the levels of income (per person) in different income groups as a percentage of incomes in 1970 (Figure 1) and 1929 (Figure 2).

Starting the story in 1970, Figure 1 shows that for about 10 years, the incomes of the rich (the top 1 percent) grew at a similar rate to those of other groups (the next top 19 percent and the bottom 20 percent).

Then, in 1983, the incomes of the top 1 percent started to outpace those of others. By 2007, the incomes of the top 1 percent were 5 times their 1970 level, of the next top 19 percent were double, and of the bottom 20 percent were only 1.8 times higher. And the bottom 20 percent made no progress at all from 1999 through 2014. It seems that there was indeed a Great Divergence.

Figure 2 tells a different story. From 1929 to 1970, while the incomes of 99 percent of people were rising to 3 times their 1929 level, those of the top 1 percent stagnated. When the incomes of the top 1 percent increased in the Great Divergence of Figure 1, they increased in a Great Convergence in Figure 2.

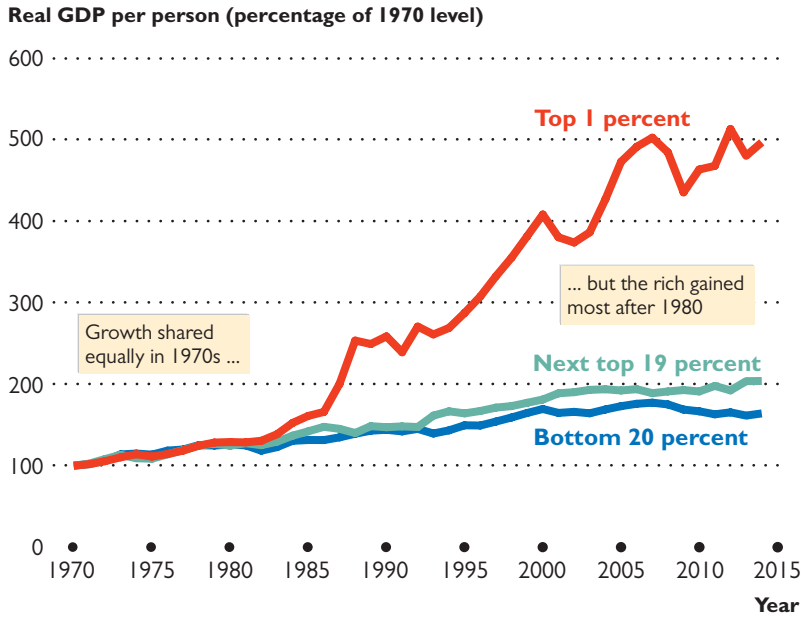


Figure 1 The Unequal Shares Since 1980

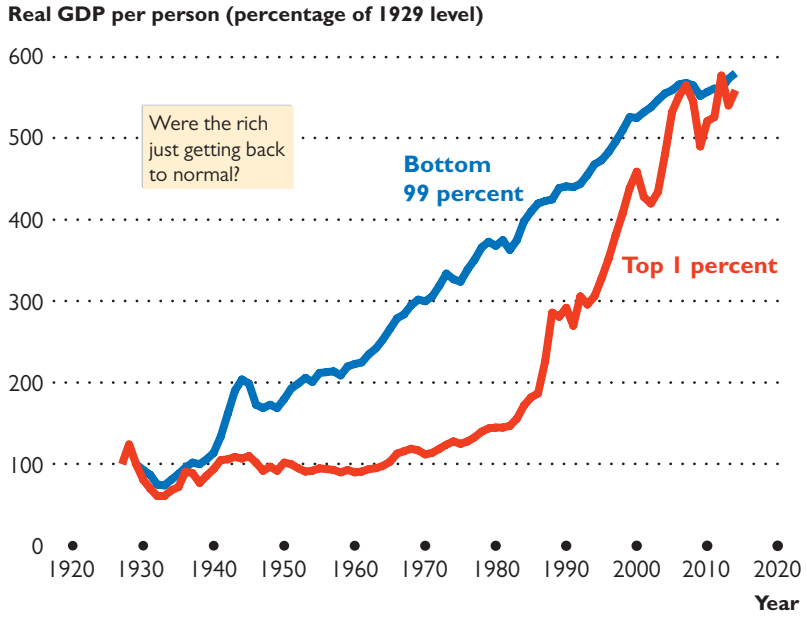


Figure 2 The Rich Climb Back

SOURCES OF DATA: Bureau of Economic Analysis, U.S. Census Bureau, World Wealth and Income Database, and authors' calculations.

The Explanations

Kuznets explained the decrease in inequality as incomes grow as resulting from market forces in a dynamic economy. Everyone is free to create a business. Some succeed and some fail. A greater number of hungry low-income entrepreneurs succeed than do rich ones, so inequality shrinks.

Paul Krugman says the Kuznets explanation of a compression driven by market forces does not fit the timing and that it was progressive income taxation, a strengthening of labor unions, and World War II wage and price controls that shrank the gap between the top and bottom earners. But timing poses a problem for this policy-induced explanation. The largest convergence occurred in the late 1930s, well before the political events that are claimed to have caused it.

Krugman also says the Great Divergence was caused by lower taxes on the rich, erosion of welfare programs, a decline in union membership, and soaring executive pay, all fostered by conservative economic policies initiated by Ronald Reagan.

French economist Thomas Piketty, the author of the best selling *Capital in the Twenty-First Century*, says that the Great Divergence is a consequence of the relationship between the interest rate, r, and the economic growth rate, g. He says that the interest rate exceeds the economic growth rate—$r > g$. The wealthy get their income from capital, which grows at rate r. The rest of us get our incomes from labor, which grows at rate g. Because $r > g$, the incomes of the rich grow faster than everyone else's income.

For Piketty, no automatic mechanism works against the steady concentration of wealth. A rapid growth spurt (rapid technological change) counters the rise in inequality temporarily. But only government redistribution can avoid rising inequality.

Economists do not yet have sound answers to the questions Simon Kuznets posed 60 years ago. We don't know enough to say where inequality is heading.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

How You Influence and Are Influenced by Economic Growth

Many of the choices that you make affect your personal economic growth rate—the pace of expansion of your own standard of living. And these same choices, in combination with similar choices made by millions of other people, have a profound effect on the economic growth of the nation and the world.

The most important of these choices right now is your choice to increase your human capital. By being in school, you have decided to expand your human capital.

You will continue to expand your human capital long after you finish school as your earning power rises with on-the-job experience. You might even decide to return to school at a later stage in your life.

A choice that will become increasingly important later in your life is to accumulate a retirement fund. This choice provides not only a source of income for you when you eventually retire but also financial resources that firms can use to finance the expansion of physical capital.

Not only do your choices influence economic growth; economic growth also has a big influence on you—on how you earn your income and on the standard of living that your income makes possible.

Because of economic growth, the jobs available today are more interesting and less dangerous and strenuous than those of 100 years ago; and jobs are hugely better paid. But for many of us, economic growth means that we must accept change and be ready to learn new skills and get new jobs.

CHECKPOINT 17.3

MyEconLab Study Plan 17.3
Key Terms Quiz
Solutions Video

Explain the sources of labor productivity growth.

Practice Problems

Use the data in Table 1 to work Problems **1** and **2**.

TABLE 1

Item	2015	2016
Aggregate labor hours (billions)	25.0	25.6
Real GDP (billions of 2009 dollars)	1,000	1,050

1. Calculate the growth rate of real GDP in 2016.

2. Calculate labor productivity in 2015 and 2016, and the growth rate of labor productivity in 2016.

In the News

Labor productivity mixed

The BLS reported the following data for the first quarter of 2016: In the nonfarm sector, output increased 0.9 percent as aggregate hours increased by 1.5 percent; in the manufacturing sector, output increased 0.6 percent as aggregate hours decreased by 0.7 percent.

Source: Productivity and Costs, Bureau of Labor Statistics, June 7, 2016

As aggregate hours and output changed, how did labor productivity in each sector change? In which sector was growth in labor productivity greater?

Solutions to Practice Problems

1. The growth rate of real GDP in 2016 was 5 percent. Growth rate equals [($1,050 billion − $1,000 billion) ÷ $1,000 billion] × 100 or 5 percent.

2. Labor productivity is $40.00 an hour in 2015 and $41.02 an hour in 2016.

Labor productivity equals real GDP divided by aggregate labor hours.

In 2015, labor productivity was ($1,000 billion ÷ 25 billion) or $40.00 per hour of labor. In 2016, labor productivity was ($1,050 billion ÷ 25.6 billion) or $41.02 per hour of labor.

The growth rate of labor productivity in 2016 was 2.55 percent.

Labor productivity growth rate was [($41.02 − $40.00) ÷ $40.00] × 100 or 2.55 percent.

Solution to In the News

In the nonfarm sector, output increased by less than the increase in aggregate hours, so labor productivity decreased. Output growth in manufacturing was less than that in the nonfarm sector, but aggregate hours decreased in manufacturing, so labor productivity increased. Because labor productivity increased in manufacturing and decreased in the nonfarm sector, labor productivity growth was greater in manufacturing.

MyEconLab Concept Video

17.4 ACHIEVING FASTER GROWTH

Why did it take more than a million years of human life before economic growth began? Why are some countries even today still barely growing? Why don't all societies save and invest in new capital, expand human capital, and discover and apply new technologies on a scale that brings rapid economic growth? What actions can governments take to encourage growth?

Preconditions for Economic Growth

The main reason economic growth is either absent or slow is that some societies lack the incentive system that encourages growth-producing activities. One of the fundamental preconditions for creating the incentives that lead to economic growth is economic freedom.

Economic Freedom

Economic freedom
A condition in which people are able to make personal choices, their private property is protected by the rule of law, and they are free to buy and sell in markets.

Economic freedom is present when people are able to make personal choices, their private property is protected by the rule of law, and they are free to buy and sell in markets. The rule of law, an efficient legal system, and the ability to enforce contracts are essential foundations for creating economic freedom. Impediments to economic freedom are corruption in the courts and government bureaucracy; barriers to trade, such as import bans; high tax rates; stringent regulations on business, such as health, safety, and environmental regulation; restrictions on banks; labor market regulations that limit a firm's ability to hire and lay off workers; and illegal markets, such as those that violate intellectual property rights.

No unique political system is necessary to deliver economic freedom. Democratic systems do a good job, but the rule of law, not democracy, is the key requirement for creating economic freedom. Nondemocratic political systems that respect the rule of law can also work well. Hong Kong is the best example of a place with little democracy but a lot of economic freedom—and a lot of economic growth. No country with a high level of economic freedom is economically poor, but many countries with low levels of economic freedom stagnate.

Property Rights

Property rights
The social arrangements that govern the protection of private property.

Economic freedom requires the protection of private property—the factors of production and goods that people own. The social arrangements that govern the protection of private property are called **property rights**. They include the rights to physical property (land, buildings, and capital equipment), to financial property (claims by one person against another), and to intellectual property (such as inventions). Clearly established and enforced property rights provide people with the incentive to work and save. If someone attempts to steal their property, a legal system will protect them. Such property rights also assure people that government itself will not confiscate their income or savings.

Markets

Economic freedom also requires free markets. Buyers and sellers get information and do business with each other in *markets.* Market prices send signals to buyers and sellers that create incentives to increase or decrease the quantities demanded and supplied. Markets enable people to trade and to save and invest. But markets cannot operate without property rights.

Property rights and markets create incentives for people to specialize and trade, to save and invest, to expand their human capital, and to discover and apply new technologies. Early human societies based on hunting and gathering did not experience economic growth because they lacked property rights and markets. Economic growth began when societies evolved the institutions that create incentives. But the presence of an incentive system and the institutions that create it do not guarantee that economic growth will occur. They permit economic growth but do not make it inevitable.

Growth begins when the appropriate incentive system exists because people can specialize in the activities at which they have a comparative advantage and trade with each other. You saw in Chapter 3 how everyone gains from such activity. By specializing and trading, everyone can acquire goods and services at the lowest possible cost. Consequently, people can obtain a greater volume of goods and services from their labor.

As an economy moves from one with little specialization to one that reaps the gains from specialization and trade, its production and consumption grow. Real GDP per person increases, and the standard of living rises.

But for growth to be persistent, people must face incentives that encourage them to pursue the three activities that generate *ongoing* economic growth: saving and investment, expansion of human capital, and the discovery and application of new technologies.

Policies to Achieve Faster Growth

To achieve faster economic growth, we must increase the growth rate of capital per hour of labor, increase the growth rate of human capital, or increase the pace of technological advance. The main actions that governments can take to achieve these objectives are

- Create incentive mechanisms.
- Encourage saving.
- Encourage research and development.
- Encourage international trade.
- Improve the quality of education.

Create Incentive Mechanisms

Economic growth occurs when the incentives to save, invest, and innovate are strong enough. These incentives require property rights enforced by a well-functioning legal system. Property rights and a legal system are the key ingredients that are missing in many societies. For example, they are absent throughout much of Africa. The first priority for growth policy is to establish these institutions so that incentives to save, invest, and innovate exist. Russia is a leading example of a country that is striving to take this step toward establishing the conditions in which economic growth can occur.

Encourage Saving

Saving finances investment, which brings capital accumulation. So encouraging saving can increase the growth of capital and stimulate economic growth. The East Asian economies have the highest saving rates and the highest growth rates. Some African economies have the lowest saving rates and the lowest growth rates.

Tax incentives can increase saving. Individual Retirement Accounts (IRAs) are an example of a tax incentive to save. Economists claim that a tax on consumption rather than on income provides the best incentive to save.

Encourage Research and Development

Everyone can use the fruits of basic research and development efforts. For example, all biotechnology firms can use advances in gene-splicing technology. Because basic inventions can be copied, the inventor's profit is limited and so the market allocates too few resources to this activity.

Governments can direct public funds toward financing basic research, but this solution is not foolproof. It requires a mechanism for allocating public funds to their highest-valued use. The National Science Foundation is one possibly efficient channel for allocating public funds to universities and public research facilities to finance and encourage basic research. Government programs such as national defense and space exploration also lead to innovations that have wide use. Laptop computers and nonstick coatings are two prominent examples of innovations that came from the U.S. space program.

Encourage International Trade

Free international trade stimulates economic growth by extracting all the available gains from specialization and trade. The fastest-growing nations today are those with the fastest-growing exports and imports. The creation of the North American Free Trade Agreement and the integration of the economies of Europe through the formation of the European Union are examples of successful actions that governments have taken to stimulate economic growth through trade.

Improve the Quality of Education

The free market would produce too little education because it brings social benefits beyond the benefits to the people who receive the education. By funding basic education and by ensuring high standards in skills such as language, mathematics, and science, governments can contribute enormously to a nation's growth potential. Education can also be expanded and improved by using tax incentives to encourage improved private provision. Singapore's Information Technology in Education program is one of the best examples of a successful attempt to stimulate growth through education.

How Much Difference Can Policy Make?

It is easy to make a list of policy actions that could increase a nation's economic growth rate. It is hard to convert that list into acceptable actions that make a big difference.

Political equilibrium arises from the balance of the interests of one group against the interests of another group. Change brings gains for some and losses for others, so change is slow. And even when change occurs, if the economic growth rate can be increased by even as much as half a percentage point, it takes many years for the full benefits to accrue.

A well-intentioned government cannot dial up a big increase in the economic growth rate, but it can pursue policies that will nudge the economic growth rate upward. Over time, the benefits from these policies will be large.



MyEconLab Critical Thinking Exercise

EYE on RICH AND POOR NATIONS

Why Are Some Nations Rich and Others Poor?

Political stability, property rights protected by the rule of law, and limited government intervention in markets: These are key features of the economies that enjoy high or rapidly rising incomes and they are the features missing in economies that remain poor. All the rich nations have possessed these growth-inducing characteristics for the many decades during which their labor productivity and standard of living have been rising.

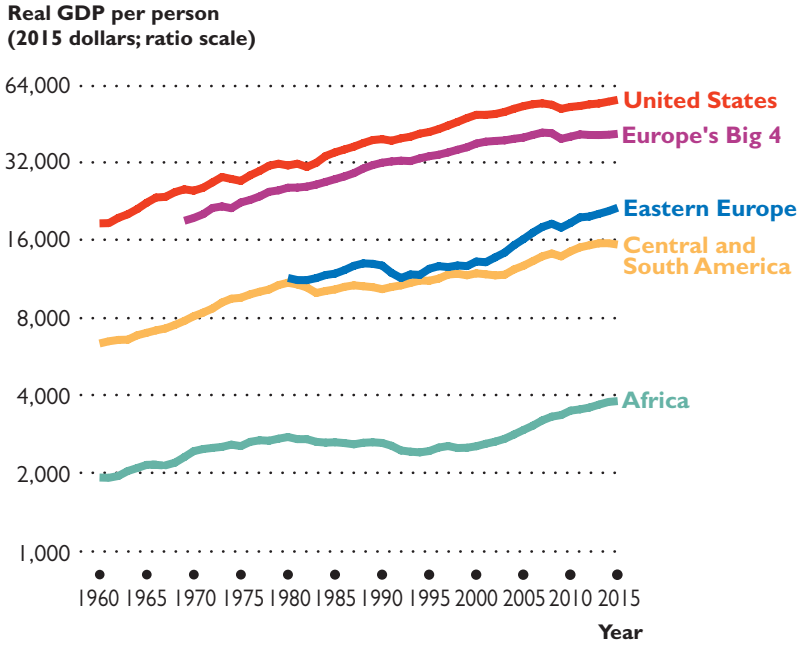
The United States started to grow rapidly 150 years ago and overtook Europe in the early 20th century. In the past 50 years, the gaps between these countries haven't changed much. (See part (a) of the figure.)

In a transition from Communism to a market economy, Eastern Europe is now growing faster.

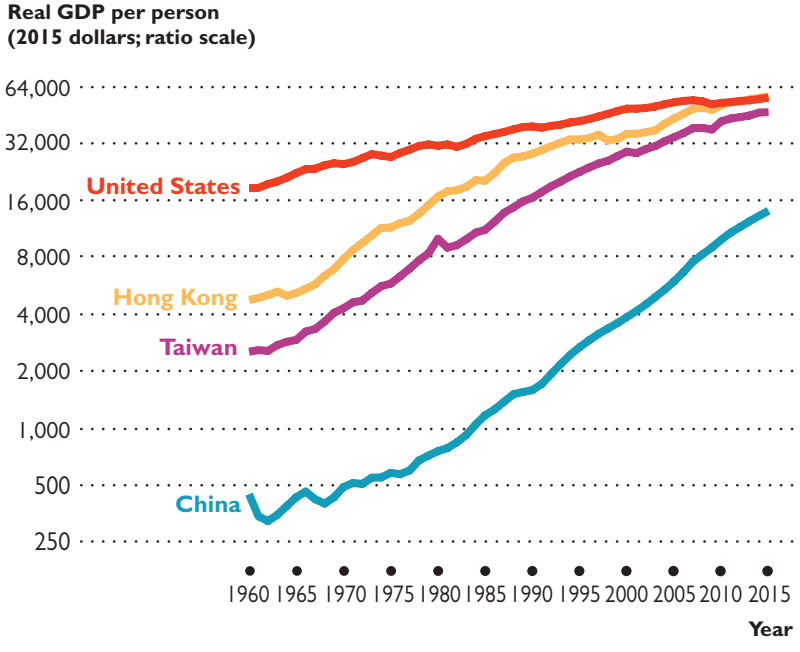
Tribal conflict in Africa and bureaucratic overload in Central and South America have kept growth slow and the gap between the United States and these regions has widened.

Real GDP per person in East Asian economies, in part (b), has converged toward that in the United States. These economies are like fast trains running on the same track at similar speeds with roughly constant gaps between them. Hong Kong is the lead train, and it runs about 15 years in front of Taiwan and almost 40 years in front of the People's Republic of China.

Between 1960 and 2015, Hong Kong and and some other smaller countries of Asia transformed themselves from poor developing economies to take their places among the world's richest economies.



(a) Persistent gaps



(b) Convergence

SOURCE OF DATA: International Monetary Fund, *World Economic Outlook Database.*

MyEconLab Study Plan 17.4
Key Terms Quiz
Solutions Video

CHECKPOINT 17.4

Describe policies that speed economic growth.

Practice Problems

1. What are the preconditions for economic growth?
2. Why does much of Africa experience slow economic growth?
3. Why is economic freedom crucial for achieving economic growth?
4. What role do property rights play in encouraging economic growth?
5. Explain why, other things remaining the same, a country with a well-educated population has a faster economic growth rate than a country that has a poorly educated population.

In the News

Government to make India's growth sturdy
The government of India is scaling up and better targeting its infrastructure investment. A key component of its policy is "digitalisation": an infrastructure program to increase Internet connectivity, digitally empower the country, and make government services available to citizens electronically.

Source: *Business Standard*, July 11, 2016

Explain how the measures reported in the news clip could lead to faster growth.

Solutions to Practice Problems

1. The preconditions for economic growth are economic freedom, private property rights, and markets. Without these preconditions, people have little incentive to undertake the actions that lead to economic growth.
2. Some African countries experience slow economic growth because they lack economic freedom, private property rights are not enforced, and markets do not function well. People in these countries have little incentive to specialize and trade or to accumulate both physical and human capital.
3. Economic freedom is crucial for achieving economic growth because economic freedom allows people to make choices and gives them the incentives to pursue growth-producing activities.
4. Clearly defined private property rights and a legal system to enforce them give people the incentive to work, save, invest, and accumulate human capital.
5. A well-educated population has more skills and greater labor productivity than a poorly educated population. A well-educated population can contribute to the research and development that create new technology.

Solution to In the News

Investment in infrastructure and Internet technology would increase India's stock of physical capital, which would increase labor productivity. Better electronic communication would increase human capital and again increase labor productivity. These measures could lead to faster growth in labor productivity and faster growth in real GDP per person in India.

CHAPTER SUMMARY

Key Points

1. Explain what determines potential GDP.

- Potential GDP is the quantity of real GDP that the full-employment quantity of labor produces.
- At full-employment equilibrium, the real wage rate makes the quantity of labor demanded equal the quantity of labor supplied.

2. Define and calculate the economic growth rate, and explain the implications of sustained growth.

- Economic growth is the sustained expansion of production possibilities. The annual percentage change in real GDP measures the economic growth rate.
- Real GDP per person must grow if the standard of living is to rise.
- Sustained economic growth transforms poor nations into rich ones.
- The Rule of 70 tells us the number of years in which real GDP doubles—70 divided by the percentage growth rate of real GDP.

3. Explain the sources of labor productivity growth.

- Real GDP grows when aggregate hours and labor productivity grow.
- Real GDP per person grows when labor productivity grows.
- The interaction of saving and investment in physical capital, expansion of human capital, and technological advances bring labor productivity growth.
- Saving and investment in physical capital alone cannot bring sustained steady growth because of diminishing marginal returns to capital.

4. Describe policies that speed economic growth.

- Economic growth requires an incentive system created by economic freedom, property rights, and markets.
- It might be possible to achieve faster growth by encouraging saving, subsidizing research and education, and encouraging international trade.

Key Terms

MyEconLab Key Terms Quiz

Classical macroeconomics, 446
Demand for labor, 451
Diminishing returns, 450
Economic freedom, 472
Economic growth, 456
Economic growth rate, 456
Keynesian macroeconomics, 446
Labor productivity, 460
Law of diminishing marginal returns, 461
Monetarist macroeconomics, 447
Potential GDP, 449
Production function, 450
Productivity curve, 462
Property rights, 472
Quantity of labor demanded, 451
Quantity of labor supplied, 451
Rule of 70, 458
Supply of labor, 452

MyEconLab Chapter 17 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

Use the events in List 1, which occur in the United States one at a time, to work Problems **1** to **4**.

LIST 1

- Dell introduces a new supercomputer that everyone can afford.
- A major hurricane hits Florida.
- More high school graduates go to college.
- The CPI rises.
- An economic slump in the rest of the world decreases U.S. exports.

1. Sort the items into four groups: those that change the production function, those that change the demand for labor, those that change the supply of labor, and those that do not change the production function, the demand for labor, or the supply of labor. Say in which direction any changes occur.

2. Which of the events increase the equilibrium quantity of labor and which decrease it?

3. Which of the events raise the real wage rate and which lower it?

4. Which of the events increase potential GDP and which decrease it?

Use the information set out in Table 1 and Table 2 about the economy of Athabasca to work Problems **5** and **6**.

TABLE 1 PRODUCTION FUNCTION

Labor hours (millions)	Real GDP (millions of 2009 dollars)
0	0
1	10
2	19
3	27
4	34
5	40

TABLE 2 LABOR MARKET

Real wage rate (2009 dollars per hour)	Quantity of labor demanded	Quantity of labor supplied
	(millions of hours per year)	
10	1	5
9	2	4
8	3	3
7	4	2
6	5	1

5. Calculate the quantity of labor employed, the real wage rate, and potential GDP.

6. If the labor force participation increases, explain how employment, the real wage rate, and potential GDP change.

7. In 2005 and 2006, India's real GDP grew by 9.2 percent a year and its population grew by 1.6 percent a year. If these growth rates are sustained, in what years would

- Real GDP be twice what it was in 2006?
- Real GDP per person be twice what it was in 2006?

8. Explain how saving and investment in capital change labor productivity. Why do diminishing returns arise? Provide an example of diminishing returns. Use a graph of the productivity curve to illustrate your answer.

9. Explain how advances in technology change labor productivity. Do diminishing returns arise? Provide an example of an advance in technology. Use a graph of the productivity curve to illustrate your answer.

10. What can governments in Africa do to encourage economic growth and raise the standard of living in their countries?

11. **As China's growth slows, income inequality speeds up**
China's real GDP growth rate has fallen from 10 percent a year to 6.8 percent a year. At the same time, the distribution of income has become more unequal. Suggestions for dealing with these problems include encouraging the growth of small firms, expanding the services sector, and investing more in human capital and research.

Source: Economywatch.com, June 16, 2016

Compare China's growth slowdown and increased inequality with that of the United States. Would the suggestions for dealing with these problems work?

12. Read *Eye on Rich and Poor Nations* on p. 475. Which nations are the richest and which are growing the fastest? What are the conditions that lead to higher incomes and faster-growing incomes?

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. Distinguish between low and high incomes and low and high economic growth rates. What key features are present in an economy when incomes are high or fast growing and absent when incomes are low and stagnating or growing slowly? Provide an example of an economy with a low income and slow growth rate, a low income and rapid growth rate, and a high income with sustained growth over many decades.

Use the following information to work Problems **2** and **3**.

In South Korea, real GDP per hour of labor is $22, the real wage rate is $15 per hour, and people work an average of 46 hours per week.

2. Draw a graph of the demand for and supply of labor in South Korea and the United States. Mark a point at the equilibrium quantity of labor per person per week and the real wage rate in each economy. Explain the difference in the two labor markets.

3. Draw a graph of the production functions in South Korea and the United States. Mark a point on each production function that shows potential GDP per hour of work in each economy. Explain the difference in the two production functions.

4. Explain how an increase in physical capital and an increase in human capital change labor productivity. Use a graph to illustrate your answer.

5. Table 1 describes labor productivity in an economy. What must have occurred in this economy during year 1?

6. Describe and illustrate in a graph what happened in the economy in Table 1 if in year 1, capital per hour of labor was 30 and in year 2 it was 40.

7. China invests almost 50 percent of its annual production in new capital compared to 15 percent in the United States. Capital per hour of labor in China is about 25 percent of that in the United States. Explain which economy has the higher real GDP per hour of labor, has the faster growth rate of labor productivity, and experiences the more severe diminishing returns.

TABLE 1 LABOR PRODUCTIVITY

Capital per hour of labor	Real GDP per hour of labor	
	in year 1	in year 2
10	7	9
20	13	17
30	18	24
40	22	30
50	25	35
60	27	39
70	28	42

Use the following information to work Problems **8**, **9**, and **10**.

Dear Silicon Valley: Forget flying cars, give us economic growth

We have made enormous advances in computing technology. In Silicon Valley at Alphabet's X labs, people are working on transformative technologies that include driverless cars, high-altitude balloons that deliver the Internet to remote regions of the world, self-navigating drones, and flying wind turbines tethered to a ground station. But despite today's advances in technology, our economic growth rate has slowed.

Source: *MIT Technology Review*, June 21, 2016

8. How would you explain the disconnect between the advances in technology described in the news clip and the pace of real GDP growth?

9. Thinking about the perpetual motion machine of economic growth (Figure 17.7 on p. 468), what are the missing ingredients that make some of today's amazing technologies fail to deliver faster economic growth?

10. Of the preconditions for economic growth and the policies that might achieve faster growth, which are already present in Silicon Valley (and the rest of the U.S. economy), and which, if any, might need to be strengthened?

MyEconLab Chapter 17 Study Plan

Multiple Choice Quiz

1. U.S. potential GDP is the value of the goods and services produced in the United States _____.

A. in the reference base year
B. when the U.S. unemployment rate is zero
C. when the U.S. economy is at full employment
D. when the U.S. inflation rate is zero

2. The demand for labor curve shows the relationship between _____.

A. the quantity of labor employed and firms' profits
B. all households' willingness to work and the real wage rate
C. the quantity of labor businesses are willing to hire and the real wage rate
D. the labor force and the real wage rate

3. The supply of labor is the relationship between _____.

A. the quantity of labor supplied and leisure time forgone
B. the real wage rate and the quantity of labor supplied
C. firms' willingness to supply jobs and the real wage rate
D. the labor force participation rate and the real wage rate

4. Households' labor supply decisions are influenced by all of the following *except* _____.

A. the opportunity cost of taking leisure and not working
B. the after-tax wage rate
C. unemployment benefits
D. the number of full-time jobs available

5. If real GDP increases from $5 billion to $5.25 billion and the population increases from 2 million to 2.02 million, real GDP per person increases by _____ percent.

A. 5.0
B. 1.0
C. 2.5
D. 4.0

6. If the population growth rate is 2 percent, real GDP per person will double in 7 years if real GDP grows by _____ percent per year.

A. 7
B. 10
C. 12
D. 14

7. All of the following increase labor productivity *except* _____.

A. the accumulation of skill and knowledge
B. an increase in capital per hour of labor
C. an increase in consumption
D. the employment of a new technology

8. An economy can achieve faster economic growth *without* _____.

A. markets and property rights
B. people being willing to save and invest
C. incentives to encourage the research for new technologies
D. an increase in the population growth rate



How does the Fed create money and regulate its quantity?

18

Money and Inflation

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Define money and describe its functions.
2. Describe the functions of banks and the Federal Reserve (the Fed).
3. Explain how the banking system creates money and how the Fed controls the quantity of money.
4. Explain how the quantity of money influences the price level and how money growth brings inflation.

MyEconLab Big Picture Video

MyEconLab Concept Video

18.1 WHAT IS MONEY?

Money, like fire and the wheel, has been around for a very long time. An incredible array of items has served as money. North American Indians used wampum (beads made from shells), Fijians used whales' teeth, and early American colonists used tobacco. Cakes of salt served as money in Ethiopia and Tibet. What do wampum, whales' teeth, tobacco, and salt have in common? Why are they examples of money? Today, when we want to buy something, we use coins or notes (dollar bills), write a check, send an e-check, present a credit or debit card, or use a smartphone app. Are all these things that we use today money? To answer these questions, we need a definition of money.

Definition of Money

Money
Any commodity or token that is generally accepted as a *means of payment*.

Money is any commodity or token that is generally accepted as a *means of payment*. This definition has three parts that we'll examine in turn.

A Commodity or Token

Money is always something that can be recognized and that can be divided up into small parts. So money might be an actual commodity, such as a bar of silver or gold. But it might also be a token, such as a quarter or a $10 bill. Money might also be a virtual token, such as an electronic record in a bank's database (more about this type of money later).

Generally Accepted

Money is *generally* accepted, which means that it can be used to buy *anything and everything*. Some tokens can be used to buy some things but not others. For example, a bus pass is accepted as payment for a bus ride, but you can't use your bus pass to buy toothpaste. So a bus pass is not money. In contrast, you can use a $5 bill to buy either a bus ride or toothpaste—or anything else that costs $5 or less. So a $5 bill is money.

Means of Payment

Means of payment
A method of settling a debt.

A **means of payment** is a method of settling a debt. When a payment has been made, the deal is complete. Suppose that Gus buys a car from his friend Ann. Gus doesn't have enough money to pay for the car right now, but he will have enough three months from now, when he gets paid. Ann agrees that Gus may pay for the car in three months' time. Gus buys the car with a loan from Ann and then pays off the loan. The loan isn't money. Money is what Gus uses to pay off the loan.

So what wampum, whales' teeth, tobacco, and salt have in common is that they have served as a generally accepted means of payment, and that is why they are examples of money.

The Functions of Money

Money performs three vital functions. It serves as a

- Medium of exchange
- Unit of account
- Store of value

Medium of Exchange

A **medium of exchange** is an object that is generally accepted in return for goods and services. Money is a medium of exchange. Without money, you would have to exchange goods and services directly for other goods and services—an exchange called **barter**. Barter requires a *double coincidence of wants.* For example, if you want a soda and have only a paperback novel to offer in exchange for it, you must find someone who is selling soda and who also wants your paperback novel. Money guarantees that there is a double coincidence of wants because people with something to sell will always accept money in exchange for it. Money acts as a lubricant that smoothes the mechanism of exchange. Money enables you to specialize in the activity in which you have a comparative advantage (see Chapter 3, pp. 73–75) instead of searching for a double coincidence of wants.

Medium of exchange
An object that is generally accepted in return for goods and services.

Barter
The direct exchange of goods and services for other goods and services, which requires a double coincidence of wants.

Unit of Account

An agreed-upon measure for stating the prices of goods and services is called a *unit of account*. To get the most out of your budget, you have to figure out whether going to a rock concert is worth its opportunity cost. But that cost is not dollars and cents. It is the number of movies, cappuccinos, ice-cream cones, or sticks of gum that you must give up to attend the concert. It's easy to do such calculations when all these goods have prices in terms of dollars and cents (see Table 18.1). If a rock concert costs $64 and a movie costs $8, you know right away that going to the concert costs you 8 movies. If a cappuccino costs $4, going to the concert costs 16 cappuccinos. You need only one calculation to figure out the opportunity cost of any pair of goods and services. For example, the opportunity cost of the rock concert is 128 sticks of gum ($64 ÷ 50¢ = 128 sticks of gum).

Now imagine how troublesome it would be if the rock concert ticket agent posted its price as 8 movies, and if the movie theater posted its price as 2 cappuccinos, and if the coffee shop posted the price of a cappuccino as 2 ice-cream cones, and if the ice-cream shop posted its price as 4 sticks of gum! Now how much running around and calculating do you have to do to figure out how much that rock concert is going to cost you in terms of the movies, cappuccino, ice cream, or sticks of gum that you must give up to attend it? You get the answer for movies right away from the sign posted by the ticket agent. For all the other goods, you're going to have to visit many different places to establish the price of each commodity in terms of another and then calculate prices in units that are relevant for your own decision. Cover up the column labeled "price in money units" in Table 18.1 and see how hard it is to figure out the number of sticks of gum it costs to attend a rock concert. It's enough to make a person swear off rock! How much simpler it is using dollars and cents.

TABLE 18.1 A UNIT OF ACCOUNT SIMPLIFIES PRICE COMPARISONS

Good	Price in money units	Price in units of another good
Rock concert	$64.00	8 movies
Movie	$8.00	2 cappuccinos
Cappuccino	$4.00	2 ice-cream cones
Ice-cream cone	$2.00	4 sticks of gum
Stick of gum	$0.50	

Store of Value

Any commodity or token that can be held and exchanged later for goods and services is called a *store of value*. Money acts as a store of value. If it did not, it would not be accepted in exchange for goods and services. The more stable the value of a commodity or token, the better it can act as a store of value and the more useful it is as money. No store of value is completely stable. The value of a physical object, such as a house, a car, or a work of art, fluctuates over time. The value of the commodities and tokens that we use as money also fluctuates, and when there is inflation, money persistently falls in value.

Money Today

Fiat money
Objects that are money because the law decrees or orders them to be money.

Money in the world today is called **fiat money**. *Fiat* is a Latin word that means decree or order. Fiat money is money because the law decrees it to be so. The objects used as money have value only because of their legal status as money.

Today's fiat money consists of

- Currency
- Deposits at banks and other financial institutions

Currency

Currency
Notes (dollar bills) and coins.

The notes (dollar bills) and coins that we use in the United States today are known as **currency**. The government declares notes to be money with the words printed on every dollar bill, "This note is legal tender for all debts, public and private."

Deposits

Deposits at banks, credit unions, savings banks, and savings and loan associations are also money. Deposits are money because they can be used to make payments. You don't need to go to the bank to get currency to make a payment. You can write a check or use your debit card to tell your bank to move some money from your account to someone else's.

Currency Inside the Banks Is Not Money

Although currency and bank deposits are money, currency *inside the banks* is *not money*. The reason is while currency is inside a bank, it isn't available as a means of payment. When you get some cash from the ATM, you convert your bank deposit into currency. You change the form of your money, but there is no change in the quantity of money that you own. Your bank deposit decreases, and your currency holding increases.

If we counted bank deposits and currency inside the banks as money, think about what would happen to the quantity of money when you get cash from the ATM. The quantity of money would appear to decrease. Your currency would increase, but both bank deposits and currency inside the banks would decrease.

You can see that counting both bank deposits and currency inside the banks as money would be double counting.

Official Measures of Money: M1 and M2

M1
Currency held by individuals and businesses, traveler's checks, and checkable deposits owned by individuals and businesses.

M2
M1 plus savings deposits and small time deposits, money market funds, and other deposits.

Figure 18.1 shows the items that make up two official measures of money. **M1** consists of currency held by individuals and businesses, traveler's checks, and checkable deposits owned by individuals and businesses. **M2** consists of M1 plus savings deposits and time deposits (less than $100,000), money market funds, and other deposits. Time deposits are deposits that can be withdrawn only after a fixed term. Money market funds are deposits that are invested in short-term securities.

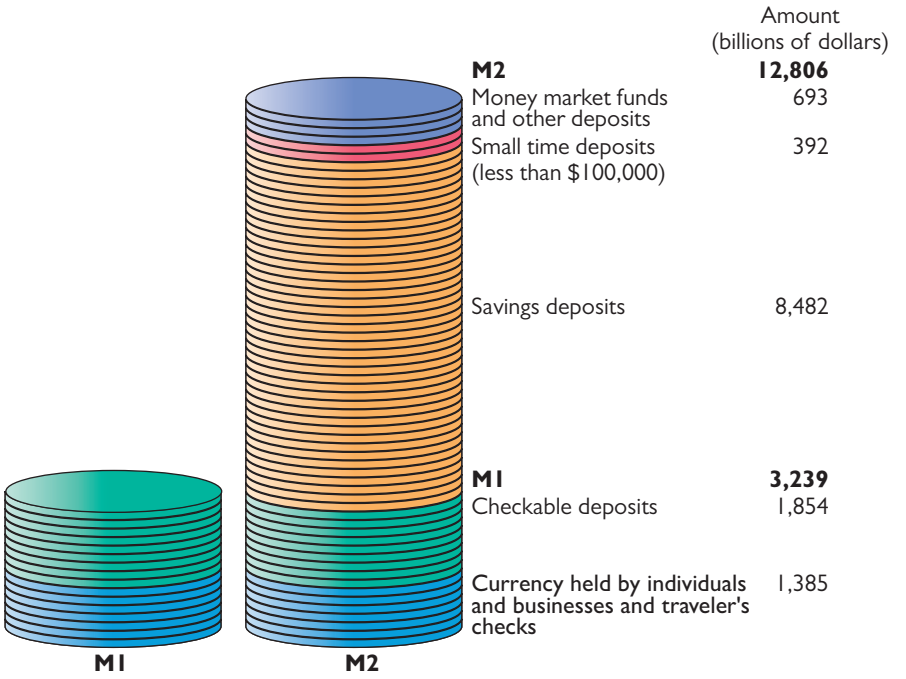
Are M1 and M2 Means of Payment?

The test of whether something is money is whether it is a generally accepted means of payment. Currency passes the test. Checkable deposits also pass the test because they can be transferred from one person to another by using a debit card or writing a check. So all the components of M1 serve as means of payment.

FIGURE 18.1

Two Measures of Money: June 2016

MyEconLab Real-time data



In June 2016, M1 was $3,239 billion— the sum of $1,385 billion currency and traveler's checks and $1,854 billion checkable deposits.

M2 was $12,806 billion—the sum of M1, $8,482 billion savings deposits, $392 billion time deposits, and $693 billion money market funds and other deposits.

SOURCE OF DATA: Federal Reserve.

Some of the savings deposits in M2 are also instantly convertible into a means of payment. You can use the ATM to get currency to pay for your groceries or gas. But other savings deposits, time deposits, and money market funds are not instantly convertible and are *not* a means of payment.

Checks, Credit Cards, Debit Cards, and Mobile Wallets

In defining money and describing the things that serve as money today, we have not included checks, credit cards and debit cards, or mobile wallets. Aren't these things that we use when we buy something also money?

Checks

A check is not money. It is an instruction to a bank to make a payment. The easiest way to see why a check is not money is to think about how the quantity of money you own changes if you write a check. You don't suddenly have more money because you've written a check to pay a bill. Your money is your bank deposit, not the value of the checks you've written.

Credit Cards

A credit card is not money. It is a special type of ID card that gets you an instant loan. Suppose that you use your credit card to buy a textbook. You sign or enter your PIN and leave the store with your book. The book may be in your possession,

but you've not yet paid for it. You've taken a loan from the bank that issued your credit card. Your credit card issuer pays the bookstore and you eventually get your credit card bill, which you pay using money.

Debit Cards

A debit card works like a paper check, only faster. And just as a check isn't money, neither is a debit card. To see why a debit card works like a check, think about what happens if you use your debit card to buy your textbook. When the sales clerk swipes your card in the bookstore, the computer in the bookstore's bank gets a message: Take $100 from your account and put it in the account of the bookstore. The transaction is done in a flash. But again, the bank deposits are the money and the debit card is the tool that causes money to move from you to the bookstore.

Mobile Wallets

A *mobile wallet* is an electronic version of a physical wallet. It is a smartphone, tablet, or smartwatch app that stores and accesses credit card or debit card data to make purchases. Examples are Apple Pay, Samsung Pay, Android Pay, and Current C. So like the credit cards and debit cards whose data it stores, a mobile wallet isn't money.

You now know that checks, credit and debit cards, and mobile wallets are not money, but one new information-age money is gradually emerging—e-cash.

An Embryonic New Money: E-Cash

Electronic cash (or *e-cash*) is an electronic equivalent of paper notes (dollar bills) and coins. It is an electronic currency, and for people who are willing to use it, e-cash works like other forms of money. But for e-cash to become a widely used form of money, it must evolve some of the characteristics of physical currency.

People use physical currency because it is portable, recognizable, transferable, untraceable, and anonymous and can be used to make change. The designers of e-cash aim to reproduce all of these features of notes and coins. Today's e-cash is portable, untraceable, and anonymous, but it has not yet reached the level of recognition that makes it *universally* accepted as a means of payment. E-cash doesn't yet meet the definition of money.

Like notes and coins, e-cash can be used in shops. It can also be used over the Internet. To use e-cash in a shop, the buyer uses a smart card that stores some e-cash and the shop uses a smart card reader. When a transaction is made, e-cash is transferred from the smart card directly to the shop's bank account. Users of smart cards receive their e-cash by withdrawing it from a bank account by using a special ATM or a smartphone.



Several versions of e-cash in U.S. dollars, euros, and other currencies are available on the Internet. The most popular and widely used e-cash system is PayPal. The most sophisticated and secure e-cash is a currency called Bitcoin, which can be used to settle debts and be traded for dollars and other currencies on the Internet.

A handy advantage of e-cash over paper notes arises when you lose your wallet. If it is stuffed with dollar bills, you're out of luck. If it contains e-cash recorded on your smart card, your bank can cancel the e-cash stored on the card and issue you replacement e-cash.

Although e-cash is not yet universally accepted, it is likely that its use will grow and that it will gradually replace physical forms of currency.

CHECKPOINT 18.1

MyEconLab Study Plan 18.1
Key Terms Quiz
Solutions Video

Define money and describe its functions.

Practice Problems

1. In the United States today, which of the items in List 1 are money?
2. In January 2016, currency held by individuals and businesses and traveler's checks were $1,347 billion; checkable deposits owned by individuals and businesses were $1,764 billion; savings deposits were $8,189 billion; small time deposits were $400 billion; and money market funds and other deposits were $709 billion. Calculate M1 and M2 in January 2016.
3. In May 2016, M1 was $3,239 billion; M2 was $12,731 billion; checkable deposits owned by individuals and businesses were $1,861 billion; small time deposits were $393 billion; and money market funds and other deposits were $706 billion. Calculate currency held by individuals and businesses and traveler's checks. Calculate savings deposits.

LIST 1

- Your Visa card
- The quarters inside vending machines
- U.S. dollar bills in your wallet
- The check that you have just written to pay for your rent
- The loan you took out last August to pay for your tuition

In the News

Android Pay adds support for 115 new U.S. banks
Android Pay now operates in the United States and the Uinted Kingdom and is expanding around the world. It supports CITI bank and AMEX and from today, 115 more banks and credit unions are joining the service.

Source: androidheadlines.com, June 30, 2016

As people use mobile wallets to make purchases, will currency disappear? How will the components of M1 change? Will credit cards and debit cards disappear?

Solutions to Practice Problems

1. Money is defined as a means of payment. Only the quarters inside vending machines and U.S. dollar bills in your wallet are money.
2. M1 is $3,111 billion. M1 is the sum of currency held by individuals and businesses and traveler's checks ($1,347 billion) and checkable deposits owned by individuals and businesses ($1,764 billion).

   M2 is $12,409 billion. M2 is the sum of M1 ($3,111 billion), savings deposits ($8,189 billion), small time deposits ($400 billion), and money market funds and other deposits ($709 billion).
3. Currency held by individuals and businesses and traveler's checks were $1,378 billion. Currency held by individuals and businesses and traveler's checks equals M1 ($3,239 billion) minus checkable deposits owned by individuals and businesses ($1,861 billion).

   Savings deposits are $8,393 billion. Savings deposits equals M2 ($12,731 billion) minus M1 ($3,239 billion) minus small time deposits ($393 billion) minus money market funds and other deposits ($706 billion)

Solution to In the News

Most people will probably carry less currency, but it won't disappear because currency is used in the underground economy. Most of M1 will be checkable deposits. Mobile wallets are digitized credit cards and debit cards, so these cards will not disappear.

MyEconLab Concept Video

18.2 THE BANKING SYSTEM

The banking system consists of the Federal Reserve and the banks and other institutions that accept deposits and that provide the services that enable people and businesses to make and receive payments. Sitting at the top of the system (see Figure 18.2), the Federal Reserve (or the Fed) sets the rules and regulates and influences the activities of banks and other institutions. Three types of financial institutions accept the deposits that are part of the nation's money:

- Commercial banks
- Thrift institutions
- Money market funds

Here, we describe the functions of these institutions, and in the next section, we describe the structure and functions of the Federal Reserve.

Commercial Banks

A *commercial bank* is a firm that is chartered by the Comptroller of the Currency in the U.S. Treasury (or by a state agency) to accept deposits and make loans. In 2016, about 5,260 commercial banks operated in the United States, down from 15,000 in the 1980s. The number of banks has shrunk because in 1997 the rules under which banks operate were changed, permitting them to open branches in every state. A wave of mergers followed this change of rules. Also, more than 130 banks failed during the financial crisis of 2008–2009.

Bank Deposits

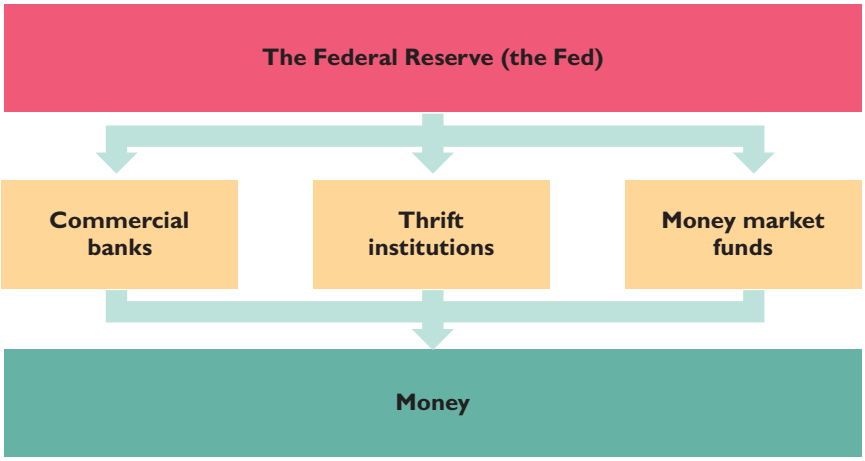
A commercial bank accepts three broad types of deposits: checkable deposits, savings deposits, and time deposits. A bank pays a low interest rate (sometimes zero) on checkable deposits, and it pays the highest interest rate on time deposits.

FIGURE 18.2

The Institutions of the Banking System

MyEconLab Animation

The Federal Reserve regulates and influences the activities of the commercial banks, thrift institutions, and money market funds, whose deposits make up the nation's money.



Profit and Risk: A Balancing Act

Commercial banks try to maximize their stockholders' wealth by lending for long terms at high interest rates and borrowing from depositors and others. But lending is risky. Risky loans sometimes don't get repaid and the prices of risky securities sometimes fall. In either of these events, a bank incurs a loss that could even wipe out the stockholders' wealth. Also, when depositors see their bank incurring losses, mass withdrawals—called a run on the bank—might create a crisis. So a bank must perform a balancing act. It must be careful in the way it uses the depositors' funds and balance security for depositors and stockholders against high but risky returns. To trade off between risk and profit a bank divides its assets into four parts: reserves, liquid assets, securities, and loans.

Reserves

A bank's **reserves** consist of currency in its vaults plus the balance on its reserve account at the Federal Reserve.

Reserves
The currency in the bank's vaults plus the balance on its reserve account at the Federal Reserve.

The currency in a bank's vaults is a reserve to meet its depositors' withdrawals. Your bank must replenish currency in its ATM every time you and your friends have raided it for cash for a midnight pizza.

A commercial bank's deposit at the Federal Reserve is similar to your own deposit at a bank. The bank uses its reserve account at the Fed to receive and make payments to other banks and to obtain currency. The Fed requires banks to hold a minimum percentage of deposits as reserves, called the *required reserve ratio*. Banks' *desired* reserves might exceed the required reserves, especially when the cost of borrowing reserves is high.

Liquid Assets

Banks' *liquid assets* are short-term Treasury bills and overnight loans to other banks. The interest rates on liquid assets are low but they are low-risk assets. The interest rate on interbank loans, called the **federal funds rate**, is the central target of the Fed's monetary policy actions.

Federal funds rate
The interest rate on interbank loans (loans made in the federal funds market).

Securities and Loans

Securities are bonds issued by the U.S. government and by other organizations. Some bonds have low interest rates and are safe. Some bonds have high interest rates and are risky. Mortgage-backed securities are examples of risky securities.

Loans are the provision of funds to businesses and individuals. Loans earn the bank a high interest rate, but they are risky and, even when not very risky, cannot be called in before the agreed date. Banks earn the highest interest rate on unpaid credit card balances, which are loans to credit card holders.

Bank Assets and Liabilities: The Relative Magnitudes

Figure 18.3 shows the relative magnitudes of the banks' assets and liabilities—deposits and other borrowing—in 2016. After performing their profit-versus-risk balancing acts, the banks kept 17 percent of total assets in reserves (and liquid assets), 22 percent in securities, and 61 percent in loans. Checkable deposits (part of M1) and savings deposits and small time deposits (part of M2) were 75 percent of total funds. Another 13 percent of total funds were borrowed and the banks' own capital—net worth of its stock holders—was 12 percent of total funds.

Thrift Institutions

The three types of thrift institutions are savings and loan associations, savings banks, and credit unions. A *savings and loan association* (*S&L*) is a financial institution that accepts checkable deposits and savings deposits and that makes personal, commercial, and home-purchase loans. A *savings bank* is a financial institution that accepts savings deposits and makes mostly consumer and home-purchase loans. The depositors own some savings banks (called mutual savings banks). A *credit union* is a financial institution owned by a social or economic group, such as a firm's employees, that accepts savings deposits and makes mostly consumer loans.

Like commercial banks, the thrift institutions hold reserves and must meet minimum reserve ratios set by the Fed.

Money Market Funds

A *money market fund* is a financial institution that obtains funds by selling shares and uses these funds to buy assets such as U.S. Treasury bills. Money market fund shares act like bank deposits. Shareholders can write checks on their money market fund accounts, but there are restrictions on most of these accounts. For example, the minimum deposit accepted might be $2,500 and the smallest check a depositor is permitted to write might be $500.

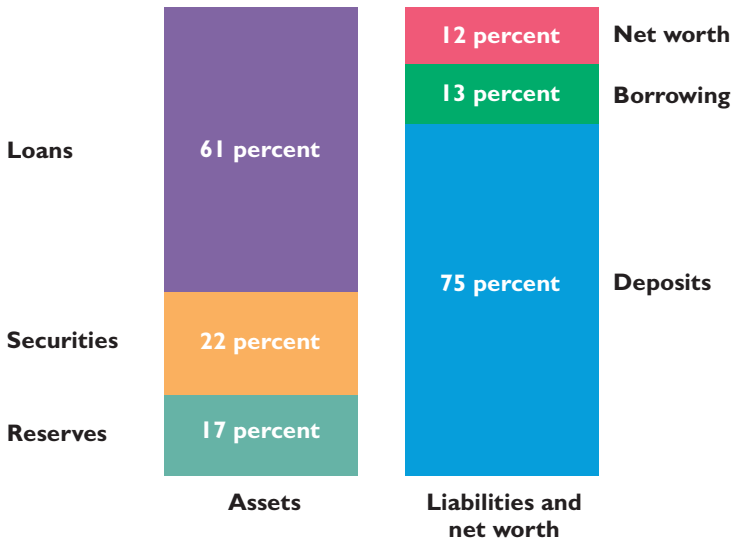
FIGURE 18.3

Commercial Banks' Assets, Liabilities, and Net Worth

MyEconLab Animation

In 2016, commercial bank loans were 61 percent of total assets, securities were 22 percent, and reserves were 17 percent.

The banks obtained the funds allocated to these assets from three sources: 75 percent from checkable deposits (part of M1) and savings deposits and small time deposits (part of M2); 13 percent borrowed from bond holders; and 12 percent from the banks' stockholders—the banks' net worth.



SOURCE OF DATA: Federal Reserve.

The Federal Reserve

The **Federal Reserve (the Fed)** is the central bank of the United States. A central bank is a public authority that provides banking services to banks and governments and regulates financial institutions and markets. A central bank's only customers are banks such as Bank of America and Citibank and the U.S. government. The Fed is organized into 12 Federal Reserve districts shown in Figure 18.4.

The Fed's main task is to regulate the interest rate and quantity of money to achieve low and predictable inflation and sustained economic expansion.

Federal Reserve (the Fed)
The central bank of the United States.

The Structure of the Federal Reserve

The key elements in the structure of the Federal Reserve are

- The Chair of the Board of Governors
- The Board of Governors
- The regional Federal Reserve Banks
- The Federal Open Market Committee

The Chair of the Board of Governors

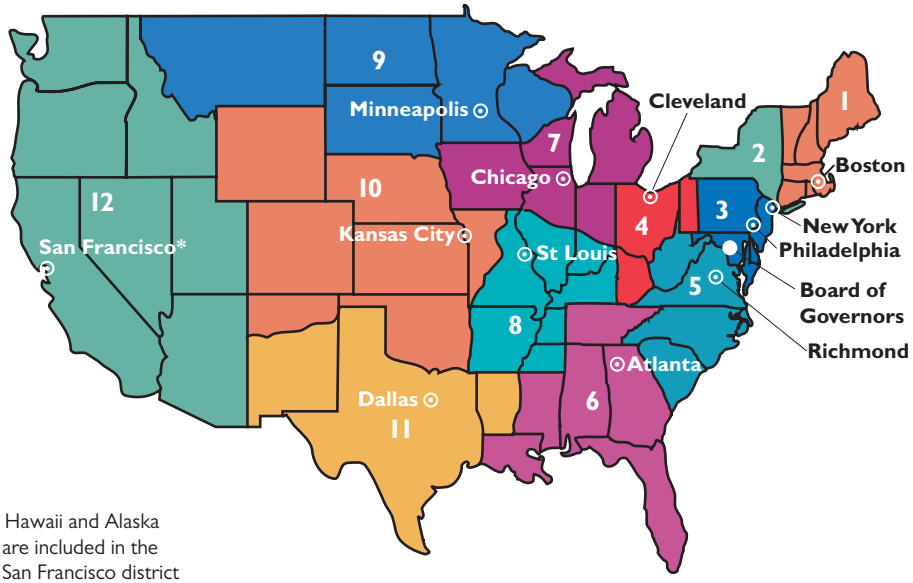
The Chair of the Board of Governors is the Fed's chief executive, public face, and center of power and responsibility. When things go right, the Chair gets the credit; when they go wrong, the Chair gets the blame. Janet Yellen, a former University of California, Berkeley, economics professor, is the Fed's current Chair.



Fed Chair Janet Yellen

FIGURE 18.4
The Federal Reserve Districts

MyEconLab Animation



* Hawaii and Alaska are included in the San Francisco district

The nation is divided into 12 Federal Reserve districts, each having a Federal Reserve Bank. (Some of the larger districts also have branch banks.) The Board of Governors of the Federal Reserve System is located in Washington, D.C.

SOURCE: *Federal Reserve Bulletin.*

The Board of Governors

The Board of Governors has seven members (including the Chair), who are appointed by the President of the United States and confirmed by the Senate, each for a 14-year term. The terms are staggered so that one seat on the board becomes vacant every two years. The President appoints one of the board members as the Chair for a term of four years, which is renewable.

The Regional Federal Reserve Banks

There are 12 regional Federal Reserve Banks, one for each of the 12 Federal Reserve districts shown in Figure 18.4. Each regional Federal Reserve Bank has nine directors, three of whom are appointed by the Board of Governors and six of whom are elected by the commercial banks in the Federal Reserve district. The directors of each regional Federal Reserve Bank appoint that Bank's president, and the Board of Governors approves this appointment.

The Federal Reserve Bank of New York (known as the New York Fed) occupies a special place because it implements some of the Fed's most important policy decisions.

The Federal Open Market Committee

Federal Open Market Committee
The Fed's main policy-making committee.

The **Federal Open Market Committee** (FOMC) is the Fed's main policy-making committee. The FOMC consists of the following twelve members:

- The Chair and the other six members of the Board of Governors
- The president of the Federal Reserve Bank of New York
- Four presidents of the other regional Federal Reserve Banks (on a yearly rotating basis)

The FOMC meets approximately every six weeks to review the state of the economy and to decide the actions to be carried out by the New York Fed.

The Fed's Policy Tools

The Fed's most important tasks are to influence the interest rate and regulate the amount of money circulating in the United States. How does the Fed perform these tasks? It does so by adjusting the reserves of the banking system. Also, by adjusting the reserves of the banking system and standing ready to make loans to banks, the Fed is able to prevent bank failures. The Fed's policy tools are

- Required reserve ratios
- Discount rate
- Open market operations
- Extraordinary crisis measures

Required Reserve Ratios

You've seen that banks hold reserves of currency and deposits at the Federal Reserve. The Fed requires the banks and thrifts to hold a minimum percentage of deposits as reserves. This minimum is known as a *required reserve ratio.* The Fed determines a required reserve ratio for each type of deposit. Currently, required reserve ratios range from zero to 3 percent on checkable deposits below a specified level to 10 percent on deposits in excess of the specified level.

Discount Rate

The discount rate is the interest rate at which the Fed stands ready to lend reserves to commercial banks. A change in the discount rate begins with a proposal to the FOMC by at least one of the 12 Federal Reserve Banks. If the FOMC agrees that a change is required, it proposes the change to the Board of Governors for its approval.

Open Market Operations

An **open market operation** is the purchase or sale of government securities—U.S. Treasury bills and bonds—by the Federal Reserve in the open market. When the Fed conducts an open market operation, it makes a transaction with a bank or some other business but it does not transact with the federal government. The New York Fed conducts the Fed's open market operations.

Open market operation
The purchase or sale of government securities—U.S. Treasury bills and bonds—by the New York Fed in the open market.

Extraordinary Crisis Measures

The financial crisis of 2008, the slow recovery, and ongoing financial stress have brought three more tools into play. They are

- Quantitative easing (or QE)
- Credit easing
- Operation Twist

Quantitative Easing (QE) When the Fed creates bank reserves by conducting a large-scale open market purchase at a low or possibly zero federal funds rate, the action is called *quantitative easing*. There have been three episodes of quantitative easing: QE1, QE2, and QE3—see *Eye on Creating Money* on pp. 500–501.

Credit Easing When the Fed buys private securities or makes loans to financial institutions to stimulate their lending, the action is called *credit easing*.

Operation Twist When the Fed buys long-term government securities and sells short-term government securities, the action is called *Operation Twist*. The idea is to lower long-term interest rates and stimulate long-term borrowing and investment expenditure. An Operation Twist was conducted in September 2011.

How the Fed's Policy Tools Work

The Fed's normal policy tools work by changing either the demand for or the supply of the monetary base, which in turn changes the interest rate. The **monetary base** is the sum of coins, Federal Reserve notes, and banks' reserves at the Fed.

Monetary base
The sum of coins, Federal Reserve notes, and banks' reserves at the Fed.

By increasing the required reserve ratio, the Fed can force the banks to hold a larger quantity of monetary base. By raising the discount rate, the Fed can make it more costly for the banks to borrow reserves—borrow monetary base. And by selling securities in the open market, the Fed can decrease the monetary base. All of these actions lead to a rise in the interest rate.

Similarly, by decreasing the required reserve ratio, the Fed can permit the banks to hold a smaller quantity of monetary base. By lowering the discount rate, the Fed can make it less costly for the banks to borrow monetary base. And by buying securities in the open market, the Fed can increase the monetary base. All of these actions lead to a decrease in the interest rate.

Open market operations are the Fed's main tool and in the next section you will learn in more detail how they work.

MyEconLab Study Plan 18.2
Key Terms Quiz
Solutions Video

CHECKPOINT 18.2

Describe the functions of banks and the Federal Reserve System (the Fed).

Practice Problems

1. What is the Fed and what is the FOMC?
2. Who is the Fed's chief executive, and what are the Fed's main policy tools?
3. What is the monetary base?
4. Suppose that at the end of December 2009, the monetary base in the United States was $700 billion, Federal Reserve notes were $650 billion, and banks' reserves at the Fed were $20 billion. Calculate the quantity of coins.

In the News

Helicopter Money Primer: The possible next frontier in quantitative easing
Central banks—the Fed, the Bank of Japan, the European Central Bank, the People's Bank of China, and others—have bought trillions of dollars of bonds. The Fed alone has bought $4 trillion worth.

Source: DailyFX, July 15, 2016

What are the Fed's policy tools and which policy tool did the Fed use to increase its assets to $4 trillion?

Solutions to Practice Problems

1. The Federal Reserve System (the Fed) is the U.S. central bank—a public authority that provides banking services to banks and the U.S. government and that regulates the quantity of money and the banking system. The FOMC is the Federal Open Market Committee—the Fed's main policy-making committee.
2. The Fed's chief executive is the Chair of the Board of Governors, currently Janet Yellen. The Fed's main policy tools are required reserve ratios, the discount rate, and open market operations. In unusual times, extraordinary crisis measures are an additional tool.
3. The monetary base is the sum of coins, Federal Reserve notes (dollar bills), and banks' reserves at the Fed.
4. To calculate the quantity of coins, we use the definition of the monetary base: coins plus Federal Reserve notes plus banks' reserves at the Fed.

   Quantity of coins = Monetary base − Federal Reserve notes − Banks' reserves at the Fed.

   So at the end of December 2009,

   Quantity of coins = $700 billion − $650 billion − $20 billion
   = $30 billion.

Solution to In the News

The Fed's policy tools are the required reserve ratio, discount rate, open market operations, and extraordinary crisis measures called *quantitative easing* and *credit easing*. The policy tool used by the Fed to increase its assets to $4 trillion were large-scale open market operations called quantitative easing. These operations were conducted in three bursts known as QE1, QE2, and QE3.

18.3 REGULATING THE QUANTITY OF MONEY

MyEconLab Concept Video

Banks create money, but this doesn't mean that they have smoke-filled back rooms in which counterfeiters are busily working. Remember, most money is deposits, not currency. What banks create is deposits, and they do so by making loans.

Creating Deposits by Making Loans

The easiest way to see that banks create deposits is to think about what happens when Andy, who has a Visa card issued by Citibank, uses his card to buy a tank of gas from Chevron. When Andy signs the card sales slip, he takes a loan from Citibank and obligates himself to repay the loan at a later date. At the end of the business day, a Chevron clerk takes a pile of signed credit card sales slips, including Andy's, to Chevron's bank. For now, let's assume that Chevron also banks at Citibank. The bank immediately credits Chevron's account with the value of the slips (minus the bank's commission).

You can see that these transactions have created a bank deposit and a loan. Andy has increased the size of his loan (his credit card balance), and Chevron has increased the size of its bank deposit. And because deposits are money, Citibank has created money.

If, as we've just assumed, Andy and Chevron use the same bank, no further transactions take place. But the outcome is essentially the same when two banks are involved. If Chevron's bank is the Bank of America, then Citibank uses its reserves to pay the Bank of America. Citibank has an increase in loans and a decrease in reserves; the Bank of America has an increase in reserves and an increase in deposits. The banking system as a whole has an increase in loans, an increase in deposits, and no change in reserves.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Money and Your Role in Its Creation

Imagine a world without money in which you must barter for everything you buy. What kinds of items would you have available for these trades? Would you keep some stocks of items that you know lots of people are willing to accept? Would you really be bartering, or would you be using a commodity as money? How much longer would it take you to conduct all the transactions of a normal day?

Now think about your own holdings of money today. How much money do you have in your pocket or wallet? How much do you have in the bank? How does the money you hold change over the course of a month?

Of the money you're holding, which items are part of M1 and which are part of M2? Are all the items in M2 means of payment?

Now think about the role that *you* play in creating money. Every time you charge something to your credit card, you help the bank that issued it to create money. The increase in your credit card balance is a loan from the bank to you. The bank pays the seller right away. So the seller's bank deposit and your outstanding balance increase together. Money is created.

You contribute to the currency drain that limits the ability of your bank to create money when you visit the ATM and get some cash to pay for your late-night pizza.

Of course, your transactions are a tiny part of the total. But together, you and a few million other students like you play a big role in the money creation process.

If Andy had swiped his card at an automatic payment pump, all these transactions would have occurred at the time he filled his tank, and the quantity of money would have increased by the amount of his purchase (minus the bank's commission for conducting the transactions).

Three factors limit the quantity of deposits that the banking system can create:

- The monetary base
- Desired reserves
- Desired currency holding

The Monetary Base

You've seen that the monetary base is the sum of coins, Federal Reserve notes, and banks' deposits at the Fed. The size of the monetary base limits the total quantity of money that the banking system can create because banks have a desired level of reserves and households and firms have a desired level of currency holding and both of these desired holdings of the monetary base depend on the quantity of money.

Desired Reserves

A bank's *desired* reserves are the reserves that the bank chooses to hold. The *desired reserve ratio* is the ratio of reserves to deposits that a bank wants to hold. This ratio exceeds the *required reserve ratio* by an amount that the banks determine to be prudent on the basis of their daily business requirements.

A bank's *actual reserve ratio* changes when its customers make a deposit or a withdrawal. If a bank's customer makes a deposit, reserves and deposits increase by the same amount, so the bank's reserve ratio increases. Similarly, if a bank's customer makes a withdrawal, reserves and deposits decrease by the same amount, so the bank's reserve ratio decreases.

Excess reserves
A bank's actual reserves minus its desired reserves.

A bank's **excess reserves** are its actual reserves minus its desired reserves. When the banking system as a whole has excess reserves, banks can create money by making new loans. When the banking system as a whole is short of reserves, banks must destroy money by decreasing the quantity of loans.

Desired Currency Holding

We hold our money in the form of currency and bank deposits. The proportion of money held as currency isn't constant but at any given time, people have a definite view as to how much they want to hold in each form of money.

Because households and firms want to hold some proportion of their money in the form of currency, when the total quantity of bank deposits increases, so does the quantity of currency that they want to hold.

Because desired currency holding increases when deposits increase, currency leaves the banks when loans are made and deposits increase. We call the leakage of currency from the banking system the *currency drain*. And we call the ratio of currency to deposits the *currency drain ratio*.

The greater the currency drain ratio, the smaller is the quantity of deposits and money that the banking system can create from a given amount of monetary base. The reason is that as currency drains from the banks, they are left with fewer reserves (and less excess reserves), so they make fewer loans.

How Open Market Operations Change the Monetary Base

When the Fed buys securities in an open market operation, it pays for them with newly created bank reserves and money. With more reserves in the banking system, the supply of interbank loans increases, the demand for interbank loans decreases, and the federal funds rate—the interest rate in the interbank loans market—falls.

Similarly, when the Fed sells securities in an open market operation, buyers pay for the securities with bank reserves and money. With smaller reserves in the banking system, the supply of interbank loans decreases, the demand for interbank loans increases, and the federal funds rate rises. The Fed sets a target for the federal funds rate and conducts open market operations on the scale needed to hit its target.

A change in the federal funds rate is only the first stage in an adjustment process that follows an open market operation. If banks' reserves increase, the banks can increase their lending and create even more money. If banks' reserves decrease, the banks must decrease their lending, which decreases the quantity of money. We'll study the effects of open market operations in some detail, beginning with an open market purchase.

The Fed Buys Securities

Suppose the Fed buys $100 million of U.S. government securities in the open market. There are two cases to consider, depending on who sells the securities. A bank might sell some of its securities, or a person or business that is not a commercial bank—the general public—might sell. The outcome is essentially the same in the two cases and we'll look at the case in which a commercial bank sells securities. (The seller will be someone who thinks the Fed is offering a good price for securities and it is profitable to make the sale.)

When the Fed buys $100 million of securities from the Manhattan Commercial Bank, two things happen:

1. The Manhattan Commercial Bank has $100 million less in securities, and the Fed has $100 million more in securities.
2. To pay for the securities, the Fed increases the Manhattan Commercial Bank's reserve account at the New York Fed by $100 million.

Figure 18.5 shows the effects of these actions on the balance sheets of the Fed and the Manhattan Commercial Bank. Ownership of the securities passes from the commercial bank to the Fed, so the bank's securities decrease by $100 million and the Fed's securities increase by $100 million, as shown by the red-to-blue arrow running from the Manhattan Commercial Bank to the Fed.

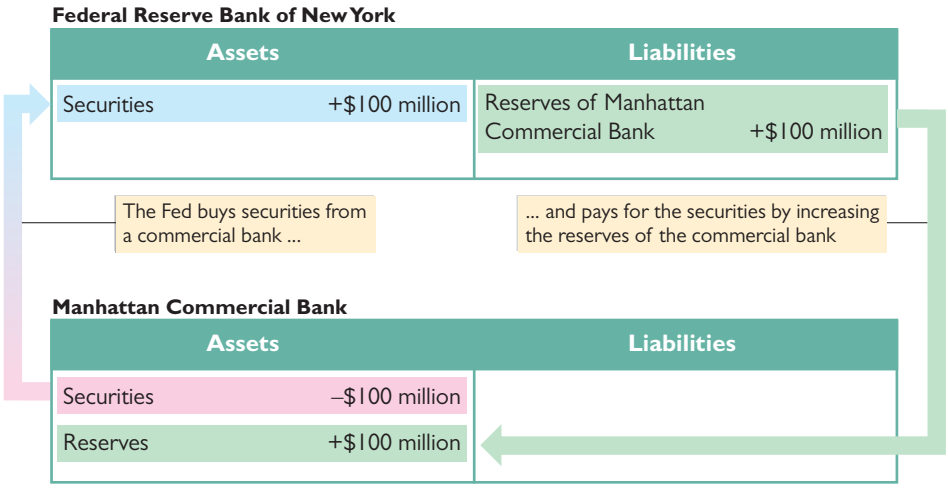
The Fed increases the Manhattan Commercial Bank's reserves by $100 million, as shown by the green arrow running from the Fed to the Manhattan Commercial Bank. This action increases the reserves of the banking system.

The commercial bank's total assets remain constant, but their composition changes. Its holdings of government securities decrease by $100 million, and its reserves increase by $100 million. The bank can use these additional reserves to make loans. When the bank makes loans, it creates deposits and the quantity of money increases.

FIGURE 18.5

The Fed Buys Securities from a Commercial Bank

MyEconLab Animation



The Fed Sells Securities

If the Fed sells $100 million of U.S. government securities in the open market and Manhattan Commercial Bank buys them, two things happen:

1. The Manhattan Commercial Bank has $100 million more in securities, and the Fed has $100 million less in securities.
2. To pay for the securities, the Manhattan Commercial Bank's reserve account at the New York Fed decreases by $100 million.

The changes in the balance sheets of the Fed and the banks that we've just described are not the end of the story about the effects of an open market operation; they are just the beginning.

The Multiplier Effect of an Open Market Operation

An open market purchase that increases bank reserves also increases the *monetary base* by the amount of the open market purchase and the banks have excess reserves that they then lend.

The following sequence of events takes place:

- An open market purchase creates excess reserves.
- Banks lend excess reserves.
- Bank deposits increase.
- The quantity of money increases.
- New money is used to make payments.
- Some of the new money is held as currency—a currency drain.
- Some of the new money remains in deposits in banks.
- Banks' desired reserves increase.
- Excess reserves decrease but remain positive.

The sequence described above repeats in a series of rounds, but each round begins with a smaller quantity of excess reserves than did the previous one. The

process ends when there are no excess reserves. This situation arises when the increase in the monetary base resulting from the open market operation is willingly held—when the increase in desired reserves plus the increase in desired currency holding equals the increase in the monetary base. Figure 18.6 illustrates and summarizes the sequence of events in one round of the multiplier process.

An open market *sale* works similarly to an open market *purchase,* but the sale *decreases* the monetary base and sets off a multiplier process similar to that described in Figure 18.6. At the end of the process the quantity of money has decreased by an amount that lowers desired reserves and desired currency holding by an amount equal to the decrease in the monetary base resulting from the open market sale. (Make your own version of Figure 18.6 to trace the multiplier process when the Fed *sells* and the banks or public *buys* securities.)

The magnitude of the change in the quantity of money brought about by an open market operation is determined by the money multiplier that we now explain.

The Money Multiplier

The **money multiplier** is the number by which a change in the monetary base is multiplied to find the resulting change in the quantity of money. It is also the ratio of the change in the quantity of money to the change in the monetary base.

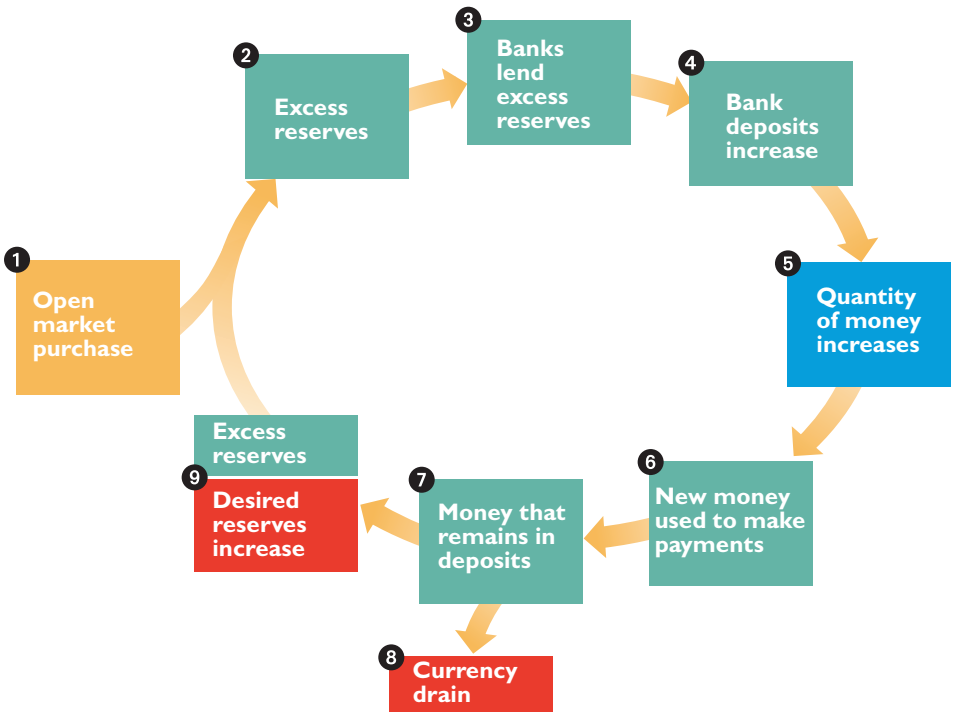
Money multiplier
The number by which a change in the monetary base is multiplied to find the resulting change in the quantity of money.

The magnitude of the money multiplier depends on the desired reserve ratio and the currency drain ratio. The smaller are these two ratios, the larger is the money multiplier. Let's explore the money multiplier in more detail.

FIGURE 18.6

A Round in the Multiplier Process Following an Open Market Operation

MyEconLab Animation



❶ An open market purchase increases bank reserves and ❷ creates excess reserves.

❸ Banks lend the excess reserves, ❹ new deposits are created, and ❺ the quantity of money increases.

❻ New money is used to make payments.

❼ Households and firms receiving payments keep some on deposit in banks and ❽ some in the form of currency—a currency drain.

❾ The increase in bank deposits increases banks' reserves but also increases banks' desired reserves.

Desired reserves increase by less than actual reserves, so the banks still have some excess reserves, but less than before. The process repeats until excess reserves have been eliminated.

To see how the desired reserve ratio and the currency drain ratio determine the size of the money multiplier, begin with two facts:

The quantity of money, M, is the sum of deposits, D, and currency, C, or $M = D + C$, and

The monetary base, MB, is the sum of desired reserves, R, and currency, C, or $MB = R + C$.

The money multiplier is equal to the quantity of money, M, divided by the monetary base, MB, that is,

$$\text{Money multiplier} = M/MB.$$



EYE on CREATING MONEY

MyEconLab Critical Thinking Exercise

How Does the Fed Create Money and Regulate Its Quantity?

During the Great Depression, many banks failed, bank deposits were destroyed, and the quantity of money crashed by 25 percent. Most economists believe that it was these events that turned an ordinary recession in 1929 into a deep and decade-long depression.

Former Fed Chair Ben Bernanke is one of the economists who has studied this tragic episode in U.S. economic history, and he had no intention of witnessing a similar event on his watch.

Figure 1 shows what the Fed did to pump reserves into the banking system. In the fall of 2008 in an episode called QE1 (see p. 493), the Fed doubled the monetary base. In 2010 and 2011, a more gradual but sustained QE2 took the monetary base to more than three times its pre-crisis level. And in 2012 and 2013, a further gradual QE3 raised the monetary base to four times its normal level.

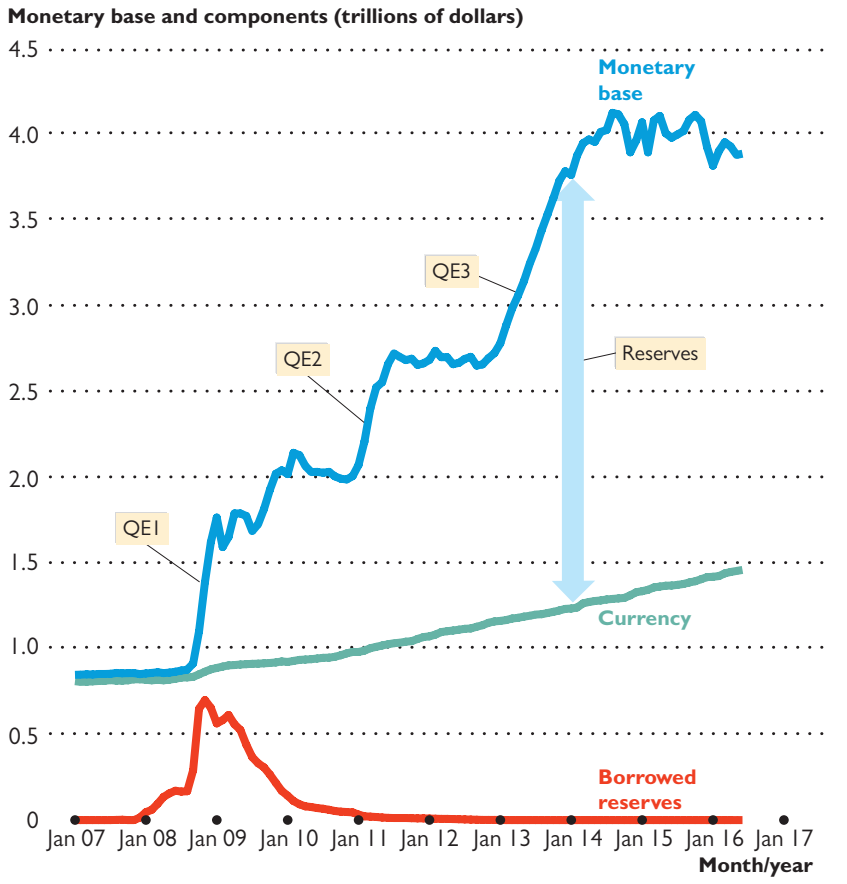


Figure 1 The Monetary Base in Financial Crisis

Because $M = D + C$ and $MB = R + C$,

$$\text{Money multiplier} = (D + C)/(R + C).$$

Now divide each item on the right-hand side of this equation by deposits, D, to get

$$\text{Money multiplier} = (1 + C/D)/(R/D + C/D).$$

Notice that C/D is the currency drain ratio and R/D is the desired reserves ratio. If the currency drain ratio is 50 percent, $C/D = 0.5$; and if the desired reserve ratio is 10 percent, $R/D = 0.1$, then the money multiplier is $1.5/0.6 = 2.5$.

The larger the desired reserve ratio and the larger the currency drain ratio, the smaller is the money multiplier.

The desired reserve ratio and the currency drain ratio that determine the magnitude of the money multiplier are not constant, so neither is the money multiplier constant. You can see in *Eye on Creating Money* below (Figure 2) that the desired reserve ratio and money multiplier changed dramatically in 2008.

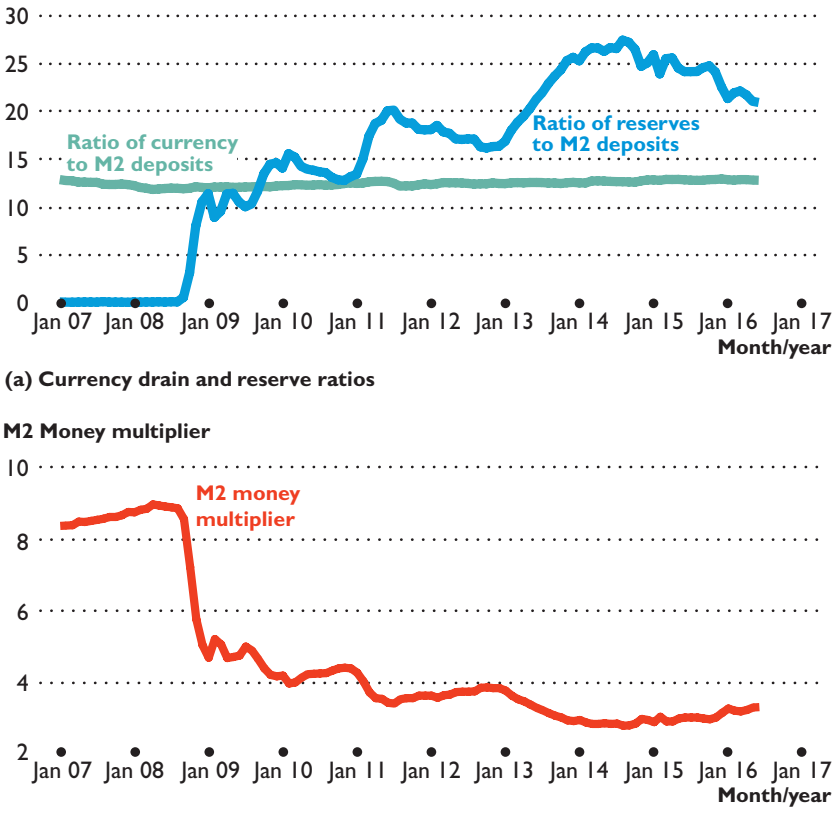


Figure 2 The Changing Money Multiplier

This extraordinary increase in the monetary base did not bring a similar increase in the quantity of money. Figure 2 shows the reason.

In 2008, the banks' desired reserve ratio, in part (a), increased tenfold from its normal level of 1.2 percent to 12 percent. This increase brought a crash in the money multiplier, in part (b), from a normal value of 9 to an unusually low value of 5.

The surge in the desired reserve ratio is the sole reason for the collapse in the money multiplier. You can see, in part (a), that the other influence on the multiplier, the currency drain ratio, barely changed.

The banks face an unusually high level of risk and this is the main source of the increase in the desired reserve ratio. As the risk faced by banks returns to normal, the desired reserve ratio will fall, and when this happens the Fed will decrease the monetary base or create an explosion in the quantity of money.

SOURCES OF DATA: Federal Reserve and Bureau of Economic Analysis.

MyEconLab Study Plan 18.3
Key Terms Quiz
Solutions Video

CHECKPOINT 18.3

Explain how the banking system creates money and how the Fed controls the quantity of money.

Practice Problems

1. How do banks create new deposits by making loans, and what factors limit the amount of deposits and loans that they can create?
2. If the Fed makes an open market sale of $1 million of securities, who can buy the securities? What initial changes occur if the Fed sells to a bank?
3. If the Fed makes an open market sale of $1 million of securities, what is the process by which the quantity of money changes? What factors determine the change in the quantity of money?

In the News

Fed doubles monetary base
During the fourth quarter of 2008, the Fed doubled the monetary base but the quantity of money (M2) increased by only 5 percent.

Source: Federal Reserve

Why did M2 not increase by much more than 5 percent? What would have happened to the quantity of M2 if the Fed had kept the monetary base constant?

Solutions to Practice Problems

1. Banks can make loans when they have excess reserves. When a bank makes a loan, it creates a new deposit for the person who receives the loan. The amount of deposits created (loans made) is limited by the banks' excess reserves, its desired reserve ratio, and the currency drain ratio.
2. The Fed sells securities to banks or the public, but not the government. The initial change is a decrease in the monetary base of $1 million. Ownership of the securities passes from the Fed to the bank, and the Fed's assets decrease by $1 million. The bank pays for the securities by decreasing its reserves at the Fed by $1 million. The Fed's liabilities decrease by $1 million. The bank's total assets are unchanged, but it has $1 million less in reserves and $1 million more in securities.
3. When the Fed sells securities to a bank, the bank's reserves decrease by $1 million. The bank's deposits do not change, so the bank is short of reserves. The bank calls in loans and deposits decrease by the same amount. The desired reserve ratio and the currency drain ratio determine the decrease in the quantity of money. The larger the desired reserve ratio or the currency drain ratio, the smaller is the decrease in the quantity of money.

Solution to In the News

When the Fed increases the monetary base, M2 increases and the increase is determined by the money multiplier, $(1 + C/D)/(R/D + C/D)$, where R/D is the banks' desired reserve ratio and C/D is the currency drain ratio. M2 didn't increase by more than 5 percent because the banks increased their desired reserve ratio, which decreased the money multiplier. If the Fed had kept the monetary base unchanged, M2 would have decreased because the money multiplier decreased.

18.4 MONEY, THE PRICE LEVEL, AND INFLATION

MyEconLab Concept Video

You've seen how the Fed controls the quantity of money and now you are ready to see how the quantity of money influences the price level and the inflation rate. Many forces change the price level and the inflation rate, and to isolate the effects of changes in the quantity of money, we focus on long-run averages and the quantity theory of money. The **quantity theory of money** is the prediction that when real GDP equals potential GDP, an increase in the quantity of money will bring an equal percentage increase in the price level. To derive this prediction, you first need to know about the *velocity of circulation* of money and the *equation of exchange*.

Quantity theory of money
The prediction that when real GDP equals potential GDP, an increase in the quantity of money will bring an equal percentage increase in the price level.

The Velocity of Circulation and Equation of Exchange

The **velocity of circulation** is the average number of times that each dollar of money is used during a year to buy final goods and services. The value of final goods and services is nominal GDP, which is real GDP, Y, multiplied by the price level, P. If we call the quantity of money M, then the velocity of circulation is determined by the equation:

$$V = (P \times Y) \div M.$$

In this equation, P is the GDP price index divided by 100. If the GDP price index is 125, then the price level is 1.25. If the price level is 1.25, real GDP is $8 trillion, and the quantity of money is $2 trillion, then the velocity of circulation is

$$V = (1.25 \times \$8 \text{ trillion}) \div \$2 \text{ trillion, or}$$
$$V = 5.$$

That is, with $2 trillion of money, each dollar is used an average of 5 times during the year, so $2 trillion × 5 equals $10 trillion of goods and services bought.

Velocity of circulation
The average number of times that each dollar of money is used during a year to buy final goods and services.

The **equation of exchange** states that the quantity of money, M, multiplied by the velocity of circulation, V, equals the price level P, multiplied by real GDP, Y. That is,

$$M \times V = P \times Y.$$

Equation of exchange
An equation that states that the quantity of money multiplied by the velocity of circulation equals the price level multiplied by real GDP.

The equation of exchange is *always* true because it is implied by the definition of the velocity of circulation. That is, if you multiply both sides of the equation that defines the velocity of circulation by M, you get the equation of exchange.

Using the above numbers—a price level of 1.25, real GDP of $8 trillion, the quantity of money of $2 trillion, and the velocity of circulation of 5—you can see that

$$M \times V = \$2 \text{ trillion} \times 5 = \$10 \text{ trillion,}$$

and

$$P \times Y = 1.25 \times \$8 \text{ trillion} = \$10 \text{ trillion.}$$

So,

$$M \times V = P \times Y = \$10 \text{ trillion.}$$

The Quantity Theory Prediction

We can rearrange the equation of exchange to isolate the price level on the left side. To do so, divide both sides of the equation of exchange by real GDP to obtain

$$P = (M \times V) \div Y.$$

On the left side is the price level, and on the right side are all the things that influence the price level. But this equation is still just an implication of the definition of the velocity of circulation. To turn the equation into a theory of what determines the price level, we use two other facts: (1) At full employment, real GDP equals potential GDP, which is determined only by real factors and not by the quantity of money; and (2) the velocity of circulation is relatively stable and does not change when the quantity of money changes.

So with V and Y constant, if M increases P must increase, and the percentage increase in P must equal the percentage increase in M.

We can use the above numbers to illustrate this prediction. Real GDP is $8 trillion, the quantity of money is $2 trillion, and the velocity of circulation is 5. Put these values into the equation:

$$P = (M \times V) \div Y$$

to obtain

$$P = (\$2 \text{ trillion} \times 5) \div \$8 \text{ trillion} = 1.25.$$

Now increase the quantity of money from $2 trillion to $2.4 trillion. The percentage increase in the quantity of money is

$$(\$2.4 \text{ trillion} - \$2 \text{ trillion}) \div \$2 \text{ trillion} \times 100 = 20 \text{ percent}.$$

Now find the new price level. It is

$$P = (\$2.4 \text{ trillion} \times 5) \div \$8 \text{ trillion} = 1.50.$$

The price level rises from 1.25 to 1.50, and the percentage increase in the price level is

$$(1.50 - 1.25) \div 1.25 \times 100 = 20 \text{ percent}.$$

When the economy is at full employment (real GDP equals potential GDP) and the velocity of circulation is stable, the price level and the quantity of money increase by the same 20 percent.

In rates of change or growth rates,

$$\text{Money growth} + \text{Velocity growth} = \text{Inflation rate} + \text{Real GDP growth},$$

which means that

$$\text{Inflation rate} = \text{Money growth} + \text{Velocity growth} - \text{Real GDP growth}.$$

Hyperinflation
Inflation at a rate that exceeds 50 percent *a month* (which translates to 12,875 percent per year).

When the inflation rate exceeds 50 percent *a month,* it is called **hyperinflation**. An inflation rate of 50 percent per month translates to an inflation rate of 12,875 percent per year. Hyperinflation occurs when the quantity of money grows at a rapid pace to pay for government expenditure that exceeds what the government can collect in tax revenue or borrow. In such a situation, the government prints money to finance its spending and the quantity of money increases at an extraordinarily rapid and increasing rate.

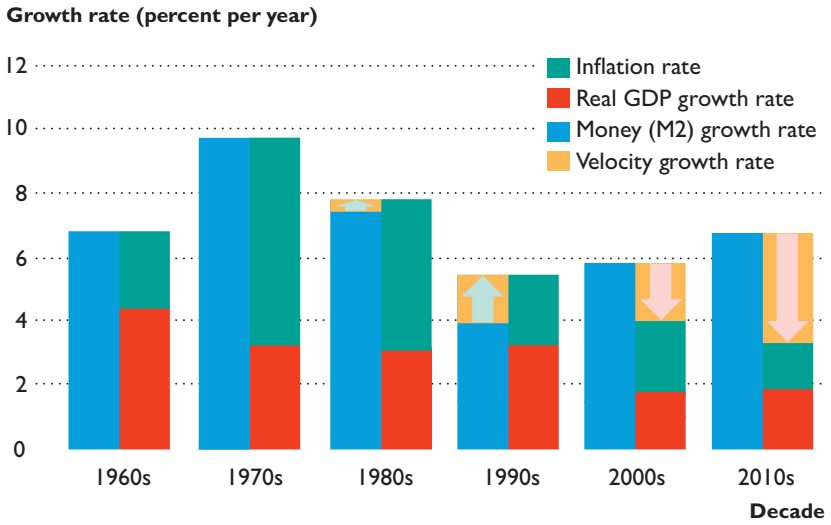
EYE on the U.S. ECONOMY

What Causes Inflation?

According to the quantity theory of money, whether we face a future with inflation, deflation, or a stable price level depends entirely on the rate at which the Fed permits the quantity of money to grow.

But is the quantity theory correct? Does it explain our past inflation with enough accuracy to be a guide to future inflation?

The figure shows how the quantity theory performs in explaining decade-average inflation rates since the 1960s.



SOURCE OF DATA: Federal Reserve and Bureau of Economic Analysis.

The 1960s and 1970s

The 1960s had low inflation (the green bars) and in the 1970s, inflation increased to become a serious problem. The quantity theory does a perfect job of explaning inflation in these two decades. The inflation rate equaled the growth rate of M2 (the blue bars) minus the growth rate of real GDP (the red bars). The velocity of circulation (of M2) was constant.

During the 1970s, an increase in the growth rate of M2 accompanied by a slowdown in the growth rate of real GDP increased the inflation rate—exactly as predicted by the quantity theory of money.

The 1980s and 1990s

The inflation rate fell in the 1980s and again in the 1990s. And again, the quantity theory does a good job of explaining why. The M2 growth rate slowed during the 10980s and again during the 1990s. With the real GDP growth rate unchanged, the inflation rate fell as predicted by the quantity theory. But the inflation rate didn't fall by as much as the theory predicts. Why?

The answer is that the velocity of circulation was increasing (the yellow bars and up-arrows). Financial innovation enabled a given quantity of money to circulate more quickly.

The 2000s and 2010s

During the 2000s and 2010s, the M2 growth rate increased but the inflation rate decreased. The changes in inflation in these two decades are the opposite of what the quantity theory predicts. The reason is that the velocity of circulation decreased (the yellow bars and down-arrows).

Velocity of circulation decreased because interest rates were lowered by the Fed to unprecedented levels. At very low interest rates, the opportunity cost of holding money is low, so the quantity of money held increases and velocity decreases.

The Future

To predict future inflation rates, we must predict the future growth rate of M2 and future real GDP and velocity growth. In the long run, real GDP growth doesn't stray far from 2 to 3 percent and velocity is constant. So the M2 growth rate is the source of possible changes in the inflation rate.

The Fed is able to influence the inflation rate and the money growth rate and, absent any pressures that the Fed finds impossible to resist, we can expect the Fed to do a good job of keeping inflation in check. That doesn't mean zero inflation. It means an inflation rate running at around 2 percent per year.

MyEconLab Study Plan 18.4
Key Terms Quiz
Solutions Video

CHECKPOINT 18.4

Explain how the quantity of money influences the price level and how money growth brings inflation.

Practice Problems

In 2016, the economy of Singapore was at full employment. In Singapore dollars, S$, real GDP was 400 billion. The nominal interest rate was 1.8 percent a year, the inflation rate was −1.6 percent a year (deflation), the price level was 1.02, and the velocity of circulation was 0.76.

1. What was the quantity of money in Singapore?
2. If the quantity of money grows at 8 percent a year, velocity of circulation is constant, and potential GDP grows at 6 percent a year, what is the inflation rate in the long run?

In the News

Argentina says consumer prices rose 3.1 percent in June
Argentina's consumer prices increased by 3.1 percent in June and the government forecasts that the 2016 inflation rate will be 40 to 42 percent.

Source: Reuters, July 13, 2016

The quantity of money in Argentina is growing at a rate of 30 percent a year. How can the inflation rate exceed the money growth rate?

Solutions to Practice Problems

1. The quantity of money was S$536.8 billion.

   Velocity of circulation (V) = Nominal GDP ($P \times Y$) ÷ Quantity of money (M). Rewrite this equation as: $M = (P \times Y) \div V$.

   ($P \times Y$) = 1.02 × S$400 billion, or S$408 billion, so M = S$408 billion ÷ 0.76, or S$536.8 billion
2. With velocity constant, velocity growth is zero. So the inflation rate in the long run equals the money growth rate minus the real GDP growth rate, which is 8 percent a year minus 6 percent a year, or 2 percent a year.

Solution to In the News

The inflation rate equals the money growth rate plus the velocity growth rate minus the real GDP growth rate. If the inflation rate is 40 percent per year and the money growth rate is 30 percent per year, then the velocity growth rate minus the real GDP growth rate equals 10 percent per year.

CHAPTER SUMMARY

Key Points

1. Define money and describe its functions.

- Money is anything that serves as a generally accepted means of payment.
- Money functions as a medium of exchange, unit of account, and store of value.
- M1 consists of currency held by individuals and businesses, traveler's checks, and checkable deposits owned by individuals and businesses.
- M2 consists of M1 plus savings deposits, small time deposits, and money market funds.

2. Describe the functions of banks and the Federal Reserve System (the Fed).

- The deposits of commercial banks and thrift institutions are money.
- The Federal Reserve (the Fed) is the central bank of the United States.
- The Fed influences the economy by setting the required reserve ratio for banks and the discount rate, by open market operations, and by taking extraordinary measures in a financial crisis.

3. Explain how the banking system creates money and how the Fed controls the quantity of money.

- Banks create money by making loans and the maximum quantity of loans (and deposits) that they can create is limited by the monetary base, the banks' desired reserves, and desired currency holding.
- When the Fed buys (sells) securities in an open market operation, it creates (destroys) bank reserves and has a multiplier effect on the quantity of money.

4. Explain how the quantity of money influences the price level and how money growth brings inflation.

- An increase in the quantity of money, other things remaining the same, increases the price level by the same percentage.
- The inflation rate in the long run equals the growth rate of the quantity of money minus the growth rate of potential GDP.

Key Terms

MyEconLab Key Terms Quiz

Barter, 483
Currency, 484
Equation of exchange, 503
Excess reserves, 496
Federal funds rate, 489
Federal Open Market Committee, 492
Federal Reserve (the Fed), 491
Fiat money, 484
Hyperinflation, 504
M1, 484
M2, 484
Means of payment, 482
Medium of exchange, 483
Monetary base, 493
Money, 482
Money multiplier, 499
Open market operation, 493
Quantity theory of money, 503
Reserves, 489
Velocity of circulation, 503

MyEconLab Chapter 18 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

LIST 1

- Store coupons for noodles
- A $100 Amazon.com gift certificate
- Frequent flier miles
- Credit available on your Visa card
- The dollar coins that a coin collector owns

1. What is money? Would you classify any of the items in List 1 as money?

2. What are the three functions that money performs? Which of the following items perform some but not all of these functions, and which perform all of these functions? Which of the items are money?

- A checking account at the Bank of America
- A dime
- A debit card

3. Monica transfers $10,000 from her savings account at the Bank of Alaska to her money market fund. What is the immediate change in M1 and M2?

4. Terry takes $100 from his checking account and deposits the $100 in his savings account. What is the immediate change in M1 and M2?

5. Suppose that banks had deposits of $500 billion, a desired reserve ratio of 4 percent, and no excess reserves. The banks had $15 billion in notes and coins. Calculate the banks' reserves at the central bank.

6. Explain the Fed's policy tools and briefly describe how each works.

TABLE 1

Assets		Liabilities	
(millions of dollars)			
Reserves at the Fed	20	Checkable deposits	80
Cash in vault	5	Savings deposits	120
Securities	75		
Loans	100		

7. Table 1 shows a bank's balance sheet. The bank has no excess reserves and there is no currency drain. Calculate the bank's desired reserve ratio.

8. If the velocity of circulation is growing at 1 percent a year, the real interest rate is 2 percent a year, the nominal interest rate is 7 percent a year, and the growth rate of real GDP is 3 percent a year, calculate the inflation rate, the growth rate of money, and the growth rate of nominal GDP.

Use the following information to work Problems **9** and **10**.

If the desired reserve ratio is 5 percent, the currency drain ratio is 20 percent of deposits, and the central bank makes an open market purchase of $1 million of securities, calculate the change in

9. The monetary base and the change in its components.

10. The quantity of money, and how much of the new money is currency and how much is bank deposits.

Use the following information to work Problems **11** and **12**.

China conducts open market operations

The People's Bank of China (the central bank of China) indicated it would lower interest rates and inject 685 billion yuan ($105 billion) into the banking system through open market operations.

Source: *Bloomberg News*, February 29, 2016

11. In the open market operation described in the news clip, explain whether the People's Bank of China buys or sells securities. Illustrate the effects of the open market operation on the balance sheets of the banks and the central bank.

12. Explain how the open market operation described in the news clip will change the quantity of money in China.

13. Read *Eye on Creating Money* on pp. 500–501. By how much did the monetary base increase and why didn't M2 increase by the same percentage?

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. When the Fed increased the monetary base between 2008 and 2014, which component of the monetary base increased most: banks' reserves or currency? How did the banks' borrowed reserves change?
2. What happened to the money multiplier between 2008 and 2014? What would the money multiplier have been if the currency drain ratio had increased? What would the money multiplier have been if the banks' desired reserve ratio had not changed?
3. What are the three functions that money performs? Explain which of the items in List 1 perform some but not all of these functions and why some of the items are money.

LIST 1

- An antique clock
- An S&L savings deposit
- Your credit card
- The coins in the Fed's museum
- Government securities

4. Naomi buys $1,000 worth of American Express traveler's checks and charges the purchase to her American Express card. What is the immediate change in M1 and M2?
5. A bank has $500 million in checkable deposits, $600 million in savings deposits, $400 million in small time deposits, $950 million in loans to businesses, $500 million in government securities, $20 million in currency, and $30 million in its reserve account at the Fed. Calculate the bank's deposits that are part of M1, deposits that are part of M2, and the bank's loans, securities, and reserves.
6. If the velocity of circulation is constant, real GDP is growing at 3 percent a year, the real interest rate is 2 percent a year, and the nominal interest rate is 7 percent a year, calculate the inflation rate, the growth rate of money, and the growth rate of nominal GDP.

Use Table 1, which shows a bank's balance sheet, to work Problems **7** and **8**. The desired reserve ratio on all deposits is 5 percent and there is no currency drain.

TABLE 1

Assets		Liabilities	
(millions of dollars)			
Reserves at the Fed	25	Checkable deposits	90
Cash in vault	15	Savings deposits	110
Securities	60		
Loans	100		

7. Calculate the bank's excess reserves. If the bank uses all of these excess reserves to make a loan, what is the quantity of the loan and the quantity of total deposits after the bank has made the loan?
8. If there is no currency drain, what is the quantity of loans and the quantity of total deposits when the bank has no excess reserves?

Use the following information to work Problems **9**, **10**, and **11**.

China lowers reserve requirements

The People's Bank of China lowered the required reserve ratio from 17.5 percent to 17 percent, noting that it remained much higher than in other countries.

Source: *Bloomberg News*, February 29, 2016

9. Compare the required reserve ratio in China and the required reserve ratio on checkable deposits in the United States today.
10. If the currency drain ratio in China is 10 percent of deposits and the desired reserve ratio equals the required reserve ratio, calculate the money multiplier in China and compare it with the U.S. money multiplier.
11. If the currency drain ratio in China is 10 percent of deposits, by how much did the money multiplier change when the required reserve ratio changed as described in the news clip?

MyEconLab Chapter 18 Study Plan

Multiple Choice Quiz

1. A commodity or token is money if it is _____.

A. generally accepted as a means of payment
B. a store of value
C. used in a barter transaction
D. completely safe as a store of value

2. Money in the United States today includes _____.

A. currency and deposits at both banks and the Fed
B. the currency in people's wallets, stores' tills, and the bank deposits that people and businesses own
C. currency in ATMs and people's bank deposits
D. the banks' reserves and bank deposits owned by individuals and businesses

3. Rick withdraws $500 from his savings account, keeps $100 as currency, and deposits $400 in his checking account.

A. M1 increases by $400 and M2 decreases by $500.
B. M1 does not change, but M2 decreases by $500.
C. M1 does not change, but M2 decreases by $400.
D. M1 increases by $500 and M2 does not change.

4. Commercial banks' assets include _____.

A. bank deposits of individuals and businesses and bank reserves
B. loans to individuals and businesses and government securities
C. bank reserves and the deposits in M2
D. government securities and borrowed funds

5. The Fed's policy tools include all the following *except* _____.

A. required reserve ratio and open market operations
B. quantitative easing
C. discount rate
D. taxing banks' deposits at the Fed

6. An open market _____ of $100 million of securities _____.

A. purchase; increases bank reserves
B. sale; increases bank reserves
C. purchase; decreases the Fed's liabilities
D. sale; increases the Fed's liabilities

7. The money multiplier _____.

A. increases if banks increase their desired reserve ratio
B. increases if the currency drain ratio increases
C. is 1 if the desired reserve ratio equals the currency drain ratio
D. decreases if banks increase their desired reserve ratio

8. If the quantity theory of money is correct and other things remain the same, an increase in the quantity of money increases _____.

A. nominal GDP and the velocity of circulation
B. the price level and potential GDP
C. real GDP
D. nominal GDP and the price level



Why did the U.S. economy go into recession in 2008?

Aggregate Supply and Aggregate Demand

19

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Define and explain the influences on aggregate supply.
2. Define and explain the influences on aggregate demand.
3. Explain how trends and fluctuations in aggregate demand and aggregate supply bring economic growth, inflation, and the business cycle.

MyEconLab Big Picture Video

MyEconLab Concept Video

19.1 AGGREGATE SUPPLY

The purpose of the aggregate supply–aggregate demand model is to explain how real GDP and the price level are determined. The model uses similar ideas to those that you encountered in Chapter 4 where you learned how the quantity and price are determined in a competitive market. But the *aggregate* supply–*aggregate* demand model (*AS-AD* model) isn't just an application of the competitive market model. Some differences arise because the *AS-AD* model is a model of an imaginary market for the total of all the final goods and services that make up real GDP. The quantity in this "market" is real GDP and the price is the price level measured by the GDP price index.

The *quantity of real GDP supplied* is the total amount of final goods and services that firms in the United States plan to produce and it depends on the quantities of

- Labor employed
- Capital, human capital, and the state of technology
- Land and natural resources
- Entrepreneurial talent

You saw in Chapter 17 that at full employment, real GDP equals *potential GDP.* The quantities of land, capital and human capital, the state of technology, and the amount of entrepreneurial talent are fixed. Labor market equilibrium determines the quantity of labor employed, which is equal to the quantity of labor demanded and the quantity of labor supplied at the equilibrium real wage rate.

Over the business cycle, real GDP fluctuates around potential GDP because the quantity of labor employed fluctuates around its full employment level. The aggregate supply–aggregate demand model explains these fluctuations.

We begin on the supply side with the basics of aggregate supply.

Aggregate Supply Basics

Aggregate supply
The relationship between the quantity of real GDP supplied and the price level when all other influences on production plans remain the same.

Aggregate supply is the relationship between the quantity of real GDP supplied and the price level when all other influences on production plans remain the same. This relationship can be described as follows:

> **Other things remaining the same, the higher the price level, the greater is the quantity of real GDP supplied, and the lower the price level, the smaller is the quantity of real GDP supplied.**

Figure 19.1 illustrates aggregate supply as an aggregate supply schedule and aggregate supply curve. The aggregate supply schedule lists the quantities of real GDP supplied at each price level, and the upward-sloping *AS* curve graphs these points.

The figure also shows potential GDP: $16 trillion in the figure. When the price level is 105, the quantity of real GDP supplied is $16 trillion, which equals potential GDP (at point *C* on the *AS* curve).

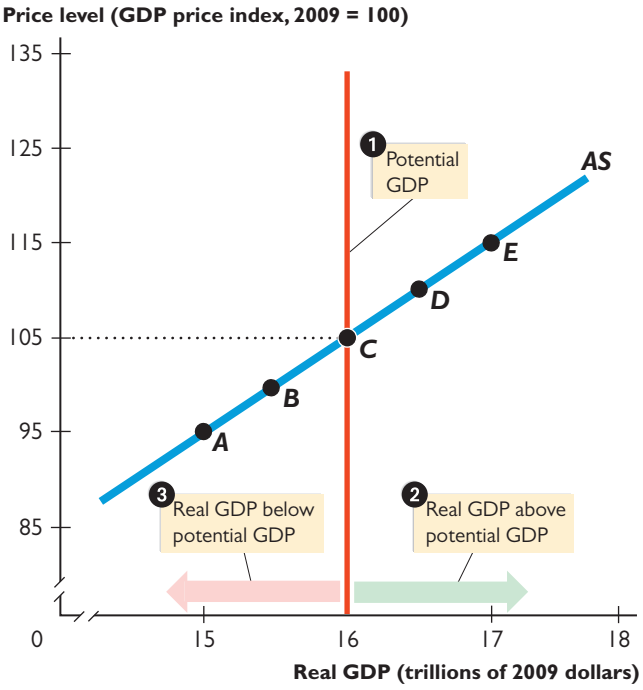
Along the aggregate supply curve, the price level is the only influence on production plans that changes. A rise in the price level brings an increase in the quantity of real GDP supplied and a movement up along the aggregate supply curve; a fall in the price level brings a decrease in the quantity of real GDP supplied and a movement down along the aggregate supply curve.

FIGURE 19.1

Aggregate Supply Schedule and Aggregate Supply Curve

MyEconLab Animation

	Price level (GDP price index, 2009 = 100)	Quantity of real GDP supplied (trillions of 2009 dollars)
E	115	17.0
D	110	16.5
C	105	16.0
B	100	15.5
A	95	15.0



The aggregate supply schedule and aggregate supply curve, *AS*, show the relationship between the quantity of real GDP supplied and the price level when all other influences on production plans remain the same. Each point *A* through *E* on the *AS* curve corresponds to the row identified by the same letter in the schedule.

1. Potential GDP is $16 trillion, and when the price level is 105, real GDP equals potential GDP.
2. If the price level is above 105, real GDP exceeds potential GDP.
3. If the price level is below 105, real GDP is less than potential GDP.

Among the other influences on production plans that remain constant along the *AS* curve are

- The money wage rate
- The money prices of other resources

In contrast, along the potential GDP line, when the price level changes, the money wage rate and the money prices of other resources change by the same percentage as the change in the price level to keep the real wage rate (and other real prices) at the full-employment equilibrium level.

Why the *AS* Curve Slopes Upward

Why does the quantity of real GDP supplied increase when the price level rises and decrease when the price level falls? The answer is that a movement along the *AS* curve brings a change in the real wage rate (and changes in the real cost of other resources whose money prices are fixed). If the price level rises, the real wage rate falls, and if the price level falls, the real wage rate rises. When the real wage rate changes, firms change the quantity of labor employed and the level of production.

Think about a concrete example. A ketchup producer has a contract with its workers to pay them $20 an hour. The firm sells ketchup for $1 a bottle. The real wage rate of a ketchup bottling worker is 20 bottles of ketchup. That is, the firm

must sell 20 bottles of ketchup to buy one hour of labor. Now suppose the price of ketchup falls to 50 cents a bottle. The real wage rate of a bottling worker has increased to 40 bottles—the firm must now sell 40 bottles of ketchup to buy one hour of labor.

If the price of a bottle of ketchup increased, the real wage rate of a bottling worker would fall. For example, if the price increased to $2 a bottle, the real wage rate would be 10 bottles per worker—the firm needs to sell only 10 bottles of ketchup to buy one hour of labor.

Firms respond to a change in the real wage rate by changing the quantity of labor employed and the quantity produced. For the economy as a whole, employment and real GDP change. There are three ways in which these changes occur:

- Firms change their output rate.
- Firms shut down temporarily or restart production.
- Firms go out of business or start up in business.

Change in Output Rate

To change its output rate, a firm must change the quantity of labor that it employs. It is profitable to hire more labor if the additional labor costs less than the revenue it generates. If the price level rises and the money wage rate doesn't change, an extra hour of labor that was previously unprofitable becomes profitable. So when the price level rises and the money wage rate doesn't change, the quantity of labor demanded and production increase. If the price level falls and the money wage rate doesn't change, an hour of labor that was previously profitable becomes unprofitable. So when the price level falls and the money wage rate doesn't change, the quantity of labor demanded and production decrease.

Temporary Shutdowns and Restarts

A firm that is incurring a loss might foresee a profit in the future. Such a firm might decide to shut down temporarily and lay off its workers.

The price level relative to the money wage rate influences temporary shutdown decisions. If the price level rises relative to wages, fewer firms decide to shut down temporarily; so more firms operate and the quantity of real GDP supplied increases. If the price level falls relative to wages, a larger number of firms find that they cannot earn enough revenue to pay the wage bill and so temporarily shut down. The quantity of real GDP supplied decreases.

Business Failure and Startup

People create businesses in the hope of earning a profit. When profits are squeezed or when losses arise, more firms fail, fewer new firms start up, and the number of firms decreases. When profits are generally high, fewer firms fail, more firms start up, and the number of firms increases.

The price level relative to the money wage rate influences the number of firms in business. If the price level rises relative to wages, profits increase, the number of firms in business increases, and the quantity of real GDP supplied increases. If the price level falls relative to wages, profits fall, the number of firms in business decreases, and the quantity of real GDP supplied decreases.

In a severe recession, business failure can be contagious. The failure of one firm puts pressure on both its suppliers and its customers and can bring a flood of failures and a large decrease in the quantity of real GDP supplied.

Changes in Aggregate Supply

Aggregate supply changes when any influence on production plans other than the price level changes. In particular, aggregate supply changes when

- Potential GDP changes.
- The money wage rate changes.
- The money prices of other resources change.

Change in Potential GDP

Anything that changes potential GDP changes aggregate supply and shifts the aggregate supply curve. Figure 19.2 illustrates such a shift. You can think of point *C* as an anchor point. The *AS* curve and potential GDP line are anchored at this point, and when potential GDP changes, aggregate supply changes along with it. When potential GDP increases from $16 trillion to $17 trillion, point *C* shifts to point *C'*, and the *AS* curve and potential GDP line shift rightward together. The *AS* curve shifts from AS_0 to AS_1.

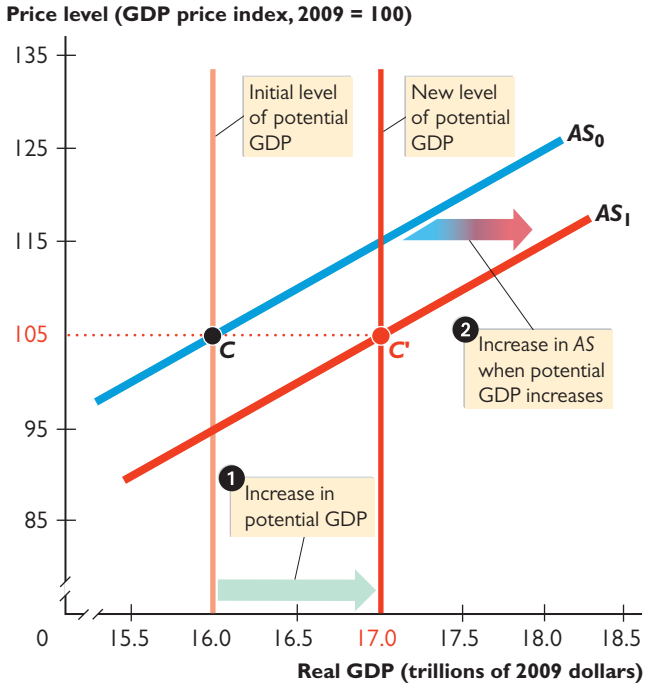
Change in Money Wage Rate

A change in the money wage rate changes aggregate supply because it changes firms' costs. The higher the money wage rate, the higher are firms' costs and the smaller is the quantity that firms are willing to supply at each price level. So an increase in the money wage rate decreases aggregate supply.

FIGURE 19.2

An Increase in Potential GDP

MyEconLab Animation



1. An increase in potential GDP increases aggregate supply.
2. When potential GDP increases from $16 trillion to $17 trillion, the aggregate supply curve shifts rightward from AS_0 to AS_1.

Suppose that the money wage rate is $52.50 an hour and the price level is 105. Then the real wage rate is $50 an hour ($52.50 × 100 ÷ 105 = $50)—see Chapter 16, p. 436. If the full-employment equilibrium real wage rate is $50 an hour, the economy is at full employment and real GDP equals potential GDP. In Figure 19.3, the economy is at point *C* on the aggregate supply curve AS_0. The money wage rate is $52.50 an hour at all points on AS_0.

Now suppose the money wage rate rises to $57.50 an hour but the full-employment equilibrium real wage rate remains at $50 an hour. Real GDP now equals potential GDP when the price level is 115, at point *D* on the aggregate supply curve AS_2. (If the money wage rate is $57.50 an hour and the price level is 115, the real wage rate is $57.50 × 100 ÷ 115 = $50 an hour.) The money wage rate is $57.50 an hour at all points on AS_2. The rise in the money wage rate *decreases* aggregate supply and shifts the aggregate supply curve leftward from AS_0 to AS_2.

A change in the money wage rate does not change potential GDP. The reason is that potential GDP depends only on the economy's real ability to produce and on the full-employment quantity of labor, which occurs at the equilibrium *real* wage rate. The equilibrium real wage rate can occur at any money wage rate.

Change in Money Prices of Other Resources

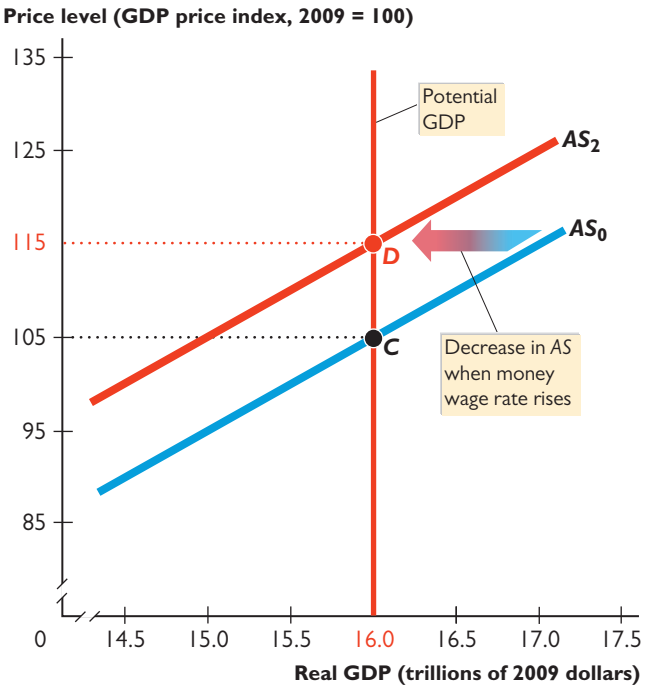
A change in the money prices of other resources has a similar effect on firms' production plans to a change in the money wage rate. It changes firms' costs. At each price level, firms' real costs change and the quantity that firms are willing to supply changes so aggregate supply changes.

FIGURE 19.3

A Change in the Money Wage Rate

MyEconLab Animation

A rise in the money wage rate decreases aggregate supply. The aggregate supply curve shifts leftward from AS_0 to AS_2. A rise in the money wage rate does not change potential GDP.



CHECKPOINT 19.1

Define and explain the influences on aggregate supply.

MyEconLab Study Plan 19.1
Key Terms Quiz
Solutions Video

Practice Problem

1. Explain the influence of each of the events in List 1 on the quantity of real GDP supplied and aggregate supply in India and use a graph to illustrate.

LIST 1

- Fuel prices rise.
- U.S. firms move their IT and data functions to India.
- Walmart and Starbucks open in India.
- Universities in India increase the number of engineering graduates.
- The money wage rate in India rises.
- The price level in India rises.

In the News

A midyear burst of minimum-wage increases starts on July 1
On July 1, 2016, the minimum wage will increase in 14 U.S. cities, states, and counties, and in the District of Columbia. In San Francisco, the minimum wage will rise to $13.00 by 2018.

Source: *The Wall Street Journal*, July 1, 2016

Explain how the widespread rise in the minimum wage will influence aggregate supply.

Solution to Practice Problem

1. As fuel prices rise, the quantity of real GDP supplied at the current price level decreases. The *AS* curve shifts leftward (Figure 1).

   As U.S. firms move their IT and data functions to India, real GDP supplied at the current price level increases. The *AS* curve shifts rightward (Figure 2).

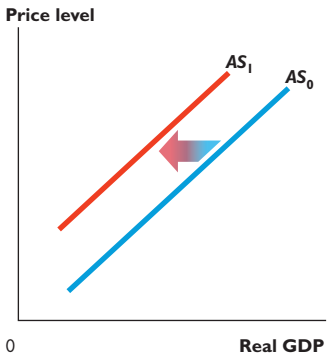
   As Walmart and Starbucks open, the quantity of real GDP supplied at the current price level increases. The *AS* curve shifts rightward (Figure 2).

   With more graduates, the number of skilled workers increases, and production increases at the current price level. The *AS* curve shifts rightward (Figure 2).

   As the money wage rate rises, firms' costs increase and the quantity of real GDP supplied at the current price level decreases. The *AS* curve shifts leftward (Figure 1).

   As the price level increases, other things remaining the same, businesses become more profitable and increase the quantity of real GDP supplied along the *AS* curve (Figure 3). The *AS* curve does not shift.

FIGURE 1



Solution to In the News

The widespread rise in the minimum wage will increase the money wage rate. At the current price level, a rise in the money wage rate increases the real wage rate and decreases aggregate supply. If the rise in the minimum wage increases the natural unemployment rate, potential GDP decreases and aggregate supply decreases further.

FIGURE 2

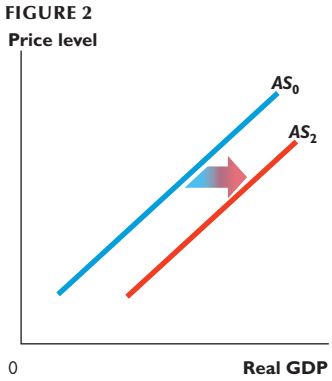


FIGURE 3



MyEconLab Concept Video

19.2 AGGREGATE DEMAND

The *quantity of real GDP demanded* (Y) is the total amount of final goods and services produced in the United States that people, businesses, governments, and foreigners plan to buy. This quantity is the sum of the real consumption expenditure (C), investment (I), government expenditure on goods and services (G), and exports (X) minus imports (M). That is,

$$Y = C + I + G + X - M.$$

Many factors influence expenditure plans. To study aggregate demand, we divide those factors into two parts: the price level and everything else. We'll first consider the influence of the price level on expenditure plans and then consider the other influences.

Aggregate Demand Basics

Aggregate demand
The relationship between the quantity of real GDP demanded and the price level when all other influences on expenditure plans remain the same.

Aggregate demand is the relationship between the quantity of real GDP demanded and the price level when all other influences on expenditure plans remain the same. This relationship can be described as follows:

Other things remaining the same, the higher the price level, the smaller is the quantity of real GDP demanded; and the lower the price level, the greater is the quantity of real GDP demanded.

Figure 19.4 illustrates aggregate demand by using an aggregate demand schedule and aggregate demand curve. The aggregate demand schedule lists the quantities of real GDP demanded at each price level, and the downward-sloping *AD* curve graphs these points.

Along the aggregate demand curve, the only influence on expenditure plans that changes is the price level. A rise in the price level decreases the quantity of real GDP demanded and brings a movement up along the aggregate demand curve; a fall in the price level increases the quantity of real GDP demanded and brings a movement down along the aggregate demand curve.

The price level influences the quantity of real GDP demanded because a change in the price level brings a change in

- The buying power of money
- The real interest rate
- The real prices of exports and imports

The Buying Power of Money

A rise in the price level lowers the buying power of money and decreases the quantity of real GDP demanded. To see why, think about the buying plans in two economies—Russia and Japan—where the price level has changed a lot in recent years.

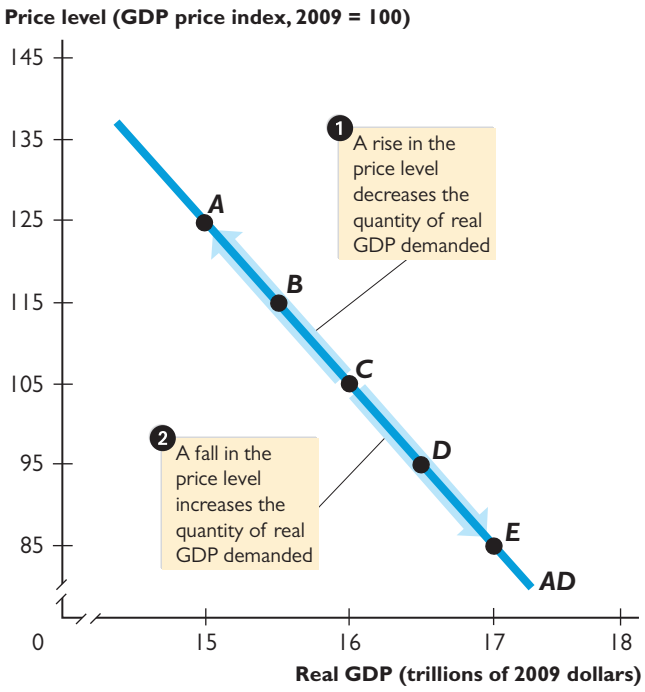
Anna lives in Moscow, Russia. She has worked hard all summer and has saved 20,000 rubles (the ruble is the currency of Russia), which she plans to spend attending graduate school after she has earned her economics degree. So Anna's money holding is 20,000 rubles. Anna has a part-time job, and her income from this job pays her expenses. The price level in Russia rises by 100 percent. Anna needs 40,000 rubles to buy what 20,000 rubles once bought. To make up some of the fall in the buying power of her money, Anna slashes her spending.

FIGURE 19.4

Aggregate Demand Schedule and Aggregate Demand Curve

MyEconLab Animation

	Price level (GDP price index, 2009 = 100)	Quantity of real GDP demanded (trillions of 2009 dollars)
A	125	15.0
B	115	15.5
C	105	16.0
D	95	16.5
E	85	17.0



The aggregate demand schedule and aggregate demand curve, *AD*, show the relationship between the quantity of real GDP demanded and the price level when all other influences on expenditure plans remain the same. Each point *A* through *E* on the *AD* curve corresponds to the row identified by the same letter in the schedule.

The quantity of real GDP demanded

1. decreases when the price level rises and
2. increases when the price level falls.

Similarly, a fall in the price level, other things remaining the same, brings an increase in the quantity of real GDP demanded. To see why, think about the buying plans of Mika, who lives in Tokyo, Japan. She too has worked hard all summer and has saved 200,000 yen (the yen is the currency of Japan), which she plans to spend attending school next year. The price level in Japan falls by 10 percent; now Mika needs only 180,000 yen to buy what 200,000 yen once bought. With a rise in what her money buys, Mika decides to buy a smartphone.

The Real Interest Rate

When the price level rises, the real interest rate rises. An increase in the price level increases the amount of money that people want to hold—increases the demand for money. When the demand for money increases, the nominal interest rate rises. In the short run, the inflation rate does not change, so a rise in the nominal interest rate brings a rise in the real interest rate. Faced with a higher real interest rate, businesses and people delay plans to buy new capital and consumer durable goods and they cut back on spending. As the price level rises, the quantity of real GDP demanded decreases.

Anna and Mika Again Think about Anna and Mika again. Both of them want to buy a computer. In Moscow, a rise in the price level increases the demand for money and raises the real interest rate. At a real interest rate of 5 percent a year,

Anna was willing to borrow to buy the new computer. But at a real interest rate of 10 percent a year, she decides that the payments would be too high, so she delays buying it. The rise in the price level decreases the quantity of real GDP demanded.

In Tokyo, a fall in the price level lowers the real interest rate. At a real interest rate of 5 percent a year, Mika was willing to borrow to buy a low-performance computer. But at a real interest rate of close to zero, she decides to buy a fancier computer that costs more: The fall in the price level increases the quantity of real GDP demanded.

The Real Prices of Exports and Imports

When the U.S. price level rises and other things remain the same, the prices in other countries do not change. So a rise in the U.S. price level makes U.S.-made goods and services more expensive relative to foreign-made goods and services. This change in real prices encourages people to spend less on U.S.-made items and more on foreign-made items. For example, if the U.S. price level rises relative to the foreign price level, foreigners buy fewer U.S.-made cars (U.S. exports decrease) and Americans buy more foreign-made cars (U.S. imports increase).

Anna's and Mika's Imports In Moscow, Anna is buying some new shoes. With a sharp rise in the Russian price level, the Russian-made shoes that she planned to buy are too expensive, so she buys a less expensive pair imported from Brazil. In Tokyo, Mika is buying a smartphone. With the fall in the Japanese price level, a Japanese-made smartphone looks like a better buy than one made in Taiwan.

In the long run, when the price level changes by more in one country than in other countries, the exchange rate changes. The exchange rate change neutralizes the price level change, so this international price effect on buying plans is a short-run effect only. But in the short run, it is a powerful effect.

Changes in Aggregate Demand

A change in any factor that influences expenditure plans other than the price level brings a change in aggregate demand. When aggregate demand increases, the aggregate demand curve shifts rightward, which Figure 19.5 illustrates as the rightward shift of the *AD* curve from AD_0 to AD_1. When aggregate demand decreases, the aggregate demand curve shifts leftward, which Figure 19.5 illustrates as the leftward shift of the *AD* curve from AD_0 to AD_2. The factors that change aggregate demand are

- Expectations about the future
- Fiscal policy and monetary policy
- The state of the world economy

Expectations

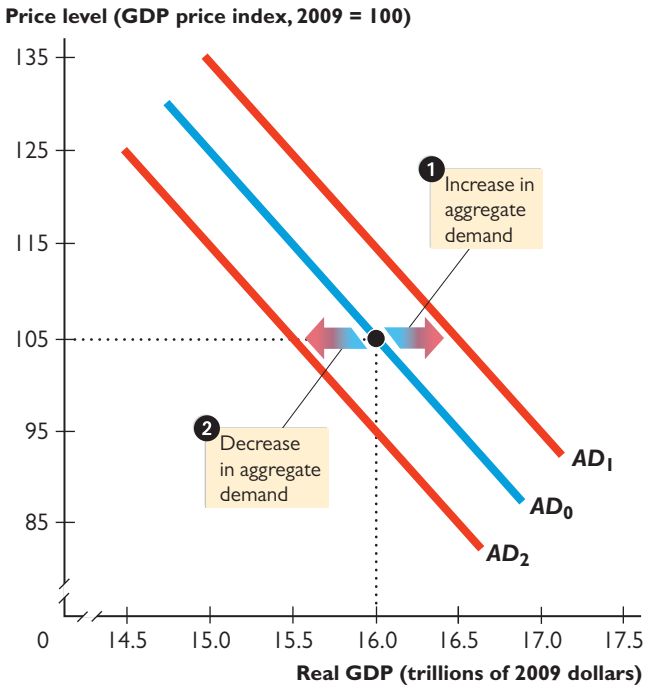
An increase in expected future income increases the amount of consumption goods (especially big-ticket items such as cars) that people plan to buy now. Aggregate demand increases. An increase in expected future inflation increases aggregate demand because people decide to buy more goods and services now before their prices rise. An increase in expected future profit increases the investment that firms plan to undertake now. Aggregate demand increases.

A decrease in expected future income, future inflation, or future profit has the opposite effect and decreases aggregate demand.

FIGURE 19.5

Change in Aggregate Demand

MyEconLab Animation



1 Aggregate demand *increases if*

- Expected future income, inflation, or profits increase.
- The government or the Federal Reserve takes steps that increase planned expenditure.
- The exchange rate falls or the global economy expands.

2 Aggregate demand *decreases if*

- Expected future income, inflation, or profits decrease.
- The government or the Federal Reserve takes steps that decrease planned expenditure.
- The exchange rate rises or the global economy contracts.

Fiscal Policy and Monetary Policy

We study the effects of policy actions on aggregate demand in Chapter 20. Here, we'll just briefly note that the government can use **fiscal policy**—changing taxes, transfer payments, and government expenditure on goods and services—to influence aggregate demand. The Federal Reserve can use **monetary policy**—changing the quantity of money and the interest rate—to influence aggregate demand. A tax cut or an increase in either transfer payments or government expenditure on goods and services increases aggregate demand. A cut in the interest rate or an increase in the quantity of money increases aggregate demand.

Fiscal policy
Changing taxes, transfer payments, and government expenditure on goods and services.

Monetary policy
Changing the quantity of money and the interest rate.

The World Economy

Two main influences that the world economy has on aggregate demand are the foreign exchange rate and foreign income. The foreign exchange rate is the amount of a foreign currency that you can buy with a U.S. dollar. Other things remaining the same, a rise in the foreign exchange rate decreases aggregate demand.

To see how the foreign exchange rate influences aggregate demand, suppose that $1 exchanges for 100 Japanese yen. A Fujitsu phone made in Japan costs 12,500 yen, and an equivalent Motorola phone made in the United States costs $110. In U.S. dollars, the Fujitsu phone costs $125, so people around the world buy the cheaper U.S. phone. Now suppose the exchange rate rises to 125 yen per dollar. At 125 yen per dollar, the Fujitsu phone costs $100 and is now cheaper than the Motorola phone. People will switch from the U.S. phone to the Japanese phone.

U.S. exports will decrease and U.S. imports will increase, so U.S. aggregate demand will decrease.

An increase in foreign income increases U.S. exports and increases U.S. aggregate demand. For example, an increase in income in Japan and Germany increases Japanese and German consumers' and producers' planned expenditures on U.S.-made goods and services.

The Aggregate Demand Multiplier

The aggregate demand multiplier is an effect that magnifies changes in expenditure plans and brings potentially large fluctuations in aggregate demand. When any influence on aggregate demand changes expenditure plans, the change in expenditure changes income; and the change in income induces a change in consumption expenditure. The increase in aggregate demand is the initial increase in expenditure plus the induced increase in consumption expenditure.

Suppose that an increase in expenditure induces an increase in consumption expenditure that is 1.5 times the initial increase in expenditure. Figure 19.6 illustrates the change in aggregate demand that occurs when investment increases by $0.4 trillion. Initially, the aggregate demand curve is AD_0. Investment then increases by $0.4 trillion ($\Delta I$) and the purple curve $AD_0 + \Delta I$ now describes aggregate spending plans at each price level. An increase in income induces an increase in consumption expenditure of $0.6 trillion, and the aggregate demand curve shifts rightward to AD_1.

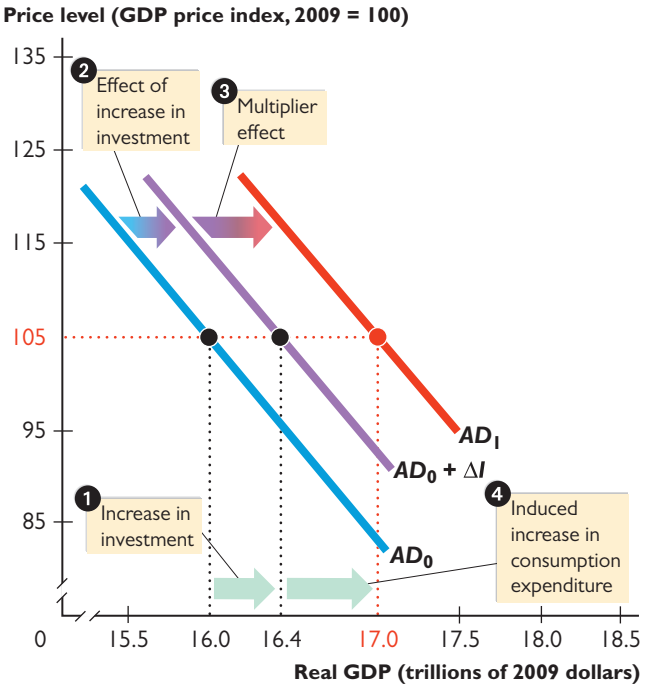
FIGURE 19.6

The Aggregate Demand Multiplier

MyEconLab Animation

❶ An increase in investment ❷ increases aggregate demand and increases income.

❸ A multiplier effect induces an increase in consumption expenditure, which ❹ increases aggregate demand by more than the initial increase in investment.



CHECKPOINT 19.2

MyEconLab Study Plan 19.2
Key Terms Quiz
Solutions Video

Define and explain the influences on aggregate demand.

Practice Problems

1. Mexico trades with the United States. Explain the effect of each of the following events on Mexico's aggregate demand.
   - The government of Mexico cuts income taxes.
   - The United States experiences strong economic growth.
   - Mexico sets new environmental standards that require factories to upgrade their production facilities.
2. Explain the effect of each of the following events on the quantity of real GDP demanded and aggregate demand in Mexico.
   - Europe trades with Mexico and goes into a recession.
   - The price level in Mexico rises.
   - Mexico increases the quantity of money.

In the News

Investment and government expenditure down and exports up
The BEA announced that nonresidential investment and federal government spending decreased in the first quarter of 2016 while U.S. exports increased and U.S. imports decreased.

Source: Bureau of Economic Analysis, June 28, 2016

Explain how the items in the news clip influenced U.S. aggregate demand.

Solutions to Practice Problems

1. A tax cut increases disposable income, which increases consumption expenditure, which increases aggregate demand. Strong U.S. growth increases the demand for Mexican-produced goods, which increases Mexico's aggregate demand. As factories upgrade their facilities, investment increases. Aggregate demand increases. In each case, the *AD* curve shifts rightward (Figure 1).
2. A recession in Europe decreases the demand for Mexico's exports, so aggregate demand decreases. The *AD* curve shifts leftward (Figure 2). A rise in the price level decreases the quantity of real GDP demanded along the *AD* curve, but the *AD* curve does not shift (Figure 3). An increase in the quantity of money increases aggregate demand, and the *AD* curve shifts rightward (Figure 1).

Solution to In the News

The decrease in nonresidential investment and federal government expenditure decreased aggregate demand. The fall in U.S. imports and rise in U.S. exports increased the demand for U.S.-produced goods and services and increased U.S. aggregate demand.

FIGURE 1

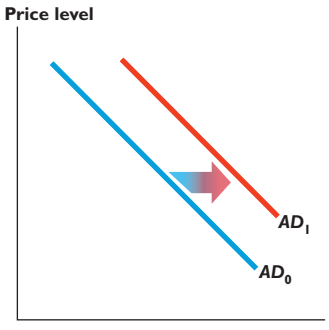


FIGURE 2

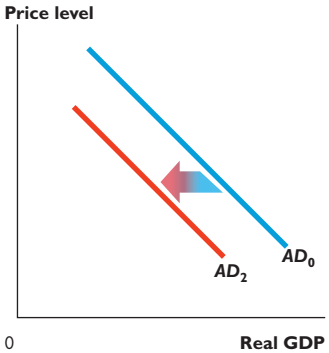
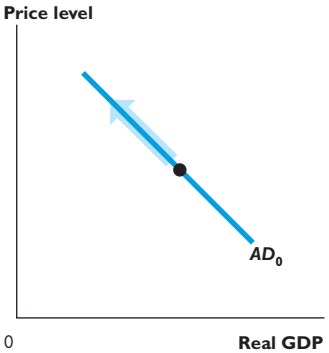


FIGURE 3



MyEconLab Concept Video

19.3 EXPLAINING ECONOMIC TRENDS AND FLUCTUATIONS

The main purpose of the *AS-AD* model is to explain business cycle fluctuations in real GDP and the price level. But the model also helps our understanding of economic growth and inflation trends that we've studied in earlier chapters. The first step toward explaining economic trends and fluctuations is to combine aggregate supply and aggregate demand and determine macroeconomic equilibrium.

Macroeconomic Equilibrium

Macroeconomic equilibrium
When the quantity of real GDP demanded equals the quantity of real GDP supplied at the point of intersection of the *AD* curve and the *AS* curve.

Aggregate supply and aggregate demand determine real GDP and the price level. **Macroeconomic equilibrium** occurs when the quantity of real GDP demanded equals the quantity of real GDP supplied at the point of intersection of the *AD* curve and the *AS* curve. Figure 19.7 shows such an equilibrium at a price level of 105 and real GDP of $16 trillion.

To see why this position is the equilibrium, think about what happens if the price level is something other than 105. Suppose the price level is 95 and real GDP is $15 trillion (point *A* on the *AS* curve). The quantity of real GDP demanded exceeds $15 trillion, so firms are unable to meet the demand for their output. Inventories decrease, and customers clamor for goods and services. In this situation, firms increase production and raise prices. Eventually they can meet demand when real GDP is $16 trillion and the price level is 105.

Now suppose that the price level is 115 and that real GDP is $17 trillion (point *B* on the *AS* curve). The quantity of real GDP demanded is less than $17 trillion, so firms are unable to sell all their output. Unwanted inventories pile up. Firms cut production and lower prices until they can sell all their output, which occurs when real GDP is $16 trillion and the price level is 105.

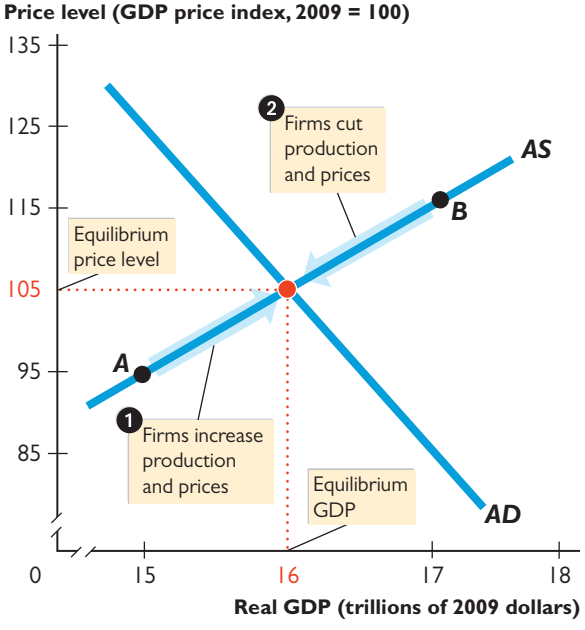
FIGURE 19.7
Macroeconomic Equilibrium

MyEconLab Animation

Macroeconomic equilibrium occurs when the quantity of real GDP supplied on the *AS* curve equals the quantity of real GDP demanded on the *AD* curve.

1. At a price level of 95, the quantity of real GDP supplied is $15 trillion at point *A*. The quantity of real GDP demanded exceeds the quantity supplied, so firms increase production and raise prices.
2. At a price level of 115, the quantity of real GDP supplied is $17 trillion at point *B*. The quantity of real GDP demanded is less than the quantity supplied, so firms cut production and lower prices.

At a price level of 105, the quantity of real GDP supplied equals the quantity of real GDP demanded in macroeconomic equilibrium.



Three Types of Macroeconomic Equilibrium

In macroeconomic equilibrium, the economy might be at full employment or above or below full employment. Figure 19.8(a) shows these three possibilities. **Full-employment equilibrium**—when equilibrium real GDP equals potential GDP—occurs where the *AD* curve intersects the aggregate supply curve *AS**.

At a higher money wage rate, aggregate supply is AS_1. Real GDP is $15.5 trillion and is less than potential GDP. The economy is *below full employment* and there is a **recessionary gap**. At a lower money wage rate, aggregate supply is AS_2. In this situation, real GDP is $16.5 trillion and is greater than potential GDP. The economy is *above full employment* and there is an **inflationary gap**.

Full-employment equilibrium
When equilibrium real GDP equals potential GDP.

Recessionary gap
A gap that exists when potential GDP exceeds real GDP and that brings a falling price level.

Inflationary gap
A gap that exists when real GDP exceeds potential GDP and that brings a rising price level.

Adjustment toward Full Employment

When real GDP is below or above potential GDP, the money wage rate gradually changes to restore full employment. Figure 19.8(b) illustrates this adjustment.

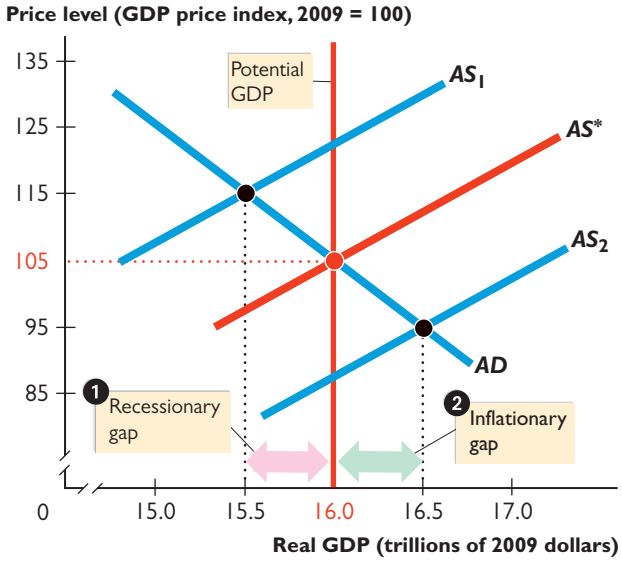
In a *recessionary gap*, there is a surplus of labor and firms can hire new workers at a lower wage rate. As the money wage rate falls, the *AS* curve shifts from AS_1 toward *AS** and the price level falls and real GDP rises. The money wage continues to fall until real GDP equals potential GDP—full-employment equilibrium.

In an *inflationary gap*, there is a shortage of labor and firms must offer a higher wage rate to hire the labor they demand. As the money wage rate rises, the *AS* curve shifts from AS_2 toward *AS** and the price level rises and real GDP falls. The money wage rate continues to rise until real GDP equals potential GDP.

FIGURE 19.8

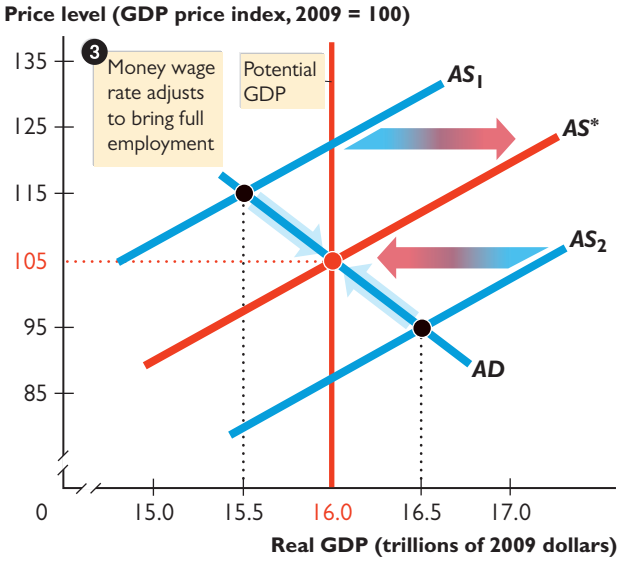
Output Gaps and Full-Employment Equilibrium

MyEconLab Animation



(a) Three types of macroeconomic equilibrium

In part (a), when equilibrium real GDP is less than potential GDP, ❶ there is a recessionary gap; when equilibrium real GDP is greater than potential GDP, ❷ there is an inflationary gap; and when equilibrium real GDP equals potential GDP, the economy is at full employment.



(b) Adjustment to full employment

In part (b), when an output gap exists ❸ the money wage rate adjusts to move the economy toward full employment. With a recessionary gap, the money wage rate falls and the *AS* curve shifts rightward from AS_1 to *AS**. With an inflationary gap, the money wage rate rises and the *AS* curve shifts leftward from AS_2 to *AS**.

Economic Growth and Inflation Trends

Economic growth results from a growing labor force and increasing labor productivity, which together make potential GDP grow. Inflation results from a growing quantity of money that outpaces the growth of potential GDP.

The *AS-AD* model can be used to understand economic growth and inflation trends. In the *AS-AD* model, economic growth is increasing potential GDP—a persistent rightward shift in the potential GDP line. Inflation arises from a persistent increase in aggregate demand at a faster pace than that of the increase in potential GDP—a persistent rightward shift of the *AD* curve at a faster pace than the growth of potential GDP. *Eye on the U.S. Economy* on pp. 526–527 shows how the *AS-AD* model explains U.S. economic growth and inflation trends.



EYE on the U.S. ECONOMY

U.S. Economic Growth, Inflation, and the Business Cycle

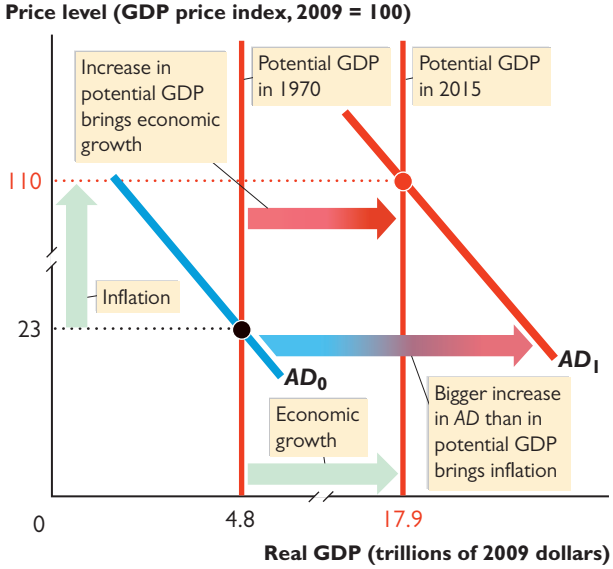
U.S. economic growth, inflation, and the business cycle result from changes in aggregate supply and aggregate demand.

A rightward movement in the U.S. potential GDP line brings economic growth and a greater rightward movement of the U.S. *AD* curve brings inflation. Part (a) shows the shifting curves that generate growth and inflation.

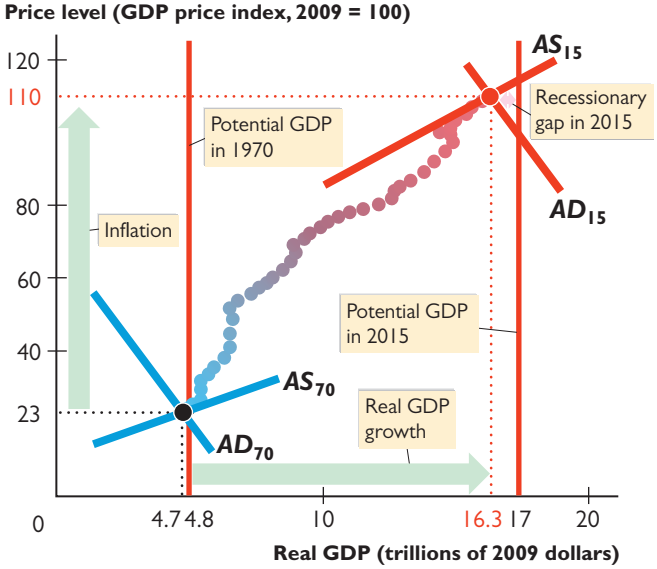
Part (b) shows the history of U.S. real GDP growth and inflation from 1970 to 2015. Each dot represents the real GDP and price level in a year—the black dot 1970 and the red dot 2015. The rightward movement of the dots is economic growth and the upward movement is a rising price level—inflation.

When the dots follow a path that is gently rising, as during the 1990s, the inflation rate is low and real GDP growth is quite rapid. When the dots follow a path that is steep, as during the 1970s, inflation is rapid and economic growth is slow.

Notice that the dots move rightward and upward in waves and occasionally



(a) Economic growth and inflation



(b) U.S. economic growth and inflation

The Business Cycle

The business cycle results from fluctuations in aggregate supply and aggregate demand. Aggregate supply fluctuates because labor productivity grows at a variable pace, which brings fluctuations in the growth rate of potential GDP. The resulting cycle is called a **real business cycle**. But aggregate demand fluctuations are the main source of the business cycle. The key reason is that the swings in aggregate demand occur more quickly than changes in the money wage rate that change aggregate supply. The result is that the economy swings from inflationary gap to full employment to recessionary gap and back again.

Eye on the U.S. Economy on pp. 526–527 shows the most recent cycle interpreted as driven by aggregate demand fluctuations. But in the 2008–2009 recession, both aggregate demand and aggregate supply were at work as you can see on p. 531.

Real business cycle
A cycle that results from fluctuations in the pace of growth of labor productivity and potential GDP.

leftward. The pattern shows the business cycle expansions and recessions.

By comparing the dots with potential GDP, we can see that the economy was at full employment in 1970 and had a recessionary gap in 2015.

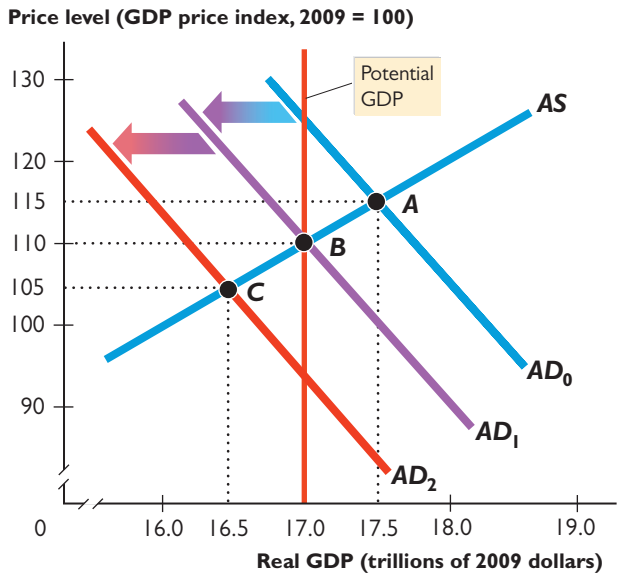
Part (c) shows how changes in aggregate demand create the business cycle, and part (d) shows the most recent cycle from 2000 to 2015.

When the *AD* curve is AD_0 in part (c), the economy is at point *A* and there is an inflationary gap. Part (d) identifies the actual gap in 2000 as *A*.

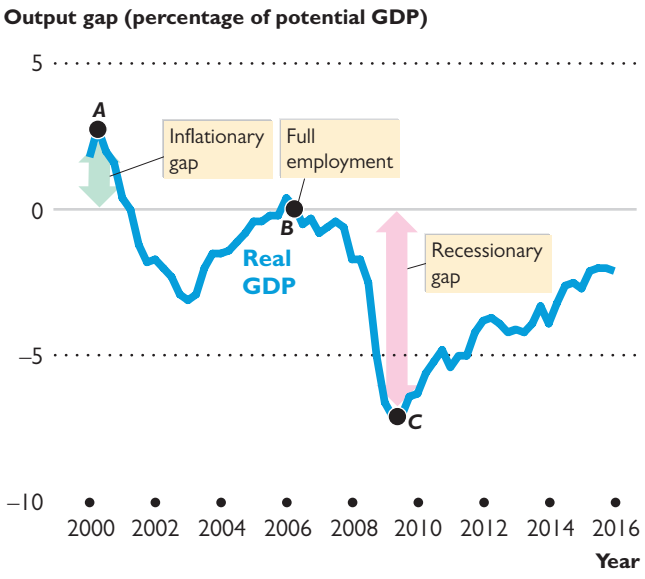
A decrease in aggregate demand to AD_1 lowers real GDP to potential GDP and the economy moves to point *B* in parts (c) and (d).

A further decrease in aggregate demand to AD_2 lowers real GDP to below potential GDP and opens up a recessionary gap at point *C* in both parts (c) and (d).

In reality, *AD* rarely decreases. It increases at a slower pace than the increase in potential GDP. Also, in reality, *AS* fluctuates. But the relative positions of the *AS* and *AD* curves and the potential GDP line are like those shown in part (c).



(c) Aggregate demand fluctuations



(d) The U.S. output gap

SOURCES OF DATA: Bureau of Labor Statistics, Bureau of Economic Analysis, and Congressional Budget Office.

Inflation Cycles

You've seen that inflation occurs if aggregate demand grows faster than potential GDP. But just as there are cycles in real GDP, there are also cycles in the inflation rate. And the two cycles are related. To study the interaction of real GDP and inflation cycles, we distinguish between two sources of inflation:

- Demand-pull inflation
- Cost-push inflation

Demand-Pull Inflation

Demand-pull inflation
Inflation that starts because aggregate demand increases.

Inflation that starts because aggregate demand increases is called **demand-pull inflation**. Demand-pull inflation can be kicked off by any of the factors that change aggregate demand but the only thing that can sustain it is growth in the quantity of money.

Figure 19.9 illustrates the process of demand-pull inflation. Potential GDP is $16 trillion. Initially, the aggregate demand curve is AD_0, the aggregate supply curve is AS_0, and real GDP equals potential GDP. Aggregate demand increases, shifting the aggregate demand curve to AD_1. Real GDP increases and the price level rises. There is now an *inflationary gap*. A shortage of labor brings a rise in the money wage rate, which shifts the aggregate supply curve to AS_1. The price level rises further and real GDP returns to potential GDP.

The quantity of money increases again, and the aggregate demand curve shifts rightward to AD_2. The price level rises further, and real GDP again exceeds potential GDP. Yet again, the money wage rate rises and decreases aggregate supply. The *AS* curve shifts to AS_2, and the price level rises further. As the quantity of money continues to grow, aggregate demand increases and the price level rises in an ongoing demand-pull inflation spiral.

FIGURE 19.9
A Demand-Pull Inflation

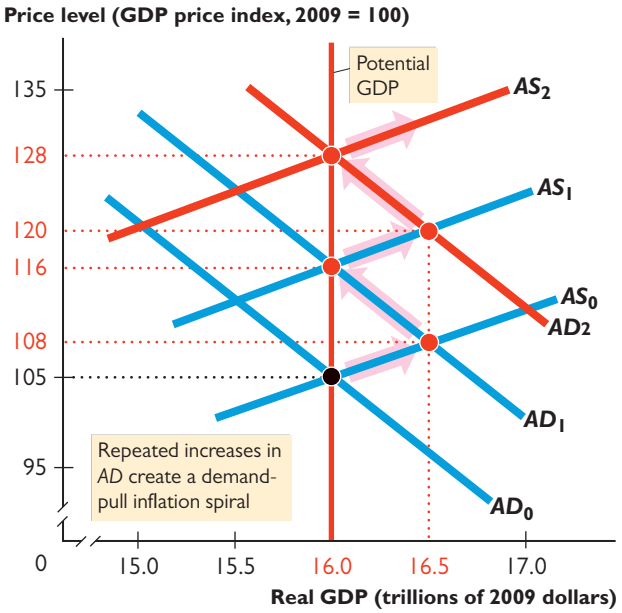
MyEconLab Animation

Each time the quantity of money increases, aggregate demand increases and the aggregate demand curve shifts rightward from AD_0 to AD_1 to AD_2, and so on.

Each time real GDP increases above potential GDP, the money wage rate rises and the aggregate supply curve shifts leftward from AS_0 to AS_1 to AS_2, and so on.

The price level rises from 105 to 108, 116, 120, 128, and so on.

A demand-pull inflation spiral results with real GDP fluctuating between $16 trillion and $16.5 trillion.



Cost-Push Inflation

Inflation that begins with an increase in cost is called **cost-push inflation**. The two main sources of cost increases are increases in the money wage rate and increases in the money prices of raw materials such as oil.

Cost-push inflation
An inflation that begins with an increase in cost.

Cost-push inflation can be kicked off by an increase in costs but the only thing that can sustain it is growth in the quantity of money.

Figure 19.10 illustrates cost-push inflation. The aggregate demand curve is AD_0, the aggregate supply curve is AS_0, and real GDP equals potential GDP. The world price of oil rises, which decreases aggregate supply. The aggregate supply curve shifts leftward to AS_1, the price level rises, and real GDP decreases so there is a *recessionary gap*.

When real GDP decreases, unemployment rises above its natural rate and the Fed increases the quantity of money to restore full employment. Aggregate demand increases and the *AD* curve shifts rightward to AD_1. Real GDP returns to potential GDP but the price level rises further.

Oil producers now see the prices of everything they buy rising so they raise the price of oil again to restore its new higher relative price. The *AS* curve now shifts to AS_2, the price level rises again, and real GDP decreases again.

If the Fed responds yet again with an increase in the quantity of money, aggregate demand increases and the *AD* curve shifts to AD_2. The price level rises even higher and full employment is again restored. A cost-push inflation spiral results.

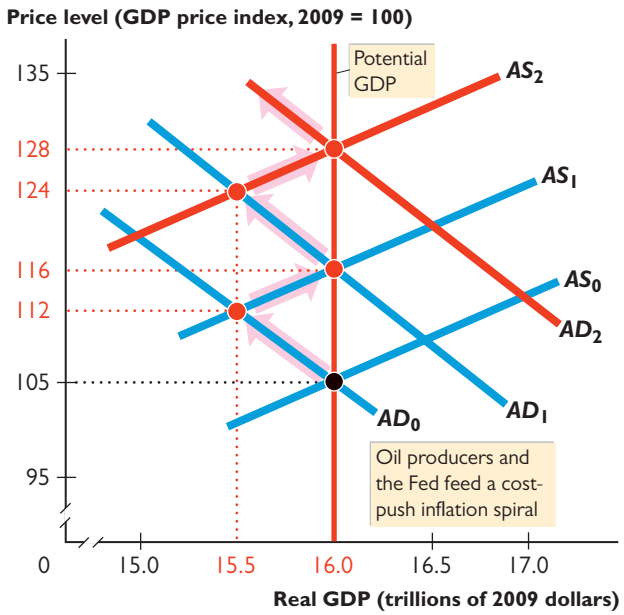
The combination of a decreasing real GDP and a rising price level is called **stagflation**. You can see that stagflation poses a dilemma for the Fed. If the Fed does not respond when producers raise the oil price, the economy remains below full employment. If the Fed increases the quantity of money to restore full employment, it invites another oil price hike that will call forth yet a further increase in the quantity of money.

Stagflation
The combination of recession (decreasing real GDP) and inflation (rising price level).

FIGURE 19.10

A Cost-Push Inflation

MyEconLab Animation



Each time a cost increase occurs, the aggregate supply curve shifts leftward from AS_0 to AS_1 to AS_2, and so on.

Each time real GDP decreases below potential GDP, the Fed increases the quantity of money and the aggregate demand curve shifts rightward from AD_0 to AD_1 to AD_2, and so on.

The price level rises from 105 to 112, 116, 124, 128, and so on.

A cost-push inflation spiral results with real GDP fluctuating between $16 trillion and $15.5 trillion.

Deflation and the Great Depression

When a financial crisis hit the United States in October 2008, many people feared a repeat of the dreadful events of the 1930s. From 1929 through 1933, the United States and most of the world experienced deflation and depression—the *Great Depression*. The price level fell by 22 percent and real GDP fell by 31 percent.

The recession of 2008–2009 turned out to be much less severe than the Great Depression. Real GDP fell by less than 4 percent and the price level continued to rise, although at a slower pace. Why was the Great Depression so bad and why was 2008–2009 so mild in comparison? You can answer these questions with what you've learned in this chapter.

During the Great Depression, banks failed and the quantity of money contracted by 25 percent. The Fed stood by and took no action to counteract the collapse of buying power, so aggregate demand also collapsed. Because the money wage rate didn't fall immediately, the decrease in aggregate demand brought a large fall in real GDP. The money wage rate and price level fell eventually, but not until employment and real GDP had shrunk to 75 percent of their 1929 levels.

In contrast, during the 2008 financial crisis, the Fed bailed out troubled financial institutions and doubled the monetary base. The quantity of money kept growing. Also, the government increased its own expenditures, which added to aggregate demand. The combined effects of continued growth in the quantity of money and increased government expenditure limited the fall in aggregate demand and prevented a large decrease in real GDP.

The challenge that now lies ahead is to unwind the monetary and fiscal stimulus as the components of private expenditure—consumption expenditure, investment, and exports—begin to increase and return to more normal levels and so bring an increase in aggregate demand. Too much stimulus will bring an inflationary gap and faster inflation. Too little stimulus will leave a recessionary gap.

You will explore these monetary and fiscal policy actions and their effects in Chapter 20.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Using the *AS-AD* Model

Using all the knowledge that you have accumulated over the term, and by watching or reading the current news, try to figure out where the U.S. economy is in its business cycle right now.

First, can you determine if real GDP is currently above, below, or at potential GDP? Second, can you determine if real GDP is expanding or contracting in a recession?

Next, try to form a view about where the U.S. economy is heading. What do you see as the main pressures on aggregate supply and aggregate demand, and in which directions are they pushing or pulling the economy?

Do you think that real GDP will expand more quickly or more slowly over the coming months? Do you think the gap between real GDP and potential GDP will widen or narrow?

How do you expect the labor market to be affected by the changes in aggregate supply and aggregate demand that you are expecting? Do you expect the unemployment rate to rise, fall, or remain constant?

Talk to your friends in class about where they see the U.S. economy right now and where it is heading. Is there a consensus or is there a wide range of opinion?



EYE on the BUSINESS CYCLE

MyEconLab Critical Thinking Exercise

Why Did the U.S. Economy Go into Recession in 2008?

What causes the business cycle and what caused the 2008–2009 recession?

Business Cycle Theory

The mainstream business cycle theory is that potential GDP grows at a steady rate while aggregate demand grows at a fluctuating rate.

Because the money wage rate is slow to change, if aggregate demand grows more quickly than potential GDP, real GDP moves above potential GDP and an inflationary gap emerges. The inflation rate rises and real GDP is pulled back toward potential GDP.

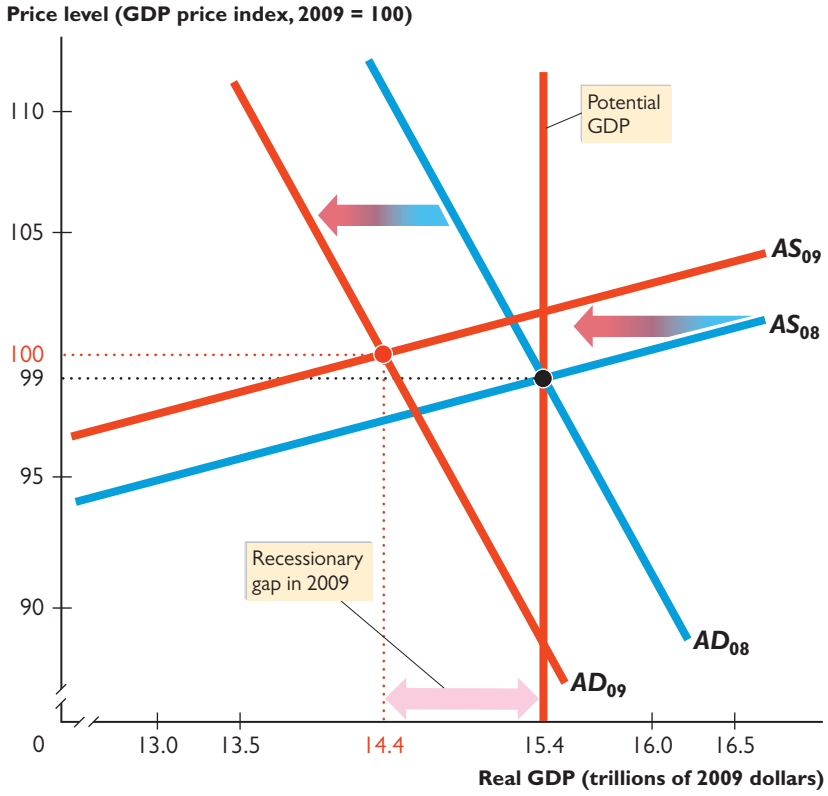
If aggregate demand grows more slowly than potential GDP, real GDP moves below potential GDP and a recessionary gap emerges. The inflation rate slows. Because the money wage rate responds very slowly to the recessionary gap, real GDP does not return to potential GDP until another increase in aggregate demand occurs.

Fluctuations in investment are the main source of fluctuations in aggregate demand. Consumption expenditure responds to changes in income.

A recession can also occur if aggregate supply decreases to bring stagflation. And a recession might occur because both aggregate demand and aggregate supply decrease.

The 2008–2009 Recession

The 2008–2009 recession is an example of a recession caused by a decrease in both aggregate demand and aggregate supply. The figure illustrates these two contributing forces.



Sources of data: Bureau of Economic Analysis and Congressional Budget Office.

At the peak in 2008, real GDP was $15.4 trillion and the price level was 99. In the second quarter of 2009, real GDP had fallen to $14.4 trillion and the price level had risen to 100.

The financial crisis that began in 2007 and intensified in 2008 decreased the supply of loanable funds and investment fell. In particular, construction investment collapsed.

Recession in the global economy decreased the demand for U.S. exports, so this component of aggregate demand also decreased.

The decrease in aggregate demand was moderated by a large injection of spending by the U.S. government, but this move was not enough to stop aggregate demand from decreasing.

We cannot account for the combination of a rise in the price level and a decrease in real GDP with a decrease in aggregate demand alone. Aggregate supply must also have decreased. The rise in oil prices in 2007 and a rise in the money wage rate were the two factors that brought about the decrease in aggregate supply.

MyEconLab Study Plan 19.3
Key Terms Quiz
Solutions Video

CHECKPOINT 19.3

Explain how trends and fluctuations in aggregate demand and aggregate supply bring economic growth, inflation, and the business cycle.

Practice Problems

The U.S. economy is at full employment when the following events occur:

- A deep recession hits the world economy.
- The world oil price rises by a large amount.
- U.S. businesses expect future profits to fall.

1. Explain the effect of each event separately on aggregate demand and aggregate supply. How will real GDP and the price level change in the short run?
2. Explain the combined effect of these events on real GDP and the price level.
3. Which event, if any, brings stagflation?

In the News

U.S. risks future of low growth, says IMF
International Monetary Fund managing director Christine Lagarde says that a falling labor force participation rate and falling productivity will slow U.S. real GDP growth. IMF economists say business investment will also slow.

Source: *Financial Times*, June 22, 2016

Explain this news report in terms of the *AS-AD* model.

FIGURE 1

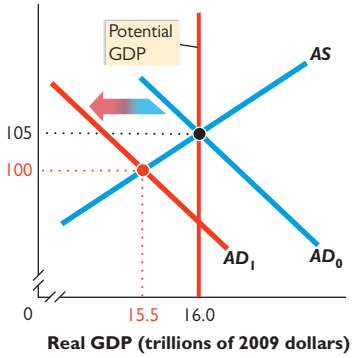
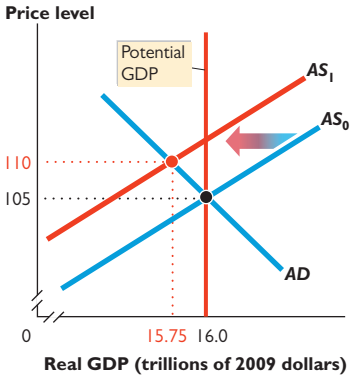


FIGURE 2



Solutions to Practice Problems

1. A deep recession in the world economy decreases U.S. aggregate demand. The *AD* curve shifts leftward. In the short run, U.S. real GDP decreases and the price level falls (Figure 1). A rise in the world oil price decreases U.S. aggregate supply. The *AS* curve shifts leftward. In the short run, U.S. real GDP decreases and the price level rises (Figure 2). A fall in expected future profits decreases U.S. aggregate demand. The *AD* curve shifts leftward. In the short run, U.S. real GDP decreases and the price level falls (Figure 1).
2. All three events decrease U.S. real GDP (Figures 1 and 2). The deep world recession and the fall in expected future profits decrease the price level (Figure 1). The rise in the world oil price increases the price level (Figure 2). So the combined effect on the price level is ambiguous.
3. Stagflation is a rising price level and a decreasing real GDP together. The rise in the world oil price brings stagflation because it decreases aggregate supply, decreases real GDP, and raises the price level (Figure 2).

Solution to In the News

The news report contains information about likely future developments in U.S. aggregate supply and aggregate demand. A falling labor force participation rate and falling productivity will slow the growth rate of U.S. potential GDP and aggregate supply. A slowdown in business investment will slow the growth rate of aggregate demand. The combination of these changes will slow the growth rate of real GDP. Their effects on the price level depend on whether aggregate supply or aggregate demand slows most.

CHAPTER SUMMARY

Key Points

1. Define and explain the influences on aggregate supply.

- Aggregate supply is the relationship between the quantity of real GDP supplied and the price level when all other influences on production plans remain the same.
- The *AS* curve slopes upward because with a given money wage rate, a rise in the price level lowers the real wage rate, increases the quantity of labor demanded, and increases the quantity of real GDP supplied.
- A change in potential GDP, a change in the money wage rate, or a change in the money price of other resources changes aggregate supply.

2. Define and explain the influences on aggregate demand.

- Aggregate demand is the relationship between the quantity of real GDP demanded and the price level when all other influences on expenditure plans remain the same.
- The *AD* curve slopes downward because a rise in the price level decreases the buying power of money, raises the real interest rate, raises the real price of domestic goods compared with foreign goods, and decreases the quantity of real GDP demanded.
- A change in expected future income, inflation, and profits; a change in fiscal policy and monetary policy; and a change in the foreign exchange rate and foreign real GDP all change aggregate demand—the aggregate demand curve shifts.

3. Explain how trends and fluctuations in aggregate demand and aggregate supply bring economic growth, inflation, and the business cycle.

- Aggregate demand and aggregate supply determine real GDP and the price level in macroeconomic equilibrium, which can occur at full employment or above or below full employment.
- Away from full employment, gradual changes in the money wage rate move real GDP toward potential GDP.
- Economic growth is a persistent increase in potential GDP, and inflation occurs when aggregate demand grows at a faster rate than potential GDP.
- Business cycles occur because aggregate demand and aggregate supply fluctuate.
- Demand-pull and cost-push forces bring inflation and real GDP cycles.

Key Terms

MyEconLab Key Terms Quiz

Aggregate demand, 518
Aggregate supply, 512
Cost-push inflation, 529
Demand-pull inflation, 528
Fiscal policy, 521
Full-employment equilibrium, 525
Inflationary gap, 525
Macroeconomic equilibrium, 524
Monetary policy, 521
Real business cycle, 527
Recessionary gap, 525
Stagflation, 529

MyEconLab Chapter 19 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. As more people in India have access to higher education, explain how potential GDP and aggregate supply will change in the long run.

2. Explain the effect of each of the following events on the quantity of U.S. real GDP demanded and the demand for U.S. real GDP:

- The world economy goes into a strong expansion.
- The U.S. price level rises.
- Congress raises income taxes.

3. The United States is at full employment when the Fed cuts the quantity of money, other things remaining the same. Explain the effect of the cut in the quantity of money on aggregate demand in the short run.

4. Table 1 sets out an economy's aggregate demand and aggregate supply schedules. What is the macroeconomic equilibrium? If potential GDP is $600 billion, what is the type of macroeconomic equilibrium? Explain how real GDP and the price level will adjust in the long run.

5. Suppose that the U.S. economy has a recessionary gap and the world economy goes into an expansion. Explain the effect of the expansion on U.S. real GDP and unemployment in the short run.

6. Explain the effect of the Fed's action that increases the quantity of money on the macroeconomic equilibrium in the short run. Explain the adjustment process that returns the economy to full employment.

Use Figure 1 to work Problems **7** to **9**. Initially, the economy is at point *B*.

7. Some events change aggregate demand from AD_0 to AD_1. Describe two possible events.What is the new equilibrium point? If potential GDP is $1 trillion, describe the type of macroeconomic equilibrium.

8. Some events change aggregate supply from AS_0 to AS_1. Describe two possible events. What is the new equilibrium point? If potential GDP is $1 trillion, does the economy have an inflationary gap, a recessionary gap, or no gap?

9. Some events change aggregate demand from AD_0 to AD_1 and aggregate supply from AS_0 to AS_1. What is the new macroeconomic equilibrium?

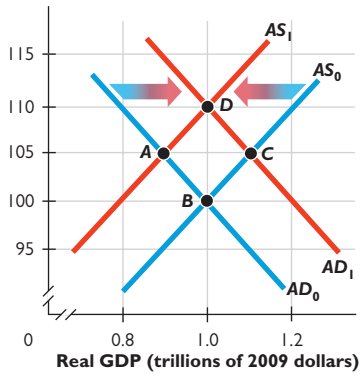
10. **"Brexit" expected to rattle U.S. economy**
The United Kingdom vote to leave the European Union (known as Brexit) is expected to affect the U.S. economy by driving up the value of the dollar. But it is not thought that Brexit alone will shrink the U.S. economy.
Source: *The Wall Street Journal*, June 24, 2016
Explain how a high value of the dollar affects U.S. real GDP and on an *AS-AD* graph show the macroeconomic equilibrium in the U.S. economy with and without the effects of Brexit.

11. Read *Eye on the Business Cycle* on p. 531. What caused the 2008–2009 recession and how do we know that a decrease in aggregate supply played a role?

TABLE 1

Price level (GDP price index)	Real GDP demanded	Real GDP supplied
	(billions of 2009 dollars)	
90	900	600
100	850	700
110	800	800
120	750	900
130	700	1,000

FIGURE 1



Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. What, according to the mainstream theory of the business cycle, is the most common source of recession: a decrease in aggregate demand, a decrease in aggregate supply, or both? Which is the most likely component of aggregate demand to start a recession? How does the aggregate demand multiplier influence a recession?
2. Suppose that the United States is at full employment. Explain the effect of each of the following events on aggregate supply:
   - Union wage settlements push the money wage rate up by 10 percent.
   - The price level increases.
   - Potential GDP increases.
3. Suppose that the United States is at full employment. Then the federal government cuts taxes, and all other influences on aggregate demand remain the same. Explain the effect of the tax cut on aggregate demand in the short run.

Use the following information to work Problems **4** and **5**.

Because fluctuations in the world oil price make the U.S. short-run macroeconomic equilibrium fluctuate, someone suggests that the government should vary the tax rate on oil, lowering the tax when the world oil price rises and increasing the tax when the world oil price falls, to stabilize the oil price in the U.S. market.

4. How would such an action influence aggregate demand?
5. How would such an action influence aggregate supply?
6. Table 1 sets out the aggregate demand and aggregate supply schedules in Japan. Potential GDP is 600 trillion yen. What is the short-run macroeconomic equilibrium? Does Japan have an inflationary gap or a recessionary gap and what is its magnitude?
7. Suppose that the world price of oil rises. On an *AS-AD* graph, show the effect of the world oil price rise on U.S. macroeconomic equilibrium in the short run. Explain the adjustment process that restores the economy to full employment.
8. Explain the effects of a global recession on the U.S. macroeconomic equilibrium in the short run. Explain the adjustment process that restores the economy to full employment.

Use the following information to work Problems **9** and **10**.

Brexit means a bumpy road ahead for the U.K. economy
The decision by the U.K. people to leave the European Union has already brought a sharp fall in the value of the pound and is expected to lower business and household spending.

Source: *Financial Times*, June 24, 2016

9. Explain the effects of a fall in the value of the U.K. pound and lower spending by businesses and households on U.K. aggregate demand and aggregate supply.
10. The U.K. economy in 2016 was close to full employment. Use the *AS-AD* model to show the effect on U.K. real GDP of the effects of Brexit described in the news clip.

TABLE 1

Price level (GDP price index)	Real GDP demanded	Real GDP supplied
	(trillions of 2005 yen)	
75	600	400
85	550	450
95	500	500
105	450	550
115	400	600
125	350	650
135	300	700

MyEconLab Chapter 19 Study Plan

Multiple Choice Quiz

1. Aggregate supply increases when _____.

A. the price level rises
B. the money wage rate falls
C. consumption increases
D. the money price of oil increases

2. When potential GDP increases, _____.

A. aggregate demand increases
B. aggregate supply increases
C. both aggregate demand and aggregate supply increase
D. the price level rises

3. The quantity of real GDP demanded increases if _____.

A. the buying power of money increases
B. the money wage rate rises
C. the price level falls
D. the nominal interest rate falls

4. An increase in expected future income increases _____.

A. consumption expenditure, which increases current aggregate demand
B. investment, which increases current aggregate supply
C. the demand for money, which decreases current aggregate demand
D. future consumption expenditure and has no effect on current aggregate demand

5. Macroeconomic equilibrium occurs when the quantity of real GDP _____ equals the quantity of _____.

A. demanded; real GDP supplied
B. demanded; potential GDP
C. supplied; potential GDP
D. demanded; real GDP supplied and potential GDP

6. If the economy is at full employment and the Fed increases the quantity of money, _____.

A. aggregate demand increases, a recessionary gap appears, and the money wage rate starts to rise
B. aggregate supply increases, the price level starts to fall, and an expansion begins
C. aggregate demand increases, an inflationary gap appears, and the money wage rate starts to rise
D. potential GDP and aggregate supply increase together and the price level does not change

7. Over the past decade, the demand for goods produced in China has brought a sustained increase in the demand for China's exports that has outstripped the growth of supply. As a result, China has experienced a _____.

A. period of stable prices and sustained economic growth
B. rising price level and demand-pull inflation
C. rising price level and cost-push inflation
D. rising price level and a falling real wage rate





Can fiscal stimulus end a recession? Did the Fed save us from another Great Depression?

Fiscal Policy and Monetary Policy

20

CHAPTER CHECKLIST

When you have completed your study of this chapter, you will be able to

1. Describe the federal budget process and explain the effects of fiscal policy.
2. Describe the Federal Reserve's monetary policy process and explain the effects of monetary policy.

MyEconLab Big Picture Video

MyEconLab Concept Video

20.1 THE FEDERAL BUDGET AND FISCAL POLICY

Fiscal policy
The use of the federal budget to achieve the macroeconomic objectives of high and sustained economic growth and full employment.

Fiscal policy is the use of the federal budget to achieve the macroeconomic objectives of high and sustained economic growth and full employment. What is the federal budget and how is it made?

The Federal Budget

The *federal budget* is an annual statement of the tax revenues, outlays, and surplus or deficit of the government of the United States.

Budget Time Line

The President and Congress make the federal budget on the time line shown in Figure 20.1. The President proposes and approves the budget, but Congress makes the tough decisions on spending and taxes. The House of Representatives and the Senate develop their ideas in their respective budget committees, and conferences between the two houses resolve differences and draft the bills that become the Budget Act.

Budget Balance and Debt

Budget balance
Tax revenues minus outlays.

The government's **budget balance** is equal to tax revenues minus outlays. That is,

$$\text{Budget balance} = \text{Tax revenues} - \text{Outlays}.$$

If tax revenues equal outlays, the government has a *balanced budget*. The government has a *budget surplus* if tax revenues exceed outlays. The government has a *budget deficit* if outlays exceed tax revenues. Table 20.1 shows the tax revenues, outlays, and budget balance for the 2017 fiscal year.

FIGURE 20.1

The Federal Budget Time Line for Fiscal 2018

MyEconLab Animation

The federal budget process begins with the President's proposals in February.

Congress debates and amends the President's proposals and enacts a budget before the start of the fiscal year on October 1.

The President signs the budget act into law.

Throughout the fiscal year, Congress might pass supplementary budget laws. The budget outcome is calculated after the end of the fiscal year.

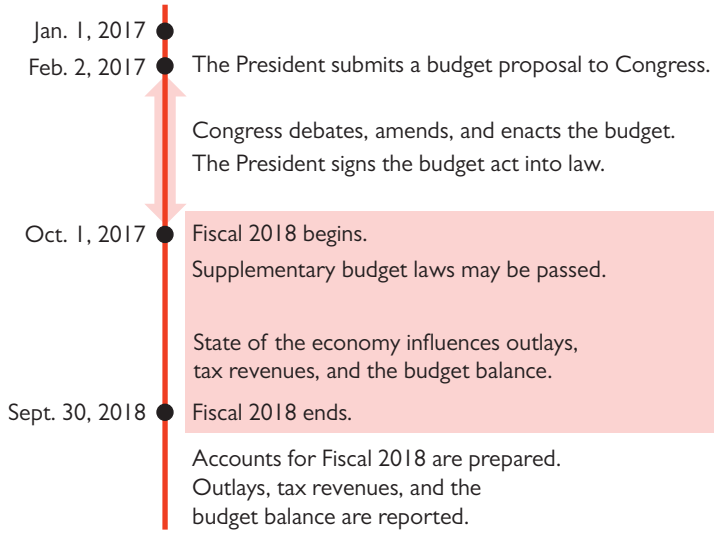


TABLE 20.1

The Federal Budget in Fiscal 2017

MyEconLab Real-time data

Item	Projections (billions of dollars)
Tax Revenues	**3,477**
Personal income taxes	1,724
Social Security taxes	1,185
Corporate income taxes	343
Indirect taxes	225
Outlays	**4,089**
Transfer payments	2,574
Expenditure on goods and services	1,211
Debt interest	403
Balance	**−612**

The federal budget for 2017 was expected to be in a deficit. Tax revenues of $3,477 billion were expected to be $612 billion less than outlays of $4,089 billion.

Personal income taxes are the largest revenue source and transfer payments are the largest outlay.

SOURCE OF DATA: *Budget of the United States Government, Fiscal Year 2017.*

Surplus, Deficit, and Debt

To finance a budget deficit, the government borrows, and it repays debt when it has a surplus. The amount of debt outstanding that has arisen from past budget deficits is called **national debt**. The national debt at the end of a fiscal year equals the national debt at the end of the previous fiscal year plus the budget deficit or minus the budget surplus. For example,

Debt at the end of 2017 = Debt at the end of 2016 + Budget deficit in 2017.

Eye on the Past on p. 540 shows the history of the U.S. budget deficit and debt.

National debt
The amount of government debt outstanding–debt that has arisen from past budget deficits.

A Personal Analogy

The government's budget and debt are like your budget and debt, only bigger. If you take a student loan each year to go to school, you have a budget deficit and a growing debt. After graduating, if you have a job and repay some of your loan each year, you have a budget surplus each year and a shrinking debt.

Types of Fiscal Policy

Fiscal policy actions can be

- Discretionary fiscal policy
- Automatic fiscal policy

Discretionary Fiscal Policy A fiscal action that is initiated by an act of Congress is called **discretionary fiscal policy**. It requires a change in a spending program or in a tax law. For example, an increase in defense spending or a cut in the income tax rate is a discretionary fiscal policy.

Discretionary fiscal policy
A fiscal policy action that is initiated by an act of Congress.

Automatic Fiscal Policy A fiscal action that is triggered by the state of the economy is called **automatic fiscal policy**. For example, an increase in unemployment induces an increase in payments to the unemployed. A fall in incomes induces a decrease in tax revenues.

Automatic fiscal policy
A fiscal policy action that is triggered by the state of the economy.

EYE on the PAST

Federal Tax Revenues, Outlays, Deficits, and Debt

Except for a few years at the end of the 1990s, the U.S. federal government has had a budget deficit every year since 1970. You can see this fact in Figure 1, which shows the budget balance along with tax revenues and outlays from 1950 to 2015 all measured as percentages of GDP.

Figure 2 shows national debt as a percentage of GDP—the debt-to-GDP ratio. Gross debt equals net debt held by the public plus debt held in federal government accounts.

Enormous deficits during World War II had left a legacy of debt equal to more than a year's GDP.

During the 1950s and 1960s, the government's debt-to-GDP ratio tumbled as balanced budgets combined with rapid real GDP growth. By 1974, the debt-to-GDP ratio had fallen to a low of 23 percent.

Budget deficits returned during the 1970s and swelled in the 1980s as the defense budget increased and some tax rates were cut. The result was a growing debt-to-GDP ratio that climbed to almost 50 percent by 1995.

Expenditure restraint combined with sustained real GDP growth lowered the debt-to-GDP ratio during the 1990s, but a surge in expenditures on defense and homeland security, further tax cuts, and a spending surge in 2009 and 2010 to fight the global financial crisis and recession, all combined to raise the debt-to-GDP ratio again.

Since 2010, the government has striven to keep spending under control and gradually shrink the deficit..

Revenues and outlays (percentage of GDP)

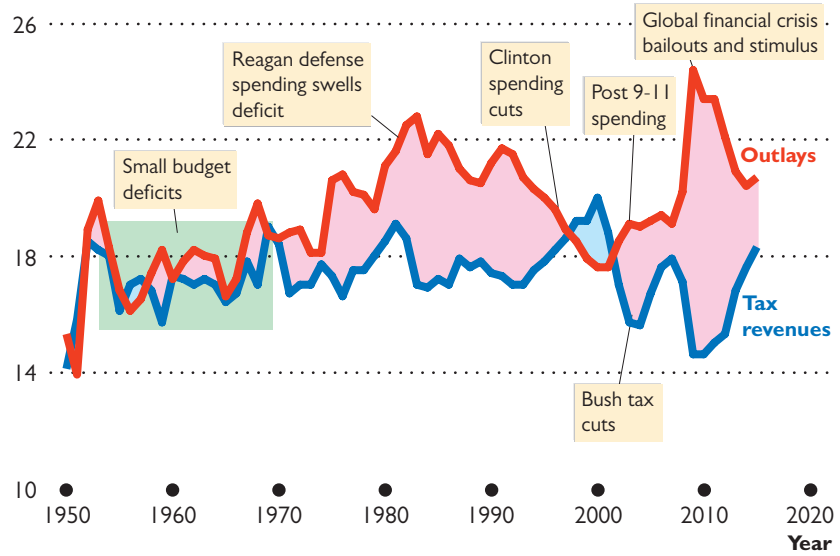


Figure 1 Tax Revenues, Outlays, and Deficits

Debt (percentage of GDP)

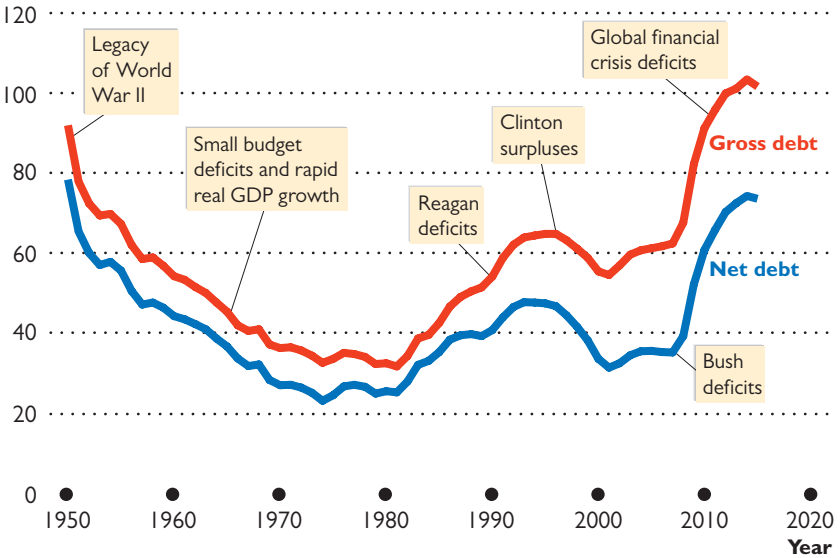


Figure 2 Debt

SOURCE OF DATA: *Budget of the U.S. Government, Fiscal Year 2017*, Historical Tables, Tables 7.1 and 14.1.

Cyclical and Structural Budget Balances

To identify the government budget deficit that arises from the business cycle, we distinguish between the structural and cyclical budget balances.

The **structural surplus or deficit** is the budget balance that would occur if the economy were at full employment. That is, the structural balance is the balance that the full-employment level of real GDP would generate given the spending programs and tax laws that Congress has created.

Structural surplus or deficit
The budget balance that would occur if the economy were at full employment.

The **cyclical surplus or deficit** is the budget balance that arises purely because tax revenues and outlays are *not* at their full-employment levels. That is, the cyclical balance is the balance that arises because tax revenues rise and outlays fall in an inflationary gap or tax revenues fall and outlays rise in a recessionary gap. The *actual* budget balance equals the sum of the structural balance and cyclical balance. A cyclical deficit corrects itself when full employment returns. A structural deficit requires action by Congress. *Eye on the U.S. Economy* below looks at the recent history of the U.S. structural and cyclical budget balances.

Cyclical surplus or deficit
The budget balance that arises because revenues and outlays are not at their full-employment levels.



EYE on the U.S. ECONOMY

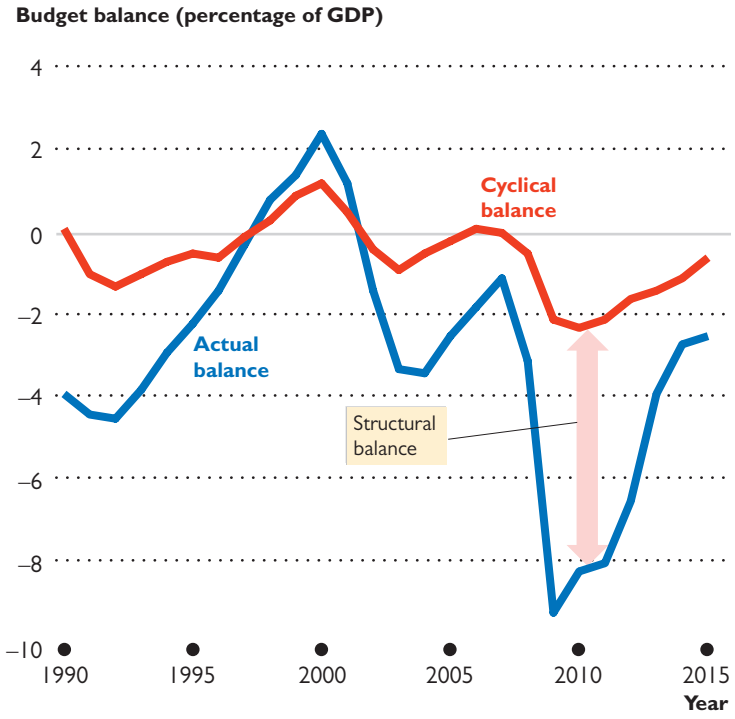
The U.S. Structural and Cyclical Budget Balances

The U.S. federal budget balance in 2015 was a deficit of $1 trillion and the recessionary gap was close to $1 trillion. With such a large recessionary gap, you would expect some of the deficit to be cyclical. But how much of the 2015 deficit was cyclical? How much was structural?

According to the Congressional Budget Office (CBO), a quarter of the 2015 deficit was cyclical. The figure shows the actual and cyclical balances as percentages of GDP from 1990 through 2015.

The structural balance equals the actual balance minus the cyclical balance. You can see that the structural deficit was small in 2007, increased in 2008, and exploded in 2009. The 2009 fiscal stimulus package created most of this structural deficit.

When full employment returns, which the CBO says will be in 2018, the cyclical deficit will vanish, but the structural deficit must be addressed by further acts of Congress. No one knows the discretionary measures that will be taken to reduce the structural deficit and this awkward fact creates uncertainty.



SOURCE OF DATA: Congressional Budget Office.

A Fiscal Policy Challenge

You've seen that the U.S. government has run a budget deficit and piled up debt for most of the past 40 years. That debt is going to keep growing as deficits become harder to avoid.

The age distribution of the U.S. population is the source of the problem. A surge in the birth rate after World War II created what is called the "baby boom generation." There are 77 million "baby boomers" and the first of them started collecting Social Security pensions in 2008 and became eligible for Medicare benefits in 2011. By 2030, all the baby boomers will be supported by Social Security and, under the existing laws, Medicare benefit payments will have doubled. The aging of the population is going to keep the government's debt rising for many future years.

How big is this debt? And who's going to bear its burden? Will it be borne by the current generation or will it be passed on for a future generation to bear?

Generational Accounting

To determine the true scale of government obligations and their distribution across generations, we use a tool called *generational accounting*—an accounting system that measures two indicators of the true state of the government's budget::

- Fiscal imbalance
- Generational imbalance

Fiscal Imbalance

Fiscal imbalance
The *present value* of the government's commitments to pay future benefits minus the *present value* of its future tax revenues..

Fiscal imbalance is the *present value* of the government's commitments to pay future benefits minus the *present value* of its future tax revenues. A *present value* is an amount of money that, if invested today, will earn interest and grow to equal a required future amount. Fiscal imbalance measures the government's true debt. It measures today's value of the future cost of the programs to which the government is committed minus today's value of the future taxes it will collect.

The government's obligation to pay Social Security pensions and Medicare benefits on an already declared scale are a debt owed by the government and are just as real as the bonds that the government issues to finance its current budget deficit. Fiscal imbalance measures the dollar value of this obligation.

Economist Jagadeesh Gokhale of the Cato Institute has reported an estimate of U.S. fiscal imbalance in his book *The Government Debt Iceberg* (see *Eye on the U.S. Economy* on p. 543). The government's debt is like an iceberg because most of it is hidden. Gokhale estimates that the Social Security and Medicare fiscal imbalance was $68 trillion in 2014. To put the $68 trillion in perspective, note that U.S. GDP in 2014 was $17 trillion. So the fiscal imbalance was 4 times the value of one year's production. And the fiscal imbalance grows every year by an amount that in 2014 was approaching $2 trillion.

These are enormous numbers and point to a catastrophic future. How can the federal government meet its Social Security and Medicare obligations? There are four alternative ways:

1. Raise income taxes
2. Raise Social Security taxes
3. Cut Social Security benefits
4. Cut other federal government spending

Because the fiscal imbalance grows every year, delaying a start on tackling the problem increases the scale of the changes needed. If we had started addressing the fiscal imbalance in 2003 and made only one of the four possible changes, income taxes would need to be raised by 69 percent, or Social Security taxes raised by 95 percent, or Social Security benefits cut by 56 percent. Cutting other government spending turns out not to be an effective alternative. Even if the government stopped *all* its other spending, including that on national defense, the saving would not eliminate the imbalance. By combining the four measures, the pain from each could be lessened, but the pain would still be severe.

Why isn't there a fifth option: keep borrowing by selling government bonds? At the current scale of deficit and debt, that option is viable. But at some point, bond holders would see that the government's debt was so large that the government would not be able to pay the interest on it. If that point were reached, the U.S. and global economies would collapse and go into deep recession or even depression.

Generational Imbalance

A fiscal imbalance must eventually be corrected and when it is, people either pay higher taxes or receive lower benefits. The concept of generational imbalance tells us who will pay. **Generational imbalance** is the division of the fiscal imbalance between the current and future generations.

Generational imbalance
The division of the fiscal imbalance between the current and future generations..

In the estimates of generational imbalance, the current generation is people born before 1988, and the future generation those born in or after 1988. With division of the population, the current generation will bear most of the cost but the next generation will pick up a big chunk of the Medicare tab.

Eye on the U.S. Economy below shows an estimate of the scale of fiscal imbalance and how it is distributed across the current and next generation.



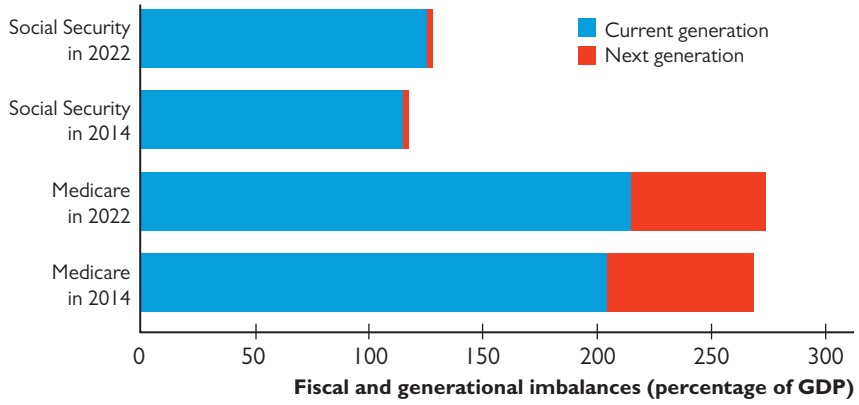
EYE on the U.S. ECONOMY

Fiscal and Generational Imbalances

The figure shows how the fiscal imbalance is divided between Social Security benefits and Medicare, and how it is distributed across the current and the next (your) generation.

Medicare is by far the major source of the imbalance.

The current generation will pay for almost all its Social Security but it will not pay for all its Medicare, and much will fall on future generations. If we sum both items, the current generation will pay 83 percent and future generations will pay 17 percent of the fiscal imbalance.



SOURCE OF DATA: Jagadeesh Gokhale, *The Government Debt Iceberg*, The Institute of Economic Affairs, London, 2014.

Discretionary Fiscal Policy: Demand-Side Effects

Discretionary fiscal policy influences both aggregate demand and aggregate supply. We'll look first at the demand-side effects. Changes in government expenditure and changes in taxes have multiplier effects on aggregate demand similar to the multiplier effect that you met in Chapter 19.

The Government Expenditure Multiplier

Government expenditure multiplier
The effect of a change in government expenditure on goods and services on aggregate demand.

The **government expenditure multiplier** is the effect of a change in government expenditure on goods and services on aggregate demand. Government expenditure is a component of aggregate expenditure, so when government expenditure increases, aggregate demand increases. Real GDP increases and induces an increase in consumption expenditure, which brings a further increase in aggregate expenditure. A multiplier process like the one described in Chapter 19 (p. 522) ensues.

The Tax Multiplier

Tax multiplier
The effect of a change in taxes on aggregate demand.

The **tax multiplier** is the magnification effect of a change in taxes on aggregate demand. A *decrease* in taxes *increases* disposable income, which increases consumption expenditure. A decrease in taxes works like an increase in government expenditure. But the magnitude of the tax multiplier is smaller than the government expenditure multiplier because a $1 tax cut generates *less than* $1 of additional expenditure. The marginal propensity to consume determines the initial increase in expenditure induced by a tax cut and the magnitude of the tax multiplier. For example, if the marginal propensity to consume is 0.75, then the initial increase in consumption expenditure induced by a $1 tax cut is only 75 cents. In this case, the tax multiplier is 0.75 times the magnitude of the government expenditure multiplier.

The Transfer Payments Multiplier

Transfer payments multiplier
The effect of a change in transfer payments on aggregate demand.

The **transfer payments multiplier** is the effect of a change in transfer payments on aggregate demand. This multiplier works like the tax multiplier but in the opposite direction. An *increase* in transfer payments *increases* disposable income, which *increases* consumption expenditure. The magnitude of the transfer payments multiplier is similar to that of the tax multiplier. Just as a $1 tax cut generates *less than* $1 of additional expenditure, so also does a $1 increase in transfer payments. Again, it is the marginal propensity to consume that determines the increase in expenditure induced by an increase in transfer payments.

The Balanced Budget Multiplier

Balanced budget multiplier
The effect on aggregate demand of a *simultaneous* change in government expenditure and taxes that leaves the budget balance unchanged.

The **balanced budget multiplier** is the magnification effect on aggregate demand of a *simultaneous* change in government expenditure and taxes that leaves the budget balance unchanged. The balanced budget multiplier is not zero. It is greater than zero because a $1 increase in government expenditure injects a dollar more into aggregate demand while a $1 tax rise (or decrease in transfer payments) takes less than $1 from aggregate demand. So when both government expenditure and taxes increase by $1, aggregate demand increases.

The magnitudes of the multiplier effects that we've just described are the subject of debate and disagreement among economists and we look at the range of views in *Eye on Fiscal Stimulus* on p. 550. For now, we will sidestep that debate and see how a successful discretionary fiscal policy works.

A Successful Fiscal Stimulus

Fiscal stimulus is achieved by increasing government outlays or decreasing tax revenues when real GDP is below potential GDP and the government wants to boost real GDP and create or save jobs. Figure 20.2 shows us how a successful stimulus package increases aggregate demand.

In Figure 20.2(a), potential GDP is $16 trillion but real GDP is only $15 trillion. The economy is at point *A* and there is a *recessionary gap* (see Chapter 19, p. 525).

To eliminate the recessionary gap and restore full employment, the government introduces a fiscal stimulus. An increase in government expenditure or a tax cut increases aggregate expenditure by ΔE. If this were the only change in spending plans, the *AD* curve would become $AD_0 + \Delta E$ in Figure 20.2(b). But the initial increase in government expenditure sets off a multiplier process, which increases consumption expenditure. As the multiplier process plays out, aggregate demand increases and the *AD* curve shifts rightward to AD_1.

With no change in the price level, the economy would move from the initial point *A* to point *B* on AD_1. But the increase in aggregate demand combined with the upward-sloping aggregate supply curve brings a rise in the price level, and the economy moves to a new equilibrium at point *C*. The price level rises to 105, real GDP increases to $16 trillion, and the economy returns to full employment.

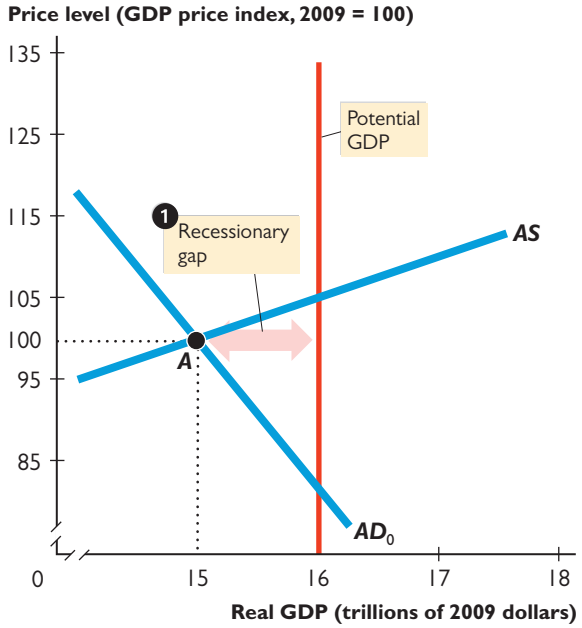
Fiscal stimulus
An increase in government outlays or a decrease in tax revenues designed to boost real GDP and create or save jobs.



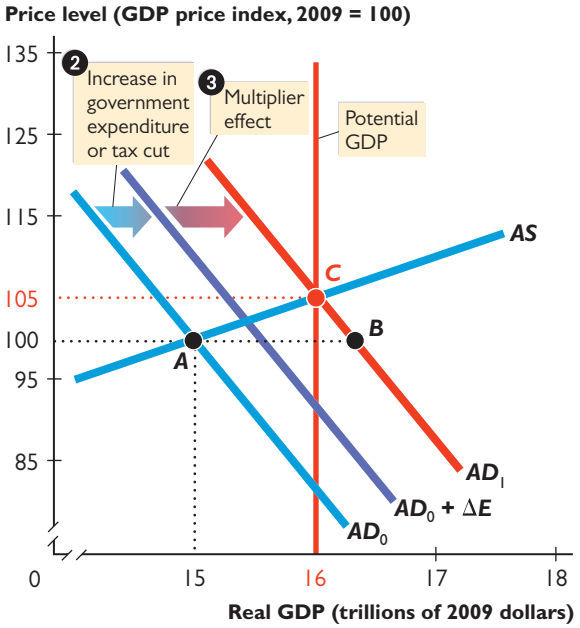
The "Cash for Clunkers" program stimulated aggregate demand.

FIGURE 20.2
Fiscal Stimulus

MyEconLab Animation



(a) Below full-employment equilibrium



(b) Full employment restored

Potential GDP is $16 trillion. At point *A*, real GDP is $15 trillion, and ❶ there is a $1 trillion recessionary gap. ❷ An increase in government expenditure or a tax cut increases expenditure by ΔE.

❸ The multiplier increases induced expenditure. The *AD* curve shifts rightward to AD_1, the price level rises to 105, real GDP increases to $16 trillion, and the recessionary gap is eliminated.

Discretionary Fiscal Policy: Supply-Side Effects

Both government expenditure and taxes influence potential GDP and aggregate supply, and we now look at the supply-side effects of fiscal policy.

Supply-Side Effects of Government Expenditure

Government provides services such as law and order, public education, and public health that increase production possibilities. For example, one of the reasons why we are more productive than are the citizens of the poor developing countries is that we are better educated and healthier than they are. Government also provides social infrastructure capital such as highways, bridges, tunnels, and dams that increase our production possibilities.

Government services and capital could be overprovided to the point at which they no longer increase production possibilities. But it is unlikely that we have reached such a point.

An *increase* in government expenditure that increases the quantities of productive services and capital increases potential GDP and increases aggregate supply.

The construction of the Hoover Dam during the 1930s and the interstate highway system that was begun during the 1950s are two of the most spectacular examples of an increase in productive government expenditures. The Hoover Dam increased the production of electricity, improved water management, and brought expanded recreation facilities. The interstate highway system improved transportation services, increased the productivity of truck drivers and other road users, and provided the foundation for the development of suburban shopping malls and entertainment centers.

Supply-Side Effects of Taxes

To pay for the productive services and capital that the government provides, it collects taxes. All taxes create disincentives to work, save, and provide entrepreneurial services.

Taxes on labor income decrease the supply of labor. A smaller supply of labor means a higher equilibrium real wage rate and a smaller equilibrium quantity of labor employed. With a smaller quantity of labor employed, potential GDP and aggregate supply are smaller than they would otherwise be.

Taxes on the income from capital decrease saving and decrease the supply of capital. A smaller supply of capital means a higher equilibrium real interest rate and a smaller equilibrium quantity of investment and capital employed. With a smaller quantity of capital, potential GDP and aggregate supply are smaller than they would otherwise be.

Taxes on the incomes of entrepreneurs weaken the incentive to take risks and create new businesses. With a smaller number of firms, the quantities of labor and capital employed are lower and potential GDP and aggregate supply are smaller than they would otherwise be.

An *increase* in taxes strengthens the disincentive effects that we've just described. It decreases the supply of labor, capital, and entrepreneurial services; decreases potential GDP; and decreases aggregate supply. And a tax cut has the opposite effects. It strengthens the incentives to work, save, and provide entrepreneurial services. So a tax cut increases potential GDP and increases aggregate supply.

Scale of Government Supply-Side Effects

If both government expenditure and taxes increase, the scale of government grows. More productive government expenditure increases potential GDP, but higher taxes to pay for the expenditure decrease potential GDP. So an increase in the scale of government might increase or decrease potential GDP and aggregate supply depending on which effect is stronger. Some economists (and politicians) believe that a larger scale of government increases potential GDP and aggregate supply despite the weakened incentives from higher tax rates. Others believe that the incentive effects are so powerful that smaller government is more productive and brings a greater potential GDP and aggregate supply.

Supply-Side Effects on Potential GDP

Figure 20.3 illustrates the effects of fiscal policy on potential GDP. Initially, the production function is PF_0, the full employment quantity of labor is 200 billion hours, and potential GDP is $16 trillion (see Chapter 17, pp. 452–453).

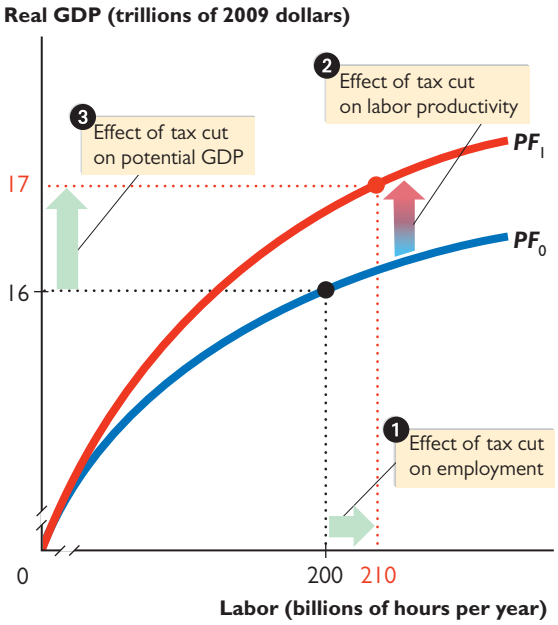
A tax cut strengthens the incentive to work, which increases the supply of labor and increases the equilibrium level of employment at full employment. In Figure 20.3, employment increases to 210 billion hours a year. The tax cut also strengthens the incentive to save and invest, which increases the quantity of capital. With more capital per worker, labor productivity increases and the production function shifts upward to PF_1.

At the increased level of employment and on the new higher production function, potential GDP is $17 trillion. An increase in potential GDP increases aggregate supply, which also increases actual real GDP.

FIGURE 20.3

The Supply-Side Effects of Fiscal Policy

MyEconLab Animation



1. A tax cut strengthens the incentive to work, increases the supply of labor, and increases employment.
2. A tax cut strengthens the incentive to save and invest, which increases the quantity of capital and increases labor productivity.
3. The combined effect of a tax cut on employment and labor productivity increases potential GDP.

Limitations of Discretionary Fiscal Policy

Discretionary fiscal stabilization policy is hampered by four problems:

- Lawmaking time lag
- Shrinking area of discretion
- Estimating potential GDP
- Economic forecasting

Lawmaking Time Lag

The lawmaking time lag is the amount of time it takes Congress to pass the laws needed to change taxes or spending. The economy might benefit from fiscal stimulation today, but by the time Congress acts, a different fiscal medicine might be needed.

Shrinking Area of Discretion

During the 2000s, federal spending increased faster than in any other peacetime period. An increased security threat brought increased expenditure on the military and homeland security, and an aging population brought increased expenditure on entitlement programs such as Social Security and Medicare.

The growth of this spending has reduced the areas in which Congress can act to change either taxes or outlays. Around 80 percent of the federal budget is effectively off limits for discretionary policy action, and the remaining 20 percent of items are very hard to cut.

So even if the state of the economy calls for a change in fiscal policy, Congress's room to maneuver is severely limited.

Estimating Potential GDP

Potential GDP is hard to estimate and sometimes we don't even get the sign of the output gap right. Because it is not always possible to tell whether real GDP is below, above, or at potential GDP, a discretionary fiscal action might move real GDP *away* from potential GDP instead of toward it.

Economic Forecasting

Fiscal policy changes take a long time to become effective. So fiscal policy must target forecasts of where the economy will be in the future. Economic forecasting is inexact and subject to error and might mislead Congress.

These four limitations of discretionary fiscal policy actions do not affect automatic fiscal policy, which we now describe.

Automatic Fiscal Policy

Automatic stabilizers
Features of fiscal policy that stabilize real GDP without explicit action by the government.

Induced taxes
Taxes that vary with real GDP.

Automatic fiscal policy is a consequence of tax revenues and outlays that fluctuate with real GDP. These features of fiscal policy are called **automatic stabilizers** because they stabilize real GDP without explicit action by the government.

On the revenue side of the budget, tax laws define tax *rates*, not tax *dollars*. Tax dollars paid depend on tax rates and incomes. But incomes vary with real GDP, so tax revenues depend on real GDP. Taxes that vary with real GDP are called **induced taxes**. When real GDP increases in an expansion, wages and profits rise, so the taxes on these incomes—induced taxes—rise. When real GDP decreases in a recession, wages and profits fall, so the induced taxes on these incomes fall.



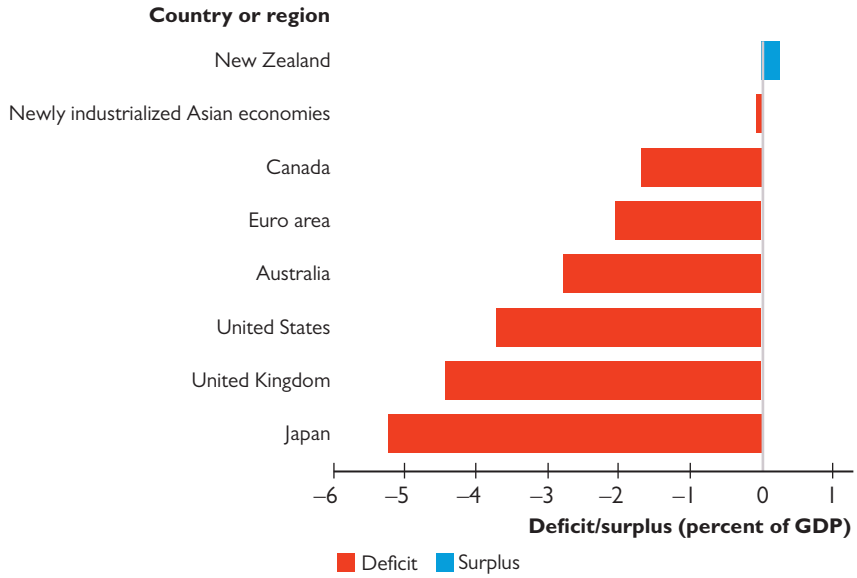
EYE on the GLOBAL ECONOMY

The U.S. Budget in Global Perspective

The United States is not alone in having a government budget deficit. All the major countries share this experience. But the United States has one of the largest budget deficits as a percentage of GDP.

To compare the budget deficits across countries, we use the concept of the "general government" deficit, which combines all levels of government: federal, state, and local.

Japan, the United Kingdom, and the United States have large deficits while Australia, Canada, the newly industrialized Asian economies, and the Euro area have smaller deficits. New Zealand has a small budget surplus.



SOURCE OF DATA: International Monetary Fund, *World Economic Outlook*, April 2016.

On the expenditure side of the budget, the government creates programs that entitle suitably qualified people and businesses to receive benefits. The spending on such programs is called *needs-tested spending*, and it results in transfer payments that depend on the economic state of individual citizens and businesses. When the economy is in a recession, the number of people experiencing unemployment and economic hardship increases, and needs-tested spending on unemployment benefits and food stamps increases. When the economy expands, the number of people experiencing unemployment and economic hardship decreases, and needs-tested spending decreases.

Automatic stabilizers give rise to cyclical fluctuations in the budget balance that we distinguish from structural changes in the budget (see *Eye on the U.S. Economy* on p. 541).

Schools of Thought and Cracks in Today's Consensus

The macroeconomic events of 2008 and 2009 have created cracks in the consensus among economists about the effects of fiscal policy.

Keynesians such as the 2008 Nobel Prize Winner Paul Krugman (Princeton University) and Christina Romer (University of California, Berkeley and President Obama's former chief economic adviser) say that fiscal stimulus boosts real GDP and employment with a large multiplier effect.

Mainstream economists such as Robert J. Barro (Harvard University), the 1995 Nobel Prize Winner Robert E. Lucas Jr. (University of Chicago), and John B. Taylor (Stanford University) say that Keynesians overestimate the multiplier effects of fiscal stimulus, which "crowds out" private consumption expenditure and investment. The durable results of a fiscal stimulus, these economists say, are bigger government, lower potential GDP, a slower real GDP growth rate, and a greater burden of government debt on future generations.



EYE on FISCAL STIMULUS

MyEconLab Critical Thinking Exercise

Can Fiscal Stimulus End a Recession?

In February 2009, in the depths of the 2008–2009 recession, Congress passed the American Recovery and Reinvestment Act, a $787 billion fiscal stimulus package that the President signed at an economic forum in Denver.

This Act of Congress is an example of discretionary fiscal policy. Did this action by Congress contribute to ending the 2008–2009 recession and making the recession less severe than it might have been?

The Obama Administration economists are confident that the answer is yes: The stimulus package made a significant contribution to easing and ending the recession.

But many, and perhaps most, economists think that the stimulus package played a small role and that the truly big story is not discretionary fiscal policy but the role played by automatic stabilizers.

Let's take a closer look at the fiscal policy actions and their likely effects.

Discretionary Fiscal Policy

In a number of speeches, President Obama promised that fiscal stimulus would save or create 650,000 jobs by the end of the 2009 summer. In October 2009, the Administration economists declared the promise fulfilled. Fiscal stimulus had saved or created the promised 650,000 jobs.

This claim of success might be correct, but it isn't startling and it isn't a huge claim. To see why, start by asking how much GDP 650,000 people would produce. In 2009, each employed person produced $100,000 of real GDP on average. So 650,000 people would produce $65 billion of GDP.

Although the fiscal stimulus passed by Congress totalled $787 billion, by October 2009 only 20 percent of the stimulus had been spent (or taken in tax breaks). So the stimulus was about $160 billion.

If government outlays of $160 billion created $65 billion of GDP, the multiplier was 0.4 (65/160 = 0.4).

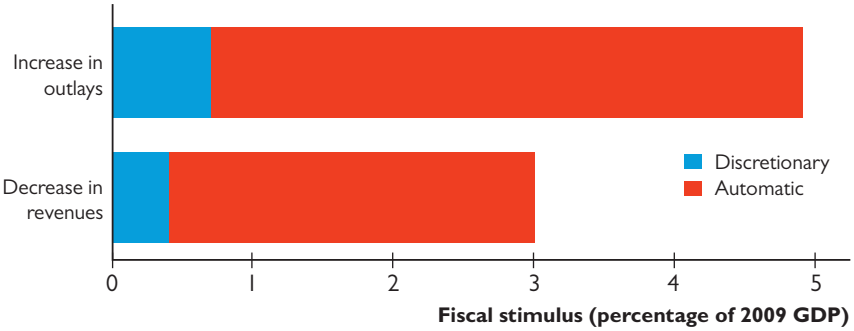
This multiplier is much smaller than the 1.6 that the Obama economists say will eventually occur. They believe, like Keynes, that the multiplier starts out small and gets larger over time as spending plans respond to rising incomes. An initial increase in expenditure increases aggregate expenditure. But the increase in aggregate expenditure generates higher incomes, which in turn induces greater consumption expenditure.

Automatic Fiscal Policy

Government revenue is sensitive to the state of the economy. When personal incomes and corporate profits fall, income tax revenues fall too. When unemployment increases, outlays on unemployment benefits and other social welfare benefits increase. These fiscal policy changes are automatic. They occur with speed and without help from Congress.

The scale of automatic fiscal policy changes depends on the depth of recession. In 2009, real GDP sank to 6 percent below potential GDP—a recessionary gap of $800 billion.

Responding to this deep recession, tax revenues crashed and transfer payments skyrocketed. The figure below shows the magnitudes as percentages of GDP. You can see that the automatic stabilizers were much bigger than the discretionary actions—six times as large. This automatic action, not the stimulus package, played the major role in limiting job losses.



SOURCES OF DATA: Budget of the United States, 2010, Bureau of Economic Analysis, and White House press releases.

CHECKPOINT 20.1

MyEconLab Study Plan 20.1
Key Terms Quiz
Solutions Video

Describe the federal budget process and explain the effects of fiscal policy.

Practice Problems

1. Classify the following items as automatic fiscal policy, discretionary fiscal policy, or not part of fiscal policy.
   - A decrease in tax revenues in a recession
   - Additional government expenditure to upgrade highways
   - An increase in the public education budget
   - A cut in infrastructure expenditure during a boom
2. Explain how aggregate demand changes when government expenditure on national defense increases by $100 billion.
3. Explain how aggregate demand changes when the government increases taxes by $100 billion.
4. Explain how aggregate demand changes when the government increases both expenditure on goods and services and taxes by $100 billion.

In the News

Clinton and Trump on fiscal policy
In the 2016 Presidential election campaign, both Hillary Clinton and Donald Trump committed to big government infrastructure spending and tax cuts.
Source: *The Wall Street Journal*, July 27, 2016

What policy will change aggregate demand the most: an increase in infrastructure spending or a cut in taxes?

Solutions to Practice Problems

1. A decrease in tax revenues in a recession is an automatic fiscal policy.
   Expenditure to upgrade highways is a discretionary fiscal policy.
   An increase in the public education budget is a discretionary fiscal policy.
   A cut in infrastructure expenditure is a discretionary fiscal policy.
2. Aggregate demand increases by more than $100 billion because government expenditure increases induced expenditure.
3. Aggregate demand decreases by less than $100 billion because the tax increase has a multiplier effect that decreases induced expenditure.
4. An increase in government expenditure of $100 billion increases aggregate demand by more than $100 billion. An increase in taxes of $100 billion decreases aggregate demand by more than $100 billion. The increase is greater than the decrease, so together aggregate demand increases. The balanced budget multiplier is positive.

In the News

Infrastructure spending is expenditure on goods and services and its effect on aggregate demand is determined by the *government expenditure multiplier*. The effect of a decrease in taxes on aggregate demand is determined by the *tax multiplier*. The magnitude of the government expenditure multiplier exceeds the tax multiplier, so infrastructure spending will increase aggregate demand by more than a tax cut of the same magnitude.

MyEconLab Concept Video

20.2 THE FEDERAL RESERVE AND MONETARY POLICY

Monetary policy
The adjustment of interest rates and the quantity of money to achieve the dual objectives of price stability and full employment.

Monetary policy is the adjustment of interest rates and the quantity of money to achieve the dual objective of price stability and full employment. The Board of Governors of the Federal Reserve System (the Fed) conducts monetary policy independently of the government but under the terms of the Federal Reserve Act of 1913 and its subsequent amendments, the most recent of which was passed in 2000. The Act defines the Fed's goals as the attainment of "maximum employment" and "stable prices," goals known as the *Fed's dual mandate.*

The Monetary Policy Process

The Fed makes monetary policy in a process that has three elements:

- Monitoring economic conditions
- Decisions of the Federal Open Market Committee (FOMC)
- Monetary Policy Report to Congress

Monitoring Economic Conditions

Each Federal Reserve Bank monitors its district by talking with business leaders, economists, market experts, and others. The Fed summarizes the state of the economy in the *Beige Book*, which the Federal Open Market Committee uses in its deliberations.

The Beige Book is available on the Fed's Web site and is a good source of up-to-date information on the current state of the economy.

Decisions of the Federal Open Market Committee (FOMC)

The FOMC, which meets eight times a year, makes the monetary policy decisions. The FOMC's first and fourth meetings of the year run for two days (the other six meetings run for one day) and are opportunities for the committee to assess the longer-term outlook as well as the current period's open market operations.

After each meeting, the FOMC announces its decisions and describes its view of the likelihood that its goals of price stability and full employment will be achieved. The FOMC publishes the minutes of its meetings after they have been confirmed as a correct record of the meeting at the next scheduled meeting. For example, the minutes of the first meeting of the year are published after the second meeting of the year.

Full transcripts of FOMC meetings are published with a five-year time lag. This delay enables the members of the FOMC to have a frank exchange of views without worrying about how their discussions might be interpreted by the traders in financial markets. The eventual publication of the transcripts permits a detailed public scrutiny of the FOMC's decision-making process.

Monetary Policy Report to Congress

Twice a year, in February and July, the Fed prepares a Monetary Policy Report to Congress, and the Fed chairman testifies before the House of Representatives Committee on Financial Services. The report and the chairman's testimony review the monetary policy and economic developments of the past year and the economic outlook for the coming year.

The Federal Funds Rate Target

Following each FOMC meeting, the Fed announces its monetary policy decision as a target for the federal funds rate. Figure 20.4 shows the federal funds rate since 2000.

You can see that the federal funds rate was 5.5 percent a year at the beginning of 2000 and during 2000 and 2001, the Fed increased the rate to 6.5 percent a year. The Fed raised the interest rate to this high level to lower the inflation rate.

Between 2002 and 2004, the federal funds rate was set at historically low levels. The reason is that with inflation well anchored at close to 2 percent a year, the Fed was less concerned about inflation than it was about recession so it wanted to lean in the direction of avoiding recession.

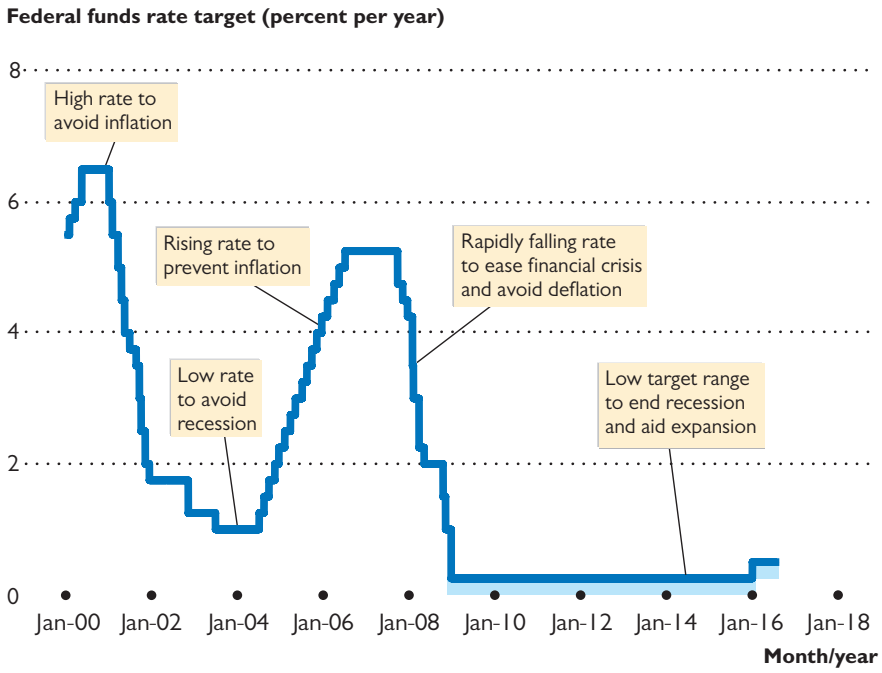
From mid-2004 through early 2006, the Fed was increasingly concerned about the build-up of inflation pressures and it raised the federal funds rate target on 17 occasions to take it to 5.25 percent a year, a level it held until September 2007.

When the global financial crisis began, the Fed acted cautiously in cutting the federal funds rate target. But as the crisis intensified, rate cuts became more frequent and larger, ending in December 2008 with an interest rate close to zero. The normal changes of a quarter of a percentage point (also called 25 *basis points*) were abandoned as the Fed slashed the rate, first by an unusual 50 basis points and finally, in December 2008, by an unprecedented 100 basis points. Since the end of 2008, the federal funds rate has been close to zero.

To hit its target for the federal funds rate, the FOMC instructs the New York Fed to conduct open market operations to adjust the banking system's reserves to the level that makes banks want to make loans to each other at the target rate.

FIGURE 20.4

The Fed's Key Monetary Policy Instrument: The Federal Funds Rate



The Fed sets a target for the federal funds rate and then takes actions to keep the rate close to the target.

When the Fed wants to slow inflation, it raises the federal funds rate target.

When the inflation rate is below target and the Fed wants to avoid recession, it lowers the federal funds rate target.

When the Fed focused on restoring financial stability, it cut the federal funds rate target aggressively to almost zero. The Fed also set the target as a range, which is shown in light blue.

SOURCE OF DATA: Board of Governors of the Federal Reserve System.

The Ripple Effects of the Fed's Actions

When the Fed changes the federal funds rate, it sets up a ripple effect that runs all the way to a change in real GDP and the price level. Figure 20.5 provides a schematic summary of these effects, which stretch out over a period of between one and two years. Let's look at each stage in the transmission process.

Other Interest Rates Change

The first effect of a change in the federal funds rate is a change in other short-term interest rates. This effect occurs quickly and predictably. The reason is that an overnight loan to another bank is a close substitute for short-term securities such as Treasury bills so the interest rates on these very similar assets keep close to each other.

The Exchange Rate Changes

A rise in the U.S. interest rate relative to the interest rate in other countries brings funds into the United States from other countries to take advantage of the higher interest rate. When people move funds into the United States, they buy dollars, the demand for dollars rises, and the exchange rate rises.

The Quantity of Money and Bank Loans Change

When the federal funds rate changes, it is because the Fed has changed the quantity of bank reserves in the opposite direction. With a change in reserves, banks change their volume of loans, which changes deposits and the quantity of money. When the Fed cuts the federal funds rate, the quantity of money and bank loans increases.

The Long-Term Real Interest Rate Changes

A fall in the federal funds rate that increases the supply of bank loans increases the supply of funds and lowers the equilibrium real interest rate. A rise in the federal funds rate that decreases the supply of bank loans decreases the supply of funds and raises the equilibrium real interest rate.

Consumption Expenditure, Investment, and Net Exports Change

The interest rate influences people's spending decisions. Other things remaining the same, the lower the real interest rate, the greater is the amount of consumption expenditure and the smaller is the amount of saving. Also, other things remaining the same, the lower the real interest rate, the greater is the amount of investment.

A fall in the interest rate lowers the exchange rate. The lower price of the dollar means that foreigners now pay less for U.S.-made goods and services, so U.S. exports increase.

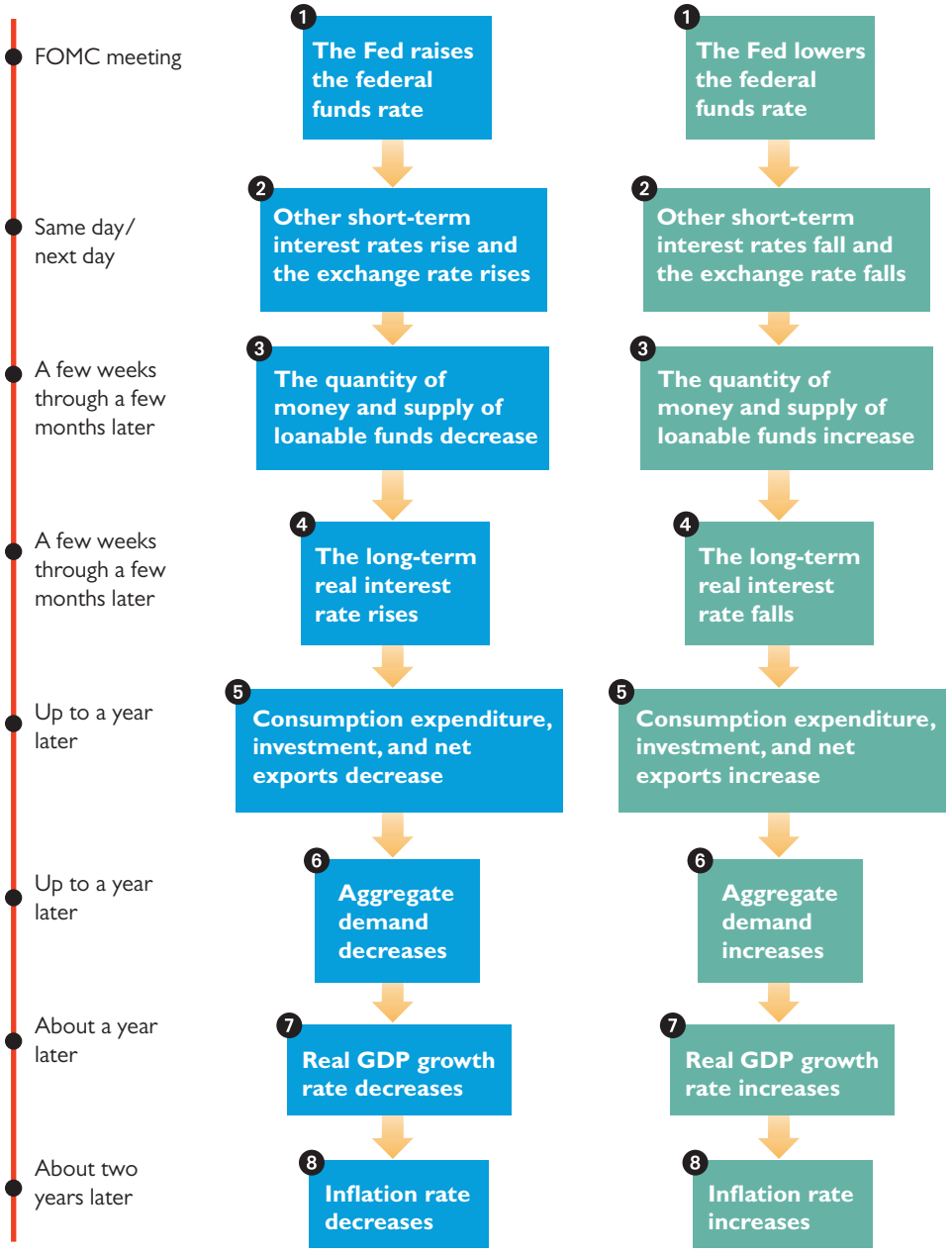
Aggregate Demand Changes

Consumption expenditure, investment, and net exports are all components of aggregate demand. So when these items change, aggregate demand also changes, and in the same direction. But aggregate demand changes by more than the change in these items because of the multiplier effect. A change in expenditure changes income, and the change in income induces a change in consumption expenditure.

FIGURE 20.5

Ripple Effects of the Fed's Actions

MyEconLab Animation



(a) The Fed tightens **(b) The Fed eases**

The Fed changes its interest rate target and conducts open market operations to ❶ change the federal funds rate. The same day ❷ other short-term interest rates change and so does the exchange rate. A few weeks through a few months after the FOMC meeting, ❸ the quantity of money and bank loans change, which ❹ changes the long-term real interest rate.

Up to a year after the FOMC meeting, ❺ consumption expenditure, investment, and net exports change, which ❻ changes aggregate demand.

Eventually, the change in the federal funds rate has ripple effects that ❼ change real GDP and about two years after the FOMC meeting ❽ the inflation rate changes.

Monetary Stabilization in the *AS-AD* Model

We've described the broad outline of how the Fed's actions influence the economy. Let's now see how monetary policy might be used to stabilize real GDP.

The Fed Eases to Fight Recession

Figure 20.6(a) shows investment demand. Think of investment demand as representing all the interest-sensitive components of aggregate expenditure. Also, assume that there is no inflation, so the interest rate is the real interest rate as well as the nominal interest rate. The interest rate is 5 percent a year, and the quantity of investment demanded is $2 trillion. In Figure 20.6(b), aggregate demand is AD_0, aggregate supply is AS, and equilibrium real GDP is $15 trillion, which is less than potential GDP. There is a recessionary gap.

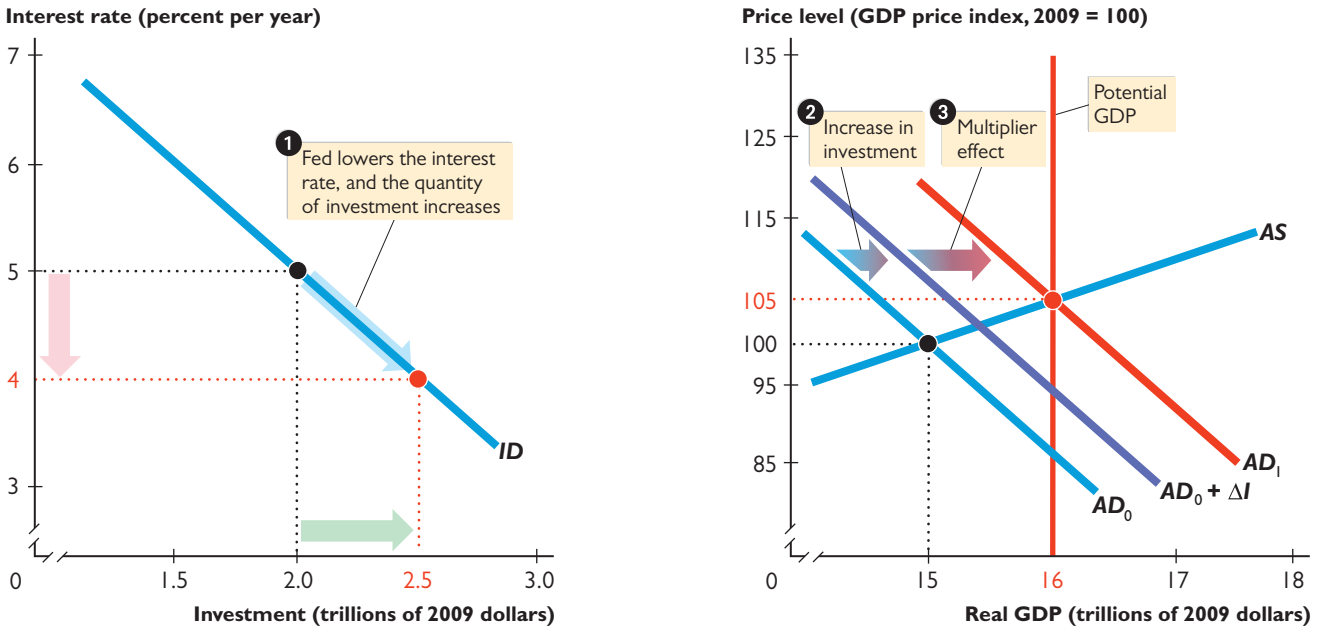
The Fed now conducts an open market purchase that lowers the interest rate to 4 percent a year. The quantity of investment increases to $2.5 trillion. Other interest-sensitive expenditure items (not shown in the figure) also increase. If this were the only change, aggregate demand would increase to $AD_0 + \Delta I$.

The multiplier increases aggregate expenditure further and the aggregate demand curve shifts to AD_1. The Fed's actions have eliminated a recession and brought real GDP to equal potential GDP at $16 trillion and the price level to 105.

FIGURE 20.6

Monetary Stabilization: Avoiding Recession

MyEconLab Animation



(a) Investment

(b) Real GDP and the price level

Real GDP is less than potential GDP (part b). To avoid recession, ❶ the Fed lowers the interest rate (part a). ❷ Expenditure increases by ΔI, and ❸ the multiplier induces additional expenditure. The aggregate demand curve shifts rightward to AD_1. Real GDP increases to potential GDP, and recession is avoided.

The Fed Tightens to Fight Inflation

In Figure 20.7(a) the interest rate is 5 percent a year and the quantity of investment is $2 trillion. At this level of investment, aggregate demand is AD_0 in Figure 20.7(b). The aggregate supply curve is *AS*, so equilibrium real GDP is $17 trillion, which exceeds potential GDP. There is an inflationary gap.

The Fed now conducts an open market sale that increases the interest rate to 6 percent a year. The quantity of investment demand decreases to $1.5 trillion. If this were the only change in aggregate expenditure, aggregate demand would be $AD_0 - \Delta I$. But the multiplier decreases aggregate expenditure further, and the aggregate demand curve shifts leftward to AD_1.

The Fed's actions have eliminated an inflation threat and brought real GDP to equal potential GDP.

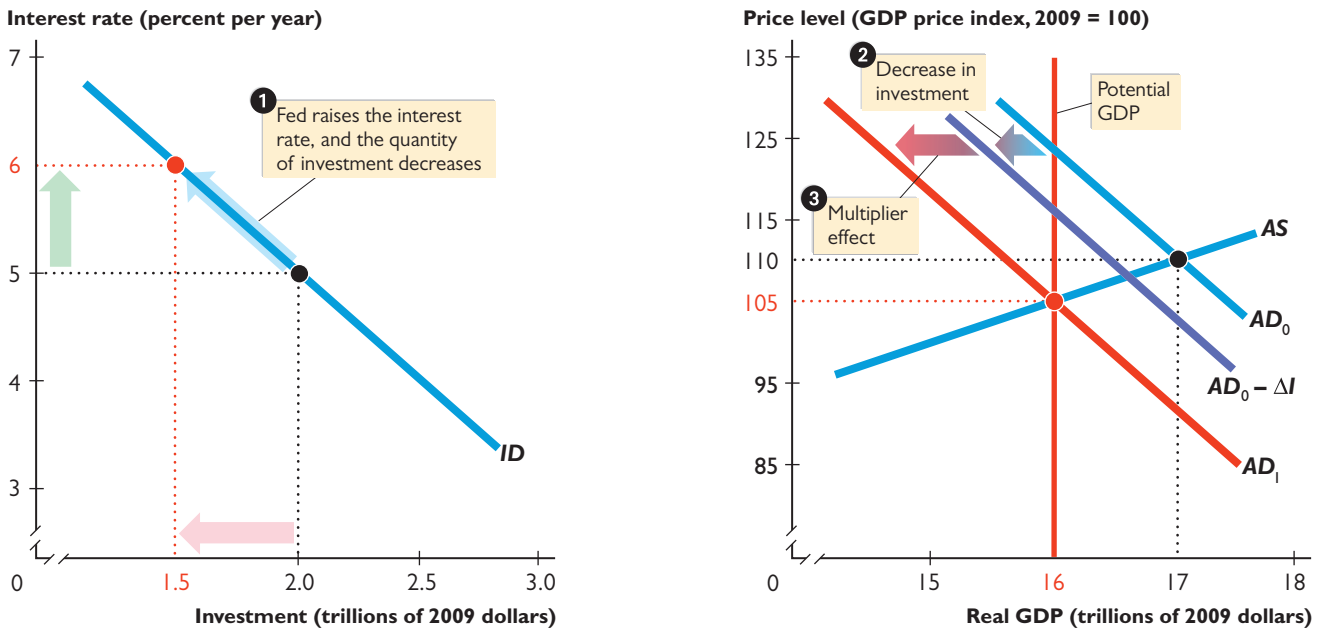
The Size of the Multiplier Effect

The size of the multiplier effect of monetary policy depends on the sensitivity of expenditure plans to the interest rate. The larger the effect of a change in the interest rate on aggregate expenditure, the greater is the multiplier effect and the smaller is the change in the interest rate that achieves the Fed's objective.

FIGURE 20.7

Monetary Stabilization: Avoiding Inflation

MyEconLab Animation



Real GDP exceeds potential GDP in part (b). To avoid inflation, ❶ the Fed raises the interest rate in part (a). ❷ Expenditure decreases by ΔI, and ❸ the multiplier induces additional expenditure cuts. The aggregate demand curve shifts leftward to AD_1. Real GDP decreases to potential GDP, and inflation is avoided.



EYE on the FED IN A CRISIS

MyEconLab Critical Thinking Exercise

Did the Fed Save Us From Another Great Depression?

The story of the Great Depression is complex and even today, after almost 80 years of research, economists are not in full agreement on its causes. But one part of the story is clear and it is told by Milton Friedman and Anna J. Schwartz: The Fed got it wrong.

An increase in financial risk drove the banks to increase their holdings of reserves and everyone else to lower their bank deposits and hold more currency.

Between 1929 and 1933, (Figure 1) the banks' desired reserve ratio increased from 8 percent to 12 percent and the currency drain ratio increased from 9 percent to 19 percent.

The money multiplier (Figure 2) fell from 6.5 to 3.8.

The quantity of money (Figure 3) crashed by 35 percent.

This massive contraction in the quantity of money was accompanied by a similar contraction of bank loans and by the failure of a large number of banks.

Friedman and Schwartz say that this contraction of money and bank loans and failure of banks could (and should) have been avoided by a more alert and wise Fed.

The Fed could have injected reserves into the banks to accommodate their desire for greater security by holding more reserves and to offset the rise in currency holdings as people switched out of bank deposits.

Ben Bernanke's Fed did almost exactly what Friedman and Schwartz said the Fed needed to do in the Great Depression.

At the end of 2008, when the banks faced increased financial risk, the Fed flooded them with the reserves that they wanted to hold (Figure 1).

The money multiplier fell from 9.1 in 2008 to 3.3 in 2013 (Figure 2)—much more than it had fallen between 1929 and 1933—but there was no contraction of the quantity of money (Figure 3). Rather, the quantity of M2 increased by 37.5 percent in the 5 years to August 2013, a 6.6 percent annual rate.

We can't be sure that the Fed averted a Great Depression in 2009, but we can be confident that the Fed's actions helped to limit the depth and duration of the 2008–2009 recession.

In 2013, the "dual mandate" put the Fed in a dilemma. The recovery was slow and unemployment was not falling quickly enough. The Fed's dilemma was when to stop fighting the slow recovery and start worrying about unleashing inflation.



Milton Friedman and Anna J. Schwartz, authors of A Monetary History of the United States, *who say the Fed turned an ordinary recession into the Great Depression.*

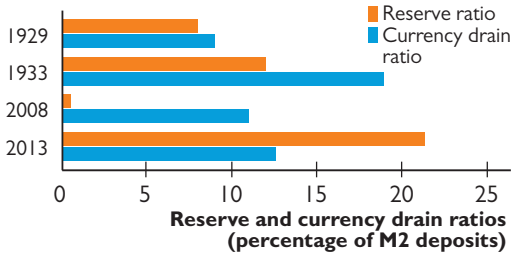


Figure 1 The Flight to Safety: Reserve and Currency Ratios Increase

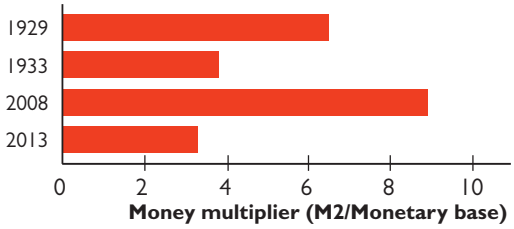


Figure 2 The Collapsing Money Multiplier

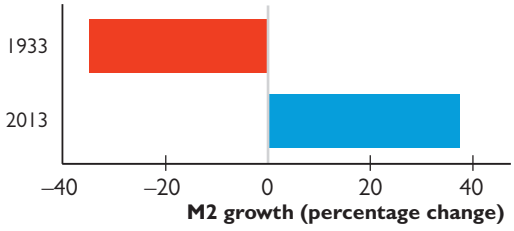


Figure 3 Money Contraction Versus Growth

SOURCE OF DATA: Federal Reserve Board.

Limitations of Monetary Stabilization Policy

Monetary policy has an advantage over fiscal policy because it cuts out the law-making time lags. The FOMC meets eight times a year and can conduct telephone meetings between its scheduled meetings if the need arises. And the actual actions that change the quantity of money are daily actions taken by the New York Fed operating under the guidelines decided by the FOMC. So monetary policy is a continuous policy process and is not subject to the long decision lag and the need to create a broad political consensus that confronts fiscal policy.

But monetary policy shares the other two limitations of fiscal policy: Estimating potential GDP is hard, and economic forecasting is error-prone. Monetary policy suffers an additional limitation: Its effects are indirect and depend on how private decisions respond to a change in the interest rate. These responses are themselves hard to forecast and vary from one situation to another in unpredictable ways. A related problem is that the time lags in the operation of monetary policy are longer than those for fiscal policy, so the forecasting horizon must be longer.



EYE on YOUR LIFE

MyEconLab Critical Thinking Exercise

Fiscal Policy and Monetary Policy and How They Affect You

Consider the U.S. economy right now. Using all the knowledge that you have accumulated during your course and by reading or watching the current news, try to determine the macroeconomic policy issues that face the U.S. economy today.

Do we have a cyclical problem? Is the economy at full employment or do we have a recessionary gap or an inflationary gap?

In light of your assessment of the current state of the U.S. economy, what type of fiscal policy would you recommend and vote for? What type of monetary policy would you recommend?

Are you concerned about the size of the federal deficit? If so, how would you propose lowering it?

Consider recent changes in fiscal policy that you have seen reported in the media. What do you think these changes say about the federal government's views of the state of the economy? Do these views agree with yours?

Thinking further about recent changes in fiscal policy, how do you expect these changes to affect you? How might your spending, saving, and labor supply decisions change?

Using your own responses to fiscal policy changes as an example, are these policy changes influencing aggregate supply, aggregate demand, or both? How do you think they will change real GDP?

By reading or watching the current news, try to determine the monetary policy issues that face the U.S. economy today.

What is the greater monetary policy risk: inflation or recession? If the risk is inflation, what action do you expect the Fed to take? If the risk is recession, what do you expect the Fed to do? Which of these problems, inflation or recession, do you care most about? Do you want the Fed to be more cautious about inflation and keep the interest rate high, or more cautious about recession and keep the interest rate low?

When Ben Bernanke (the former Fed Chairman) was an economics professor at Princeton, he studied inflation targeting and found that it works well.

Do you think the United States should join the ranks of inflation targeters? Should the Fed announce an inflation target? Watch the media for commentary on the Fed's interest rate decisions and evolving monetary policy strategy.

MyEconLab Study Plan 20.2
Key Terms Quiz
Solutions Video

CHECKPOINT 20.2

Describe the Federal Reserve's monetary policy process and explain the effects of monetary policy.

Practice Problems

1. List the sequence of events in the transmission process from a rise in the federal funds rate to a change in the inflation rate.

The economy has slipped into recession and the Fed takes actions to lessen its severity. Use this information to work Problems **2** and **3**.

2. What action does the Fed take? Explain the effects of the Fed's actions in the money market and the market for loans.
3. Explain how the Fed's actions change aggregate demand and real GDP. Use a graph to illustrate your answer.

In the News

Strong U.S. employment report brightens economic outlook
The U.S. economy added more jobs than expected in both June and July. Wages increased more rapidly and real GDP was expected to grow faster. These developments raise the likelihood of a Fed interest rate increase

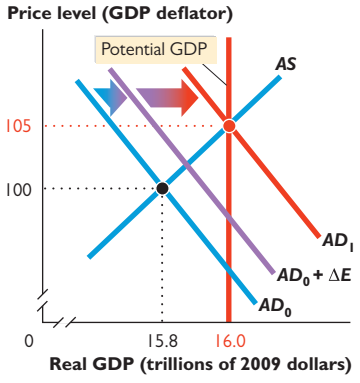
Source: Reuters, August 5, 2016

What are the ripple effects and time lags that the Fed must consider in deciding when to raise the interest rate?

Solutions to Practice Problems

1. When the Fed raises the federal funds rate, other short-term interest rates rise and the exchange rate rises; the quantity of money and bank loans decrease and the long-term real interest rate rises; consumption, investment, and net exports decrease; aggregate demand decreases; and eventually the real GDP growth rate and the inflation rate decrease.
2. The Fed lowers the federal funds rate, which lowers other short-term interest rates, and increases the supply of money. The increase in the supply of money increases the supply of bank loans and the real interest rate falls.
3. A lower real interest rate (and lower exchange rate) and greater quantity of money and loans increases investment (and other expenditures), which increases aggregate expenditure. Aggregate demand increases and the *AD* curve shifts to $AD_0 + \Delta E$. A multiplier effect increases aggregate demand and the *AD* curve shifts rightward to AD_1. Real GDP increases and recession is avoided (Figure 1).

FIGURE 1



Solution to In the News

Following a change in the interest rate: several months later the quantity of money and loans respond; up to a year later, expenditure plans and real GDP respond; and up to two years later the inflation rate responds.

CHAPTER SUMMARY

Key Points

1. Describe the federal budget process and explain the effects of fiscal policy.

- The federal budget is an annual statement of the tax revenues, outlays, and surplus or deficit of the government of the United States.
- Fiscal policy is the use of the federal budget to finance the federal government and to stabilize the economy.
- An ever rising national debt and large fiscal imbalance is a major fiscal policy challenge.
- Fiscal policy can be either discretionary or automatic.
- Changes in government expenditure and changes in taxes have multiplier effects on aggregate demand and can be used to try to keep real GDP at potential GDP.
- In practice, lawmaking time lags, the difficulty of estimating potential GDP, and the limitations of economic forecasting seriously hamper discretionary fiscal policy.
- Automatic stabilizers arise because tax revenues and outlays fluctuate with real GDP.

2. Describe the Federal Reserve's monetary policy process and explain the effects of monetary policy.

- The Fed makes monetary policy in an open and transparent process that involves three main elements: the Beige Book, meetings of the Federal Open Market Committee, and the Monetary Policy Report to Congress.
- When the FOMC announces a policy change, it is in terms of a target for the federal funds rate.
- When the Fed changes the federal funds rate, other interest rates change and the effects ripple through the economy by changing aggregate demand.
- The size of the multiplier effect of monetary policy depends on the sensitivity of expenditure plans to the interest rate.
- Monetary policy has no lawmaking time lag, but its effects are indirect and depend on how the interest rate influences private decisions.

Key Terms

MyEconLab Key Terms Quiz

Automatic fiscal policy, 539
Automatic stabilizers, 548
Balanced budget multiplier, 544
Budget balance, 538
Cyclical surplus or deficit, 541
Discretionary fiscal policy, 539
Fiscal imbalance, 542
Fiscal policy, 538
Fiscal stimulus, 545
Generational imbalance, 543
Government expenditure multiplier, 544
Induced taxes, 548
Monetary policy, 552
National debt, 539
Structural surplus or deficit, 541
Tax multiplier, 544
Transfer payments multiplier, 544

MyEconLab Chapter 20 Study Plan

CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. Suppose that in an economy, investment is $400 billion, saving is $400 billion, tax revenues are $500 billion, exports are $300 billion, and imports are $200 billion. Calculate government expenditure and the budget balance.

2. Classify the following items as automatic fiscal policy actions, discretionary fiscal policy actions, or neither.

- An increase in expenditure on homeland security
- An increase in unemployment benefits paid during a recession
- Decreased expenditures on national defense during peace time
- An increase in Medicaid expenditure brought about by a flu epidemic
- A cut in farm subsidies

3. The U.S. economy is in recession and has a large recessionary gap. Describe what automatic fiscal policy might occur. Describe a fiscal stimulus that could be used that would not increase the budget deficit.

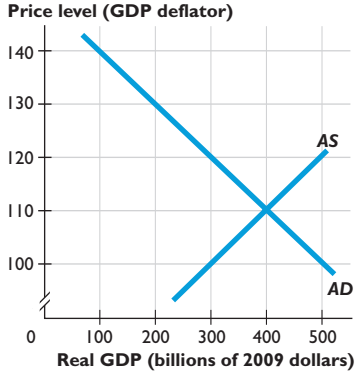
4. IMF reduces forecast for U.S. growth
The IMF expects U.S. economic growth to slow to 2% in 2012 and 2.25% in 2013. That's down from its earlier estimates of 2.15% in 2012 and 2.4% in 2013. Christine Lagarde, the IMF's managing director, said that Congress should "promptly" raise the debt ceiling and adopt strong fiscal policies.
Source: *The New York Times*, July 3, 2012

Explain the effects of strong fiscal stimulus if it is implemented well.

Use the following information to work Problems **5** to **7**.

Figure 1 shows the aggregate demand curve, *AD*, and the short-run aggregate supply curve, *AS*, in the economy of Artica. Potential GDP is $300 billion.

FIGURE 1



5. What are the price level and real GDP? Does Artica have an unemployment problem or an inflation problem? Why?

6. What do you predict will happen if the central bank takes no monetary policy actions? What monetary policy action would you advise the central bank to take and what do you predict will be the effect of that action?

7. Suppose that a drought decreases potential GDP in Artica to $250 billion. Explain what happens if the central bank lowers the federal funds rate. Do you recommend that the central bank lower the interest rate? Why?

8. Premature to rule out an interest rate increase this year
In the current state of the economy, it would be worse to raise rates too soon than moving slightly too late and adjusting by raising rates more quickly.
Source: *The Wall Street Journal*, August 1, 2016

What are some of the problems that could arise if the Fed raises interest rates too soon or too late?

9. Read *Eye on Fiscal Stimulus* on p. 550. How big was the fiscal stimulus package of 2008–2009, how many jobs was it expected to create, and how large was the multiplier implied by that expectation? Did the stimulus work?

10. Read *Eye on the Fed in a Crisis* on p. 558. What are the key differences in monetary policy between the Great Depression and the slow recovery from the 2008–2009 recession?

Instructor Assignable Problems and Applications

MyEconLab Homework, Quiz, or Test if assigned by instructor

1. From the peak in 1929 to the Great Depression trough in 1933, government tax revenues fell by 1.9 percent of GDP and government expenditure increased by 0.3 percent. Real GDP fell by 25 percent. Compare and contrast this experience with the fiscal policy that accompanied the 2008–2009 recession. What did fiscal policy do to moderate the last recession that was largely absent during the Great Depression?
2. In which episode, the Great Depression or the 2008–2009 recession, did the banks' desired reserve ratio and the currency drain ratio increase by the larger amount and the money multiplier fall by the larger amount?
3. Suppose that the U.S. government increases its expenditure on highways and bridges by $100 billion. Explain the effect that this expenditure would have on aggregate demand and real GDP.
4. Suppose that the U.S. government increases its expenditure on highways and bridges by $100 billion. Explain the effect that this expenditure would have on needs-tested spending and the government's budget surplus.
5. Describe the supply-side effects of a fiscal stimulus and explain how a tax cut will influence potential GDP.
6. Use an aggregate supply–aggregate demand graph to illustrate the effects on real GDP and the price level of a fiscal stimulus when the economy is in recession.

Use the following information to work Problems **7** and **8**.

CBO expects higher long-term deficits

The Congressional Budget Office (CBO) says the national debt is on an upward path and will hit 122 percent of GDP in 2040.

Source: *The Wall Street Journal*, July 12, 2016

7. Explain why the national debt does not measure the federal government's true indebtedness. How does the nation's fiscal imbalance provide a more accurate account of government's debt?
8. If the plan to reduce the deficit includes a cut in transfer payments and a rise in taxes of the same amount, how will this policy influence the budget deficit and real GDP?
9. Suppose that inflation is rising toward 5 percent a year, and the Fed, Congress, and the White House are discussing ways of containing inflation without damaging employment and output. The President wants to cut aggregate demand but to do so in a way that will give the best chance of keeping investment high to encourage long-term economic growth. Explain the Fed's best action for meeting the President's objectives.
10. **What the U.S. jobs report means for the Fed**

    Despite U.S. job creation exceeding forecasts in July, experts believe that with weak output growth, the Fed will not raise the interest rate until after the U.S. presidential election.

    Source: *The Financial Times*, August 5, 2016

    Explain why the Fed might be cautious about raising interest rates despite strong jobs growth.

MyEconLab Chapter 20 Study Plan

Multiple Choice Quiz

1. The federal government's major outlay in its budget is _____ and its major source of revenue is _____.

A. debt interest; sales of government bonds
B. expenditure on goods and services; taxes on goods and services
C. Social Security and other benefits; personal income taxes
D. subsidies to farmers; corporate taxes

2. U.S. national debt _____ when the federal government's _____.

A. increases; outlays exceed tax revenue
B. decreases; outlays exceed tax revenue
C. increases; tax revenue rises faster than outlays
D. decreases; tax revenue rises faster than outlays

3. Discretionary fiscal policy to stimulate the economy includes _____.

A. lowering the tax rate paid by households with middle incomes
B. raising the tax on gasoline
C. the fall in tax revenue as the economy goes into recession
D. the rise in tax revenue collected from businesses as their profits increase

4. Automatic fiscal policy _____.

A. requires an action of the government
B. is weak unless the government cuts its outlays to reduce the deficit
C. operates as the economy moves along its business cycle
D. reduces the deficit as the economy goes into recession

5. The Fed's "dual mandate" is to achieve _____.

A. a government budget surplus and low interest rates
B. low inflation and maximum employment
C. a stable quantity of money and stable prices
D. zero unemployment and a stable means of payment

6. When the Fed lowers the federal funds rate _____.

A. aggregate demand increases the same day
B. investment increases, but only after the economy's growth rate rises
C. the quantity of money and loans increase in the short term
D. the inflation rate increases about two years later

7. The Fed fights inflation by _____.

A. lowering the federal funds rate, which lowers interest rates and decreases aggregate demand
B. raising the federal funds rate, which raises interest rates and decreases aggregate demand
C. decreasing the monetary base, which raises the interest rate and increases saving
D. lowering the long-term real interest rate, which increases investment and spurs economic growth

8. To fight unemployment and close a recessionary gap, the Fed _____.

A. stimulates aggregate demand by lowering the federal funds rate, which increases the quantity of money
B. stimulates aggregate supply by lowering the federal funds rate, which increases potential GDP
C. increases employment, which increases real GDP
D. increases bank reserves, which banks use to make new loans to businesses, which increases aggregate supply

Glossary

Abatement technology A production technology that reduces or prevents pollution. (p. 231)

Absolute advantage When one person (or nation) is more productive than another—needs fewer inputs or takes less time to produce a good or perform a production task. (p. 73)

Aggregate demand The relationship between the quantity of real GDP demanded and the price level when all other influences on expenditure plans remain the same. (p. 518)

Aggregate supply The relationship between the quantity of real GDP supplied and the price level when all other influences on production plans remain the same. (p. 512)

Allocative efficiency A situation in which the quantities of goods and services produced are those that people *value most highly*—it is not possible to produce more of a good or service without giving up some of another good that people *value more highly*. (p. 143)

Automatic fiscal policy A fiscal policy action that is triggered by the state of the economy. (p. 539)

Automatic stabilizers Features of fiscal policy that stabilize real GDP without explicit action by the government. (p. 548)

Average cost pricing rule A rule that sets price equal to average total cost to enable a regulated firm to avoid economic loss. (p. 330)

Average fixed cost Total fixed cost per unit of output. (p. 265)

Average product Total product divided by the quantity of a factor of production. The average product of labor is total product divided by the quantity of labor employed. (p. 260)

Average total cost Total cost per unit of output, which equals average fixed cost plus average variable cost. (p. 265)

Average variable cost Total variable cost per unit of output. (p. 265)

Balanced budget multiplier The effect on aggregate demand of a *simultaneous* change in government expenditure and taxes that leaves the budget balance unchanged. (p. 544)

Barrier to entry Any constraint that protects a firm from competitors. (p. 308)

Barter The direct exchange of goods and services for other goods and services, which requires a double coincidence of wants. (p. 483)

Benefit The benefit of something is the gain or pleasure that it brings, measured by what you are willing to give up to get it. (p. 9)

Big tradeoff A tradeoff between efficiency and fairness that recognizes the cost of making income transfers. (p. 161)

Black market An illegal market that operates alongside a government-regulated market. (p. 177)

Budget balance Tax revenues minus outlays. (p. 538)

Business cycle A periodic but irregular up-and-down movement of total production and other measures of economic activity. (p. 384)

Capital Tools, instruments, machines, buildings, and other items that have been produced in the past and that businesses now use to produce goods and services. (p. 37)

Capital goods Goods bought by businesses and governments to increase productive resources to use over future periods to produce other goods. (p. 34)

Capture theory The theory that regulation serves the self-interest of the producer and results in maximum profit, underproduction, and deadweight loss. (p. 328)

Cartel A group of firms acting together to limit output, raise price, and increase economic profit. (p. 352)

Chained Consumer Price Index A measure of the price level calculated using current month and previous month prices and expenditures. (p. 430)

Chained-dollar real GDP The measure of real GDP calculated by the Bureau of Economic Analysis. (p. 395)

Change in demand A change in the quantity that people plan to buy when any influence on buying plans other than the price of the good changes. (p. 88)

Change in the quantity demanded A change in the quantity of a good that people plan to buy that results from a change in the price of the good with all other influences on buying plans remaining the same. (p. 90)

Change in the quantity supplied A change in the quantity of a good that suppliers plan to sell that results from a change in the price of the good with all other influences on selling plans remaining the same. (p. 97)

Change in supply A change in the quantity that suppliers plan to sell when any influence on selling plans other than the price of the good changes. (p. 95)

Circular flow model A model of the economy that shows the circular flow of expenditures and incomes that result from decision makers' choices and the way those choices interact to determine what, how, and for whom goods and services are produced. (p. 48)

Classical macroeconomics The view that the market economy works well, that aggregate fluctuations are a natural consequence of an expanding economy, and that government intervention cannot improve the efficiency of the market economy. (p. 446)

Coase theorem The proposition that if property rights exist and the costs of enforcing them are low, then the market outcome is efficient and it doesn't matter who has the property rights. (p. 231)

Command system A system that allocates resources by the order of someone in authority. (p. 141)

Command-and-control regulation The direct regulation of what is and is not permitted. (p. 233)

Comparative advantage The ability of a person to perform an activity or produce a good or service at a lower opportunity cost than anyone else. (p. 73)

Complement A good that is consumed with another good. (p. 88)

Complement in production A good that is produced along with another good. (p. 95)

Constant returns to scale Features of a firm's technology that keep average total cost constant as output increases. (p. 272)

Consumer Price Index A measure of the average of the prices paid by urban consumers for a fixed market basket of consumption goods and services. (p. 422)

Consumer surplus The marginal benefit from a good or service in excess of the price paid for it, summed over the quantity consumed. (p. 149)

Consumption expenditure The expenditure by households on consumption goods and services. (p. 371)

Consumption goods and services Goods and services that individuals and governments buy and use in the current period. (p. 34)

Core inflation rate The annual percentage change in the PCEPI excluding the prices of food and energy. (p. 431)

Cost of living index A measure of the change in the amount of money that people need to spend to achieve a given standard of living. (p. 428)

Cost-push inflation An inflation that begins with an increase in costs. (p. 529)

Cross elasticity of demand A measure of the responsiveness of the demand for a good to a change in the price of a substitute or complement when other things remain the same. (p. 131)

Cross-section graph A graph that shows the values of an economic variable for different groups in a population at a point in time. (p. 24)

Currency Notes (dollar bills) and coins. (p. 484)

Cyclical surplus or deficit The budget balance that arises because tax revenues and outlays are not at their full-employment levels. (p. 541)

Cyclical unemployment The fluctuating unemployment over the business cycle that increases during a recession and decreases during an expansion. (p. 411)

Deadweight loss The decrease in total surplus that results from an inefficient underproduction or overproduction. (p. 157)

Decreasing marginal returns When the marginal product of an additional worker is less than the marginal product of the previous worker. (p. 258)

Deflation A situation in which the price level is *falling* and the inflation rate is *negative*. (p. 425)

Demand The relationship between the quantity demanded and the price of a good when all other influences on buying plans remain the same. (p. 85)

Demand curve A graph of the relationship between the quantity demanded of a good and its price when all the other influences on buying plans remain the same. (p. 86)

Demand for labor The relationship between the quantity of labor demanded and the real wage rate when all other influences on firms' hiring plans remain the same. (p. 451)

Demand-pull inflation An inflation that starts because aggregate demand increases. (p. 528)

Demand schedule A list of the quantities demanded at each different price when all the other influences on buying plans remain the same. (p. 86)

Depreciation The decrease in the value of capital that results from its use and from obsolescence. (p. 378)

Deregulation The process of removing regulation of prices, quantities, entry, and other aspects of economic activity in a firm or an industry. (p. 328)

Diminishing returns The tendency for each additional hour of labor employed to produce a successively smaller additional amount of real GDP. (p. 450)

Direct relationship A relationship between two variables that move in the same direction. (p. 26)

Discouraged worker A marginally attached worker who has not made specific efforts to find a job within the past four weeks because previous unsuccessful attempts to find a job were discouraging. (p. 402)

Discretionary fiscal policy A fiscal policy action that is initiated by an act of Congress. (p. 539)

Diseconomies of scale Features of a firm's technology that make average total cost rise as output increases. (p. 272)

Dumping When a foreign firm sells its exports at a lower price than its cost of production. (p. 216)

Duopoly A market with only two firms. (p. 352)

Economic depreciation An opportunity cost of a firm using capital that it owns—measured as the change in the *market value* of capital over a given period. (p. 253)

Economic freedom A condition in which people are able to make personal choices, their private property is protected by the rule of law, and they are free to buy and sell in markets. (p. 472)

Economic growth The sustained expansion of production possibilities. (pp. 70, 456)

Economic growth rate The annual percentage change of real GDP. (p. 456)

Economic model A description of the economy or part of the economy that includes only those features assumed necessary to explain the observed facts. (p. 15)

Economic profit A firm's total revenue minus total cost. (p. 253)

Economics The social science that studies the choices that individuals, businesses, government, and entire societies make as they cope with *scarcity*, the influences on those choices, and the arrangements that coordinate them. (p. 2)

Economies of scale Features of a firm's technology that make average total cost fall as output increases. (p. 271)

Efficient scale The quantity at which average total cost is a minimum. (p. 345)

Elastic demand When the percentage change in the quantity demanded exceeds the percentage change in price. (p. 116)

Elastic supply When the percentage change in the quantity supplied exceeds the percentage change in price. (p. 126)

Employment–population ratio The percentage of the people of working age who are employed. (p. 401)

Entrepreneurship The human resource that organizes labor, land, and capital to produce goods and services. (p. 38)

Equation of exchange An equation that states that the quantity of money multiplied by the velocity of circulation equals the price level multiplied by real GDP. (p. 503)

Equilibrium price The price at which the quantity demanded equals the quantity supplied. (p. 100)

Equilibrium quantity The quantity bought and sold at the equilibrium price. (p. 100)

Excess burden The amount by which the burden of a tax exceeds the tax revenue received by the government—the deadweight loss from a tax. (p. 172)

Excess capacity The amount by which the efficient scale exceeds the quantity that the firm produces. (p. 345)

Excess reserves A bank's actual reserves minus its desired reserves. (p. 496)

Explicit cost A cost paid in money. (p. 253)

Export subsidy A payment by the government to a producer to cover part of the cost of production that is exported. (p. 213)

Exports The goods and services that firms in one country sell to people and firms in other countries. (p. 198)

Exports of goods and services Items that firms in the United States produce and sell to the rest of the world. (p. 372)

Externality A cost or a benefit that arises from production and that falls on someone other than the producer; or a cost or benefit that arises from consumption and that falls on someone other than the consumer. (p. 226)

Factor markets Markets in which the services of factors of production are bought and sold. (p. 48)

Factors of production The productive resources that are used to produce goods and services—land, labor, capital, and entrepreneurship. (p. 36)

Federal funds rate The interest rate at which banks can borrow and lend reserves (interbank loans) in the federal funds market. (p. 489)

Federal Open Market Committee The Fed's main policy-making committee. (p. 492)

Federal Reserve System (the Fed) The central bank of the United States. (p. 491)

Fiat money Objects that are money because the law decrees or orders them to be money. (p. 484)

Final good or service A good or service that is produced for its final user and not as a component of another good or service. (p. 370)

Firms The institutions that organize the production of goods and services. (p. 48)

Fiscal imbalance The present value of the government's commitments to pay future benefits minus the present value of its tax revenues. (p. 542)

Fiscal policy Changing taxes, transfer payments, and government expenditure on goods and services. (p. 521) The use of the federal budget to achieve the macroeconomic objectives of high and sustained economic growth and full employment. (p. 538)

Fiscal stimulus An increase in government outlays or a decrease in tax revenues designed to boost real GDP and create or save jobs. (p. 545)

Four-firm concentration ratio The percentage of the total revenue in an industry accounted for by the four largest firms in the industry. (p. 342)

Frictional unemployment The unemployment that arises from people entering and leaving the labor force, from quitting jobs to find better ones, and from the ongoing creation and destruction of jobs—from normal labor turnover. (p. 410)

Full employment When the unemployment rate equals the natural unemployment rate. (p. 411)

Full-employment equilibrium When equilibrium real GDP equals potential GDP. (p. 525)

Full-time workers People who usually work 35 hours or more a week. (p. 403)

Game theory The tool that economists use to analyze *strategic behavior*—behavior that recognizes mutual interdependence and takes account of the expected behavior of others. (p. 357)

GDP price index An average of the current prices of all the goods and services included in GDP expressed as a percentage of base-year prices. (p. 435)

Generational imbalance The division of the fiscal imbalance between the current and future generations. (p. 543)

Goods and services The objects (goods) and the actions (services) that people value and produce to satisfy human wants. (p. 3)

Goods markets Markets in which goods and services are bought and sold. (p. 48)

Government expenditure multiplier The effect of a change in government expenditure on goods and services on aggregate demand. (p. 544)

Government expenditure on goods and services The expenditure by all levels of government on goods and services. (p. 372)

Great Depression A period of high unemployment, low incomes, and extreme economic hardship that lasted from 1929 to 1939. (p. 405)

Gross domestic product (GDP) The market value of all the final goods and services produced within a country in a given time period. (p. 370)

Herfindahl-Hirschman Index The square of the percentage market share of each firm summed over the 50 largest firms (or summed over all the firms if there are fewer than 50) in a market. (p. 342)

Households Individuals or groups of people living together. (p. 48)

Human capital The knowledge and skill that people obtain from education, on-the-job training, and work experience. (p. 37)

Hyperinflation Inflation at a rate that exceeds 50 percent a *month* (which translate to 12,875 percent a year). (p.504)

Implicit cost An opportunity cost incurred by a firm when it uses a factor of production for which it does not make a direct money payment. (p. 253)

Import quota A quantitative restriction on the import of a good that limits the maximum quantity of a good that may be imported in a given period. (p. 211)

Imports The goods and services that people and firms in one country buy from firms in other countries. (p. 198)

Imports of goods and services Items that households, firms, and governments in the United States buy from the rest of the world. (p. 372)

Incentive A reward or a penalty—a "carrot" or a "stick"—that encourages or discourages an action. (p. 11)

Income elasticity of demand A measure of the responsiveness of the demand for a good to a change in income when other things remain the same. (p. 132)

Increasing marginal returns When the marginal product of an additional worker exceeds the marginal product of the previous worker. (p. 258)

Induced taxes Taxes that vary with real GDP. (p. 548)

Inelastic demand When the percentage change in the quantity demanded is less than the percentage change in price. (p. 116)

Inelastic supply When the percentage change in the quantity supplied is less than the percentage change in price. (p. 126)

Infant-industry argument The argument that it is necessary to protect a new industry to enable it to grow into a mature industry that can compete in world markets. (p. 215)

Inferior good A good for which demand decreases when income increases and demand increases when income decreases. (p. 89)

Inflation rate The percentage change in the price level from one year to the next. (p. 425)

Inflationary gap A gap that exists when real GDP exceeds potential GDP and that brings a rising price level. (p. 525)

Interest Income paid for the use of capital. (p. 39)

Intermediate good or service A good or service that is used as a component of a final good or service. (p. 370)

Inverse relationship A relationship between two variables that move in opposite directions. (p. 27)

Investment The purchase of new *capital goods*—tools, instruments, machines, buildings, and additions to inventories. (p. 371)

Keynesian macroeconomics The view that the market economy is inherently unstable and needs active government intervention to achieve full employment and sustained economic growth. (p. 446)

Labor The work time and work effort that people devote to producing goods and services. (p. 37)

Labor force The number of people employed plus the number unemployed. (p. 400)

Labor force participation rate The percentage of the working-age population who are members of the labor force. (p. 402)

Labor productivity The quantity of real GDP produced by one hour of labor. (p. 460)

Land The "gifts of nature," or *natural resources*, that we use to produce goods and services. (p. 36)

Law of decreasing returns As a firm uses more of a variable input, with a given quantity of fixed inputs, the marginal product of the variable input eventually decreases. (p. 260)

Law of demand Other things remaining the same, if the price of a good rises, the quantity demanded of that good decreases; and if the price of a good falls, the quantity demanded of that good increases. (p. 85)

Law of diminishing marginal returns If the quantity of capital is small, an increase in capital brings a large increase in production; and if the quantity of capital is large, an increase in capital brings a small increase in production. (p. 461)

Law of market forces When there is a surplus, the price falls; when there is a shortage, the price rises. (p. 100)

Law of supply Other things remaining the same, if the price of a good rises, the quantity supplied of that good increases; and if the price of a good falls, the quantity supplied of that good decreases. (p. 92)

Legal monopoly A market in which competition and entry are restricted by the granting of a public franchise, government license, patent, or copyright. (p. 309)

Linear relationship A relationship that graphs as a straight line. (p. 26)

Long run The time frame in which the quantities of *all* resources can be varied. (p. 256)

Long-run average cost curve A curve that shows the lowest average total cost at which it is possible to produce each output when the firm has had sufficient time to change both its plant size and labor employed. (p. 272)

Loss Income earned by an entrepreneur for running a business when that income is negative. (p. 39)

M1 Currency held by individuals and firms, traveler's checks, and checkable deposits owned by individuals and businesses. (p. 484)

M2 M1 plus savings deposits and small time deposits, money market funds, and other deposits. (p. 484)

Macroeconomic equilibrium When the quantity of real GDP demanded equals the quantity of real GDP supplied at the point of intersection of the *AD* curve and the *AS* curve. (p. 524)

Macroeconomics The study of the aggregate (or total) effects on the national economy and the global economy of the choices that individuals, businesses, and governments make. (p. 3)

Margin A choice on the margin is a choice that is made by comparing *all* the relevant alternatives systematically and incrementally. (p. 10)

Marginal benefit The benefit that arises from a one-unit increase in an activity. The marginal benefit of something is measured by what you *are willing to* give up to get *one additional* unit of it. (p. 10)

Marginal cost The opportunity cost that arises from a one-unit increase in an activity. The marginal cost of something is what you *must* give up to get one additional unit of it. (p. 10) The marginal cost of producing a good is the change in total cost that results from a one-unit increase in output. (p. 264)

Marginal cost pricing rule A rule that sets price equal to marginal cost to achieve an efficient output. (p. 328)

Marginal external benefit The benefit from an additional unit of a good or service that people other than the consumer of the good or service enjoy. (p. 239)

Marginal external cost The cost of producing an additional unit of a good or service that falls on people other than the producer. (p. 228)

Marginal private benefit The benefit from an additional unit of a good or service that the consumer of that good or service receives. (p. 239)

Marginal private cost The cost of producing an additional unit of a good or service that is borne by the producer of that good or service. (p. 228)

Marginal product The change in total product that results from a one-unit increase in the quantity of labor employed. (p. 258)

Marginal revenue The change in total revenue that results from a one-unit increase in the quantity sold. (p. 281)

Marginal social benefit The marginal benefit enjoyed by society—by the consumer of a good or service and by everyone else who benefits from it. It is the sum of marginal private benefit and marginal external benefit. (p. 239)

Marginal social cost The marginal cost incurred by the entire society—by the producer and by everyone else on whom the cost falls. It is the sum of marginal private cost and marginal external cost. (p. 228)

Marginally attached worker A person who does not have a job, is available and willing to work, has not made specific efforts to find a job within the previous four weeks, but has looked for work sometime in the recent past. (p. 402)

Market Any arrangement that brings buyers and sellers together and enables them to get information and do business with each other. (p. 48)

Market equilibrium When the quantity demanded equals the quantity supplied—buyers' and sellers' plans are in balance. (p. 100)

Market failure A situation in which the market delivers an inefficient outcome. (p. 157)

Means of payment A method of settling a debt. (p. 482)

Medium of exchange An object that is generally accepted in return for goods and services. (p. 483)

Microeconomics The study of the choices that individuals and businesses make and the way these choices interact and are influenced by governments. (p. 2)

Minimum wage law A government regulation that makes hiring labor services for less than a specified wage illegal. (p. 183)

Monetarist macroeconomics The view that the market economy works well, that aggregate fluctuations are the natural consequence of an expanding economy, but that fluctuations in the quantity of money generate the business cycle. (p. 447)

Monetary base The sum of coins, Federal Reserve notes, and banks' reserves at the Fed. (p. 493)

Monetary policy Changing the quantity of money and the interest rate. (p. 521) The adjustment of interest rates and the quantity of money to achieve the dual objectives of price stability and full employment. (p. 552)

Money Any commodity or token that is generally accepted as a means of payment. (p. 482)

Money multiplier The number by which a change in the monetary base is multiplied to find the resulting change in the quantity of money. (p. 499)

Monopolistic competition A market in which a large number of firms compete by making similar but slightly different products. (p. 280)

Monopoly A market in which one firm sells a good or service that has no close substitutes and a barrier blocks the entry of new firms. (pp. 280, 308)

Nash equilibrium An equilibrium in which each player takes the best possible action given the action of the other player. (p. 358)

National debt The amount of government debt outstanding—the debt that has arisen from past budget deficits. (p. 539)

Natural monopoly A monopoly that arises because one firm can meet the entire market demand at a lower average total cost than two or more firms could. (p. 308)

Natural unemployment rate The unemployment rate when all the unemployment is frictional and structural and there is no cyclical unemployment. (p. 411)

Negative externality A production or consumption activity that creates an external cost. (p. 226)

Negative relationship A relationship between two variables that move in opposite directions. (p. 27)

Net exports of goods and services The value of exports of goods and services minus the value of imports of goods and services. (p. 372)

Net taxes Taxes paid minus cash benefits received from governments. (p. 372)

Nominal GDP The value of the final goods and services produced in a given year expressed in terms of the prices of that same year. (p. 380)

Nominal interest rate The dollar amount of interest expressed as a percentage of the amount loaned. (p. 438)

Nominal wage rate The average hourly wage rate measured in *current* dollars. (p. 436)

Normal good A good for which demand increases when income increases and demand decreases when income decreases. (p. 89)

Normal profit The return to entrepreneurship. Normal profit is part of a firm's opportunity cost because it is the cost of not running another firm. (p. 253)

Oligopoly A market in which a small number of interdependent firms compete. (p. 280)

Open market operation The purchase or sale of government securities—U.S. Treasury bills and bonds—by the New York Fed in the open market. (p. 493)

Opportunity cost The opportunity cost of something is the best thing you *must* give up to get it. (p. 8)

Output gap Real GDP minus potential GDP expressed as a percentage of potential GDP. (p. 415)

Part time for economic reasons People who work 1 to 34 hours per week but are looking for full-time work and cannot find it because of unfavorable business conditions. (p. 403)

Part-time workers People who usually work less than 35 hours a week. (p. 403)

Payoff matrix A table that shows the payoffs for each player for every possible combination of actions by the players. (p. 358)

PCEPI An average of the current prices of the goods and services included in the consumption expenditure component of GDP expressed as a percentage of base-year prices. (p. 431)

Perfect competition A market in which there are many firms, each selling an identical product; many buyers; no barriers to the entry of new firms into the industry; no advantage to established firms; and buyers and sellers are well informed about prices. (p. 280)

Perfect price discrimination Price discrimination that extracts the entire consumer surplus by charging the highest price that consumers are willing to pay for each unit. (p. 324)

Perfectly elastic demand When the quantity demanded changes by a very large percentage in response to an almost zero percentage change in price. (p. 116)

Perfectly elastic supply When the quantity supplied changes by a very large percentage in response to an almost zero percentage change in price. (p. 126)

Perfectly inelastic demand When the percentage change in the quantity demanded is zero for any percentage change in the price. (p. 116)

Perfectly inelastic supply When the percentage change in the quantity supplied is zero for any percentage change in the price. (p. 126)

Positive externality A production or consumption activity that creates an external benefit. (p. 226)

Positive relationship A relationship between two variables that move in the same direction. (p. 26)

Potential GDP The value of real GDP when all the economy's factors of production—labor, capital, land, and entrepreneurial ability—are fully employed. (pp. 385, 415, 449)

Price cap A government regulation that places an upper limit on the price at which a particular good, service, or factor of production may be traded. (p. 176)

Price cap regulation A rule that specifies the highest price that a firm is permitted to set—a price ceiling. (p. 333)

Price ceiling A government regulation that places an *upper* limit on the price at which a particular good, service, or factor of production may be traded. (p. 176)

Price-discriminating monopoly A monopoly that sells different units of a good or service for different prices not related to cost differences. (p. 310)

Price elasticity of demand A measure of the responsiveness of the quantity demanded of a good to a change in its price when all other influences on buyers' plans remain the same. (p. 114)

Price elasticity of supply A measure of the responsiveness of the quantity supplied of a good to a change in its price when all other influences on sellers' plans remain the same. (p. 126)

Price floor A government regulation that places a *lower* limit on the price at which a particular good, service, or factor of production may be traded. (p. 182)

Price level An average of the level of prices during a given period. (p. 425)

Price taker A firm that cannot influence the price of the good or service that it produces. (p. 281)

Prisoners' dilemma A game between two prisoners that shows why it is hard to cooperate, even when it would be beneficial to both players to do so. (p. 357)

Producer surplus The price of a good in excess of the marginal cost of producing it, summed over the quantity produced. (p. 152)

Product differentiation Making a product that is slightly different from the products of competing firms. (p. 340)

Production efficiency A situation in which the economy is getting all that it can from its resources and cannot produce more of one good or service without producing less of something else. (p. 62)

Production function A relationship that shows the maximum quantity of real GDP that can be produced as the quantity of labor employed changes and all other influences on production remain the same. (p. 450)

Production possibilities frontier The boundary between the combinations of goods and services that can be produced and the combinations that cannot be produced, given the available

factors of production and the state of technology. (p. 60)

Production quota A government regulation in a market that places an upper limit on the quantity that may be supplied. (p. 189)

Productivity curve The relationship that shows how real GDP per hour of labor changes as the quantity of capital per hour of labor changes. (p. 462)

Profit Income earned by an entrepreneur for running a business. (p. 39)

Property rights Social arrangements that govern the protection of private property—legally established titles to the ownership, use, and disposal of factors of production and goods and services that are enforceable in the courts. (pp. 231, 472)

Public provision The production of a good or service by a public authority that receives most of its revenue from the government. (p. 241)

Quantity demanded The amount of any good, service, or resource that people are willing and able to buy during a specified period at a specified price. (p. 85)

Quantity of labor demanded The total labor hours that all the firms in the economy plan to hire during a given time period at a given real wage rate. (p. 451)

Quantity of labor supplied The number of labor hours that all the households in the economy plan to work during a given time period at a given real wage rate. (p. 451)

Quantity supplied The amount of any good, service, or resource that people are willing and able to sell during a specified period at a specified price. (p. 92)

Quantity theory of money The proposition that when real GDP equals potential GDP, an increase in the quantity of money brings an equal percentage increase in the price level. (p. 503)

Rate of return regulation A regulation that sets the price at a level that enables a firm to earn a specified target rate of return on its capital. (p. 332)

Rational choice A choice that uses the available resources to best achieve the objective of the person making the choice. (p. 9)

Real business cycle A cycle that results from fluctuations in the pace of growth of labor productivity and potential GDP. (p. 527)

Real GDP The value of the final goods and services produced in a given year expressed in terms of the prices in a *base year*. (p. 380)

Real interest rate The goods and services forgone in interest expressed as a percentage of the amount loaned and calculated as the nominal interest rate minus the inflation rate. (p. 438)

Real wage rate The average hourly wage rate measured in the dollars of a given reference base year. (p. 436)

Recession A period during which real GDP decreases for at least two successive quarters; or defined by the NBER as "a period of significant decline in total output, income, employment, and trade, usually lasting from six months to a year, and marked by contractions in many sectors of the economy." (p. 384)

Recessionary gap A gap that exists when potential GDP exceeds real GDP and that brings a falling price level. (p. 525)

Reference base period A period for which the CPI is defined to equal 100. Currently, the reference base period is 1982–1984. (p. 422)

Regulation Rules administered by a government agency to influence prices, quantities, entry, and other aspects of economic activity in a firm or an industry. (p. 328)

Rent Income paid for the use of land (p. 39)

Rent ceiling A regulation that makes it illegal to charge more than a specified rent for housing. (p. 176)

Rent seeking Lobbying and other political activity that aims to capture the gains from trade. (p. 219) The act of obtaining special treatment by the government to create economic profit or divert consumer surplus or producer surplus away from others. (p. 319)

Reserves The currency in the bank's vaults plus the balance on its reserve account at a Federal Reserve Bank. (p. 489)

Rule of 70 The number of years it takes for the level of any variable to double is approximately 70 divided by the annual percentage growth rate of the variable. (p. 458)

Saving The amount of income that is not paid in net taxes or spent on consumption goods and services. (p. 372)

Scarcity The condition that arises because wants exceed the ability of resources to satisfy them. (p. 2)

Scatter diagram A graph of the value of one variable against the value of another variable. (p. 24)

Search activity The time spent looking for someone with whom to do business. (p. 178)

Self-interest The choices that are best for the individual who makes them. (p. 4)

Short run The time frame in which the quantities of some resources are fixed. In the short run, a firm can usually change the quantity of labor it uses but not its technology and quantity of capital. (p. 256)

Shutdown point The point at which price equals minimum average variable cost and the quantity produced is that at which average variable cost is at a minimum. (p. 285)

Single-price monopoly A monopoly that must sell each unit of its output for the same price to all its customers. (p. 310)

Slope The change in the value of the variable measured on the y-axis divided by the change in the value of the variable measured on the x-axis. (p. 29)

Social interest The choices that are best for society as a whole. (p. 4)

Social interest theory The theory that regulation achieves an efficient allocation of resources. (p. 328)

Stagflation A combination of recession (falling real GDP) and inflation (rising price level). (p. 529)

Strategies All the possible actions of each player in a game. (p. 358)

Structural surplus or deficit The budget balance that would occur if the economy were at full employment. (p. 541)

Structural unemployment The unemployment that arises when changes in technology or international competition change the skills needed to perform jobs or change the locations of jobs. (p. 410)

Subsidy A payment by the government to a producer to cover part of the cost of production. (p. 242)

Substitute A good that can be consumed in place of another good. (p. 88)

Substitute in production A good that can be produced in place of another good. (p. 95)

Supply The relationship between the quantity supplied and the price of a good when all other influences on selling plans remain the same. (p. 92)

Supply curve A graph of the relationship between the quantity supplied of a good and its price when all the other influences on selling plans remain the same. (p. 93)

Supply of labor The relationship between the quantity of labor supplied and the real wage rate when all other influences on work plans remain the same. (p. 452)

Supply schedule A list of the quantities supplied at each different price when all the other influences on selling plans remain the same. (p. 93)

Tariff A tax imposed on a good when it is imported. (p. 207)

Tax incidence The division of the burden of a tax between the buyer and the seller. (p. 170)

Tax multiplier The effect of a change in taxes on aggregate demand. (p. 544)

Time-series graph A graph that measures time on the *x*-axis and the variable or variables in which we are interested on the *y*-axis. (p. 24)

Total cost The cost of all the factors of production used by a firm. (p. 263)

Total fixed cost The cost of the firm's fixed factors of production—the cost of land, capital, and entrepreneurship. (p. 263)

Total product The total quantity of a good produced in a given period. (p. 257)

Total revenue The amount spent on a good and received by the seller and equals the price of the good multiplied by the quantity of the good sold. (p. 122)

Total revenue test A method of estimating the price elasticity of demand by observing the change in total revenue that results from a price change (with all other influences on the quantity sold remaining unchanged). (p. 123)

Total surplus The sum of consumer surplus and producer surplus. (p. 155)

Total variable cost The cost of the firm's variable factor of production—the cost of labor. (p. 263)

Tradeoff An exchange—giving up one thing to get something else. (pp. 8, 63)

Transactions costs The opportunity costs of making trades in a market or conducting a transaction. (p. 159)

Transfer payments multiplier The effect of a change in transfer payments on aggregate demand. (p. 544)

Trend A general tendency for the value of a variable to rise or fall over time. (p. 24)

Unemployment rate The percentage of the people in the labor force who are unemployed. (p. 401)

Unit elastic demand When the percentage change in the quantity demanded equals the percentage change in price. (p. 116)

Unit elastic supply When the percentage change in the quantity supplied equals the percentage change in price. (p. 126)

Velocity of circulation The average number of times that each dollar of money is used during a year to buy final goods and services. (p. 503)

Voucher A token that the government provides to households, which they can use to buy specified goods or services. (p. 243)

Wages Income paid for the services of labor. (p. 39)

Working-age population The total number of people aged 16 years and over who are not in jail, hospital, or some other form of institutional care or in the U.S. Armed Forces. (p. 400)

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	NATIONAL INCOME AND PRODUCT ACCOUNTS	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
	EXPENDITURES APPROACH										
the sum of	1 Personal consumption expenditure	648	701	769	851	932	1,033	1,150	1,277	1,426	1,590
	2 Gross private domestic investment	170	197	228	267	275	257	323	397	478	540
	3 Government expenditure	254	269	288	306	343	383	406	436	477	526
	4 Exports	60	63	71	95	127	139	150	159	187	230
less	5 Imports	56	62	74	91	128	123	151	182	212	253
equals	6 Gross domestic product	1,076	1,168	1,282	1,429	1,549	1,689	1,878	2,086	2,357	2,632
	INCOMES APPROACH										
	7 Compensation of employees	625	667	734	815	890	950	1,051	1,169	1,320	1,481
plus	8 Net operating surplus	222	247	280	317	323	357	405	457	526	564
equals	9 Net domestic product at factor cost	847	914	1,013	1,132	1,214	1,307	1,457	1,626	1,846	2,045
plus	10 Indirect taxes less subsidies	87	96	101	112	122	131	141	153	162	172
	11 Depreciation (capital consumption)	137	149	161	178	206	238	259	288	325	371
	12 GDP (income approach)	1,071	1,158	1,275	1,423	1,541	1,676	1,857	2,067	2,334	2,587
	13 Statistical discrepancy	5	10	7	6	7	13	21	19	23	45
equals	14 GDP (expenditure approach)	1,076	1,168	1,282	1,429	1,549	1,689	1,878	2,086	2,357	2,632
	15 Real GDP (billions of 2009 dollars)	4,722	4,878	5,134	5,424	5,396	5,385	5,675	5,937	6,267	6,466
	16 Real GDP growth rate (percent per year)	0.2	3.3	5.3	5.6	−0.5	−0.2	5.4	4.6	5.6	3.2
	OTHER DATA										
	17 Population (millions)	205	208	210	212	214	216	218	220	223	225
	18 Labor force (millions)	83	84	87	89	92	94	96	99	102	105
	19 Employment (millions)	79	79	82	85	87	86	89	92	96	99
	20 Unemployment (millions)	4	5	5	4	5	8	7	7	6	6
	21 Labor force participation rate (percent of working-age population)	60.4	60.2	60.4	60.8	61.3	61.2	61.6	62.2	63.2	63.7
	22 Unemployment rate (percent of labor force)	5.0	6.0	5.6	4.9	5.6	8.5	7.7	7.1	6.1	5.9
	23 Real GDP per person (2009 dollars per year)	23,024	23,485	24,458	25,593	25,227	24,935	26,024	26,951	28,151	28,725
	24 Growth rate of real GDP per person (percent per year)	2.9	2.0	4.1	4.6	−1.4	−1.2	4.4	3.6	4.5	2.0
	25 Quantity of money (M2, billions of dollars)	602	674	758	832	881	964	1,087	1,221	1,322	1,426
	26 GDP price index (209 = 100)	22.8	23.9	25.0	26.3	28.7	31.4	33.1	35.1	37.6	40.7
	27 GDP price index inflation rate (percent per year)	5.3	5.1	4.3	5.4	9.0	9.3	5.5	6.2	7.0	8.3
	28 Consumer price index (1982–1984 = 100)	38.8	40.5	41.8	44.4	49.3	53.8	56.9	60.6	65.2	72.6
	29 CPI inflation rate (percent per year)	5.9	4.2	3.3	6.3	11.0	9.1	5.8	6.5	7.6	11.3
	30 Current account balance (billions of dollars)	4	0	−4	9	6	20	7	−11	−13	−1

1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992
1,755	1,938	2,074	2,287	2,498	2,723	2,898	3,092	3,347	3,593	3,826	3,960	4,216
530	631	581	638	820	830	849	892	937	1,000	994	944	1,013
591	655	710	766	825	908	975	1,031	1,078	1,152	1,238	1,298	1,345
281	305	283	277	302	303	321	364	445	504	552	595	633
294	318	303	329	405	417	453	509	554	591	630	624	668
2,863	3,211	3,345	3,638	4,041	4,347	4,590	4,870	5,253	5,658	5,980	6,174	6,539
1,626	1,795	1,895	2,014	2,218	2,389	2,546	2,726	2,951	3,144	3,345	3,455	3,674
576	670	684	767	921	983	987	1,059	1,175	1,242	1,258	1,270	1,341
2,202	2,465	2,578	2,782	3,139	3,372	3,533	3,785	4,126	4,386	4,603	4,725	5,015
191	224	226	242	269	287	299	317	345	372	398	430	453
426	485	534	561	594	637	682	728	782	836	887	931	960
2,819	3,174	3,338	3,584	4,002	4,296	4,513	4,830	5,253	5,594	5,888	6,086	6,428
44	37	7	54	39	51	77	41	−1	64	91	88	111
2,862	3,211	3,345	3,638	4,041	4,347	4,590	4,870	5,253	5,658	5,980	6,174	6,539
6,450	6,618	6,491	6,792	7,285	7,594	7,861	8,133	8,475	8,786	8,955	8,948	9,267
−0.2	2.6	−1.9	4.6	7.3	4.2	3.5	3.5	4.2	3.7	1.9	−0.1	3.6
228	230	232	234	236	239	241	243	245	247	250	254	257
107	109	110	112	114	115	118	120	122	124	126	126	128
99	100	100	101	105	107	110	112	115	117	119	118	118
8	8	11	11	9	8	8	7	7	7	7	9	10
63.8	63.9	64.0	64.0	64.4	64.8	65.2	65.6	65.9	66.4	66.5	66.2	66.4
7.2	7.6	9.7	9.6	7.5	7.2	7.0	6.2	5.5	5.3	5.6	6.9	7.5
28,325	28,772	27,953	28,984	30,817	31,839	32,659	33,489	34,581	35,517	35,794	35,295	36,068
−1.4	1.6	−2.8	3.7	6.3	3.3	2.6	2.5	3.3	2.7	0.8	−1.4	2.2
1,540	1,679	1,831	2,055	2,219	2,417	2,613	2,782	2,932	3,055	3,223	3,342	3,404
44.4	48.5	51.5	53.6	55.5	57.2	58.4	59.9	62.0	64.4	66.8	69.0	70.6
9.0	9.3	6.2	3.9	3.5	3.2	2.0	2.6	3.5	3.9	3.7	3.3	2.3
82.4	90.9	96.5	99.6	103.9	107.6	109.7	113.6	118.3	123.9	130.7	136.2	140.3
13.5	10.4	6.2	3.2	4.4	3.5	1.9	3.6	4.1	4.8	5.4	4.2	3.0
9	3	−3	−35	−90	−114	−143	−154	−116	−92	−75	8	−46

Macroeconomic Data

These macroeconomic data series show some of the trends in GDP and its components, the price level, and other variables that provide information about changes in the standard of living and the cost of living—the central questions of macroeconomics. You will find these data in a spreadsheet that you can download from your MyEconLab Web site.

	NATIONAL INCOME AND PRODUCT ACCOUNTS	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
	EXPENDITURES APPROACH										
the sum of	1 Personal consumption expenditure	4,471	4,741	4,984	5,268	5,561	5,903	6,307	6,792	7,103	7,384
	2 Gross private domestic investment	1,107	1,257	1,318	1,432	1,596	1,735	1,884	2,034	1,929	1,925
	3 Government expenditure	1,366	1,404	1,452	1,496	1,554	1,614	1,726	1,834	1,959	2,095
	4 Exports	655	721	813	868	954	953	992	1,097	1,027	1,003
less	5 Imports	720	813	903	964	1,056	1,116	1,249	1,473	1,395	1,429
equals	6 Gross domestic product	6,879	7,309	7,664	8,100	8,609	9,089	9,661	10,285	10,622	10,978
	INCOMES APPROACH										
	7 Compensation of employees	3,824	4,014	4,207	4,426	4,719	5,082	5,418	5,863	6,054	6,150
plus	8 Net operating surplus	1,432	1,590	1,721	1,896	2,059	2,154	2,251	2,344	2,410	2,517
equals	9 Net domestic product at factor cost	5,256	5,604	5,928	6,322	6,779	7,236	7,669	8,207	8,464	8,667
plus	10 Indirect taxes less subsidies	466	513	523	546	578	603	628	663	669	721
	11 Depreciation (capital consumption)	1,004	1,056	1,123	1,176	1,240	1,310	1,401	1,514	1,604	1,662
	12 GDP (income approach)	6,726	7,172	7,574	8,044	8,596	9,149	9,698	10,384	10,737	11,050
	13 Statistical discrepancy	152	137	91	57	12	−60	−38	−100	−115	−73
equals	14 GDP (expenditure approach)	6,879	7,309	7,664	8,100	8,609	9,089	9,661	10,285	10,622	10,978
	15 Real GDP (billions of 2009 dollars)	9,521	9,905	10,175	10,561	11,035	11,526	12,066	12,560	12,682	12,909
	16 Real GDP growth rate (percent per year)	2.7	4.0	2.7	3.8	4.5	4.4	4.7	4.1	1.0	1.8
	OTHER DATA										
	17 Population (millions)	260	263	267	270	273	276	279	282	285	288
	18 Labor force (millions)	129	131	132	134	136	138	139	143	144	145
	19 Employment (millions)	120	123	125	127	130	131	134	137	137	136
	20 Unemployment (millions)	9	8	7	7	7	6	6	6	7	8
	21 Labor force participation rate (percent of working–age population)	66.3	66.6	66.6	66.8	67.1	67.1	67.1	67.1	66.8	66.6
	22 Unemployment rate (percent of labor force)	6.9	6.1	5.6	5.4	4.9	4.5	4.2	4.0	4.7	5.8
	23 Real GDP per person (2009 dollars per year)	36,580	37,598	38,167	39,156	40,427	41,737	43,196	44,475	44,464	44,829
	24 Growth rate of real GDP per person (percent per year)	1.4	2.8	1.5	2.6	3.2	3.2	3.5	3.0	0.0	0.8
	25 Quantity of money (M2, billions of dollars)	3,439	3,482	3,552	3,723	3,911	4,191	4,499	4,771	5,181	5,565
	26 GDP price index (209 = 100)	72.2	73.8	75.3	76.7	78.0	78.9	80.1	81.9	83.8	85.0
	27 GDP price index inflation rate (percent per year)	2.4	2.1	2.1	1.8	1.7	1.1	1.5	2.3	2.3	1.5
	28 Consumer price index (1982–1984 = 100)	144.5	148.2	152.4	156.9	160.5	163.0	166.6	172.2	177.0	179.9
	29 CPI inflation rate (percent per year)	3.0	2.6	2.8	2.9	2.3	1.5	2.2	3.4	2.8	1.6
	30 Current account balance (billions of dollars)	−79	−115	−105	−114	−129	−205	−287	−404	−389	−451

2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
7,766	8,260	8,794	9,304	9,751	10,014	9,847	10,202	10,689	11,051	11,361	11,863	12,284
2,028	2,277	2,527	2,681	2,644	2,425	1,878	2,101	2,240	2,512	2,706	2,887	3,057
2,221	2,357	2,494	2,642	2,802	3,003	3,089	3,174	3,169	3,159	3,116	3,152	3,218
1,040	1,182	1,309	1,476	1,665	1,842	1,588	1,852	2,106	2,198	2,277	2,375	2,264
1,544	1,801	2,030	2,247	2,383	2,565	1,983	2,365	2,686	2,764	2,769	2,884	2,786
11,511	12,275	13,094	13,856	14,478	14,719	14,419	14,964	15,518	16,155	16,692	17,393	18,037
6,373	6,749	7,098	7,514	7,909	8,090	7,796	7,970	8,277	8,619	8,852	9,264	9,704
2,665	2,886	3,176	3,483	3,307	3,177	3,212	3,563	3,786	4,132	4,233	4,489	4,575
9,038	9,634	10,274	10,997	11,216	11,267	11,007	11,532	12,063	12,750	13,085	13,752	14,279
759	818	874	940	980	989	968	1,001	1,043	1,074	1,116	1,154	1,181
1,727	1,832	1,982	2,136	2,264	2,363	2,368	2,382	2,451	2,534	2,629	2,745	2,831
11,524	12,284	13,129	14,073	14,460	14,619	14,344	14,915	15,556	16,359	16,830	17,651	18,290
−14	−9	−36	−217	18	99	75	49	−38	−203	−138	−258	−254
11,511	12,275	13,094	13,856	14,478	14,719	14,419	14,964	15,518	16,155	16,692	17,393	18,037
13,271	13,774	14,234	14,614	14,874	14,830	14,419	14,784	15,021	15,355	15,612	15,982	16,397
2.8	3.8	3.3	2.7	1.8	−0.3	−2.8	2.5	1.6	2.2	1.7	2.4	2.6
291	293	296	299	302	305	307	310	312	314	317	319	322
147	147	149	151	153	154	154	154	154	155	155	156	157
138	139	142	144	146	145	140	139	140	142	144	146	149
9	8	8	7	7	9	14	15	14	13	11	10	8
66.2	66.0	66.0	66.2	66.0	66.0	65.4	64.7	64.1	63.7	63.3	62.9	62.6
6.0	5.5	5.1	4.6	4.6	5.8	9.3	9.6	8.9	8.1	7.4	6.2	5.3
45,664	46,967	48,090	48,905	49,300	48,697	46,930	47,719	48,117	48,824	49,282	50,065	50,970
1.9	2.9	2.4	1.7	0.8	−1.2	−3.6	1.7	0.8	1.5	0.9	1.6	1.8
5,953	6,236	6,503	6,844	7,265	7,758	8,383	8,593	9,225	10,020	10,697	11,357	12,017
86.7	89.1	92.0	94.8	97.3	99.2	100.0	101.2	103.3	105.2	106.9	108.8	110.0
2.0	2.7	3.2	3.1	2.7	2.0	0.8	1.2	2.1	1.8	1.6	1.8	1.1
184.0	188.9	195.3	201.6	207.3	215.3	214.6	218.1	224.9	229.6	233.0	236.7	237.0
2.3	2.7	3.4	3.2	2.9	3.8	−0.3	1.6	3.1	2.1	1.5	1.6	0.1
−516	−627	−738	−802	−718	−692	−382	−446	−482	−468	−386	−402	−477

Microeconomic Data

These microeconomic data series show some of the trends in what, how, and for whom goods and services are produced — the central questions of microeconomics. You will find these data in a spreadsheet that you can download from your MyEconLab Web site.

		1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
WHAT WE PRODUCE												
Percentage of gross domestic product												
1	Agriculture, forestry, fishing, and hunting	2.6	2.6	2.8	3.8	3.3	3.1	2.7	2.5	2.6	2.7	2.2
2	Mining	1.5	1.4	1.3	1.4	2.0	2.1	2.1	2.2	2.2	2.3	3.3
3	Utilities	2.1	2.2	2.2	2.1	2.0	2.3	2.4	2.3	2.3	2.1	2.2
4	Construction	4.8	4.8	4.9	4.9	4.9	4.5	4.6	4.6	4.8	4.9	4.7
5	Durable goods manufacture	13.5	13.2	13.4	13.5	12.9	12.2	12.7	13.2	13.3	13.1	12.2
6	Nondurable goods manufacture	9.2	8.9	8.7	8.4	8.3	8.4	8.5	8.5	8.0	8.2	7.9
7	Wholesale trade	6.5	6.5	6.6	6.6	6.9	7.0	6.7	6.6	6.6	6.8	6.7
8	Retail trade	8.0	8.1	7.9	7.8	7.6	7.8	7.9	7.8	7.7	7.5	7.1
9	Transportation and warehousing	3.9	3.9	3.9	3.9	3.9	3.7	3.8	3.8	3.8	3.8	3.7
10	Information	3.6	3.6	3.7	3.6	3.6	3.7	3.7	3.7	3.8	3.8	3.9
11	Finance, insurance, real estate, rental, and leasing	14.7	15.1	15.0	14.7	14.9	15.2	15.0	15.0	15.2	15.4	16.0
12	Professional and business services	5.0	5.0	5.1	5.1	5.2	5.3	5.3	5.6	5.7	5.9	6.2
13	Educational services, health care, and social assistance	3.9	4.0	4.1	4.1	4.2	4.5	4.5	4.5	4.6	4.6	4.8
14	Arts, entertainment, recreation, accommodation, and food services	2.9	2.9	2.8	2.8	2.8	2.8	2.9	2.9	3.0	3.0	3.0
15	Other services, except government	2.7	2.6	2.6	2.5	2.5	2.4	2.4	2.3	2.4	2.4	2.5
16	Government	15.2	15.3	15.1	14.6	14.8	15.1	14.7	14.4	13.8	13.5	13.7
HOW WE PRODUCE												
17	Average weekly hours	37.0	36.8	36.9	36.9	36.4	36.0	36.1	35.9	35.7	35.6	35.2
	Employment (percentage of total)											
18	Agriculture	4.4	4.3	4.2	4.1	4.0	4.0	3.8	3.6	3.5	3.4	3.4
19	Mining	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	1.0
20	Construction	4.6	4.7	4.8	4.9	4.7	4.2	4.1	4.3	4.5	4.6	4.5
21	Manufacturing	22.7	21.6	21.5	21.9	21.3	19.7	19.8	19.8	19.7	19.7	18.9
22	Services	67.5	68.6	68.7	68.4	69.2	71.2	71.5	71.5	71.4	71.4	72.3
FOR WHOM WE PRODUCE												
23	Wage rate (dollars per hour)	3.40	3.62	3.90	4.14	4.44	4.73	5.07	5.44	5.88	6.34	6.85
24	Real wage rate (2009 dollars per hour)	14.92	15.12	15.61	15.72	15.47	15.08	15.33	15.48	15.64	15.58	15.44
25	Stock price index (Dow Jones)	753	885	950	924	759	803	975	894	821	844	891
26	Real stock price index (2009 dollars)	3,305	3,696	3,804	3,509	2,645	2,560	2,948	2,545	2,184	2,074	2,008
27	Interest rate Aaa (percent per year)	8.0	7.4	7.2	7.4	8.6	8.8	8.4	8.0	8.7	9.6	11.9
28	Real interest rate (percent per year)	2.6	2.2	2.8	1.9	−0.4	−0.4	2.8	1.7	1.6	1.3	2.7
GOVERNMENT IN THE ECONOMY												
29	Government receipts (billions of dollars)	290	308	352	395	436	447	513	576	653	736	808
30	Government outlays (billions of dollars)	340	371	404	434	488	571	609	657	726	804	924
31	Government surplus(+)/deficit(−) (billions of dollars)	−49	−63	−52	−39	−52	−124	−96	−81	−73	−68	−116
32	Government debt (billions of dollars)	377	406	434	461	481	543	627	690	762	818	895

1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
2.4	2.2	1.6	2.0	1.8	1.7	1.7	1.5	1.7	1.6	1.5	1.6	1.4	1.5
3.9	3.6	2.9	2.7	2.5	1.6	1.5	1.5	1.4	1.5	1.3	1.2	1.1	1.1
2.3	2.6	2.7	2.7	2.7	2.6	2.7	2.5	2.5	2.5	2.6	2.5	2.5	2.4
4.3	4.0	3.9	4.1	4.2	4.4	4.4	4.4	4.4	4.2	3.8	3.7	3.8	3.9
12.0	11.0	10.9	11.5	10.9	10.5	10.4	10.5	10.3	9.6	9.2	9.1	9.0	9.2
7.8	7.6	7.7	7.1	6.9	6.9	7.0	7.1	7.1	7.1	7.1	7.0	6.8	6.7
6.6	6.4	6.3	6.4	6.4	6.3	6.0	6.2	6.1	6.0	6.1	6.0	6.0	6.3
7.0	7.0	7.2	7.3	7.3	7.4	7.3	7.2	7.1	6.9	6.8	6.8	6.9	7.1
3.5	3.3	3.3	3.3	3.3	3.3	3.2	3.2	3.0	3.0	3.0	3.0	3.1	3.2
4.0	4.2	4.3	4.1	4.2	4.2	4.2	4.0	4.1	4.1	4.1	4.1	4.2	4.2
16.1	16.7	17.3	17.2	17.5	18.0	18.0	18.0	17.9	18.1	18.5	18.8	18.9	18.7
6.3	6.6	6.9	7.1	7.5	7.9	8.1	8.3	8.6	8.9	8.7	8.9	9.0	9.0
4.9	5.2	5.4	5.3	5.3	5.5	5.9	5.9	6.2	6.5	6.9	7.1	7.1	7.1
3.0	3.1	3.2	3.1	3.1	3.2	3.2	3.3	3.4	3.4	3.4	3.5	3.5	3.4
2.4	2.4	2.5	2.4	2.5	2.6	2.6	2.6	2.6	2.7	2.6	2.6	2.7	2.7
13.6	14.2	13.9	13.7	13.8	13.9	13.9	13.8	13.7	13.9	14.3	14.2	14.0	13.6
35.2	34.7	34.9	35.1	34.9	34.7	34.8	34.6	34.5	34.3	34.1	34.2	34.3	34.5
3.4	3.4	3.4	3.2	3.0	2.9	2.9	2.8	2.7	2.7	2.8	2.7	2.6	2.8
1.1	1.1	0.9	0.9	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5
4.3	4.0	4.0	4.3	4.5	4.5	4.5	4.6	4.5	4.4	4.1	3.9	4.0	4.1
18.6	17.4	16.9	17.1	16.6	16.0	15.7	15.6	15.3	14.9	14.5	14.2	13.9	13.8
72.7	74.0	74.8	74.6	75.1	75.9	76.3	76.5	76.9	77.4	78.1	78.7	79.0	78.8
7.44	7.87	8.20	8.49	8.74	8.92	9.14	9.44	9.80	10.20	10.51	10.77	11.05	11.33
15.33	15.27	15.31	15.31	15.27	15.28	15.26	15.23	15.22	15.28	15.23	15.26	15.29	15.36
933	885	1,191	1,179	1,328	1,793	2,278	2,061	2,510	2,679	2,929	3,284	3,525	3,795
1,923	1,717	2,223	2,125	2,320	3,071	3,803	3,326	3,899	4,013	4,245	4,654	4,879	5,143
14.2	13.8	12.0	12.7	11.4	9.0	9.4	9.7	9.3	9.3	8.8	8.1	7.2	8.0
4.4	7.1	7.8	8.8	7.9	6.9	6.7	6.0	5.2	5.4	5.3	5.7	4.7	5.7
928	951	1,010	1,123	1,225	1,302	1,417	1,518	1,644	1,729	1,779	1,864	1,970	2,117
1,042	1,152	1,252	1,347	1,474	1,573	1,654	1,736	1,870	2,025	2,131	2,305	2,377	2,448
−114	−202	−242	−224	−248	−271	−237	−218	−226	−297	−352	−441	−407	−331
991	1,120	1,338	1,553	1,814	2,097	2,335	2,580	2,838	3,198	3,618	4,027	4,382	4,679

Microeconomic Data

These microeconomic data series show some of the trends in what, how, and for whom goods and services are produced — the central questions of microeconomics. You will find these data in a spreadsheet that you can download from your MyEconLab Web site.

		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
WHAT WE PRODUCE												
Percentage of gross domestic product												
1	Agriculture, forestry, fishing, and hunting	1.2	1.5	1.3	1.1	1.0	1.0	0.9	0.9	1.0	1.2	1.0
2	Mining	1.0	1.1	1.1	0.9	0.9	1.1	1.2	1.0	1.2	1.4	1.7
3	Utilities	2.4	2.2	2.0	1.8	1.9	1.8	1.7	1.6	1.6	1.7	1.5
4	Construction	4.0	4.1	4.0	4.2	4.3	4.5	4.6	4.5	4.6	4.8	5.0
5	Durable goods manufacture	9.1	9.0	9.6	9.4	9.1	9.0	7.9	7.6	7.5	7.4	7.3
6	Nondurable goods manufacture	6.8	6.4	6.5	6.4	6.4	6.1	6.1	5.8	5.8	5.8	5.7
7	Wholesale trade	6.2	6.3	6.2	6.2	6.1	6.1	5.8	5.6	5.6	5.7	5.8
8	Retail trade	7.1	7.1	6.8	7.0	6.8	6.8	6.7	6.7	6.7	6.5	6.5
9	Transportation and warehousing	3.1	3.1	3.0	3.1	3.0	3.0	2.9	2.8	2.8	2.9	2.9
10	Information	4.2	4.3	4.6	4.8	5.0	4.6	4.7	5.0	4.9	5.1	4.9
11	Finance, insurance, real estate, rental, and leasing	19.0	19.0	18.9	19.0	19.2	19.4	20.3	20.5	20.3	19.7	20.2
12	Professional and business services	9.3	9.7	9.8	10.1	10.4	10.8	10.9	10.9	10.8	10.9	11.0
13	Educational services, health care, and social assistance	7.1	7.0	6.8	6.7	6.6	6.6	6.9	7.2	7.3	7.4	7.3
14	Arts, entertainment, recreation, accommodation, and food services	3.4	3.5	3.5	3.5	3.7	3.8	3.7	3.8	3.8	3.8	3.7
15	Other services, except government	2.7	2.7	2.7	2.7	2.7	2.7	2.5	2.6	2.5	2.4	2.4
16	Government	13.4	13.1	13.3	13.1	13.0	12.9	13.2	13.5	13.6	13.4	13.2
HOW WE PRODUCE												
17	Average weekly hours	34.3	34.3	34.5	34.5	34.4	34.3	34.0	33.9	33.7	33.7	33.7
	Employment (percentage of total)											
18	Agriculture	2.8	2.7	2.6	2.6	2.5	1.8	1.7	1.7	1.7	1.6	1.6
19	Mining	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
20	Construction	4.2	4.4	4.5	4.7	4.9	5.0	5.0	4.9	4.9	5.0	5.2
21	Manufacturing	13.8	13.6	13.4	13.4	13.0	12.6	12.0	11.2	10.5	10.3	10.0
22	Services	78.7	78.9	79.0	78.9	79.2	80.3	80.9	81.8	82.5	82.7	82.8
FOR WHOM WE PRODUCE												
23	Wage rate (dollars per hour)	11.65	12.04	12.51	13.01	13.49	14.01	14.54	14.96	15.36	15.69	16.12
24	Real wage rate (2009 dollars per hour)	15.47	15.70	16.04	16.50	16.85	17.11	17.36	17.59	17.71	17.61	17.52
25	Stock price index (Dow Jones)	4,499	5,744	7,443	8,632	10,483	10,724	10,206	9,215	9,007	10,316	10,547
26	Real stock price index (2009 dollars)	5,973	7,489	9,541	10,946	13,093	13,096	12,185	10,836	10,384	11,575	11,465
27	Interest rate Aaa (percent per year)	7.6	7.4	7.3	6.5	7.0	7.6	7.1	6.5	5.7	5.6	5.2
28	Real interest rate (percent per year)	5.4	5.4	5.5	5.4	5.4	5.2	4.7	4.9	3.6	2.8	2.0
GOVERNMENT IN THE ECONOMY												
29	Government receipts (billions of dollars)	2,243	2,411	2,592	2,770	2,945	3,174	3,161	3,005	3,076	3,301	3,701
30	Government outlays (billions of dollars)	2,562	2,655	2,732	2,808	2,948	3,093	3,310	3,528	3,760	3,976	4,258
31	Government surplus(+)/deficit(−) (billions of dollars)	−319	−244	−140	−37	−3	81	−150	−523	−684	−676	−556
32	Government debt (billions of dollars)	4,945	5,207	5,418	5,558	5,681	5,699	5,813	6,192	6,728	7,345	7,929

2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
0.9	1.0	1.0	1.0	1.1	1.3	1.2	1.4	1.2	1.1
2.0	2.2	2.7	2.0	2.2	2.6	2.5	2.6	2.6	1.7
1.7	1.6	1.6	1.7	1.8	1.8	1.6	1.6	1.6	1.6
5.0	4.9	4.4	4.0	3.6	3.5	3.6	3.7	3.8	4.0
7.3	7.1	6.8	6.1	6.4	6.5	6.5	6.5	6.5	6.5
5.8	5.7	5.6	5.9	5.8	5.8	5.8	5.7	5.6	5.5
5.9	5.9	6.0	5.7	5.8	5.8	6.0	6.0	6.0	6.0
6.3	6.1	5.8	5.8	5.8	5.7	5.8	5.8	5.8	5.8
2.9	2.8	2.9	2.8	2.8	2.9	2.9	2.9	2.9	2.9
4.7	4.9	5.0	4.9	4.9	4.7	4.6	4.8	4.8	4.8
20.0	19.9	19.1	19.9	19.7	19.7	20.0	19.8	20.0	20.3
11.1	11.4	11.9	11.5	11.6	11.7	11.8	11.7	11.9	12.2
7.3	7.4	7.8	8.4	8.3	8.3	8.3	8.2	8.2	8.3
3.7	3.7	3.6	3.6	3.6	3.6	3.7	3.8	3.8	3.9
2.4	2.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2
13.1	13.2	13.6	14.3	14.3	14.0	13.6	13.4	13.1	12.9
33.9	33.8	33.6	33.1	33.4	33.6	33.7	33.7	33.7	33.7
1.5	1.4	1.5	1.5	1.6	1.6	1.5	1.5	1.4	1.5
0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.5
5.3	5.2	4.9	4.3	4.0	4.0	4.0	4.1	4.2	4.3
9.8	9.5	9.2	8.5	8.3	8.4	8.4	8.4	8.3	8.3
82.9	83.4	83.9	85.3	85.7	85.5	85.6	85.5	85.5	85.4
16.74	17.41	18.07	18.61	19.05	19.44	19.73	20.14	20.60	21.04
17.66	17.89	18.21	18.61	18.82	18.82	18.75	18.84	18.93	19.13
11,410	13,178	11,244	8,886	10,669	11,958	12,965	15,010	16,778	17,587
12,034	13,539	11,329	8,886	10,540	11,574	12,323	14,039	15,417	15,988
5.6	5.6	5.6	5.3	4.9	4.6	3.7	4.2	4.2	3.9
2.4	2.8	3.6	4.5	3.7	2.5	1.8	2.6	2.3	2.8
4,041	4,240	4,151	3,725	3,956	4,147	4,334	4,851	5,045	5,279
4,471	4,775	5,206	5,572	5,775	5,813	5,781	5,765	5,899	6,062
−430	−535	−1,055	−1,847	−1,819	−1,667	−1,447	−913	−854	−782
8,495	8,989	9,914	11,723	13,390	14,657	15,990	16,851	17,800	18,344