Robin Bade

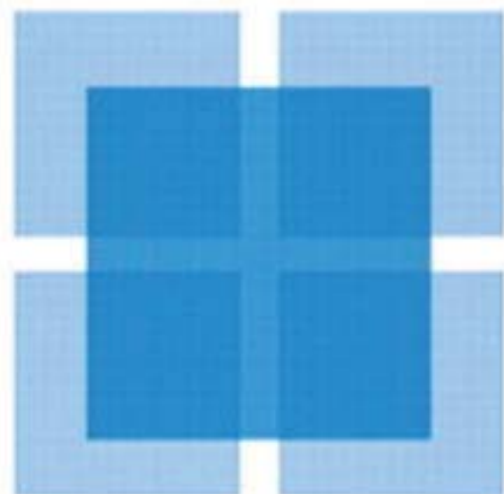**Michael Parkin**

Essential
Foundations of

Economics

Sixth Edition

MyEconLab PROVIDES THE POWER OF PRACTICE

Optimize your study time with MyEconLab, the online assessment and tutorial system. When you take a sample test online, **MyEconLab** gives you targeted feedback and a personalized Study Plan to identify the topics you need to review.

MyEconLab

You can work these problems in Chapter 4 Study Plan and get instant feedback.

CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. Explain how each of the following events changes the demand 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.

Study Plan The Study Plan consists of practice problems taken directly from the end-of-chapter Study Plan Problems and Applications in the textbook.

Unlimited Practice As you work each exercise, instant feedback helps you understand and apply the concepts. Many Study Plan exercises contain algorithmically generated values to ensure that you get as much practice as you need.

Study Plan Practice - Myeconlab Helper - Windows Internet Explorer

http://spider.mathxl.com/Student/PlayerPractice.aspx?chapterId=3&id=5&objectiveId=-1&exId=2&allObj=0

Support Log Out Help 11/5/10 3:55 PM
Myeconlab Helper

3.5 Predicting Changes in Price and Quantity Overview

3.5 Review Quiz 2
0 correct | 0 of 13 complete

OPEC deadlocked on oil production hike
Oil prices breached 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

Consider the market for oil when oil prices "breached the $100-a-barrel mark".

Draw a demand curve and a supply curve consistent with this information. Label both curves.

Draw a point at the equilibrium price and equilibrium quantity. Label it 1.

Well done!
Initially the price of a barrel of oil is greater than $100.

When OPEC members agree to increase production, the supply of oil increases and the supply curve shifts rightward.

The equilibrium price of a barrel of oil falls and the equilibrium quantity increases.

Done

All parts Check Answer

Learning Resources

Study Plan problems link to learning resources that further reinforce concepts you need to master.

- **Help Me Solve This** learning aids help you break down a problem much the same way as an instructor would do during office hours. Help Me Solve This is available for select problems.
- Links to the **eText** promote reading of the text when you need to revisit a concept or explanation.
- **Animated graphs,** with audio narration, appeal to a variety of learning styles.
- A **graphing tool** enables you to build and manipulate graphs to better understand how concepts, numbers, and graphs connect.

MyEconLab

Find out more at www.myeconlab.com

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 soar in 2010 and 2011?

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.

...supply determine price and quantity in a ...ffects of changes in demand and supply.

CHECKPOINT 4.1

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 cell phones:
- The price of a cell phone falls.
- Everyone believes that the price of a cell phone will fall next month.
- The price of a call made from a cell phone falls.
- The price of a call made from a land-line phone increases.
- The introduction of camera phones makes cell phones more popular.

1. Explain the effect of each event on the demand for cell phones.
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

Airlines, now flush, fear a downturn
So far this year, airlines have been able to raise fares but still fill their planes.
Source: *The New York Times*, June 10, 2011

MyEconLab
You can work these problems in Study Plan 4.1 and get instant feedback.

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 4.3**

Changes in Demand   MyEconLab Animation
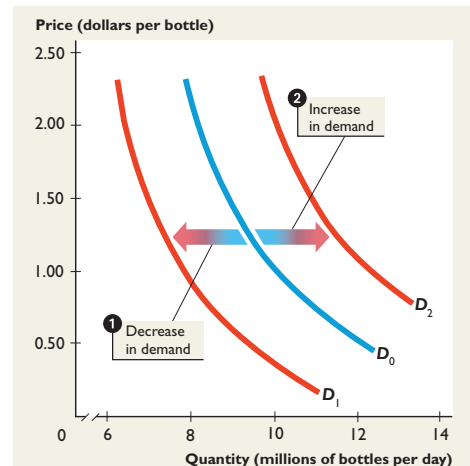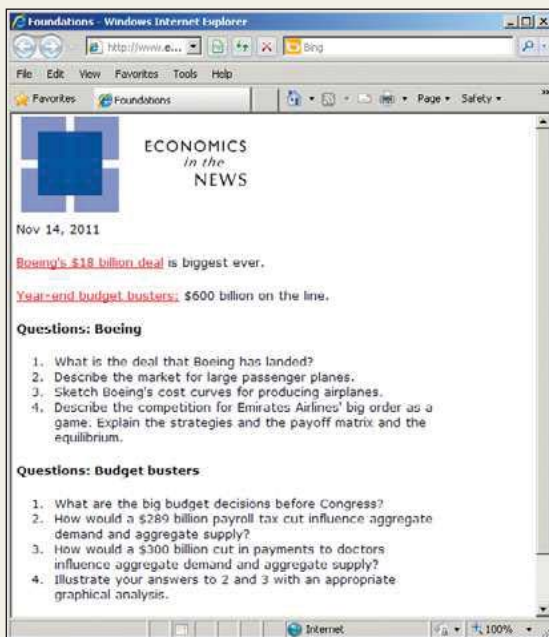
A change in any influence on buying plans, other than a change in the price of the good itself, changes demand and shifts the demand curve.

❶ When demand decreases, the demand curve shifts leftward from D_0 to D_1.

❷ When demand increases, the demand curve shifts rightward from D_0 to D_2.

Real Applications

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

Eye On boxes that build off the chapter opening question help students see the economics behind key issues facing our world.

Economics in the News

MyEconLab

To keep you informed about the latest economic news, each day the authors upload two relevant news articles: a microeconomic topic and a macroeconomic topic. Each article includes discussion questions, links to additional online resources, and references to related textbook chapters.

Practice and Learning Aids in MyEconLab

An end-of-chapter problem based on the chapter-opening issue gives students further practice.

All of the Checkpoint problems are in MyEconLab and available for self-assessment or instructor assignment.

Immediate feedback and problem specific learning aids give students support when they need it most.

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Essential Foundations of
ECONOMICS

Robin Bade

Michael Parkin
University of Western Ontario

SIXTH EDITION

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Many of the designations by manufacturers and sellers to distinguish their products are claimed as trademarks. Where those designations appear in this book, and the publisher was aware of a trademark claim, the designations have been printed in initial caps or all caps.

To Erin, Tessa, Jack, Abby, and Sophie

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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.
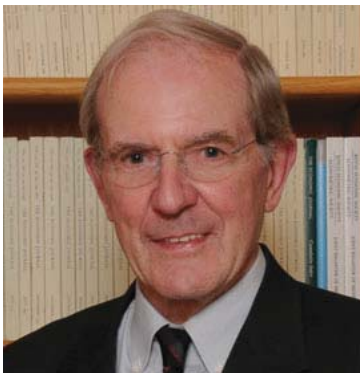
Michael Parkin studied economics in England and began his university teaching career immediately after graduating with a B.A. from the University of Leicester. He learned the subject on the job at the University of Essex, England's most exciting new university of the 1960s, and at the age of 30 became 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_ (Addison-Wesley), now in its Ninth 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 an ever-growing body of students.

Music, the theater, art, walking on the beach, and five fast-growing grandchildren provide their relaxation and fun.

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ECONOMICS

Brief Contents

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Contents

PART 2   A CLOSER LOOK AT MARKETS

PART 3   PRICES, PROFITS, AND INDUSTRY PERFORMANCE

PART 4   MONITORING THE MACROECONOMY

PART 5   UNDERSTANDING THE MACROECONOMY

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 to achieve its goals, 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 SIXTH EDITION

The extraordinary events in the U.S. and global economies provide a rich display of economic forces in action through which students can be motivated to discover the economic way of thinking. The global financial crisis, slump, and faltering recovery; ongoing tensions that result from globalization and international outsourcing; the continued spectacular expansion of China and India in the information-age economy; enhanced concern about climate change; relentless pressure on the federal budget from the demands of an aging population and increased defense and homeland security expenditures; the dilemma posed by slow recovery and rising government debt; and the ever-growing federal budget deficit and national debt are just a few of these interest-arousing events. All of them feature at the appropriate points in our new edition, and the text and examples are all thoroughly updated to reflect the most recently available data and events.

Every chapter contains many small changes, all designed to enhance clarity and currency. We have also made a few carefully selected major changes that we describe below.

■ New Features

We have simplified the chapter openers to grab student attention and provide instant focus for the chapter. Each chapter opens with a question about a central issue that the chapter addresses and is illustrated with a carefully selected photograph. An *Eye On* box returns to and discusses the question and an end-of-chapter problem, that is also in the MyEconLab Homework and Test Manager, makes the issue available for assignment with automatic grading. This feature enables the student to get the point of the chapter quickly; ties the chapter together; and enables the instructor to focus on a core issue in class and for practice.

The Chapter Checkpoint (the last three pages of each chapter) has been thoroughly revised. The first page contains problems and applications for the student to work, which are replicated in the MyEconLab Study Plan. The second page contains problems and applications for the instructor to assign for homework, quiz, or test. Many of these problems and applications are new to the sixth edtion and include mini case studies from recent news stories. The third page contains a short multiple choice quiz. This quiz, also available in MyEconLab for student practice, hits the high points of the chapter and enables students to test themselves on the types of questions they are likely to encounter on tests and exams.

The Checkpoints at the end of each major section of a chapter have been reorganized to separate practice with basic analysis and "In the News" applications. Worked solutions are provided for both types of questions.

■ Major Content Changes in Introductory Chapters

You're in school! Did you make the right decision? Who makes the iPhone? Is wind power free? Why did the price of coffee soar in 2010 and 2011? These are the questions that motivate the four introductory chapters.

We reworked Chapter 1 to strengthen the explanation and illustration of the economic way of thinking by placing the student center stage and focusing on the decision to remain in school or get a full-time job. Our goal is to engage the student from the outset of the course, grab attention, and show the relevance of economics and its place in everyday life. We also revised and improved our explanation of the scientific method in economics.

Chapter 3 has a more gradual and fully illustrated explanation of the mutual gains from trade arising from comparative advantage and a new *Eye On* box on the power of specialization and trade through the classic story of the production of the pencil.

■ Major Content Changes in Micro Chapters (Parts 2 and 3)

What do you do when the price of gasoline rises? Should price gouging be illegal? Can the President repeal the laws of supply and demand? Who wins and who loses from globalization? How can we limit climate change? Does health care need fixing? Which store has the lower costs: Wal-Mart or 7-Eleven? Why did GM fail? Are Microsoft's prices too high? Which cell phone? Are two

computer-chip makers two too few? These are the motivating questions and features of *Eye On* boxes and end-of chapter problems in the 9 micro chapters.

Overall, these chapters have been well-received and positively reviewed, so for the most part we have limited our changes to refinements and updating data and examples. Beyond these many smaller innovations, we have made two larger structural changes.

The first of these is a reorganization of the chapters that deal with externalties, public goods, and common resources. In the fifth edition, we covered public goods and positive externalities on one chapter and negative externalities and common resources in another. In the sixth edition, we have reverted to our earlier organization of this material. Chapter 9 explains all types of externalities. It explains negative externalities, illustrated with pollution, and positive externalities, illustrated with knowledge (education and research). A new *Eye On* features Caroline Hoxby's research on charter schools and vouchers. This chapter also explains health-care markets and public health externalities. The U.S. health-care market is compared with those in other countries and Laurence Kotlikoff's voucher-based "Medicare Part C for All" is described.

■ Major Content Changes in Macro Chapters (Parts 4 and 5)

The macroeconomic events and debates triggered by the 2007 global financial crisis, the 2008–2009 recession, the stubbornly slow recovery, and the headwinds of the European debt problems of 2011 permeate the macro chapters, all of which have been radically updated and revised. Policy features at every possible opportunity throughout these chapters.

How do we track our economy's booms and busts? How long does it take to find a job? Which movie *really* was the biggest box office hit? Why do Americans earn more and produce more than Europeans? Why are some nations rich and others poor? How does the Fed create money and regulate its quantity? Why did the U.S. economy go into recession in 2008? Can fiscal stimulus end a recession? Did the Fed save us from another Great Depression? These are the motivating questions and features of *Eye On* boxes and end-of-chapter problems in the 7 macro chapters.

Our macro coverage, like our micro, has been generally well-received, so again we have limited most of our revision to refining explanations and ensuring that our coverage is thoroughly up-to-date.

Beyond this careful updating and fine-tuning, we have made five more substantial change in the macro chapters. First, in Chapter 17 "Potential GDP and Economic Growth," we have thoroughly revised the section on labor productivity growth. We have built the explanation of the effects on labor productivity around the productivity curve—the relationship between real GDP per hour of labor and capital per hour of labor. This change makes our treatment more mainstream and less reliant on the preceding chapter and potential GDP. It also makes the contrast between the effects of capital accumulation and technological change more vivid.

Second, in Chapter 18 "Money and the Monetary System," we include a description of QE2 and "operation twist."

Third, in Chapter 19 "Aggregate Supply and Aggregate Demand," we have revised and developed a more graphic application section that shows how the

AS-AD model explains economic growth, inflation, and the business cycle. This chapter also has a new explanation of "demand-pull" and "cost-push" inflation cycles. These applications and exercises using the *AS-AD* model provide additional practice in working with the model and show its relevance to the U.S. economy today.

Fourth, in Chapter 20 "Fiscal Policy and Monetary Policy," we have provided a new section that explains the distinction between a structural deficit and a cyclical deficit.

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. In MyEconLab, students have a powerful tool at their fingertips: They can complete all Checkpoint problems online and get instant feedback, work interactive graphs, assess their skills by taking Practice Tests, and receive a personalized Study Plan, and step-by-by help through the feature 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.

The *Eye On* boxes that build off of the chapter-opening question help students see the economics behind key issues facing our world and highlight 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. xxxiii 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 chart identifies 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, and tutorial options, instructors can manage all their assessment needs in one program.

- All of the Checkpoint and Chapter Checkpoint Problems and Applications are assignable and automatically graded in MyEconLab.
- Extra problems and applications, including algorithmic, draw-graph, and numerical exercises are available for student practice or instructor assignment.
- Problems and applications that use real-time data continuously update.
- Test Item File questions are available for assignment as homework.
- Custom Exercise Builder gives instructors the flexibility of creating their own problems for assignment.
- Gradebook records each student's performance and time spent on the Tests and Study Plan and generates reports by student or by chapter.

Real-Time Data   The real-time data problems are new. These problems load the latest available data from FRED, a comprehensive up-to-date data set maintained by the Federal Reserve Bank of St Louis. The questions are graded with feedback in exactly the same way as those based on static data.

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 and students to use.

- Single-player experiments 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.

  For a complete list of available experiments, visit www.myeconlab.com

Economics in the News   Economics in the News is a turn-key solution to bringing daily news into the classroom. Updated daily during the academic year, the authors upload two relevant articles (one micro, one macro) and provide discussion questions.

Videos   A comprehensive suite of ABC news videos, which address current topics such as education, energy, Federal Reserve policy, and business cycles, is available for classroom use. Video-specific exercises are available for instructor assignment.

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.

We are the authors of the MyEconLab content for *Essential Foundations of Economics* and have worked hard to ensure that it is tightly integrated with the book's content and vision. For more information, visit the online demonstration at www.myeconlab.com.

MyEconLab Also Includes

- Enhanced Pearson eText, available within the online course materials and offline via an iPad app, allows instructors and students to highlight, bookmark, and take notes.
- Advanced Communication Tools enable students and instructors communication through email, discussion board, chat, and ClassLive.
- Customization options provide new and enhanced ways to share documents, add content, and rename menu items.
- Prebuilt courses offer a turn-key way for instructors to create a course that includes pre-built assignments distributed by chapter.
- Temporary Access for students who are awaiting financial aid provides a seventeen-day grace period of temporary access.
- One Place for students to access all their MyLab Courses. Students and instructors can register, create, and access all of their courses, regardless of discipline, from one convenient online location: www.pearsonmylab.com.

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 and PowerPoint content, we have helped in the reviewing and revising of the Study Guide, 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.

■ Study Guide

Mark Rush of the University of Florida has prepared the Study Guide, which is available in both print and electronic formats in MyEconLab. It provides an expanded Chapter Checklist that enables the student to break the learning tasks

down into smaller, bite-sized pieces; self-test materials; and additional practice problems. The Study Guide has been carefully coordinated with the text, MyEconLab, and the Test Item Files.

■ Solutions Manual

The Solutions Manual, written by Mark Rush, and checked for accuracy by Jeannie Gillmore, contains the solutions to all the Checkpoint Practice Problems and Chapter Checkpoint Problems and Applications. It is available for download in Word and PDF formats.

■ Instructor's Manual

The Instructor's Manual, written by Luke Armstrong and edited 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. Both the micro and macro portions have been updated to reflect changes in the main text as well as infused with a fresh and intuitive approach to teaching this course. It is available for download in Word and PDF formats.

■ Three Test Item Files and TestGen

More than 7,000 multiple-choice, numerical, fill-in-the-blank, short answer, essay, and integrative questions make up the three Test Item Files that support *Essentials Foundations of Economics.* Mark Rush reviewed and edited questions from four dedicated principles instructors to form one of the most comprehensive testing systems on the market. Our microeconomics authors are Carol Dole (Jacksonville University); Luke Armstrong (Lee College); and Fola Odebunmi (Cypress College). Our macroeconomics questions were written by Carol Dole and Homer Guevara, Jr. (Northwest Vista College).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.

■ PowerPoint Resources

We have created the PowerPoint resources based on our 20 years of experience using this tool in our own classrooms. Six sets of PowerPoint presentations are available:

- 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

- Checkpoint Practice Problems and solutions
- Alternative lecture notes with full-color, animated figures and tables that use examples different from those in the textbook
- Clicker-enabled slides for your Personal Response System. The slides consist of 10 multiple choice questions from the Study Guide for each chapter. You can use these in class to encourage active learning.

■ Instructor's Resource Disk

This disk 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 your convenience, all instructor resources are also available online via our centralized supplements Web site, the Instructor Resource Center (www.pearsonhighered.com/irc). 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 Study Guide, 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, Luke Armstrong, Fola Odebunmi and Homer Guevara, Jr. authored new questions for the Test Item Files.

The ideas that ultimately became *Foundations* 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 has been our ongoing inspiration for more than 10 years. She is the most knowledgeable economics editor in the business, and we are privileged to have the benefit of her enormous experience.

The success of *Foundations* owes much to its outstanding Sponsoring Editor, Adrienne D'Ambrosio. Adrienne's acute intelligence and sensitive understanding of the market have helped sharpen our vision of this text and package. Her value-added on this project is huge. It has been, and we hope it will for many future editions remain, a joy to work with her.

Sarah Dumouchelle, Project Manager, and Elissa Senra-Sargent, Editorial Assistant, ensured that we were provided with outstanding and timely reviews and gave our draft chapters a careful and helpful read and edit.

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

Susan Schoenberg, Media Director, Denise Clinton, Media Publisher, Melissa Honig, Senior Media Producer, and Noel Lotz, MyEconLab Content Lead have set a new standard for online learning and teaching resources. Building on the pioneering work of Michelle Neil, Susan worked creatively to improve our technology systems. Melissa managed the building of MyEconLab, and Noel provided reviews of the content. They have all 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, Project Manager, 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 Executive Marketing Manager, Lori DeShazo, has been a constant source of good judgment and sound advice on content and design issues, ranging over the entire package from text to print and electronic supplements. Dave Theisen reviewed our previous edition and gave excellent advice (much of which we have taken) on areas that needed adjusting to achieve the clarity that we seek.

Richard Parkin, our technical illustrator, created the figures in the text, the dynamic figures in the eText, and the animated figures in the PowerPoint presentations and contributed many ideas to improve the clarity of our illustrations. Laurel Davies provided painstakingly careful work on MyEconLab questions and acted as one of its accuracy checkers.

Jeannie Gillmore, our personal assistant, worked closely with us in creating MyEconLab exercises and guided solutions.

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.

Robin Bade
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michael.parkin@uwo.ca

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ESSENTIAL FOUNDATIONS OF ECONOMICS: FLEXIBILITY CHART

Flexibility

Chapter 1

Getting Started

Chapter 2

The U.S. and Global Economies

Chapter 3

The Economic Problem

Chapter 4

Demand and Supply

Chapter 5

Elasticity

Chapter 6

Efficiency and Equity

Chapter 7

Government Actions in Markets

Chapter 8

Global Markets in Action

Chapter 9

Externalities: Pollution, Education, and Health Care

Chapter 10

Production and Costs

Chapter 11

Perfect Competition

Chapter 12

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Chapter 13

Monopolistic Competition and Oligopoly

Chapter 14

GDP: A Measure of Total Production

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Chapter 17

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Chapter 18

Money and the Monetary System

Chapter 19

Aggregate Supply and Aggregate Demand

Chapter 20

Fiscal Policy and Monetary Policy

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Getting Started

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.

1

CHAPTER CHECKLIST

1.1   DEFINITION AND QUESTIONS

We all want more than we can get. We want good health and long lives. We want spacious and comfortable homes. We want running shoes and jet skis. We want the time to enjoy our favorite sports, video games, novels, music, and movies; to travel to exotic places; and just to hang out with friends. Human wants exceed the resources available to satisfy them, and this fact is the source of all economic questions and problems.

■ 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 Beyonce's latest album and a paperback but has only $10.00 in his pocket. He faces scarcity. Brad Pitt wants to spend a week in New Orleans discussing plans for his new eco-friendly housing and he also wants to spend the week promoting his new movie. He faces scarcity. The U.S. government wants to increase defense spending and cut taxes. It faces scarcity. An entire society wants improved health care, an Internet connection in every classroom, an ambitious space exploration program, clean lakes and rivers, and so on. Society faces scarcity.

Faced with scarcity, we must make choices. We must choose among the available alternatives. The student must choose the album or the paperback. Brad Pitt must choose New Orleans or promoting his new movie. The government must choose defense or tax cuts. And society must choose among health care, computers, space exploration, the environment, and so on. Even parrots face scarcity!

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

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■ Economics Defined

Economics
The social science that studies the choices that individuals, businesses, governments, and entire societies make as they cope with *scarcity*, the *incentives* 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*, the *incentives* 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 television 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? Are MP3 downloads killing CDs?

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 2010 and 2011? Why are incomes growing much faster in China and India than in the United States? Why are production and incomes stagnating in Japan? Why are Americans borrowing more than $2 billion a day from the rest of the world?

Two big questions provide a useful summary of 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*?

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.

■ 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. Running 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 health care 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 health-care services we produce? Sixty years ago, 25 percent of Americans worked on a farm. That number has shrunk to less than 3 percent today. Over the same period, the number of people who produce goods—in mining, construction, and manufacturing—has also shrunk, from 30 percent to 20 percent. The decrease in farming and the production of goods is matched by an increase in the production of services. 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, 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 that a hundred grape pickers in France do. Look around you 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. GM hires workers to weld auto bodies in some of its plants and uses robots to do the job in others.

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.

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

For Whom?

For whom are goods and services produced? The answer to this question 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 the 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 get produced. In answering these questions, we have a deeper agenda in mind. We're not interested in just knowing how many Blu-ray players get produced, how they get 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.

■ When Is the Pursuit of Self-Interest in the Social Interest?

Every day, you and 311 million other Americans, along with 7 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? Do the scarce resources get used in the best possible way? Do the goods and services that we produce go to the people 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 makes most sense to you. But you don't think much about how your choices affect other people. You order a home delivery pizza because you're hungry and want to eat. You don't order it thinking 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, everyone else makes 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.

Could it be possible that when each one of us makes choices that are in our own best interest—our self-interest—it turns out that these choices are also the best for society as a whole—in 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 Age
- Climate change
- A Social Security time bomb

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 accelerated. Microchips, satellites, and fiber-optic cables have lowered the cost of communication. A video-conference of people who live 10,000 miles apart has become an everyday and easily affordable event.

This explosion of communication has globalized production decisions. When Nike produces more sports shoes, people in Malaysia get more work. When Steven Spielberg wants an animation sequence for a new movie, programmers in New Zealand write the code. And when China Airlines wants a new airplane, Americans who work for Boeing build it.

Globalization is bringing rapid income growth, especially in Asia. China, already the world's second largest economy, will become the largest in the 2020s.

But globalization is leaving some people behind. Jobs in manufacturing and routine services are shrinking in the United States and Europe. And the nations of Africa and parts of South America are not sharing in the prosperity that globalization is bringing to other parts of the world.

Workers in Asia make our shoes.

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 just benefit some at the expense of others?

The Information Age

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* that occurred around 1800 and the *Agricultural Revolution* of 12,000 years ago.

The changes that occurred during the last 25 years were based on one major technology: the microprocessor or computer chip. The spin-offs from faster and

The computer chip has transformed our lives.

cheaper computing have been widespread in telecommunications, music and movie recording, and the automation of millions of routine tasks that previously required human decision and action. You encounter these automated tasks every day when you check out at the grocery store, use an ATM, or call a government department or large business. All the new products and processes and the low-cost computing power that made them possible resulted from people pursuing their self-interest. They did not result from any grand design or government plan.

When Gordon Moore set up Intel and started making chips, and Bill Gates quit Harvard to set up Microsoft, they weren't thinking how much easier it would be for you to turn in your essay on time if you had a better computer. Moore and Gates and thousands of other entrepreneurs were in hot pursuit of the big payoffs that many of them achieved. Yet their actions made many other people better off. They advanced the social interest.

But were resources used in the best possible way? Or did Intel and Microsoft set their prices too high and put their products out of reach for too many people? And did they really need to be rewarded with billions of dollars?

Climate Change

Human activity is raising the Earth's 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 choices that each of us makes to use energy 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?

A Social Security Time Bomb

A Social Security time bomb is ticking as benefits grow faster than contributions.

Every year since 2001, the U.S. government has run a budget deficit. On average, the government has spent $1.8 billion a day more than it has received in taxes. The government's debt has increased each day by that amount. Over the ten years 2002 through 2011, government debt increased by $6.5 trillion. Your personal share of this debt is $21,600.

Also, since 2001, Americans bought goods and services from the rest of the world in excess of what foreigners have bought from the United States to the tune of $5.7 trillion. To pay for these goods and services, Americans borrowed from the rest of the world.

These large deficits are just the beginning of an even bigger problem. From about 2019 onwards, the retirement and health-care benefits to which older Americans are entitled are going to cost increasingly more than current taxes can cover. With no changes in taxes or benefit rates, the deficit and 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 and our choices to buy from or sell to the rest of the world, we pursue our self-interest. Do our choices serve the social interest?

We'll return to all these questions at various points throughout this text.

CHECKPOINT 1.1

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. According to the Bureau of Labor Statistics (BLS), high-paying jobs in health care 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. In May 2011, businesses cut hiring because higher prices of gas pushed up costs and higher food prices forced consumers to cut spending.
   Source: CNNMoney, June 4, 2011

   Did businesses and consumers act in their self-interest or the social interest?

Solutions to Practice Problems

1. The fact is scarcity—human wants exceed the resources available.
2. Security from international terrorism, cleaner air in our cities, better public schools. (You can perhaps think of some more.)
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 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 goods and services produced by workers in health care, leisure, hospitality, and education to increase. For whom goods and services are produced are the people who work in these expanding industries.
2. Businesses made their decisions on the basis of their costs, so they acted in their self-interest. Consumers' decisions to cut spending was made on the basis of the prices they face, so they acted in their self-interest.

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.

■ Economic Ideas

Six ideas define the *economic way of thinking*:

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

■ A Choice Is a Tradeoff

Because we face scarcity, we must make choices. And when we make a choice, we select from the available alternatives. For example, you can spend Saturday 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.

You can think about your choices as tradeoffs. A **tradeoff** is an exchange—giving up one thing to get something else. When you choose how to spend your Saturday night, you face a tradeoff between studying and hanging out with your friends.

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

■ Rational Choice

The most 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.

Only the wants and preferences of the person making a choice are relevant to determine its rationality. 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 event. 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.

The idea of rational choice provides an answer to the first economic question: What goods and services will be produced and in what quantities? The answer is: The goods and services that people rationally choose to buy.

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? Why have most people chosen to buy Microsoft's Windows operating system rather than another? Why do more people today choose an iPhone rather than a BlackBerry? Why has the U.S. government chosen to fund the building of an interstate highway system and not an interstate high-speed railroad system?

The answer is that we make rational choices by comparing *benefits* and *costs.*

■ Benefit: What You Gain

The **benefit** from something is the gain or pleasure that it brings and 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 "Guitar Hero," 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.

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 to be in school. But you would give up only an iTunes download for a slice of pizza.

Benefit
The benefit of something is the gain or pleasure that it brings.

■ Cost: What You *Must* Give Up

The **opportunity cost** of something is the best alternative that must be given up to get it.

To make the idea of opportunity cost concrete, think about your opportunity cost of being in school. It has two components: the things you can't afford to buy and the 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 at Citibank as a teller

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

For these students, the opportunity cost of being in school is worth bearing.

For the full-time bank teller, the opportunity cost of remaining in school is too high.

earning $24,000 a year. Another part of your opportunity cost of being in school is all the things that you could buy with that extra $24,000.

As you well know, being a student eats up many hours in class time, doing homework assignments, preparing for tests, and so on. To do all these school activities, you must give up many hours of what would otherwise be leisure time spent with your friends.

So the opportunity cost of being in school is the best alternative things that you can't afford and don't have the spare time to enjoy. You might want to put a dollar value on that cost or you might just list all the items that make up the opportunity cost.

The examples of opportunity cost that we've just considered are *all-or-nothing costs*—you're either in school or not in school. Most situations are not like this one. They involve choosing *how much* of an activity to do.

■ How Much? Choosing at the Margin

You can allocate the next hour between studying and instant messaging 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*.

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

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 for two movies, so you don't count that cost as resulting from the 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

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.

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

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.

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.

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? If the marginal cost of the movie is less than the marginal benefit from it, your rational choice will be to see the third movie. If the marginal cost exceeds the marginal benefit, your rational choice will be to spend the evening studying. As long as the marginal benefit from something exceeds or equals its marginal cost, our choice is rational and our scarce resources are used to make us as well off as possible.

■ 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 had a movie feast. 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, your grade on next week's 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.

■ Economics as 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.

A scientist begins with a question or a puzzle 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 some third factor causing both the price of a computer to fall and the quantity of computers bought to increase?

Economic Models

Economic model
A description of some feature of the economic world that includes only those features assumed necessary to explain the observed facts.

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 some feature of the economic world that includes only those features assumed necessary to explain the observed facts.

A model is analogous to 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 telephone engineer who is wanting to fix a broken connection, you use a map of the wires and tubes under the streets.

Sometimes, in the natural sciences, models are physical objects such as a plastic model of an atom or DNA. But models are also mathematical and often can be visualized in graphs. You can imagine a Lego model of an economy but you can also see that such a model wouldn't be very revealing. So in economics we use mathematical and graph-based models.

The questions we posed about the price and quantity of computers are answered by an economic model called the "demand and supply model" that you will study in Chapter 4.

Check Models Against Facts

A scientist's third step is to check the proposed model against the facts. Physicists can 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 an economic model against the facts, economists use natural experiments, statistical investigations, and economic 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.

Correlation
The tendency for the values of two variables to move together in a predictable and related way.

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 does cause lung cancer. But sometimes the direction of causation is hard to determine.

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 Kirkcaldy, a small fishing town near Edinburgh, Scotland, Smith was the only child of the town's customs officer. Lured from his professorship (he was a full professor at 28) by a wealthy Scottish duke who gave him a pension of £300 a year—ten times the average income at that time—Smith devoted ten years to writing his masterpiece, *An Inquiry into the Nature and Causes of the Wealth of Nations,* published in 1776.

Why, Adam Smith asked in that book, are some nations wealthy while others are poor? He was pondering these questions at the height of the Industrial Revolution. During these years, new technologies were applied to the manufacture of textiles, iron, transportation, and agriculture.

Adam Smith answered his questions by emphasizing the role of the division of labor and free markets. 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 those same hand tools but breaking the process into a number of individually small operations in which people specialize—by the division of labor—ten people could make a staggering 48,000 pins a day. One draws out the wire, another straightens it, a third cuts it, a fourth points it, a fifth grinds it. Three specialists make the head, and a fourth attaches it. Finally, the pin is polished and packaged.

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!

An economic experiment puts people in a decision-making situation and varies the influence of one factor at a time to discover how they respond.

Disagreement: Normative versus Positive

Economists sometimes disagree about assumptions and models. They also sometimes disagree about what policy should be followed. Some disagreements can be settled by appealing to further facts, but others cannot.

Disagreements that can't be settled by facts are *normative statements*—statements about what *ought to be.* These statements depend on values and cannot be tested. The statement "We *ought to* cut back on our use of coal" is a normative statement. 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 statements*—statements about *what is.* A positive statement might be right or wrong and we can discover which by careful observation of facts. "Our planet is warming because of the quantity of coal that we're burning" is a positive statement. It could be right or wrong, and it can be tested.

◼ Economics as Policy Tool

Economics is useful, and you don't have to be an economist to think like one and to use the insights of economics as a policy tool. The subject provides a way of approaching problems in all aspects of our lives:

- Personal
- Business
- Government

Personal Economic Policy

Should you take out a student loan? Should you get a weekend job? Should you buy a used car or a new one? Should you rent an apartment or take out a loan and buy a condominium? Should you pay off your credit card balance or make just the minimum payment? How should you allocate your time between study, working for a wage, caring for family members, and having fun? How should you allocate your time between studying economics and your other subjects? Should you leave school after getting a bachelor's degree or should you go for a master's or a professional qualification?

All these questions involve 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 Economic Policy

Should Sony make only flat panel televisions and stop making conventional ones? Should Texaco get more oil and gas from the Gulf of Mexico or from Alaska? Should Palm outsource its online customer services to India or run the operation from California? Should Marvel Studios produce *Spider-Man 4,* a sequel to *Spider-Man 3*? Can Microsoft compete with Google in the search engine business? Can eBay compete with the surge of new Internet auction services? Is Alex Rodriguez really worth $32,000,000 to the New York Yankees?

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

Government Economic Policy

How can California balance its budget? Should the federal government cut taxes or raise them? How can the tax system be simplified? Should people be permitted to invest their Social Security money in stocks that they pick themselves? Should Medicaid and Medicare be extended to the entire population? 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 tomatoes and sugar beets receive a subsidy? Should water be transported from Washington and Oregon to California?

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.

Notice that all the policy questions we've just posed involve a blend of the positive and the normative. Economics can't help with the normative part—the objective. But for a given objective, economics provides a method of evaluating alternative solutions. That method is to evaluate the marginal benefits and marginal costs and to find the solution that brings the greatest available gain.

EYE on the BENEFIT AND COST OF SCHOOL
Did You Make the Right Decision?

Did you make the right decision when you chose school over looking for 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 but 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.

On average, a high-school graduate earns $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 costs of being in school for a full-time student are:

- Tuition
- Books
- Other study costs
- Forgone earnings

For a student in state university in her or his home state, tuition runs at around $7,000 per year.

Books and other study costs run at around $1,000 per year.

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

So the total annual cost is about $32,000 or $96,000 for a 3-year degree and $128,000 for a 4-year degree.

Benefit-Cost Balance

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.

The costs are incurred in the present and the benefits accrue in the future, so we need to lower the benefits to be able 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 now and the benefits in the future, the net gain is big!

Is School Always Best?

Alex Rodriguez, the highest earning baseball player ($32,000,000 in 2011) ever, turned down a scholarship at the University of Miami and chose instead to sign with the Seattle Mariners right out of high school. With a 0.311 batting average, he quickly rose through the player ranks and played his first Major League game at the age of 18.

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

CHECKPOINT 1.2

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 a valuable and necessary part of it.

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 chose to take a cruise.

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. People make *rational* choices by comparing benefits and costs .
  3. *Benefit* is what you gain when you get something (measured by what you *are willing to* give up to get it).
  4. *Cost* is what you *must* give up to get something.
  5. A "how much" choice is made on the *margin* by comparing *marginal benefit* and *marginal cost*.
  6. Choices respond to *incentives*.
- 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 economic experiments.
- Economics is a tool for personal, business, and government decisions.

Key Terms

Benefit, 9
Correlation, 12
Economic model, 12
Economics, 2
Goods and services, 3
Incentive, 11

Macroeconomics, 3
Margin, 10
Marginal benefit, 10
Marginal cost, 10
Microeconomics, 2
Opportunity cost, 9

Rational choice, 8
Scarcity, 2
Self-interest, 4
Social interest, 4
Tradeoff, 8

LIST 1

- Local car sales in India grow at their slowest pace in two years.
- Coffee prices rocket.
- Globalization has reduced African poverty.
- The government must cut its deficit.
- Apple sells 2 million iPhones a month.

 # CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. Provide three examples of scarcity that illustrate why even the 1,210 billion-aires 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.

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

The Social Network had world-wide box office receipts of $225 million. The movie had a production budget of about $70 million and additional marketing costs of about $50 million. Creating a successful movie brings pleasure to millions, generates work for thousands, and makes a few rich.

3. What contribution does a movie like *The Social Network* make to coping with scarcity? When you buy a ticket to see a movie in a theater, 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 Jesse Eisenberg had been offered a bigger and better part in another movie and that to hire him for *The Social Network,* the producer had to double Jesse's pay. What incentives would have changed? How might the changed incentives have changed the choices that people made?

7. 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?

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

9. 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.

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

Hundreds line up for 5 p.m. Eminem ticket giveaway

Hundreds of Eminem fans lined up to get a free ticket to the rapper's secret concert. Although tickets would be released at 5 p.m., people lined up all day. Eminem will release his new album *Relapse* (his first in 5 years) on the same day.

Source: *Detroit Free Press*, May 18, 2009

10. Eminem is giving away tickets to his show in a 1,500-seat theater in Detroit. What is free and what is scarce? Explain your answer.

11. What do you think Eminem's incentive is to give a free show? Was his decision made in self-interest or in the social interest? Explain.

12. Because all the tickets were free, was the marginal benefit from the concert zero? Explain your answer.

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 population of rural United States is declining.

Instructor Assignable Problems and Applications

1. Which of the following are components of the opportunity cost of being a full-time student? The cost of:
- Tuition and books
- Residence and a meal plan
- A subscription to the *New Yorker* magazine
- The income a 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.
- Health-care professionals and drug companies recommend that Medicaid drug rebates be made available to everyone in need.
- A doubling of the gas tax might lead to a better public transit system.

3. On Friday June 16, 2011, 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 two examples of monetary and two examples of non-monetary incentives, a carrot and a stick of each, that government policies 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 each of a student, a business, and a government. Classify your examples as dealing with microeconomic topics and macroeconomic topics.

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

Obama will drive up miles-per-gallon requirements

Obama's revision of auto-emission and fuel-economy standards will require automakers to boost fuel economy to 35.5 miles per gallon by 2016, notching up 5% each year from 2012, to limit the amount of carbon dioxide cars can emit.

Source: *USA Today*, May 18, 2009

9. What are two benefits of the new miles-per-gallon requirements? Are these benefits in someone's self-interest or in the social interest?

10. What are two benefits of the new auto-emission standards?

11. What costs associated with the new miles-per-gallon requirements arise from decisions made in self-interest and in the social interest?

12. What costs associated with the new auto-emission standards arise from decisions made in self-interest and in the social interest?

LIST 1
- Apple Opens Locker for Songs.
- U.S. Household Debt Falls.
- Indian Carriers Set to Order 60 Airbus Planes.
- U.S. Trade Gap Narrows.

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.

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 2 hours a night for a month
B. The best things forgone by studying 2 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 cell phone 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

2 Ice cream consumption (gallons per day)

4 20 gallons a day at 80°F

B

3 5 gallons a day at 40°F

A

1 Temperature (degrees F)
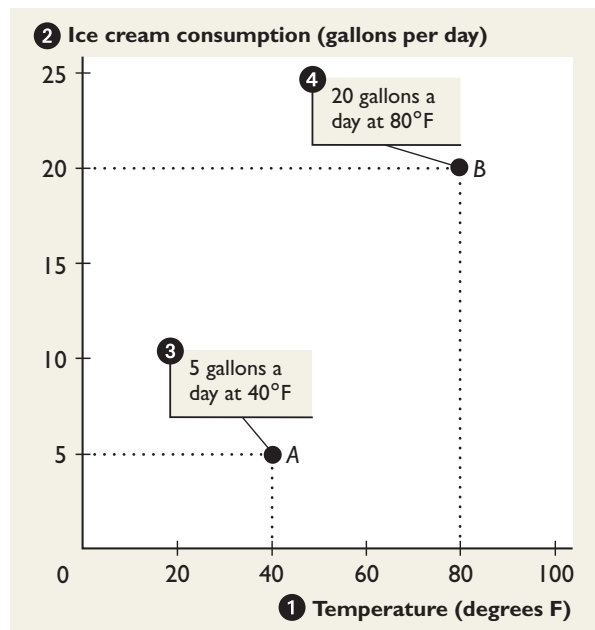
All graphs have axes that measure quantities as distances.

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 2010. The points are "scattered" within the graph. The label on each point shows its year. The point marked 04 shows that in 2004, income per person was $28,990 and expenditure per person was $27,401. This scatter diagram reveals that as income increases, expenditure also increases.

Figure A1.2(b) shows the relationship 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 2010. 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 2008. When the line is close to the *x*-axis, the price is low, as it was in 1993.
2. Rising or falling. When the line slopes upward, as in 1994, the price is rising. When the line slopes downward, as in 1998, 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 1994 and slowly in 1984. The price fell quickly in 1998 and slowly in 2003.

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 rise from 1980 to the late 1990s. That is, although the price rose and fell, it had a general tendency to rise.

With a time-series graph, we can compare different periods quickly. Figure A1.2(c) shows that the period after 1990 was different from the period before 1990. The price of coffee jumped during the early 1990s, remained high for a number of years, then fell quickly before rising again to a new high. This graph conveys a wealth of information, 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

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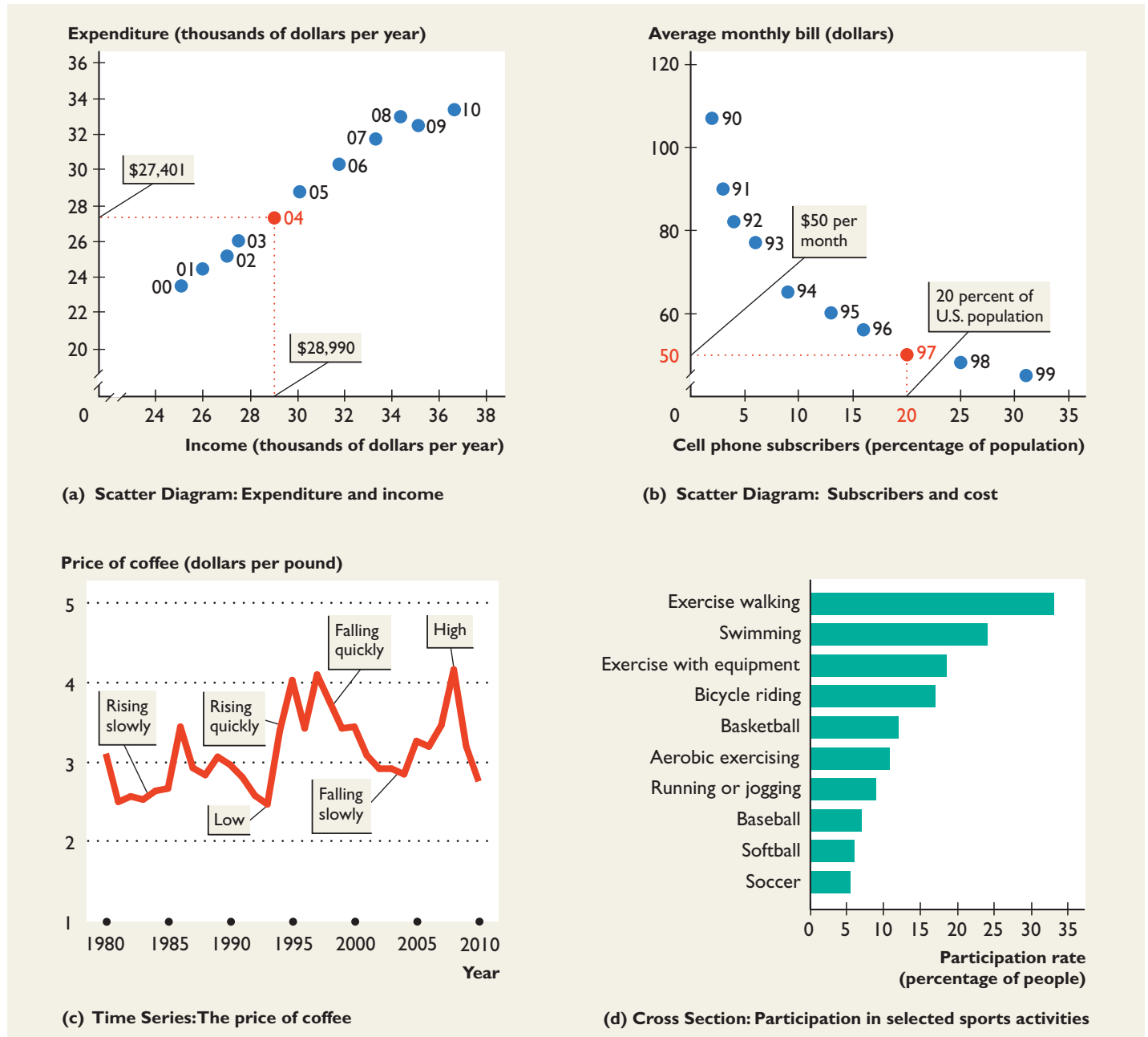
A scatter diagram reveals the relationship between two variables. In part (a), as income increases, expenditure almost always increases. In part (b), as the monthly cell phone bill falls, the percentage of people who own a cell phone increases.

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 2010. 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.

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

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**

Positive (Direct) Relationships

MyEconLab Animation

(a) **Positive linear relationship**

(b) **Positive becoming steeper**

(c) **Positive becoming less steep**
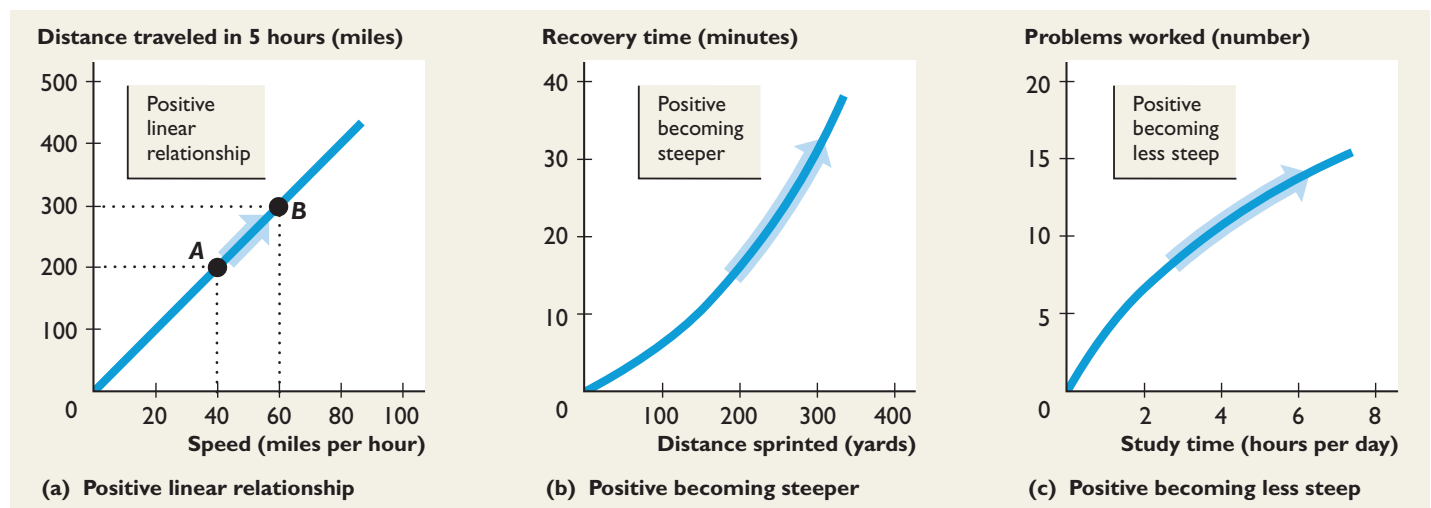
Part (a) shows that as speed increases, the distance traveled in a given number of hours increases along a straight line.

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

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**.

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.

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

FIGURE A1.4

Negative (Inverse) Relationships   MyEconLab Animation

(a) **Negative linear relationship**

(b) **Negative becoming less steep**

(c) **Negative becoming steeper**
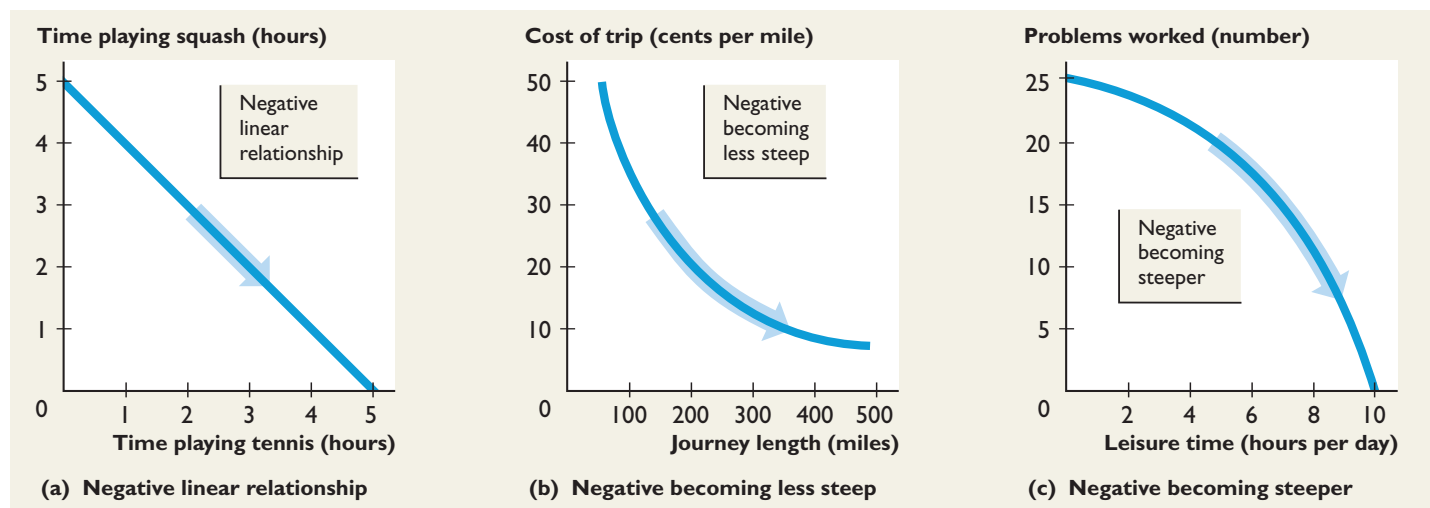
Part (a) shows that as the time playing tennis increases, the time playing squash decreases along a straight line.

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

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

In part (a), as the rainfall increases, the curve **1** slopes upward as the yield per acre rises, **2** is flat at point *A*, the maximum yield, and then **3** slopes downward as the yield per acre falls.

In part (b), as the speed increases, the curve **1** slopes downward as the cost per mile falls, **2** is flat at the minimum point *B*, and then **3** slopes upward as the cost per mile rises.

Wheat yield (bushels per acre)

2 Maximum yield
A
1 Yield rising
3 Yield falling

Rainfall (days per month)

(a) Relationship with a maximum

Gasoline cost (cents per mile)

1 Cost falling
3 Cost rising
2 Minimum cost
B

Speed (miles per hour)

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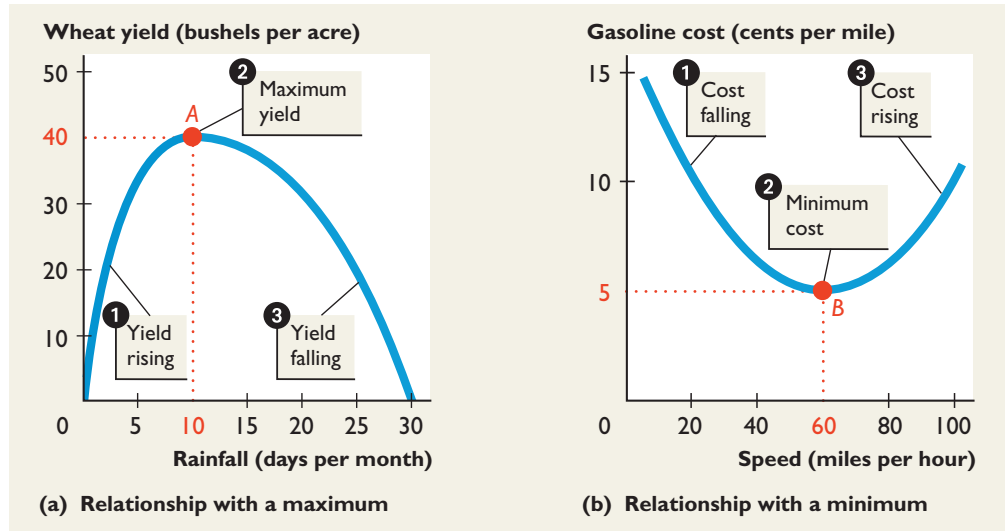
Part (a) shows a relationship that starts out sloping upward, reaches a maximum, and then slopes downward. Part (b) shows a relationship that begins sloping downward, falls to a minimum, and then slopes upward.

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

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.

Grade in economics (percent)

Unrelated: *y* constant

Price of bananas (cents per pound)

(a) Unrelated: *y* constant

Rainfall in California (days per month)

Unrelated: *x* constant

Output of French wine (billions of gallons)

(b) Unrelated: *x* constant
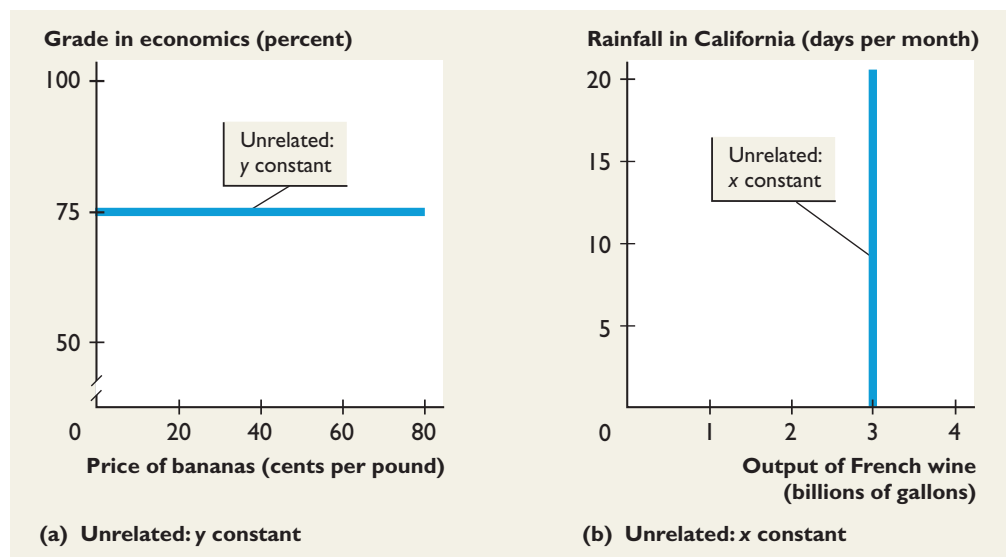
■ The Slope of a Relationship

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

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

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.

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.

■ **FIGURE A1.7**

Calculating Slope   MyEconLab Animation

(a) **Positive slope**

(b) **Negative slope**

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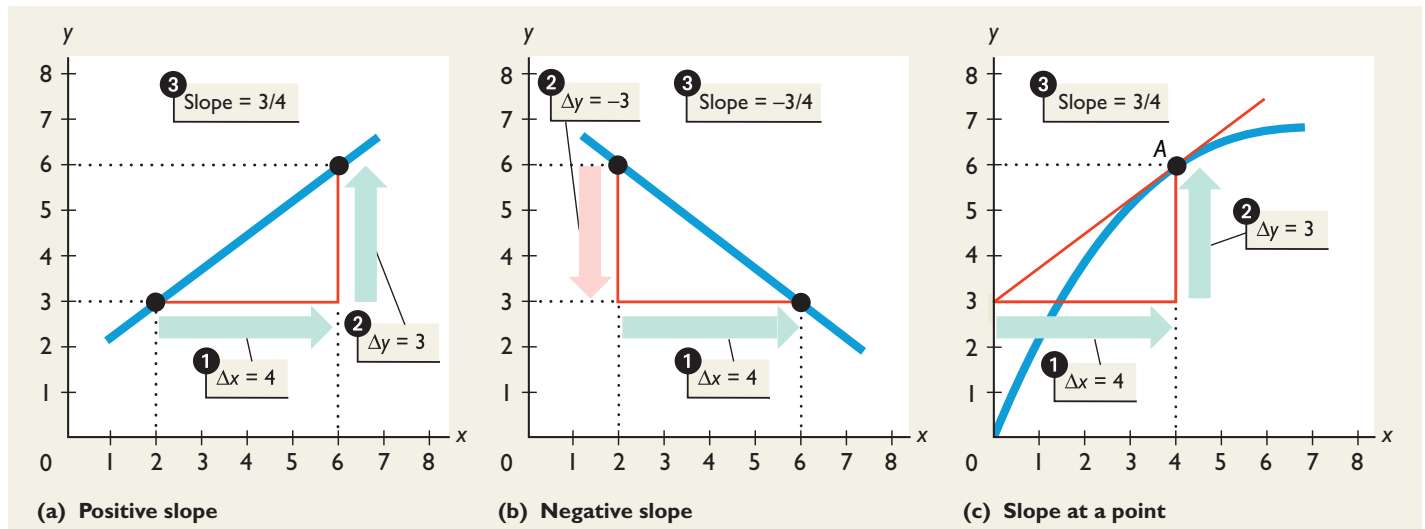
In part (a), ❶ when Δx is 4, ❷ Δy is 3, so ❸ the slope ($\Delta y \div \Delta x$) is 3/4.

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

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 70°F shows the relationship between ice cream consumption and the price of ice cream if the temperature is 70°F. The numbers used to plot that curve are those in the first and fourth columns of the table in Figure A1.8. For example, if the temperature is 70°F, 10 gallons are consumed when the price is $2.75 a scoop and 18 gallons are consumed when the price is $2.25 a scoop. The curve labeled 90°F shows the relationship between consumption and the price when the temperature is 90°F.

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 $2.75 shows how the consumption of ice cream varies with the temperature when the price of ice cream is $2.75 a scoop. The numbers used to plot that curve are those in the fourth row of the table in Figure A1.8. For example, at $2.75 a scoop, 10 gallons are consumed when the temperature is 70°F and 20 gallons are consumed when the temperature is 90°F. A second curve shows the relationship when the price of ice cream is $2.00 a scoop.

Figure A1.8(c) shows the combinations of temperature and price that result in a constant consumption of ice cream. One curve shows the combinations that result in 10 gallons a day being consumed, and the other shows the combinations that result in 7 gallons a day being consumed. A high temperature and a high price lead to the same consumption as a lower temperature and a lower price. For example, 10 gallons of ice cream are consumed at 90°F and $3.25 a scoop, at 70°F and $2.75 a scoop, and at 50°F and $2.50 a scoop.

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
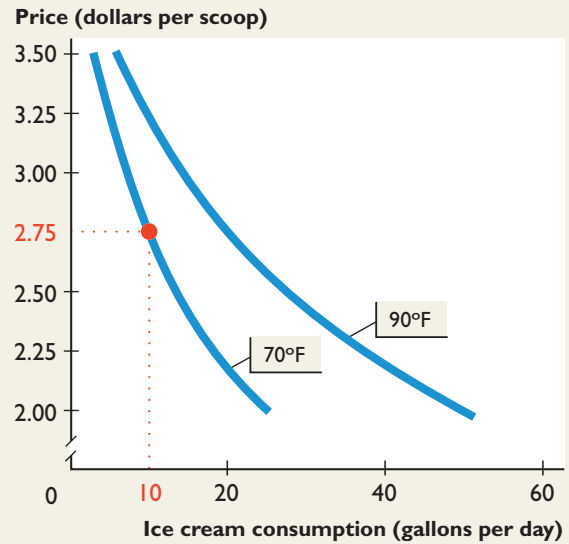
(a) Price and consumption at a given temperature
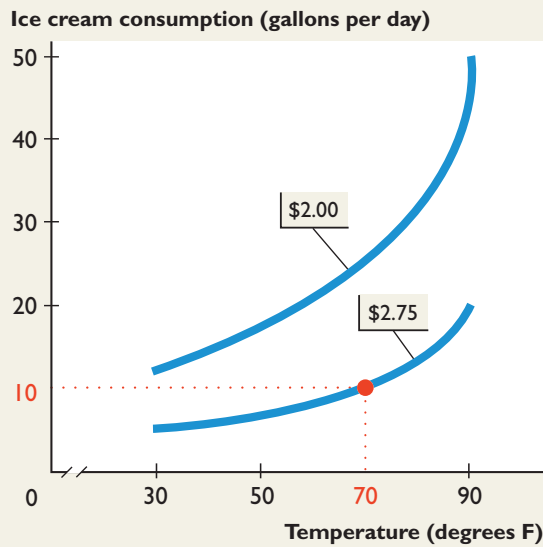
(b) Temperature and consumption at a given price
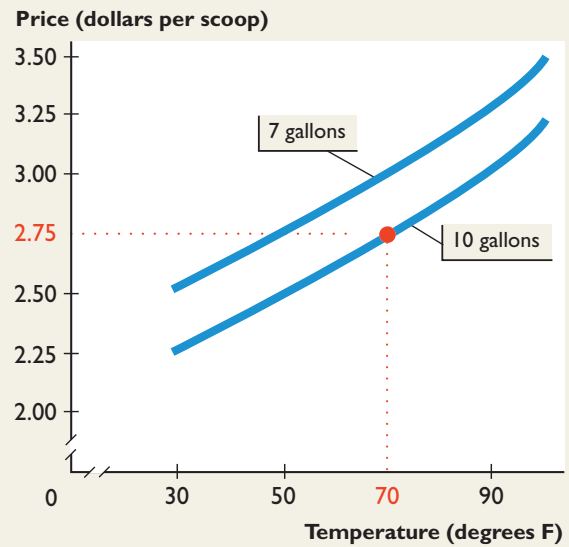
(c) Temperature and price at a given consumption

The table tells us how many gallons of ice cream are consumed at different prices and different temperatures. For example, if the price is $2.75 a scoop and the temperature is 70°F, 10 gallons of ice cream are consumed. This set of values is highlighted in the table and each part of the figure.

Part (a) shows the relationship between price and consumption when temperature is held constant. One curve holds temperature at 90°F, and the other at 70°F.

Part (b) shows the relationship between temperature and consumption when price is held constant. One curve holds the price at

$2.75 a scoop, and the other at $2.00 a scoop.

Part (c) shows the relationship between temperature and price when consumption is held constant. One curve holds consumption at 10 gallons a day, and the other at 7 gallons a day.

TABLE 1

	A	B	C	D
1	2000	943	18	19
2	2002	803	15	51
3	2004	767	33	139
4	2006	620	23	586
5	2008	385	13	1,033
6	2010	226	9	1,162

TABLE 2

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

TABLE 3

Price (dollars per cup)	Hot chocolate (number 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

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**.

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. The following data shows the relationship between two variables x and y.

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

   Is the relationship between x and y 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 2 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

Use the following 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.

Use the following data on the relationship between two variables x and y to work Problems **3** and **4**.

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

3. Is the relationship between x and y positive or negative? Explain.

4. Calculate the slope of the relationship when x equals 2 and x equals 4. How does the slope change as the value of x increases?

5. Table 3 provides data on the price of hot chocolate, the temperature, and the number of cups a week. Draw graphs to show the relationship between

   • The price and the number of cups of hot chocolate, when the temperature is constant.

   • The temperature and the number of cups of hot chocolate, when the price is constant.

The U.S. and Global Economies

2

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 Use the circular flow model to provide a picture of how households, firms, and governments interact in the U.S. economy and how the U.S. and other economies interact in the global economy.

2.1   WHAT, HOW, AND FOR WHOM?

Walk around a shopping mall and pay close attention to the range of goods and services that are being offered for sale. Go inside some of the shops and look at the labels to see where various items are manufactured. The next time you travel on an interstate highway, look at the large trucks and pay attention to the names and products printed on their sides and the places in which the trucks are registered. Open the Yellow Pages and flip through a few sections. Notice the huge range of goods and services that businesses are offering.

You've just done a sampling of *what* goods and services are produced and consumed in the United States today.

■ What Do We Produce?

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

- Consumption goods and services
- Capital goods
- Government goods and services
- Export goods and services

Consumption goods and services are items that are bought by individuals and used to provide personal enjoyment and contribute to a person's quality of life. They include items such as housing, SUVs, bottled water and ramen noodles, chocolate bars and Po' Boy sandwiches, movies, downhill skiing lessons, and doctor and dental services.

Capital goods are goods that are bought by businesses to increase their productive resources. They include items such as auto assembly lines, shopping malls, airplanes, and oil tankers.

Government goods and services are items that are bought by governments. Governments purchase missiles and weapons systems, travel services, Internet services, police protection, roads, and paper and paper clips.

Export goods and services are items that are produced in one country and sold in other countries. U.S. export goods and services include the airplanes produced by Boeing that Singapore Airlines buys, the computers produced by Dell that Europeans buy, and licenses sold by U.S. film companies to show U.S. movies in European movie theaters.

Of the four groups of goods and services that we've just defined, consumption goods and services have the largest share and a share that doesn't fluctuate much. The volume of capital goods produced fluctuates as the economy cycles from boom to recession. Goods and services bought by governments are close to a fifth of total production and export goods around one tenth.

Breaking the goods and services down into smaller categories, health services is the largest category, with 17 percent of the value of total production. Real estate services come next at 12 percent. The main component of this item is the services of rental and owner-occupied housing. Education is the next largest service, followed by retail and wholesale trades and transportation and storage.

The categories of goods production are smaller than those of services. The largest category of goods—construction—accounts for only 4 percent of the value of total production, and the next three—utilities, food, and chemicals—each accounts for 2 percent or less.

Consumption goods and services
Goods and services that are bought by individuals and used to provide personal enjoyment and contribute to a person's quality of life.

Capital goods
Goods that are bought by businesses to increase their productive resources.

Government goods and services
Goods and services that are bought by governments.

Export goods and services
Goods and services that are produced in one country and sold in other countries.

EYE on the U.S. ECONOMY
What We Produce

In 2011, consumption goods and services accounted for 61 percent of total production, both capital goods and export goods and services accounted for 11 percent, and government goods and services for 17 percent.

Health-care and real estate services, education, retail and wholesale trades, and transportation and storage are the six largest services produced. Construction, utilities, food, and chemicals are the largest categories of goods produced.

The production of services greatly exceeds goods production and is growing faster.

Health-care services …

education services …

retail trades …

Consumption goods and services (61%)

Capital goods (11%)

Export goods and services (11%)

Government goods and services (17%)

(a) The broad categories

Services
Health
Real estate
Education
Retail trades
Wholesale trades
Transportation and storage

Goods
Construction
Utilities
Food
Chemicals

0   5   10   15   20
Percentage of total production

(b) Some of the details

and chemicals are among the largest categories of goods and services produced.
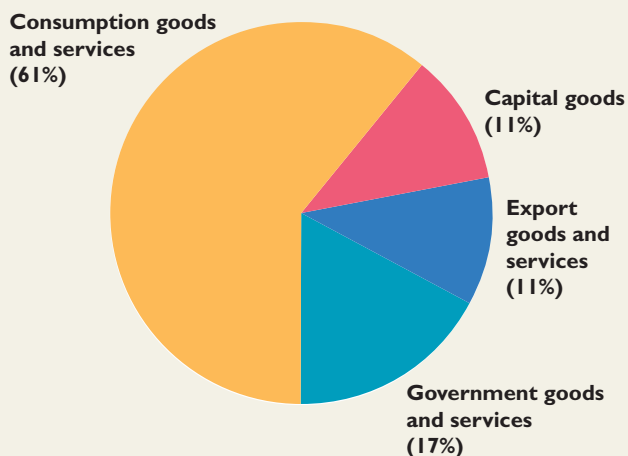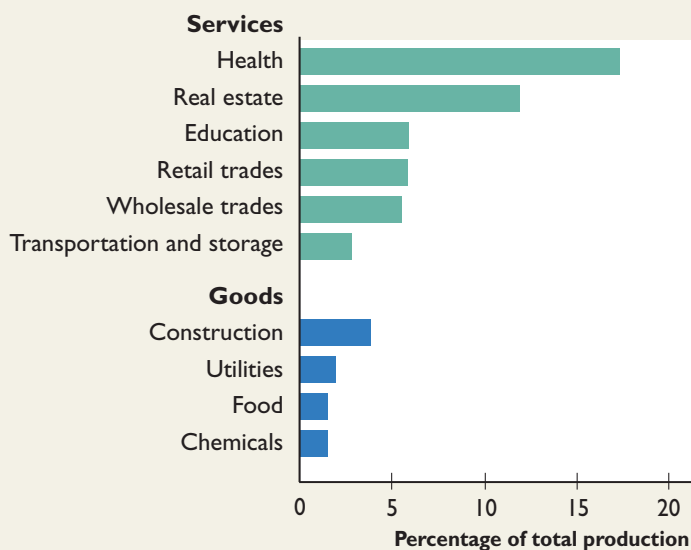
SOURCE OF DATA: Bureau of Economic Analysis.

Seventy years ago, one American in four worked on a farm. That number has shrunk to one in thirty-five. The number of people who produce goods—in mining, construction, and manufacturing—has also shrunk, from one in three to one in five. In contrast, the number of people who produce services has expanded from one in two to almost four in five. These changes in employment reflect changes in what we produce—services.

We hear a lot about globalization and American manufacturing jobs going overseas, but the expansion of service jobs and shrinking of manufacturing jobs is not new. It has been going on over the past 60 years and is likely to continue.

Employment (percentage of total)
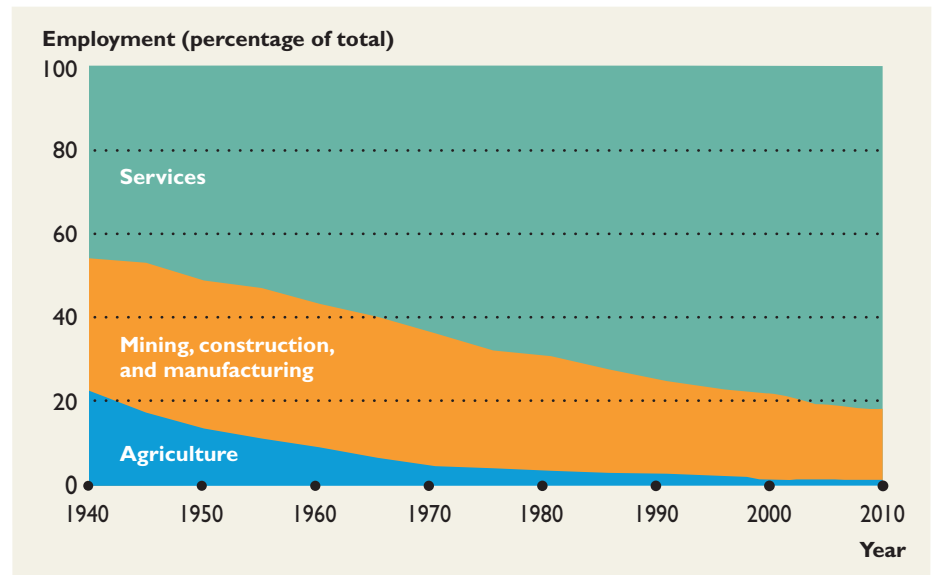
SOURCE OF DATA: U.S. Census Bureau, *Statistical Abstract of the United States,* 1999 and 2010.

◼ How Do We Produce?

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

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

Land

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 non-renewable. 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 but much smaller known reserves of oil and natural gas.

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

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.

In the United States in April 2011, 153 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 2011 was about 250 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.

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.

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

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

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, shirt factories, and shopping malls.

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 the pusher of 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.

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.

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. They enable people to provide businesses with financial resources, but they are *not* used to produce goods and services. They are not capital.

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 40 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
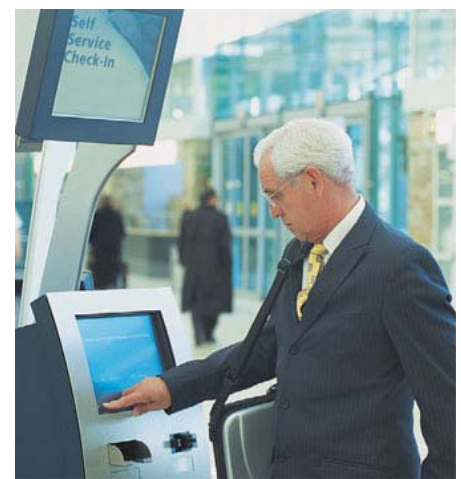
Entrepreneurship is the human resource that organizes land, labor, and capital to produce goods and services. Entrepreneurs are creative and imaginative. They come up with new ideas about what and how to produce, make business decisions, and bear the risks that arise from these decisions. If their ideas 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 69 percent of total income in 2010 and rent, interest, and profit were 31 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. Some households, like that of Carlos Rodriguez, earn many million of dollars a year. These households are in the richest 20 percent who earn 51 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 2010?

MyEconLab Animation

(a) Functional distribution of income

(b) Personal distribution of income
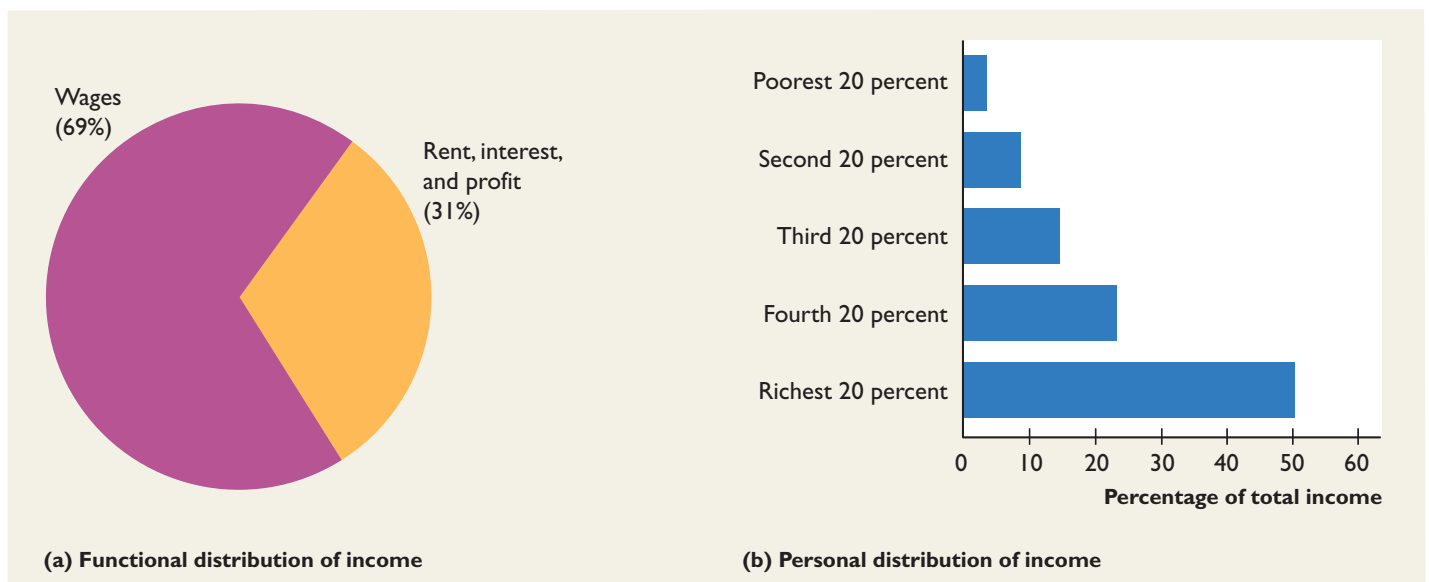
Sources of data: Bureau of Economic Analysis, *National Income and Product Accounts*, Table 1.10 and U.S. Census Bureau, *Income, Poverty, and Health Insurance in the United States*: 2010, Current Population Reports P60-235, 2010.

In 2010, wages (the income from labor) were 69 percent of total income. Rent, interest, and profit (the income from the services of land, capital, and entrepreneurship) totaled the remaining 31 percent.

In 2010, the 20 percent of the population with the highest incomes received 51 percent of total income. The 20 percent with the lowest incomes received only 3 percent of total income.

CHECKPOINT 2.1

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

Practice Problems

1. Name the four broad categories of goods and services that we use in economics. Provide an example of each (different from those in the chapter) and say what percentage of total production each accounted for in 2011.
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 2010 and what percentage did it earn?

In the News

What microloans miss
The 2006 Nobel Peace Prize winner Muhammad Yunus has said that "all people are entrepreneurs" and that microloans will pull poor people out of poverty. Only 14 percent of Americans are entrepreneurs while almost 40 percent of Peruvians are.

Source: James Surowiecki, *The New Yorker*, March 17, 2008

With only 14 percent of Americans earning their income from entrepreneurship, from what factor of production do most Americans earn their income? What is that income called? Why might so many people in Peru be entrepreneurs?

Solutions to Practice Problems

1. The four categories are consumption goods and services, capital goods, government goods and services, and export goods and services. A shirt is a consumption good and a haircut is a consumption service. An oil rig is a capital good, police protection is a government service, and a computer chip sold to Ireland is an export good. Of total production in 2011, consumption goods and services were 61 percent; capital goods, 11 percent; government goods and services, 17 percent; and export goods and services, 11 percent.
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 the United States. In 2010, labor earned 69 percent of total income.

Solution to In the News

Most Americans earn their income from labor and the income they earn is called a wage. Peru is a poor country in which jobs are more limited than in the United States. So to earn an income, many people are self-employed and work as small entrepreneurs.

2.2   THE GLOBAL ECONOMY

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, June 5, 2011, the U.S. clock recorded a population of 311,495,726. The world clock recorded a global population of 6,923,027,156. The U.S. clock ticks along showing a population increase of one person every 12 seconds. The world clock spins faster, adding 30 people in the same 12 seconds.

■ The Countries

The world's 7 billion (and rising) population lives in 176 countries, which the International Monetary Fund classifies into two broad groups of economies:

- 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 the 28 countries in Central and Eastern Europe and Asia that were, until the early 1990s, part of the Soviet Union or one of its satellites. Russia is the largest of these economies. Others include the Czech Republic, Hungary, Poland, Ukraine, and Mongolia.

Almost 500 million people live in these countries—only about half of the number in the advanced economies. But 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 to 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 that include China, India, Indonesia, and Brazil. These economies have not yet achieved high average incomes for their people. Average incomes in these economies vary a great deal, but in all cases, these average incomes are much lower than those in the advanced economies, and in some cases, they are extremely low. More than 5 billion people—almost four out of every five people—live in developing economies.

■ *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 2011, the pie was worth about $70 trillion! To give this number some meaning, if the pie were shared equally among the world's 6.9 billion people, each of us would get a slice worth a bit more than $10,145.

Where Is the Global Pie Baked?

Figure 2.2 shows us where in the world the pie is baked. The advanced economies produce 53 percent—20 percent in the United States, 15 percent in the Euro area, and 18 percent in the other advanced economies. The emerging market economies produce another 8 percent. These economies, which produce 61 percent of the world's output (by value) are home to only 20 percent of the world's population.

Most of the rest of the global pie comes from Asia. China produces 13 percent of the total and other developing Asian economies produce 10 percent. The developing countries of Africa and the Middle East produce 7 percent, and the Western Hemisphere—Mexico and South America—produces the rest.

The sizes of the slices in the global production pie are gradually changing—the U.S. share is shrinking and China's share is expanding.

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 2010   MyEconLab Animation

If we show the value of production in the world economy as a pie, the United States produces a slice that is 20 percent of the total. The Euro zone and other advanced economies produce 33 percent of the total.

Most of the rest of the global pie comes from Asia. China produces a slice that is 13 percent of the total, and the rest of the developing Asian economies produce 10 percent. The developing countries of Africa, the Middle East, and the Western Hemisphere produce 16 percent, and the emerging market economies produce the rest.
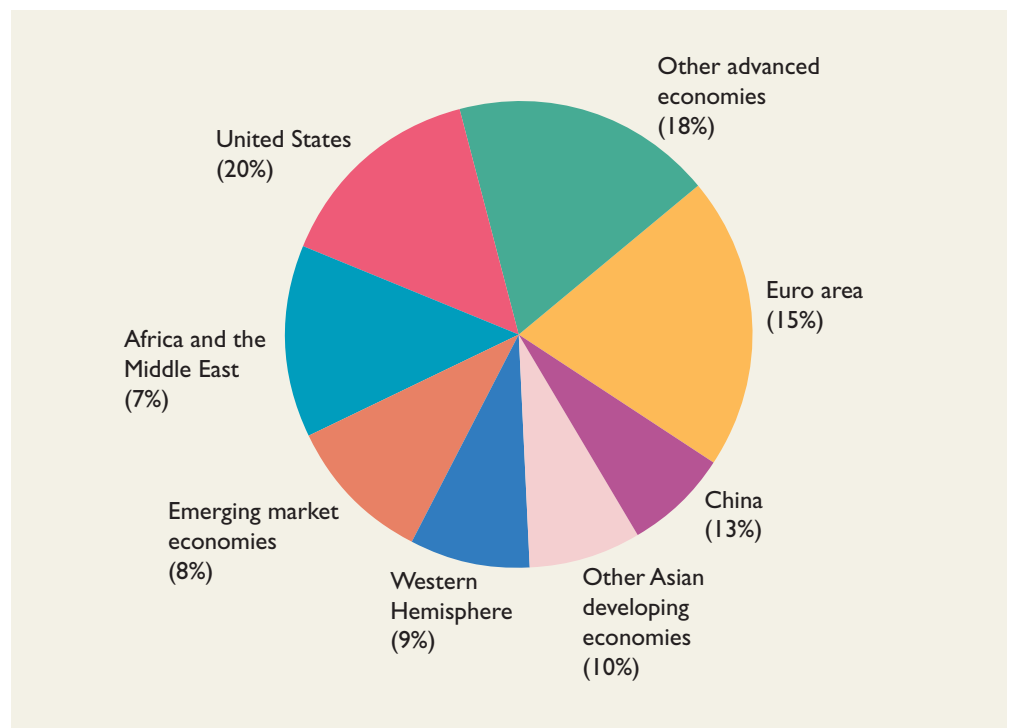
SOURCE OF DATA: International Monetary Fund, World Economic Outlook Database, April 2011.

EYE on the iPHONE
Who Makes the iPhone?

Apple designed and markets the iPhone but it doesn't make it. Apple wants to get the iPhone manufactured at the lowest possible cost. It achieves this goal by assigning the task to more than 30 companies on 3 continents who employ thousands of workers. The table identifies some of the companies and the costs of the components they make.

Apple 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.

4Gbyte iPhone costs and producers

Item	Cost	Producer (incomplete list)	Country
		Taiwan Semiconductor	Taiwan
		United Microelectronics Corp	Taiwan
Processing chips	31.40	Samsung	Korea
		Marvell	United States
		Micron	United States
Memory chips	45.80	Intel, SST	United States
Bluetooth	19.10	Cambridge Silicon Radio	United Kingdom
Printed circuit board	36.05	Cheng Uei, Entery	Taiwan
		Cyntec	Taiwan
Phone interface	19.25	Infineon Technology	Germany
Camera module	11.00	Largan Precision	Taiwan
		Altus-Tech, Primax, Lite On	Taiwan
		National Semiconductor	United States
Display	33.50	Novatek	Taiwan
		Sanyo, Epson, Sharp, TMD	Japan
Touch screen controller	1.15	Balda	Germany
		Broadcom	United States
Battery and power management	8.60	Delta Electronics	Taiwan
Case	8.50	Catcher, Foxconn Tech	Taiwan
Assembly	15.50	Foxconn Quanta	Taiwan
Royalties	15.98		
Total cost	**245.83**		

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 producing 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 come? Because *total* production is much larger in the advanced economies than in the developing economies, and a small percentage of a big number can be greater 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, the United Colors of Benetton, Gap, Tommy Hilfiger, Tie Rack, 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. Energy production illustrates this point.

Energy is produced from oil, coal, natural gas, waterfalls and dams, nuclear reactors, windmills, and solar panels. Each of these sources of power uses different combinations of land (which includes natural resources), labor, and capital.

Figure 2.3 shows some interesting facts about energy use and production. Some 80 percent of the energy we use is in the form of electricity. The other 20 percent is for transportation—part (a). Most of the world's electricty is generated using coal (33 percent), natural gas (29 percent), and oil (21 percent), and only 1 percent is generated using wind and solar power —part (b). And almost all the world's transportation is powered by oil (gasoline and diesel), and only 2 percent is powered by ethanol—part (c).

Each country or region has its own blend of land, labor, and capital. But there are some interesting common patterns and crucial differences between the advanced and developing economies that we'll now examine.

Human Capital Differences

The proportion of the population with a degree or that has completed high school is small in developing economies. And 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.

■ **FIGURE 2.3**

How Energy is Used and Produced in the Global Economy   MyEconLab Animation

(a) Energy uses   (b) Energy to produce electricity   (c) Energy used in transportation
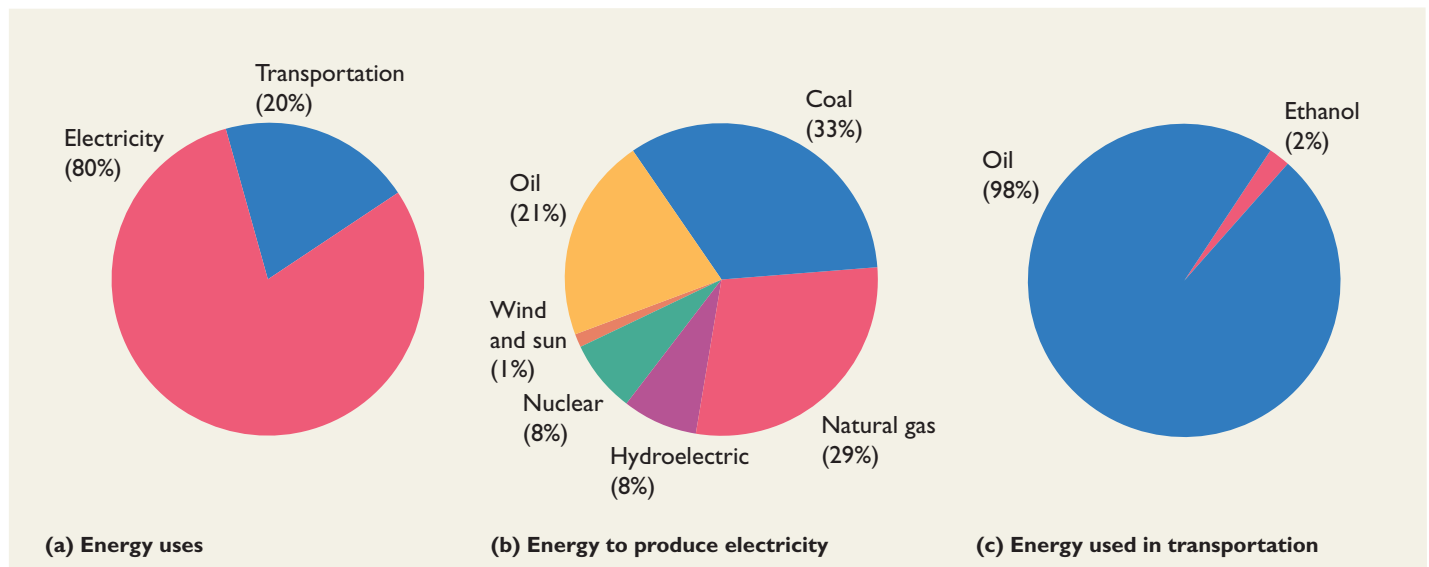
SOURCES OF DATA: Energy Information Administration and BP Review of World Energy, June 2011.

Energy is used to generate electricity (80 percent) and for transportation (20 percent) shown in part (a).

Most electricity is produced using coal, natural gas, and oil. Only 9 percent comes from water, wind, and sun power—in part (b).

Almost all transportation is powered by oil (gasoline and diesel) and only 2 percent is powered by ethanol—in part (c).

Physical Capital Differences

The 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 system. In the advanced economies, a well-developed highway system connects all the major cities and points of production. You can see this difference most vividly by opening a road atlas of North America and contrasting the U.S. interstate highway system with the sparse highways of Mexico. You would see a similar contrast if you flipped through a road atlas of Western Europe and Africa.

But it isn't the case that the developing economies have no highways. In fact, some of them have the newest and the best. But the new and best are usually inside and around the major cities. The smaller centers and rural areas of developing economies often have some of the worst roads in the world.

The contrast in vehicles is perhaps even greater than that in highways. You're unlikely to run across a horse-drawn wagon in an advanced economy, but in a developing economy, animal power can still be found, and trucks are often old and unreliable.

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 black and white. Some factories in India, China, and other parts of Asia use the very latest technologies. Furniture manufacture 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.

Again, it is the extensiveness of the use of modern capital-intensive technologies that distinguishes a developing economy from an advanced economy. All the factories in the advanced economies are capital intensive compared with only some in the developing economies.

The differences in human and physical capital between advanced and developing economies have a big effect on who gets the goods and services.

Beijing has a highway system to match that of any advanced country. But away from the major cities, many of China's roads are unpaved and driving on them is slow and sometimes hazardous.

■ *For Whom* in the Global Economy?

Who gets the world's goods and services depends on the incomes that people earn. So how are incomes distributed across the world?

Personal Distribution of Income

You saw earlier (on p. 37) 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 51 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 2.4 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 $129 a day—an average person in the United States can buy goods and services that cost $129. This amount is around

five times the world average. Canada is close to the United States at $126 a day and Japan at $116 a day. The United Kingdom and Euro zone have average incomes of around 80 percent of that of the United States. Income levels fall off quickly as we move farther down the graph, with Africa achieving an average income of only $4 a day and India only $3 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 happy 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 2.4**

For Whom in the Global Economy in 2010   MyEconLab Animation

In 2010, the average income per person per day in the United States was $129. It was $126 in Canada and $99 in the United Kingdom. It was $116 in Japan and $100 in the Euro area. The number falls off rapidly to $29 in Russia, $12 in China, $4 in Africa, and $3 in India.
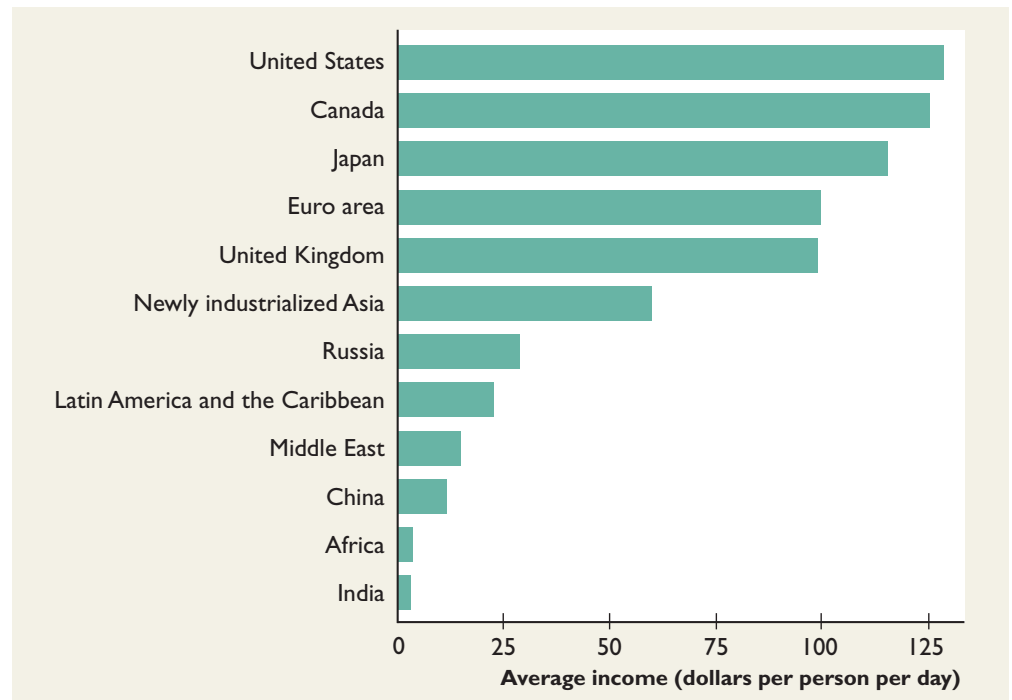
SOURCE OF DATA: International Monetary Fund, World Economic Outlook Database, April 2011.

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 health care, 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

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. Rwandan coffee growers improved 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.

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.

Households

Individuals or groups of people living together.

Firms

The institutions that organize the production of goods and services.

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.

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 2.5 shows the circular flow model.

■ Households and Firms

Households are individuals or groups of people living together. The 118 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 20 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

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 2.5 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 2.5 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 2.5

The Circular Flow Model   MyEconLab Animation

Rent, wages, interest, and profit

HOUSEHOLDS

Expenditures on goods and services

Land, labor, capital, and entrepreneurship services supplied

Goods and services bought

FACTOR MARKETS

GOODS MARKETS

Land, labor, capital, and entrepreneurship services hired

Goods and services supplied

FIRMS

Rent, wages, interest, and profit

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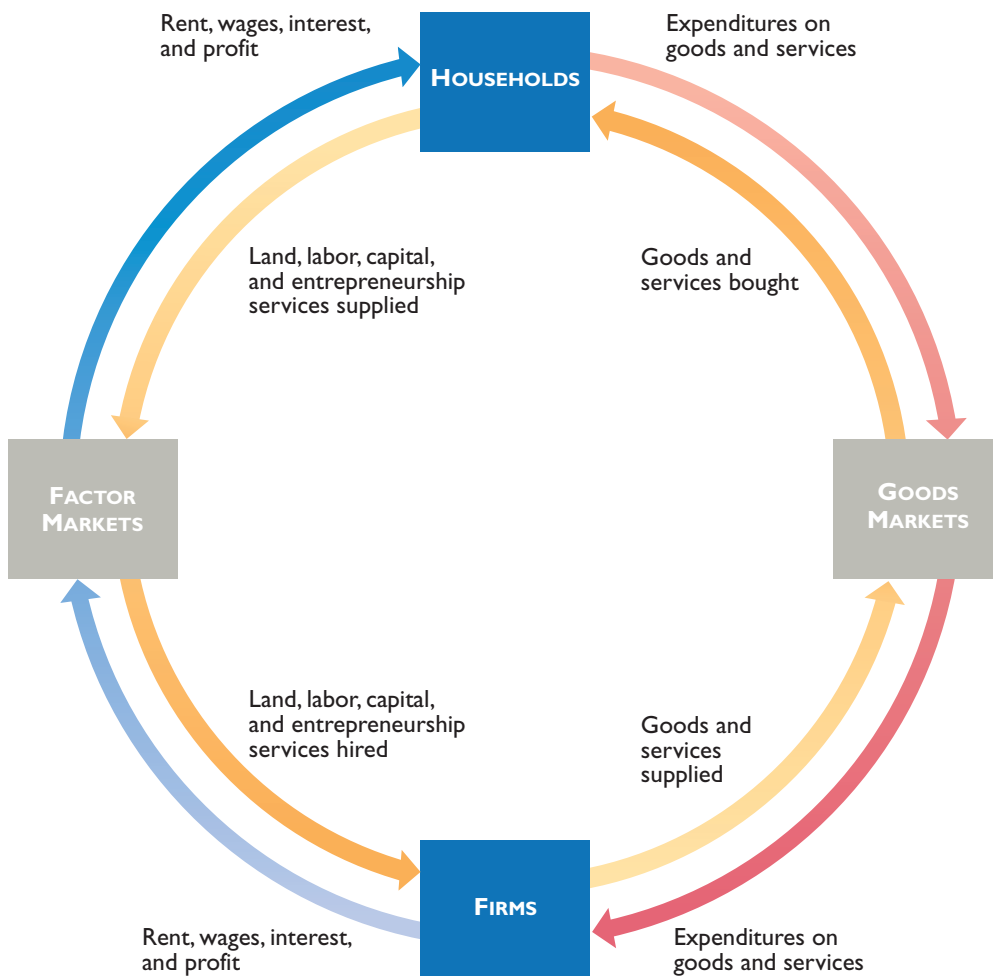
The orange flows are the services of factors of production that go from households through factor markets to firms and the goods and services that go from firms through goods markets to households. These flows are *real* flows.

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. Good 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 2010, the federal government spent $3.5 trillion—about 24 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 2007-08, state and local governments spent $2.1 trillion or 17 percent of the total value of all the goods and services produced in the United States.

■ Governments in the Circular Flow

Figure 2.6 adds governments to the circular flow model. As you study this figure, first notice that the outer circle is the same as in Figure 2.5. 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 2.6, 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 2.6**

Governments in the Circular Flow

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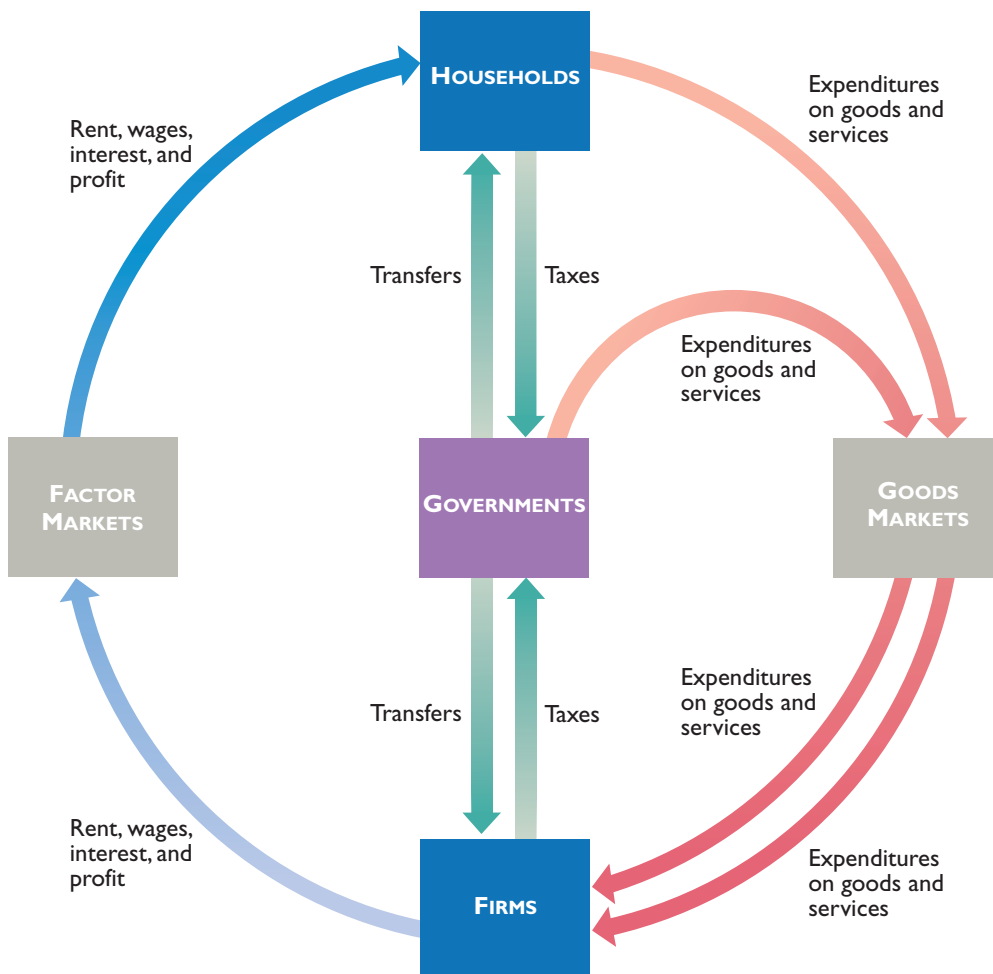
The green flows from households and firms to governments are taxes, and the green flows from governments to households and firms are money transfers.

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

■ Federal Government Expenditures and Revenue

What are the main items of expenditure by the federal government on goods and services and transfers? And what are its main sources of tax revenue? Figure 2.7 answers these questions.

Three items of expenditure are similar in magnitude—and large. They are Social Security benefits, Medicare and Medicaid, and national defense and homeland security. The combined total of these items is 64 percent of the government's expenditures. Other transfers to persons, which includes unemployment benefits, are also large. The "Others" category covers a wide range of items and includes transfers to state governments, NASA's space program, and the National Science Foundation's funding of research in the universities.

National debt
The total amount that the federal government has borrowed to make expenditures that exceed tax revenue—to run a government budget deficit.

The interest payment on the national debt is another significant item. The **national debt** is the total amount that the federal government has borrowed to make expenditures that exceed tax revenue—to run a government budget deficit. The national debt is a bit like a large credit card balance, and paying the interest on the national debt is like paying the minimum required monthly payment.

Most of the tax revenue of the federal government comes from personal income taxes and Social Security taxes. Corporate income taxes and other taxes are a small part of the federal government's revenue.

■ **FIGURE 2.7**

Federal Government Expenditures and Revenue   MyEconLab Animation

(a) Federal government expenditures

(b) Federal government revenue

Social Security benefits (20%); Medicare and Medicaid (24%); Other transfers to persons (21%); Interest on national debt (6%); Others (9%); National defense and homeland security (20%)

Personal income taxes (41%); Corporate income taxes (9%); Other taxes (10%); Social Security taxes (40%)
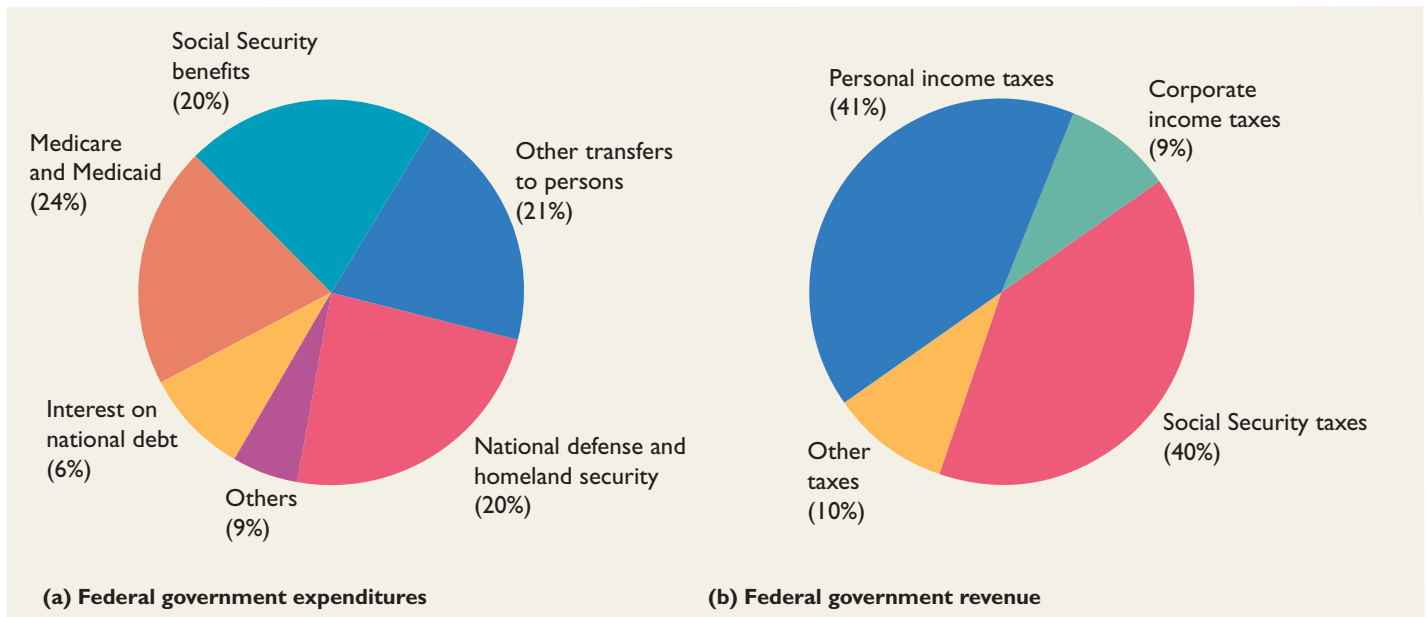
SOURCE OF DATA: Budget of the United States Government, Historical Tables, Table 2.1 and Table 3.1, 2010 data.

Social Security benefits, Medicare and Medicaid, and national defense and homeland security absorb 64 percent of the federal government's expenditures. Interest on the national debt is also a significant item.

Most of the federal government's revenue comes from personal income taxes and Social Security taxes. Corporate income taxes and other taxes are a small part of total revenue.

■ State and Local Government Expenditures and Revenue

What are the main items of expenditure by the state and local governments on goods and services and transfers? And what are the main sources of state and local government revenue? Figure 2.8 answers these questions.

You can see that education is by far the largest part of the expenditures of state and local governments. This item covers the cost of public schools, colleges, and universities. It absorbs 34 percent of total expenditures—approximately $826 billion, or $2,650 per person.

Public welfare benefits are the second largest item and they take 17 percent of total expenditures. Highways are the next largest item, and they account for 6 percent of total expenditures. The remaining 43 percent is spent on other local public goods and services such as police services, garbage collection and disposal, sewage management, and water supplies.

Sales taxes and transfers from the federal government bring in similar amounts—about 18 percent and 20 percent of total revenue, respectively. Property taxes account for 17 percent of total revenue. Individual income taxes account for 13 percent, and corporate income taxes account for 2 percent. The remaining revenue comes from other taxes such as those on gasoline, cigarettes, and beer and wine.

FIGURE 2.8

State and Local Government Expenditures and Revenue   MyEconLab Animation

(a) State and local government expenditures

(b) State and local government revenue
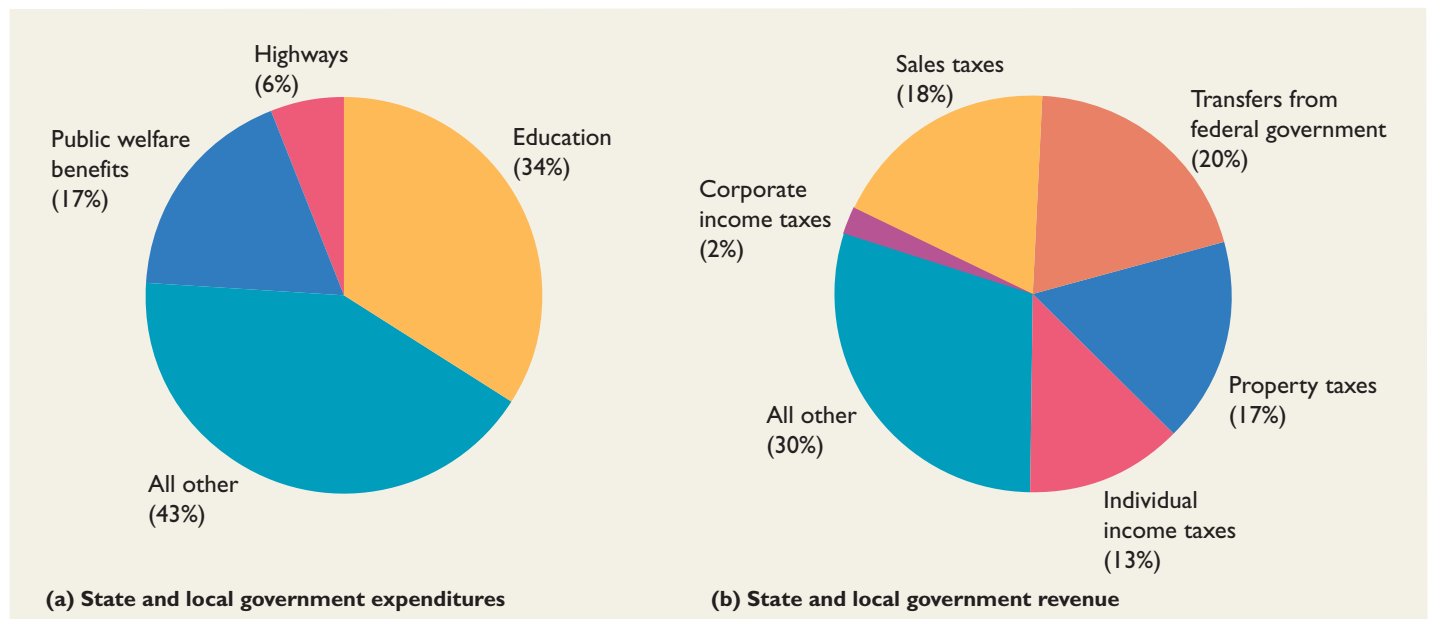
SOURCES OF DATA: *Economic Report of the President 2009,* Table B-86, 2007–2008 data.

The largest slices of state and local government expenditures are education (34 percent of total expenditure), public welfare benefits (17 percent), and highways (6 percent).

Most of the state and local government revenue comes from sales taxes (18 percent of total revenue), property taxes (17 percent), and transfers from the federal government (20 percent).

EYE on the PAST
Growing Government

One hundred years ago, the federal government spent 2 cents out of each dollar earned. Today, the federal government spends 23 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, and fiscal stimulus and bailouts to cope with the global financial crisis sent spending soaring.

Federal expenditures (percentage of GDP)
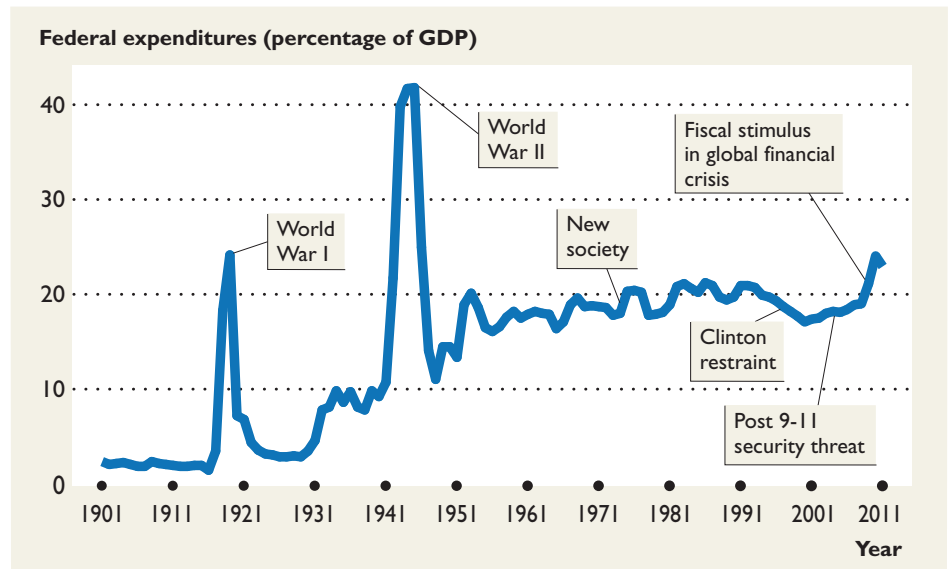
SOURCE OF DATA: Budget of the United States Government, Historical Tables, Table 1.1.

◼ 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, cell phone, 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 sold here. Boeing, for example, sells most of the airplanes it makes to foreign airlines. And 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 2.9 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 2.9

Circular Flows in the Global Economy   MyEconLab Animation
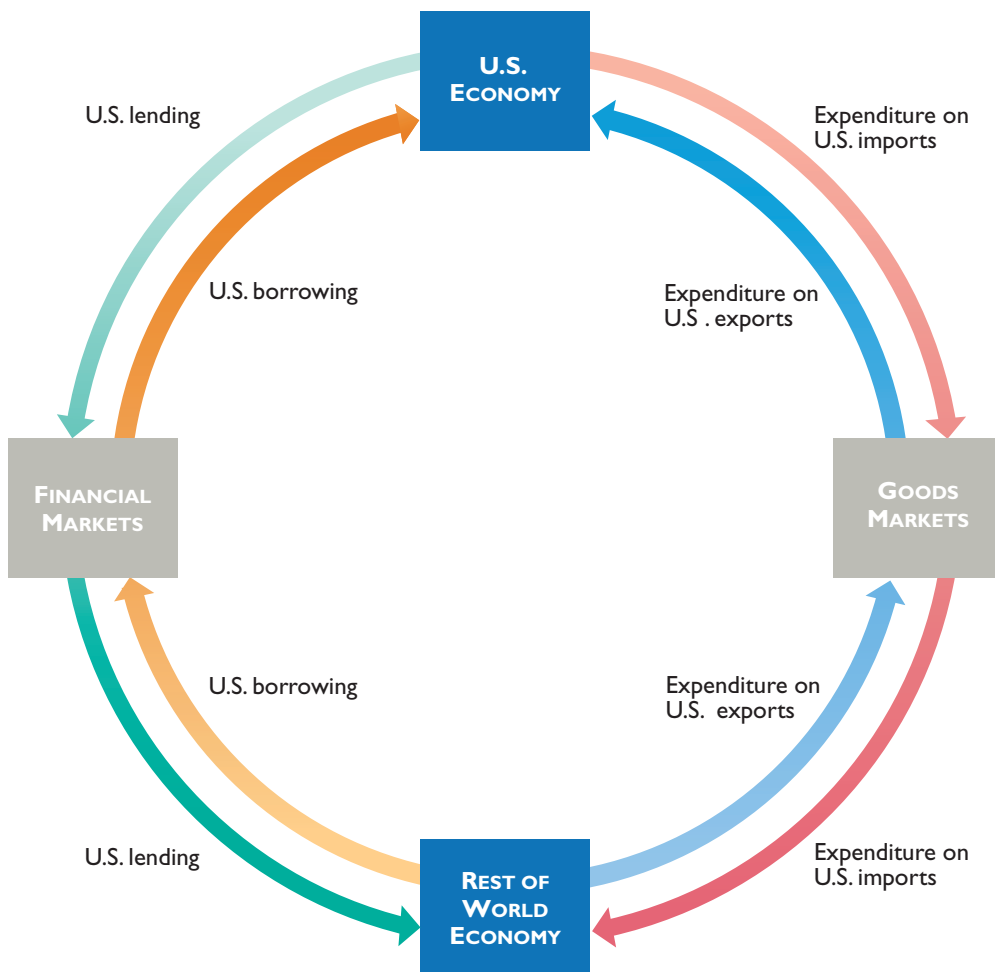
Households and firms in the U.S. economy interact with those in the rest of the world (other economies) in goods markets and financial markets.

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 has expanded rapidly during the past 25 years. At an average growth rate of close to 7 percent a year, world trade has doubled every decade.

In 2001, a mini-recession in the United States slowed world trade growth to a crawl.

But the 2001 slowdown looks mild compared to the collapse in world trade during the 2009 global economic slump. Despite the slump in 2009, world trade was back to a normal level in 2010 and 2011.

Change in volume of international trade (percent per year)

SOURCE OF DATA: International Monetary Fund, World Economic Outlook Database, April 2011.

CHECKPOINT 2.3

Use the circular flow model to provide a picture of how households, firms, and governments interact in the U.S. economy and how the U.S. and other economies interact in the global economy.

Practice Problems

1. Describe the flows in the circular flow model in which consumption expenditure, purchases of new national defense equipment, and payments for labor services appear. Through which market does each of these flows 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. Consumption expenditure 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 real flows are the services of factors of production that go from households to firms through factor markets and the goods and services that go from firms to households and from firms to governments through goods markets. The money flows are 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 61 percent of total production; capital goods represent 11 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.

- Sixty-one percent of the world's production (by value) comes from the advanced industrial countries and the emerging market 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 has increased in Africa.

3. Use the circular flow model to provide a picture of how households, firms, and governments interact in the U.S. economy and how the U.S. and other economies interact in 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

Capital, 35	Factors of production, 34	Labor, 35
Capital goods, 32	Firms, 46	Land, 34
Circular flow model, 46	Goods markets, 46	Market, 46
Consumption goods and services, 32	Government goods and services, 32	National debt, 50
Entrepreneurship, 36	Households, 46	Profit (or loss), 37
Export goods and services, 32	Human capital, 35	Rent, 37
Factor markets, 46	Interest, 37	Wages, 37

CHAPTER CHECKPOINT

Study Plan Problems and Applications

1. Explain which of the following items are *not* consumption goods and services:
   • A chocolate bar
   • A ski lift
   • A golf ball

2. Explain which of the following items are *not* capital goods:
   • An auto assembly line
   • A shopping mall
   • A golf ball

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

4. Which of the four factors of production earns the highest percentage of total U.S. income? Define that factor of production. What is the income it earns 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. A Job Creation through Entrepreneurship Act, debated in the House of Representatives in 2009, would award grants to small business owners, some of which would be aimed at women, Native Americans, and veterans. The Act would provide $189 million in 2010 and $531 million between 2010 and 2014. Explain how you would expect this Act to influence *what*, *how*, and *for whom* goods and services are produced in the United States.

8. Indicate on a graph of the circular flow model, the real or money flow in which the following items belong:
   • You pay your tuition.
   • The University of Texas buys some Dell computers.
   • A student works at FedEx Kinko's.
   • Donald Trump rents a Manhattan building to a hotel.
   • You pay your income tax.

9. For-profit colleges may face aid cuts

The Obama administration proposes a new rule: Federal aid to for-profit colleges will be cut if students in vocational programs graduate with worthless degrees. Millions of low-income students are borrowing heavily to attend colleges and too many of them are dropping out, and failing to get a job.

Source: *USA Today*, June 2, 2011

How do you think the personal distribution of income would change if all graduates could obtain a well-paying job that uses their knowledge gained in college?

Instructor Assignable Problems and Applications

1. Buzz surrounds Apple's iPhone. Can you explain:
  • Why doesn't Apple manufacture the iPhone at its own factory in the United States?
  • Why doesn't Apple offer a cheaper version of the iPhone with no camera?
  • In view of the cost of producing an iPhone (in the table on p. 41), why do you think the price of an iPhone is so high? What other costs must be incurred to bring the iPhone to market other than the cost of manufacturing it?

2. The global economy has three cell phone users for every fixed line user. Two in every three cell phone users lives in a developing nation and the growth rate is fastest in Africa. In 2000, 1 African in 50 had a cell phone; in 2009, it was 14 in 50. Describe the changes in *what, how,* and *for whom* telecommunication services the global economy produces.

3. Which of the entries in List 1 are consumption goods and services and which are government goods? 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 prosperity brings income gap

The Asian Development Bank [ADB] reports that China has the largest gap between the rich and the poor in Asia. Ifzal Ali, the ADB's chief economist, claims it is not that the rich are getting richer and the poor are getting poorer, but that the rich are getting richer faster than the poor.

Source: *Financial Times*, August 9, 2007

Explain how the distribution of personal income in China can be getting more unequal even though the poorest 20 percent 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 graph 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.
• Chrysler buys robots.
• Southwest rents some aircraft.
• Nike pays Roger Federer for promoting its sports shoes.

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. Government goods and services and export goods and services each account for the same percentage of total production.

   B. Capital goods account for a larger percentage of total production than do consumption goods and services.

   C. Most of U.S. production is consumption goods and services.

   D. Most of what the United States produces is goods not services.

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. Immigrant labor

   B. Someone who operates heavy equipment

   C. Your professor's knowledge of the economy

   D. A car 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

The Economic Problem

3

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.

3.1   PRODUCTION POSSIBILITIES

Every working day in mines, factories, shops, and offices and on farms and construction sites across the United States, we produce a vast array of goods and services. In the United States in 2011, 250 billion hours of labor equipped with $50 trillion worth of capital produced $15 trillion worth of goods and services.

Although our production capability is enormous, 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. Because our wants exceed our resources, we must make choices. We must rank our wants and decide which to satisfy and which to leave unsatisfied. In using our scarce resources, we make rational choices. And to make a rational choice, we must determine the costs and benefits of the alternatives.

Your first task in this chapter is to learn about an economic model of scarcity, choice, and opportunity cost—a model 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 imagine a simpler world that produces just two goods. Imagine an economy that produces only DVDs and cell phones. All the land, labor, capital, and entrepreneurship available gets used to produce these two goods.

Land can be used for movie studios and DVD factories or cell-phone factories. Labor can be trained to work as movie actors, camera and sound crews, movie producers and DVD makers or as cell-phone makers. Capital can be used for making movies, making and coating disks, and transferring images to disks, or for the equipment that makes cell phones. Entrepreneurs can put their creative talents to managing movie studios and running electronics businesses that make DVDs or to running cell-phone businesses. In every case, the more resources that are used to produce DVDs, the fewer are left to produce cell phones.

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

The table in Figure 3.1 illustrates these two combinations of cell phones and DVDs 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 cell phones a year and allocates no resources to producing DVDs. 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 cell phones and DVDs. 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 cell phones and 14 million DVDs. These quantities also appear in the table as possibility *B*.

The *PPF* shows the limits to production *with the available resources and technology*. If either resources or technology change, the *PPF* shifts. More resources or better technology shift it outward and a loss of resources shifts it inward.

The *PPF* is a valuable tool for illustrating the effects of scarcity and its consequences. The *PPF* puts three features of production possibilities in sharp focus. They are the distinctions between

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

■ **FIGURE 3.1**

The Production Possibilities Frontier

MyEconLab Animation
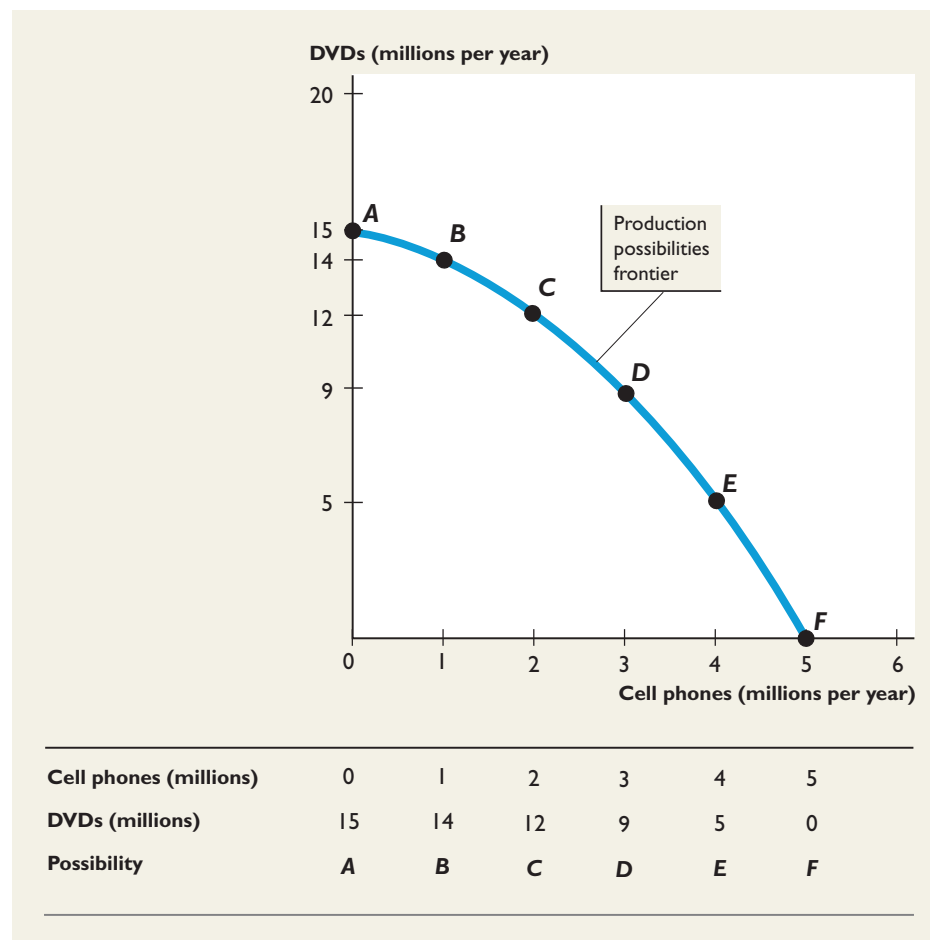
The table and the graph show the production possibilities frontier for cell phones and DVDs.

Point *A* tells us that if the economy produces no cell phones, the maximum quantity of DVDs 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.

Cell phones (millions)	0	1	2	3	4	5
DVDs (millions)	15	14	12	9	5	0
Possibility	*A*	*B*	*C*	*D*	*E*	*F*

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 cell phones and DVDs that are smaller than those on the *PPF,* and it can produce any of the combinations *on* the *PPF.* These combinations of cell phones and DVDs 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 cell phones and DVDs 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 cell phones and 5 million DVDs at point *E or* 2 million cell phones and 12 million DVDs at point *C.* But the economy cannot produce 4 million cell phones and 12 million DVDs 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.
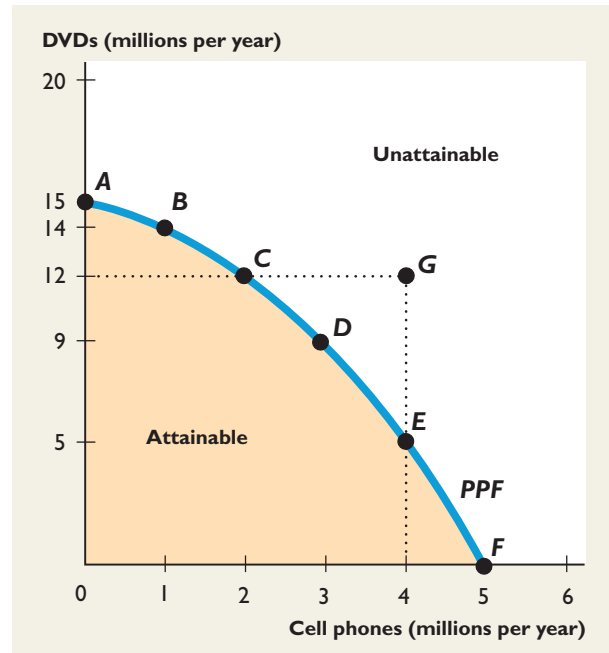
Figure 3.3 illustrates the distinction between efficient and inefficient production. With *inefficient* production, the economy might be producing 3 million cell phones and 5 million DVDs at point *H*. With an *efficient* use of the economy's resources, it is possible to produce at a point on the *PPF* such as point *D* or *E*. At point *D*, there are more DVDs and the same quantity of cell phones as at point *H*. And at point *E*, there are more cell phones and the same quantity of DVDs as at point *H*. At points *D* and *E*, production is efficient.

Tradeoffs and Free Lunches

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 DVDs, they must forgo some cell phones. In the move from point *E* to point *D*, people trade off cell phones for DVDs.

Economists often express the central idea of economics—that choices involve 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

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

FIGURE 3.3

Efficient and Inefficient Production, Tradeoffs, and Free Lunches

MyEconLab Animation
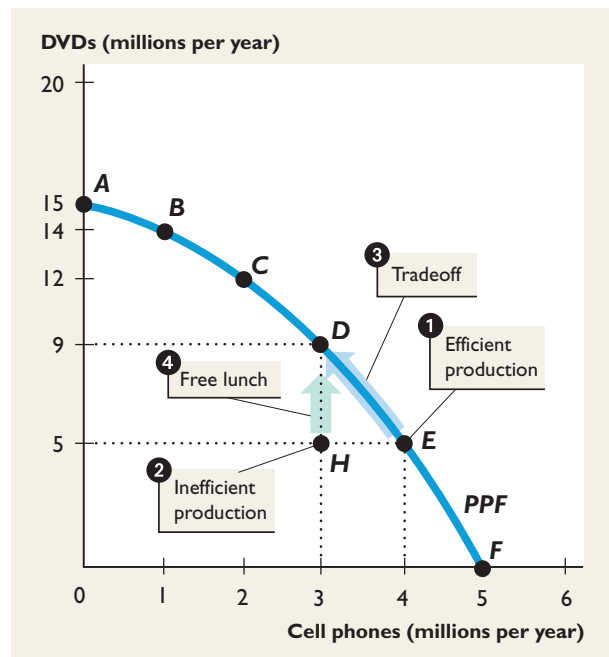
1. When production occurs at a point on the *PPF*, such as point *E*, resources are used efficiently.

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 cell phones be given up for more DVDs.

4. When production is inefficient—inside the *PPF*—there is a free lunch. To move from point *H* to point *D* 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 DVDs 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
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 beneath the *PPF* is attainable and any point above the *PPF* is unattainable. A student who wastes time or doesn't study efficiently 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.
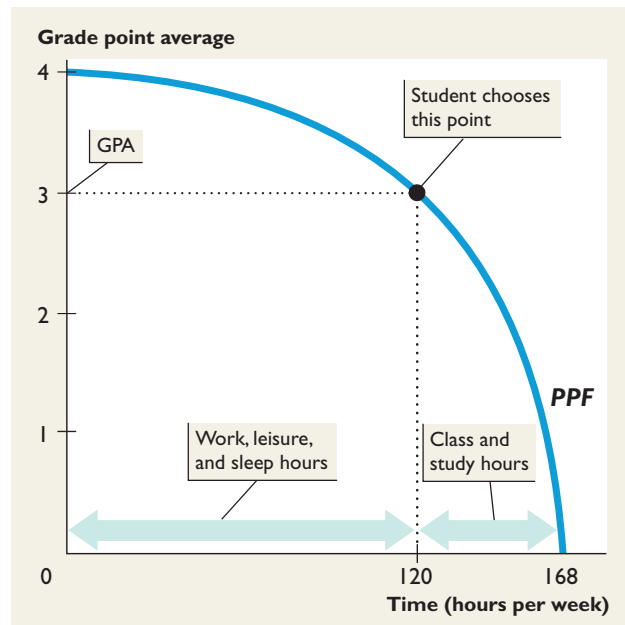
CHECKPOINT 3.1

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.

In the News

Loss of honeybees is less but still a threat

Honeybees are crucial for the pollination of almonds in California's Central Valley. During 2008, 30 percent of U.S. honeybees died.

Source: *USA Today*, May 20, 2009

Explain how this loss of honeybees affected the Central Valley'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 below (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.

Solution to In the News

Honeybees are a resource used in the production of almonds. At the start of 2008, Central Valley farmers were at a point on their *PPF*. A 30 percent drop in honeybees reduced the quantity of almonds produced by about 30 percent. With no change in the quantity of other crops produced, the Central Valley *PPF* shifted inward.

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

FIGURE 1

Cars (thousands per week)

FIGURE 2

Berries (pounds)
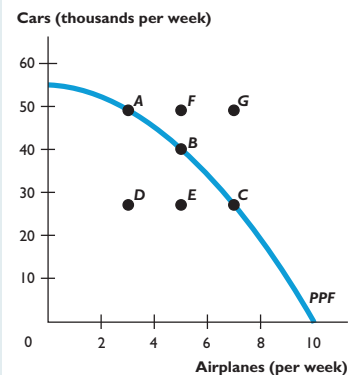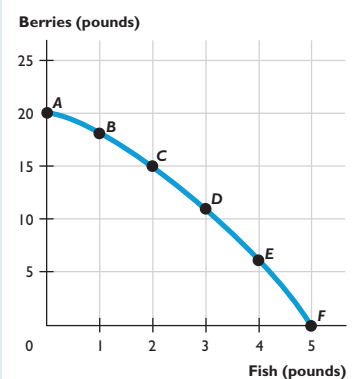
3.2   OPPORTUNITY COST

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. 9). We can use the *PPF* to calculate opportunity cost.

■ The Opportunity Cost of a Cell Phone

The opportunity cost of a cell phone is the number of DVDs forgone to get an additional cell phone. It is calculated as the number of DVDs forgone divided by the number of cell phones gained.

Figure 3.4 illustrates the calculation. At point *A*, the quantities produced are zero cell phones and 15 million DVDs; and at point *B*, the quantities produced are 1 million cell phones and 14 million DVDs. To gain 1 million cell phones by moving from point *A* to point *B*, 1 million DVDs are forgone, so the opportunity cost of 1 cell phone is 1 DVD.

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

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 Cell Phone   MyEconLab Animation

Movement along *PPF*	Decrease in quantity of DVDs	Increase in quantity of cell phones	Decrease in DVDs divided by increase in cell phones
A to *B*	1 million	1 million	1 DVD per phone
B to *C*	2 million	1 million	2 DVDs per phone
C to *D*	3 million	1 million	3 DVDs per phone
D to *E*	4 million	1 million	4 DVDs per phone
E to *F*	5 million	1 million	5 DVDs per phone

Along the *PPF* from *A* to *F*, the opportunity cost of a cell phone increases as the quantity of cell phones 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 cell phone and notice that they follow a striking pattern. The opportunity cost of a cell phone increases as the quantity of cell phones 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 cell phones produced increases.

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

■ Opportunity Cost Is a Ratio

The opportunity cost of a cell phone is the *ratio* of DVDs forgone to cell phones gained. Similarly, the opportunity cost of a DVD is the *ratio* of cell phones forgone to DVDs gained. So the opportunity cost of a DVD is equal to the inverse of the opportunity cost of a cell phone. For example, moving along the *PPF* in Figure 3.4 from *C* to *D* the opportunity cost of a cell phone is 3 DVDs. Moving along the *PPF* in the opposite direction, from *D* to *C,* the opportunity cost of a DVD is 1/3 of a cell phone.

■ FIGURE 3.5

The Opportunity Cost of a Cell Phone
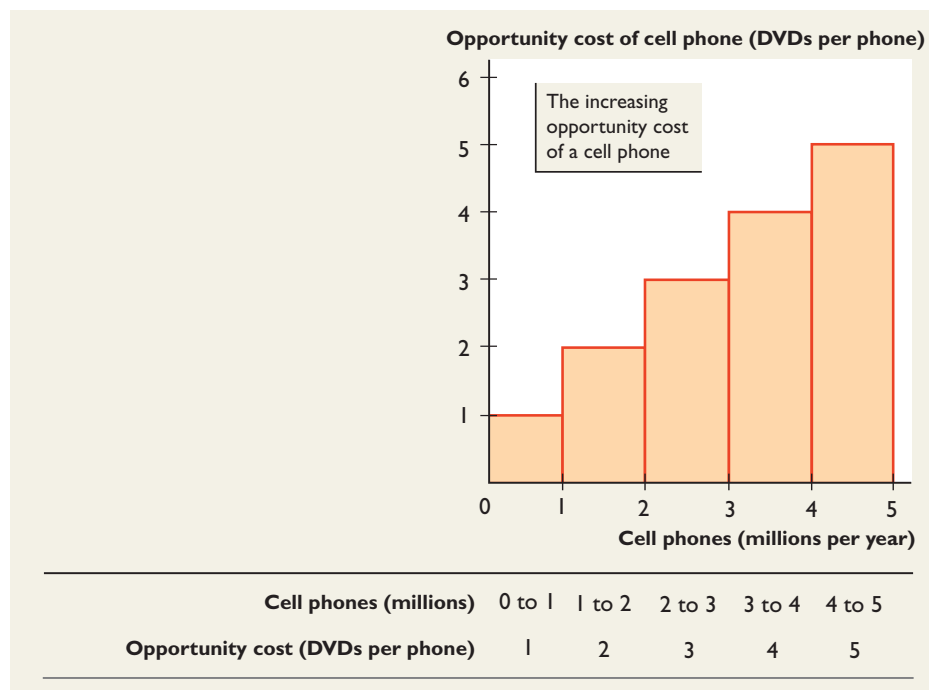
Because the *PPF* in Figure 3.4 is bowed outward, the opportunity cost of a cell phone increases as the quantity of cell phones produced increases.

Cell phones (millions)	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5
Opportunity cost (DVDs per phone)	1	2	3	4	5

EYE on the ENVIRONMENT
Is Wind Power Free?

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

Wind turbines can produce electricity only when there is wind, which turns out, at best, to be 40 percent of the time and, on average, about 25 percent of the time. Also some of the best wind farm locations are a long way from major population centers, so transmission lines would be long and power transmission losses large.

If we produced 55 percent of our electricity using South Dakota wind power, we would be operating inside the *PPF* at a point such as *Z*.

Other goods and services

Production efficiency using coal, gas, oil, nuclear, hydro, and limited wind power

A

Production inefficiency relying too much on wind power

Z

PPF

0   **Electricity**
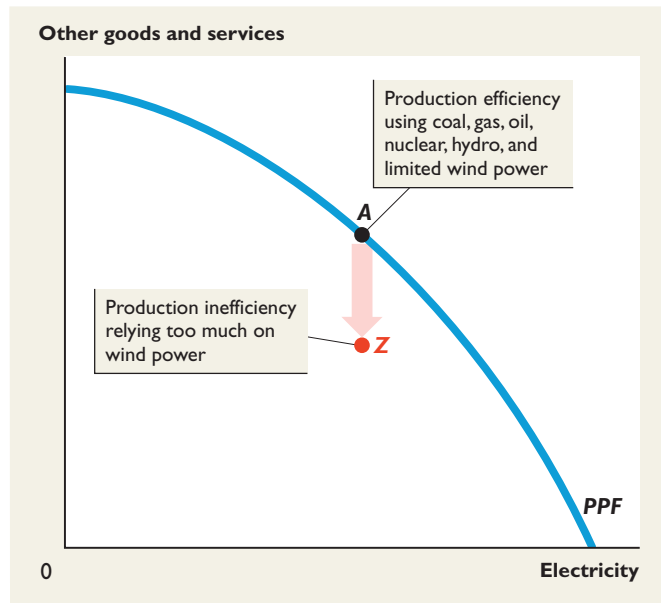
■ Increasing Opportunity Costs Are Everywhere

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 health-care 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 health care at a low opportunity cost. But if we keep increasing health-care 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 health-care services is small. The opportunity cost of a unit of health-care services rises. Similarly, if we shift resources away from health care toward farming, we must eventually use more skilled doctors and nurses as farmers and more hospitals as hydroponic tomato factories. The decrease in the production of health-care services is large, but the increase in food production is small. The opportunity cost of a unit of food rises.

■ Your Increasing Opportunity Cost

Flip back to the *PPF* in *Eye on Your Life* on page 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?

EYE on the U.S. ECONOMY
Guns Versus Butter

Guns versus butter is the classic economic tradeoff. "Guns" stand for defense goods and services and "butter" stands for food and more generally for all other goods and services. Recently, the U.S. economy has been producing more guns and less butter.

Figure 1 shows the fluctuations in the quantity of defense goods and services produced. (The quantity is measured by expenditure on defense using the prices in 2005 to remove the effects of price changes.) The quantity of defense goods and services produced increases in times of war and decreases in times of peace.

Figure 2 illustrates the recent changes in the production of defense goods and services using the *PPF*.

During the late 1980s and the 1990s, the *PPF* was *PPF₀*. President Reagan raised the stakes in the Cold War between the United States and the (former) Soviet Union by a big expansion of military expenditure and we were at point *A*. By the mid-1990s, the Soviet Union had collapsed and we enjoyed a peace dividend by moving along *PPF₀* to *B*.

During the next decade, production possibilities expanded from *PPF₀* to *PPF₁*. Defense production and the production of other goods and services increased, and in 2001 we operated at point *C*. Then, in response to the attacks of September 11, 2001, defense spending increased again and by 2011 we had moved along *PPF₁* to point *D*.

Defense goods and services (billions of 2005 dollars)
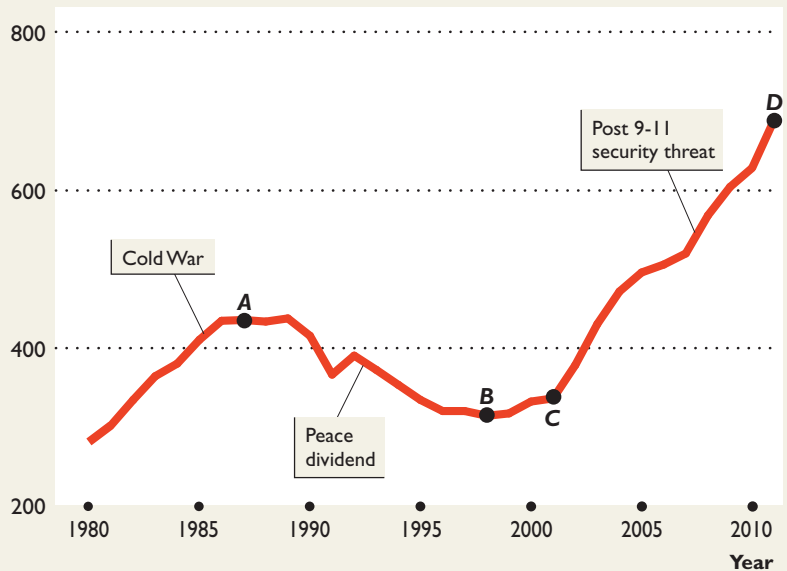
Figure 1 The quantity of defense goods produced

Other goods and services
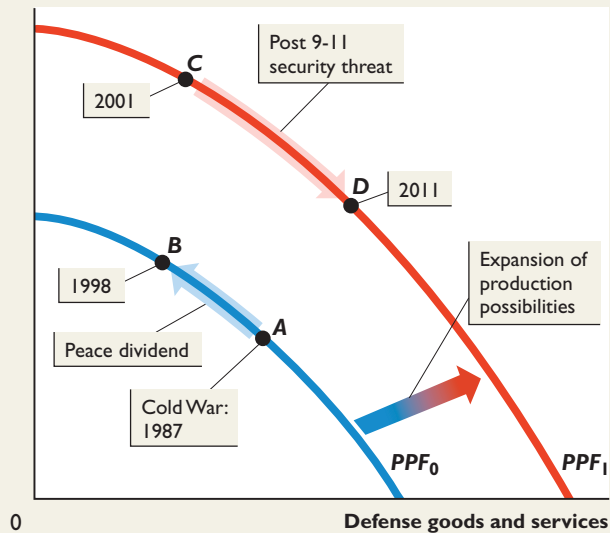
Figure 2 The guns versus butter tradeoff

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
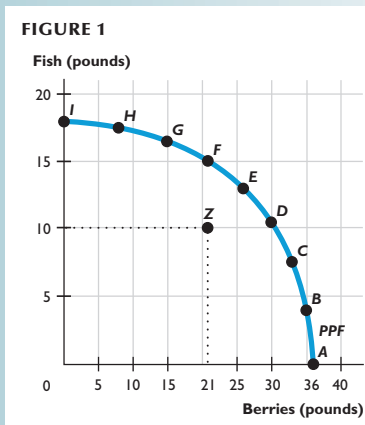
CHECKPOINT 3.2

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.

In the News

Obama drives up miles-per-gallon requirements

Emissions from all new vehicles must be cut from 354 grams to 250 grams. To meet this new standard, the price of a new vehicle will rise by $1,300.

Source: *USA Today*, May 20, 2009

Calculate the opportunity cost of reducing the 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* in the direction of producing more berries.

   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.

FIGURE 1

Fish (pounds)

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.

Solution to In the News

By spending $1,300 extra on a new car, you forgo $1,300 of other goods. With a new car, your emissions fall from 354 grams to 250 grams, a reduction of 104 grams. The opportunity cost of a 1-gram reduction in emissions is $1,300 of other goods divided by 104 grams, or $12.50 of other goods.

3.3 ECONOMIC GROWTH

Economic growth is the sustained expansion of production possibilities. Our economy grows when we develop better technologies for producing goods and services; improve the quality of labor by education, on-the-job training, and work experience; and acquire more machines to help us produce.

To study economic growth, we must change the two goods and look at the production possibilities for a consumption good and a capital good. A cell phone is a consumption good and a cell-phone factory is a capital good. By using today's resources to produce cell-phone factories, the economy can expand its future production possibilities. The greater the production of new capital—number of new cell-phone 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 cell phones and using resources to produce 2 new cell-phone factories (at point *K*), production possibilities expand and the *PPF* rotates outward to the new *PPF*.

But economic growth is *not* free. To make it happen, consumption must decrease. The move from *L* to *K* in Figure 3.6 means forgoing 2 million cell phones now. The opportunity cost of producing more cell-phone factories is producing fewer cell phones today.

Also, economic growth is no magic formula for abolishing scarcity. Economic growth shifts the *PPF* outward, but on the new *PPF* we continue to face opportunity costs. To keep producing capital, current consumption must be less than its maximum possible level.

Economic growth
The sustained expansion of production possibilities.

FIGURE 3.6

Expanding Production Possibilities

MyEconLab Animation
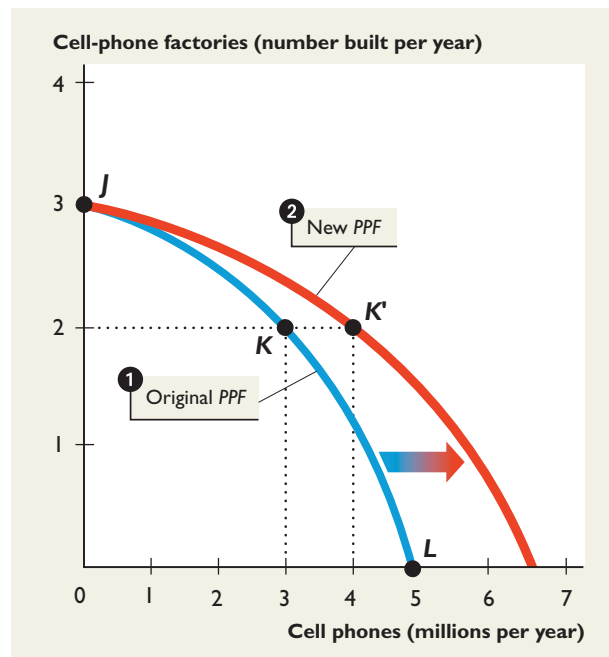
① If firms allocate no resources to producing cell-phone factories and produce 5 million cell phones a year at point *L*, the *PPF* doesn't change.

② If firms decrease cell-phone production to 3 million a year and produce 2 cell-phone factories, at point *K*, production possibilities will expand. After a year, the *PPF* shifts outward to the new *PPF* and production can move to point *K'*.

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 2011, 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 PPFs. In 2011, Hong Kong was at point B and the United States was at point C.

If Hong Kong continues to produce at a point such as B, 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

such as D, the pace of expansion of its PPF will slow.
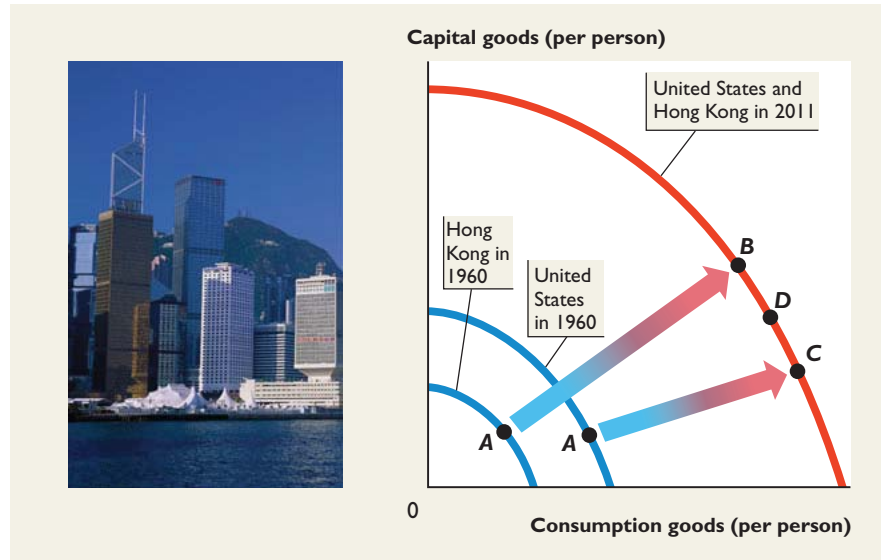
Capital goods (per person)

United States and Hong Kong in 2011

Hong Kong in 1960

United States in 1960

B

D

C

A   A

0   Consumption goods (per person)

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 machines to use in production. Economic growth occurs when resources are used today to produce better technologies, better 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

When Adam Smith visited a pin factory (see p. 13), he discovered that 10 people, each specializing in a small task, could make 48,000 pins a day. By dividing pin-making into small parts, what he called the *division of labor*, he found that people were 240 times as productive as they would be if each person performed all the tasks needed to make a pin.

You can see the productivity of specialization and the division of labor in many everyday places. One of these is a fast-food restaurant. One person specializes in keeping the kitchen stocked with bread, salad materials, meat, sauces, boxes, and wrappers. One works the grill and another the fry maker. Another specializes in assembling the meals. Yet another takes the customers' orders and handles payment. Another has the job of keeping things clean and hygenic.

Imagine how long you would have to wait for your burger if one person performed all these tasks. You place your order and then wait while your friendly server disappeared into the kitchen and emerged 15 minutes later with your not-so-fast-food order.

The productivity gain from specialization makes some people more productive than others. The server at McDonald's can take orders and payment in less time than the grill operator would take to do the same job. And the grill operator can make more burgers per hour than the server could make.

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, we say that person (or nation) has an **absolute advantage**.

You are going to discover another way in which people gain by specializing: by producing the good in which they have a *comparative advantage.*

In an 18th century pin factory …

… and a 21st century fast-food kitchen, specialization boosts productivity.

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.

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 dollar's 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

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.

A person has a **comparative advantage** in an activity if that person can perform the activity at a lower opportunity cost than anyone else. 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.

Let's explore the idea of comparative advantage and make it more concrete by looking at production in two quite different smoothie bars: one operated by Liz and the other operated by Joe.

Liz's Smoothie Bar

Liz produces smoothies and salads. In Liz's 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. 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 also produces both smoothies and salads. Joe's bar is smaller 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, so if he uses all his resources to make salads, he can produce 30 an hour. 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

■ **FIGURE 3.7**

Production Possibilities Frontiers

(a) Liz's *PPF* and production

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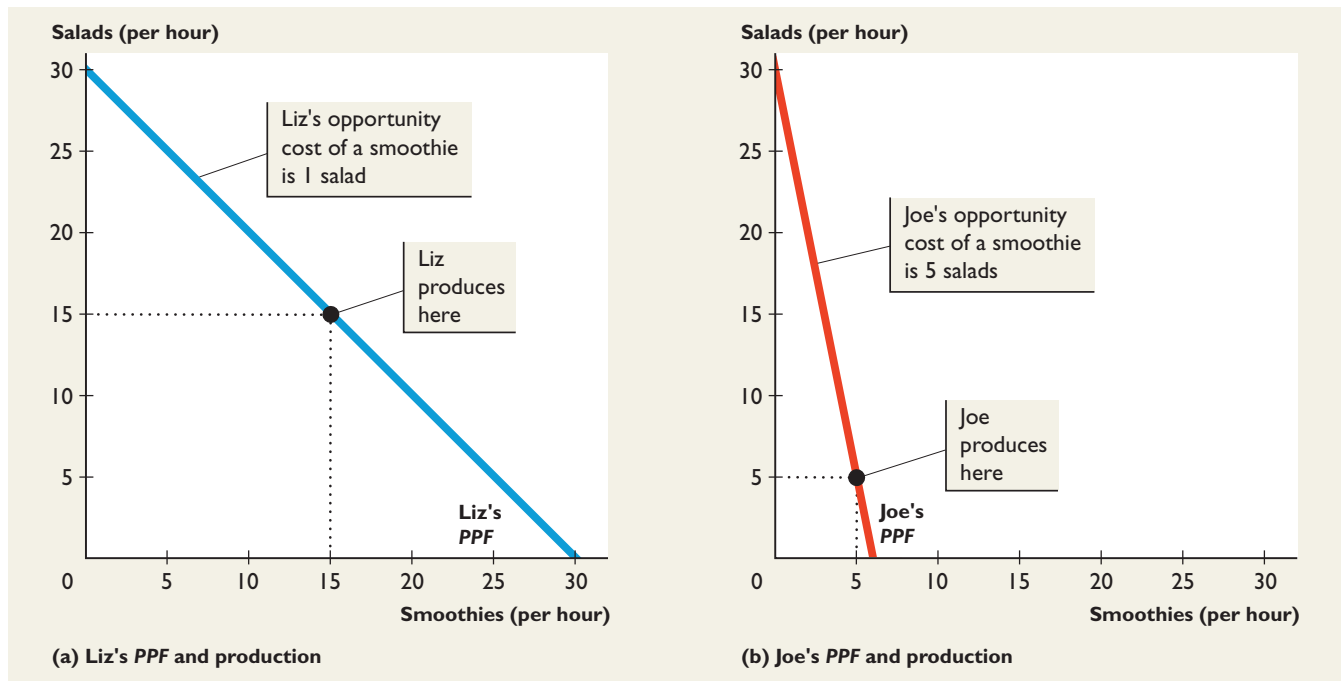
Liz can produce 30 smoothies per hour or 30 salads per hour or any other combination along her *PPF* in part (a). Liz chooses to produce 15 smoothies and 15 salads per hour.

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.

faces a *PPF* that enables him to produce 5 smoothies and 5 salads. On Liz's *PPF*, one smoothie costs one salad. On Joe's *PPF*, one smoothie costs 5 salads.

Liz's Greater Productivity

You can see from the numbers that describe the two smoothie bars 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 one evening in a singles bar. After a few minutes of getting acquainted, Liz tells Joe about her amazingly profitable smoothie business. Her only problem, she tells Joe, is that she wishes she could produce more because potential customers leave when her lines get too long.

Joe isn't sure whether to risk spoiling his chances by telling Liz about his own struggling business. But he takes the risk. When he explains to Liz that he spends 50 minutes of every hour making 5 smoothies and 10 minutes making 5 salads, Liz's eyes pop. "Have I got a deal for you!" she exclaims.

Here's the deal that Liz sketches on a paper napkin. Joe stops making smoothies and allocates all his time to producing salads. Liz stops making salads and allocates all her time to producing smoothies. 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).

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).

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

EYE on YOUR LIFE
Your Comparative Advantage

What you have learned in this chapter has huge implications for the way you organize your life. It also has implications for the position that you take on the controversial issue of offshore outsourcing.

Just as an economy expands its production possibilities by accumulating capital, so also will you expand your production possibilities by accumulating human capital. That is what you're doing right now in school.

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 that you do comparatively better than others. That, most likely, is where your comparative advantage lies.

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. But some Americans lose, at least in the short run.

Liz draws a figure (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*. They then trade smoothies and salads.

There is a range of prices at which they might trade. If the price is 5 salads per smoothie (or equivalently, 1/5 smoothies per salad), Liz gets all the gains. If the price is 1 salad per smoothie (1 smoothie per salad), Joe gets all the gains.

Liz suggests that they trade at a price of 2 salads per smoothie (1/2 a smoothie per salad). This price turns out to give each of them equal gains.

Liz gets salads for 1/2 a smoothie each, which is less than the 1 smoothie that it costs her to produce them. Joe gets smoothies for 2 salads each, which is less than the 5 salads it costs him to produce them. Each moves to the points marked *C* where Liz has 20 smoothies and 20 salads, 5 of each more than she has producing only for herself. And Joe has 10 smoothies and 10 salads, also 5 more of each than he has producing only for himself. Because of the gains from trade, total production increases by 10 smoothies and 10 salads.

Notice that the points *C* are *outside* Liz's and Joe's *PPF*s. This is the magic of the gains from trade. Everyone gains and everyone can enjoy quantities of goods and services that exceed their own ability to produce.

■ **FIGURE 3.8**

The Gains from Specialization and Trade   MyEconLab Animation

(a) Liz's gains from trade   **(b) Joe's gains from trade**
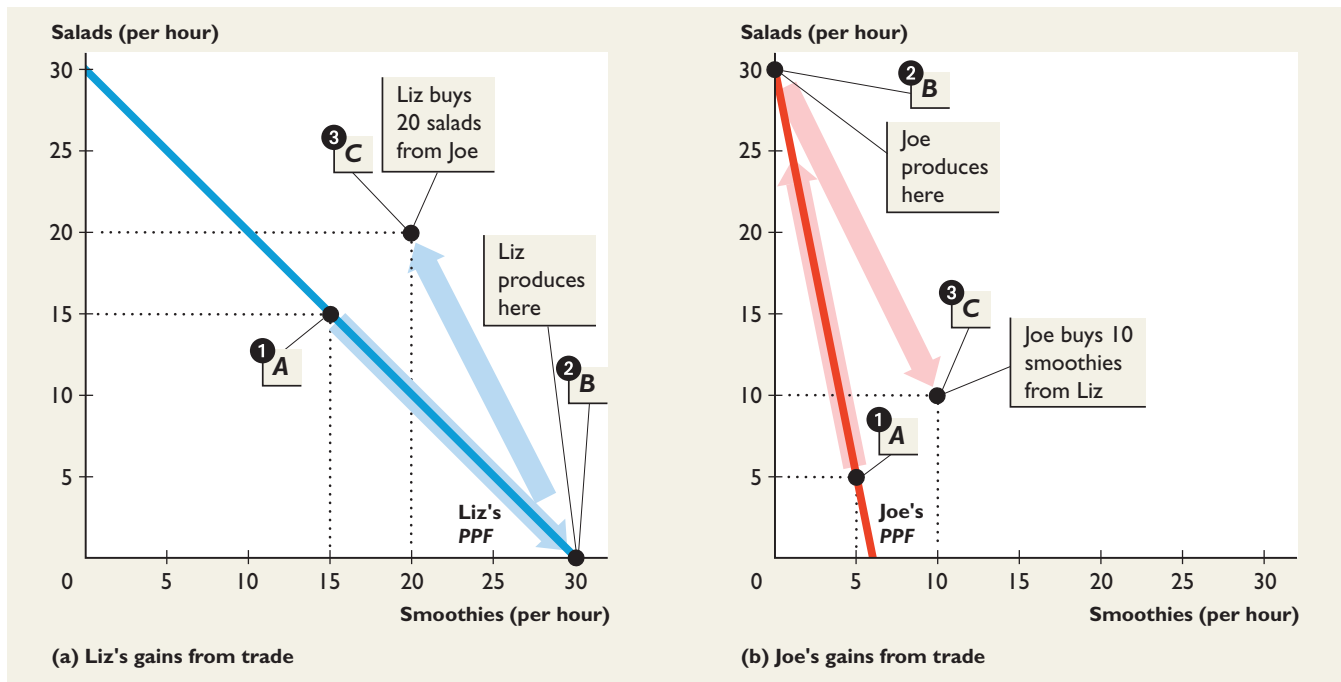
❶ Liz and Joe each produce at point *A* on their respective *PPF*s. Liz has a comparative advantage in producing smoothies, and Joe has a comparative advantage in producing salads.

❷ Joe specializes in salads and Liz specializes in smoothies, so they each produce at point *B* on their respective *PPF*s.

❸ They exchange smoothies for salads at a price of 2 salads per smoothie. 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*.

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

With big boost from sugar cane, Brazil is satisfying its fuel needs
Brazil is almost self-sufficient in ethanol. Brazilian ethanol is made from sugar and costs 83¢ per gallon whereas U.S. ethanol, made from corn, costs $1.14 per gallon. The United States does not import ethanol.
Source: *The New York Times*, April 12, 2006

Which country has a comparative advantage in producing ethanol? Explain why both the United States and Brazil can gain from specialization and trade.

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 a gallon of ethanol is less in Brazil than in the United States, so Brazil has a comparative advantage in producing ethanol. If Brazil specialized in producing ethanol and the United States specialized in producing other goods (for example, movies or food) and the two countries engaged in free trade, each country can gain because it would get to a point outside its own *PPF*.

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.

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

Absolute advantage, 73
Comparative advantage, 74
Economic growth, 71

Production efficiency, 62
Production possibilities frontier, 60
Tradeoff, 63

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
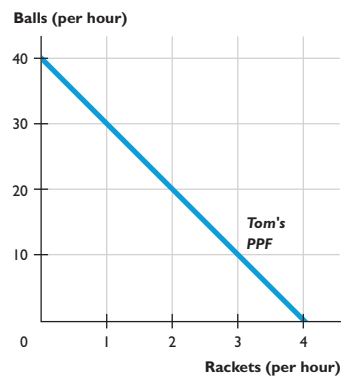
FIGURE 2
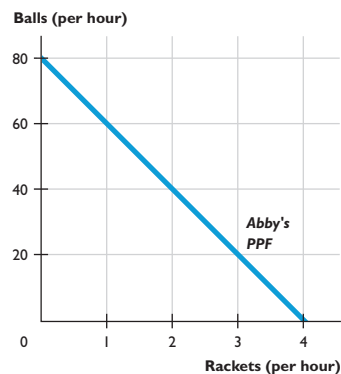
CHAPTER CHECKPOINT

Study Plan Problems and Applications

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**.

Figure 1 shows Tom's production possibilities and Figure 2 shows 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 15 balls for 1 racket, what are the gains from trade?

Instructor Assignable Problems and Applications

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 rights to emit 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	400

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 information to work Problems **9** to **11**.

Cheap broadband's a winner

Inexpensive broadband access has created a new generation of television producers and the Internet is their native medium.

Source: *The New York Times*, December 2, 2007

9. How has inexpensive broadband changed the production possibilities of video entertainment and other goods and services?

10. Sketch a *PPF* for video entertainment and other goods and services before broadband.

11. Explain how the arrival of inexpensive broadband has changed the *PPF*.

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

Multiple Choice Quiz

1. Table 1 shows the *PPF* 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 *PPF* 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 *PPF* 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 *PPF* of an island community. Choose the best statement.

 A. When a drought hits the island, its *PPF* shifts outward.

 B. When the islanders discover a better way of catching fish, the island's *PPF* shifts outward.

 C. When islanders reduce the time they spend gathering berries, the *PPF* shifts 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 a cake is 2 pies. Tim makes 20 pies and 10 cakes a day and his opportunity cost of a cake is 4 pies. If they specialize in the good in which they have a comparative advantage _____.

 A. Mary produces pies

 B. Tim produces pies and cakes

 C. Mary produces cakes while Tim produces pies

 D. Tim produces cakes while Mary produces pies

Why did the price of coffee
soar in 2010 and 2011?

Demand and Supply

**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.

COMPETITIVE MARKETS

When you need a new pair of running shoes, want a bagel and a latte, or need to fly home for Thanksgiving, you must find a place where people sell those items or offer those services. The place where you find them is a *market*.

You learned in Chapter 2 that a market is any arrangement that brings buyers and sellers together. A market has two sides: buyers (demanders) and sellers (suppliers). There are markets for *goods* such as apples and hiking boots, for *services* such as haircuts and tennis lessons, for *resources* such as computer programmers and tractors, and for other manufactured *inputs* such as memory chips and auto parts. There are also markets for money such as Japanese yen and for financial securities such as Yahoo! 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 bananarepublic.com, and auction sites such as eBay.

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 basketball shoes. The buyers in this $3-billion-a-year market are the 45 million Americans who play basketball (or who want to make a fashion statement) and are looking for a new pair of shoes. The sellers are the tens of thousands of retail sports equipment and footwear stores. Each buyer can visit several different stores, and each seller knows that the buyer has a choice of stores.

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 running shoes …   *coffee and bagel …*   *and airline travel.*

4.1   DEMAND

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.**

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 $1 a bottle to 25 cents a bottle while the price of Gatorade remained at $1 a bottle. Wouldn't some people switch from Gatorade to water? By doing so, they save 75 cents 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 now buy but would if you could afford them. How cheap would a PC have to be for you to buy *both* a desktop 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. It 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 cents 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
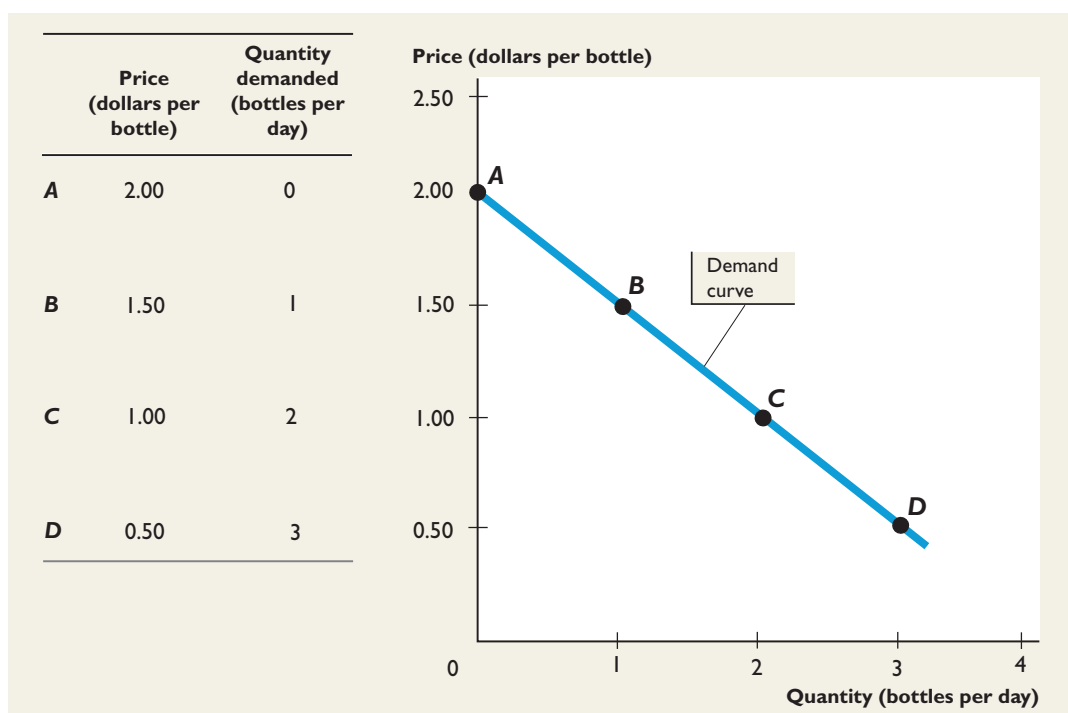
■ Individual Demand and Market Demand

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.

Market demand
The sum of the demands of all the buyers in the market.

■ 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.

(a) Tina's demand

(b) Tim's demand

(c) Market demand

■ Changes in Demand

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

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. Wrist guards are a complement of in-line skates, and bottled water is a complement of fitness center services.

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.

Substitute
A good that can be consumed in place of another good.

Complement
A good that is consumed with another good.

■ **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.

❶ When demand decreases, the demand curve shifts leftward from D_0 to D_1.

❷ When demand increases, the demand curve shifts rightward from D_0 to D_2.
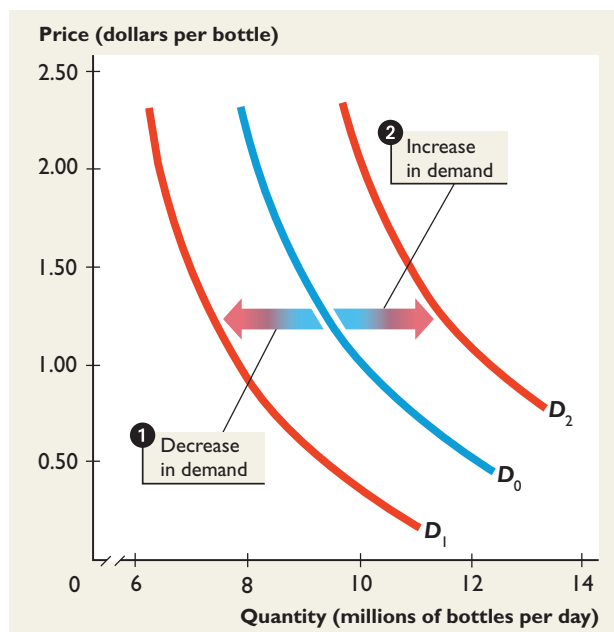
The demand for a good and the price of one of its substitutes move in the *same direction*. The demand for a good *increases* if the price of one of its substitutes *rises* and *decreases* if the price of one of its substitutes *falls*. For example, the demand for cheesecake increases when the price 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 wrist guards decreases when the price of in-line skates 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 has 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 MP3 technology has decreased the demand for CDs and has increased the demand for Internet service and MP3 players.

■ Change in Quantity Demanded Versus Change in Demand

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**.

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 distinction between a change in demand and a change in the quantity demanded is crucial for figuring 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

❶ A decrease in the quantity demanded

If the price of a good rises, *cet. par.*, the quantity demanded decreases. There is a movement up along the demand curve D_0.

❷ 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.
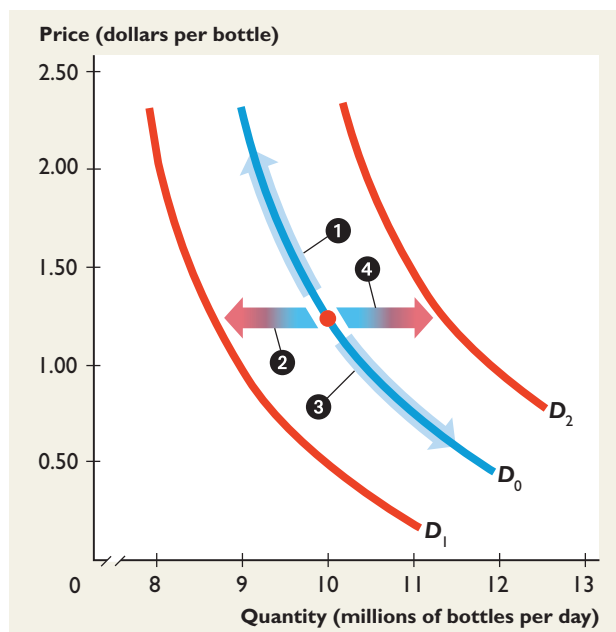
❸ An increase in the quantity demanded

If the price of a good falls, *cet. par.*, the quantity demanded increases. There is a movement down along the demand curve D_0.

❹ 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

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 cell phones:
- The price of a cell phone falls.
- Everyone believes that the price of a cell phone will fall next month.
- The price of a call made from a cell phone falls.
- The price of a call made from a land-line phone increases.
- The introduction of camera phones makes cell phones more popular.

1. Explain the effect of each event on the demand for cell phones.

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

Airlines, now flush, fear a downturn
So far this year, airlines have been able to raise fares but still fill their planes.
Source: *The New York Times*, June 10, 2011
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 cell phone increases the quantity of cell phones demanded but has no effect on the demand for cell phones.
   An expected fall in the price of a cell phone next month decreases the demand for cell phones today as people wait for the lower price.
   A fall in the price of a call from a cell phone increases the demand for cell phones because a cell phone call and a cell phone are complements.
   A rise in the price of a call from a land-line phone increases the demand for cell phones because a land-line phone and a cell phone are substitutes.
   With cell phones more popular, the demand for cell phones increases.

2. Figure 1 illustrates the effect of a fall in the price of a cell phone as a movement along the demand curve D.
   Figure 2 illustrates the effect of an increase in the demand for cell phones as the shift of the demand curve from D_0 to D_1 and a decrease in the demand for cell phones as the shift of the demand curve from D_0 to D_2.

3. A fall in the price of a cell phone (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.

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 still fill their planes because "other things" did not remain the same. Some event increased the demand for air tickets.
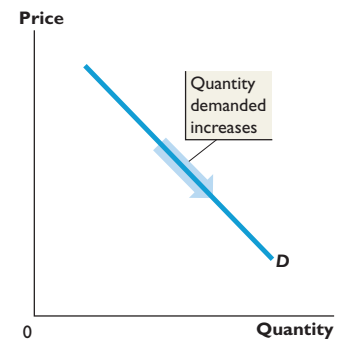
FIGURE 1

FIGURE 2
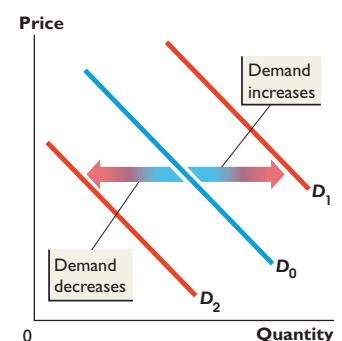
4.2 SUPPLY

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 price of bottled water rises, spring owners will offer more water for sale; if the price of a flat panel TV falls, Sony Corp. will offer fewer flat panel 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 cents 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.

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.

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.

Supply schedule
A list of the quantities supplied at each different price when all the other influences on selling plans remain the same.

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.

■ **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
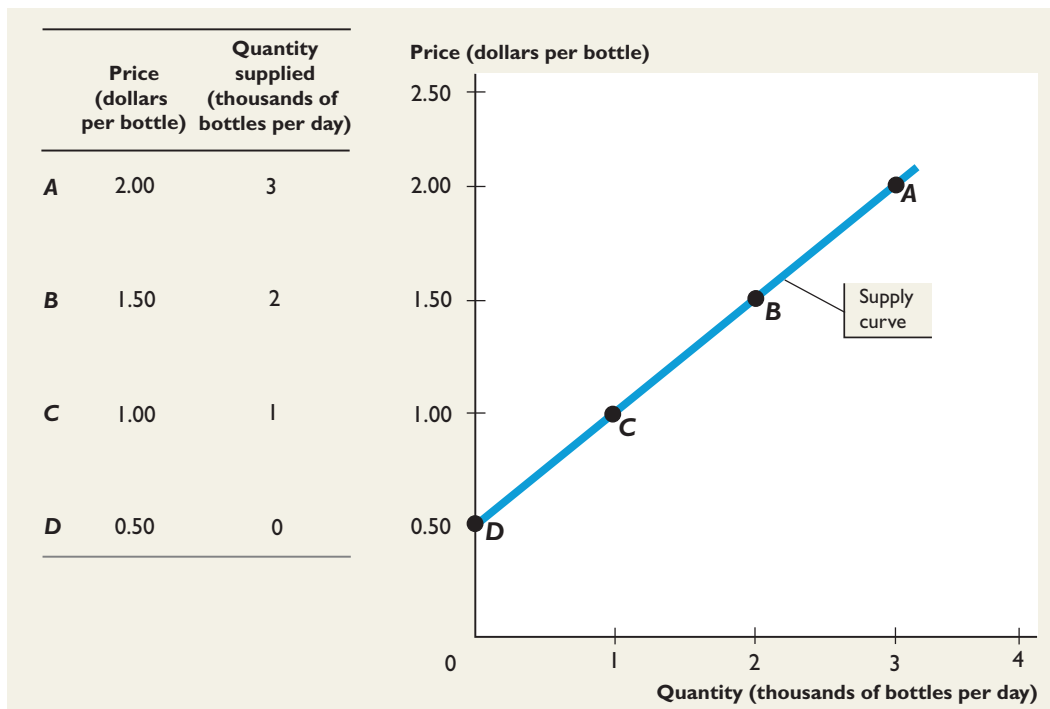
The table shows a supply schedule that lists the quantity of water supplied at each price if all other influences on selling plans remain the same. At a price of $1.50 a bottle, the quantity supplied is 2,000 bottles a day.

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

The sum of the supplies of all the sellers in the market.

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.

(a) Agua's supply

(b) Prima's supply

(c) Market supply

■ Changes in Supply

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*.

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

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.

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.

A **complement in production** of a good is another good that is produced along with it. Cream is a complement in production of skim milk in a dairy.

Substitute in production
A good that can be produced in place of another good.

Complement in production
A good that is produced along with another good.

■ **FIGURE 4.7**

Changes in Supply
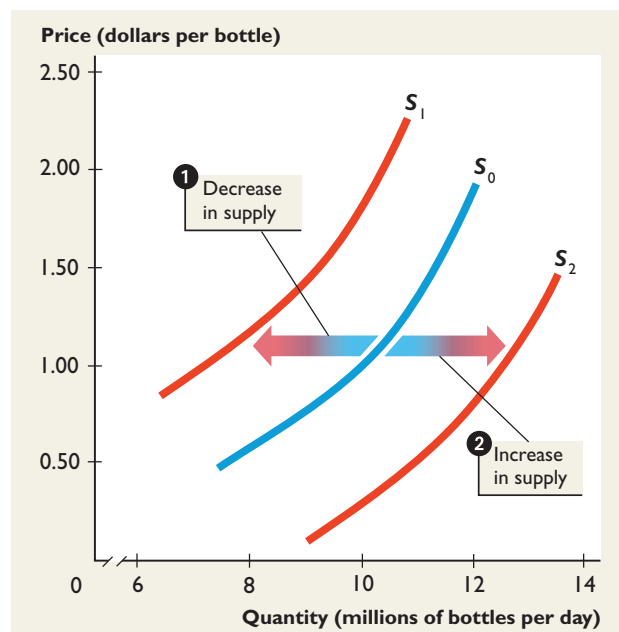
A change in any influence on selling plans other than a change in the price of the good itself changes supply and shifts the supply curve.

❶ When supply decreases, the supply curve shifts leftward from S_0 to S_1.

❷ 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 cargo pants 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 cargo pants to button-fly jeans, so the supply of cargo pants 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 iPod, the supply of which was previously zero.

Natural events such as severe weather and earthquakes decrease productivity and decrease supply. For example, the tsunami of 2004 decreased the supply of agricultural products and seafood in many places surrounding the Indian Ocean.

■ Change in Quantity Supplied Versus Change in Supply

The influences on sellers' plans 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**.

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.

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.

■ FIGURE 4.8

Change in Quantity Supplied Versus Change in Supply   MyEconLab Animation

1 **A decrease in the quantity supplied**
If the price of a good falls, *cet. par.*, the quantity supplied decreases. There is a movement down along the supply curve S_0.

2 **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.
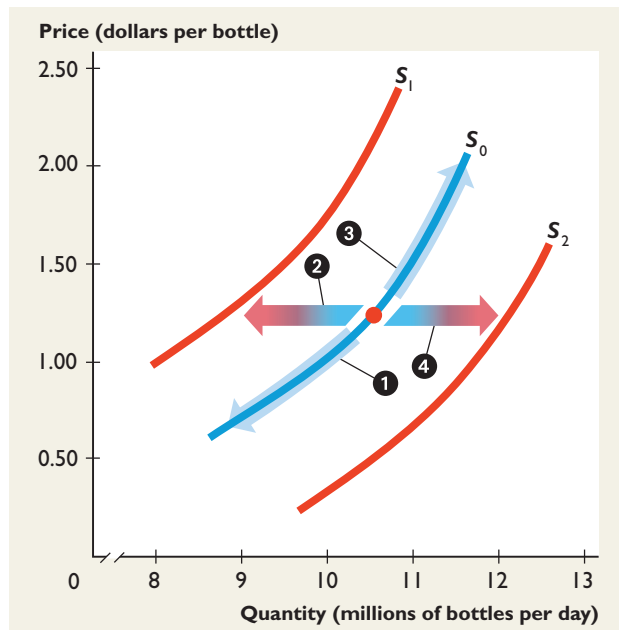
3 **An increase in the quantity supplied**
If the price of a good rises, *cet. par.*, the quantity supplied increases. There is a movement up along the supply curve S_0.

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.

CHECKPOINT 4.2

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.
- The price of a timber beam is expected to rise next year.
- 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

GM, UAW reach crucial cost-cutting pact
GM and the UAW agree on restructuring workers' jobs. This restructuring, with no change in the wage rate, will save GM billions in labor costs.

Source: *Wall Street Journal*, May 22, 2009

How will this cost-cutting agreement change GM's supply of vehicles? Explain.
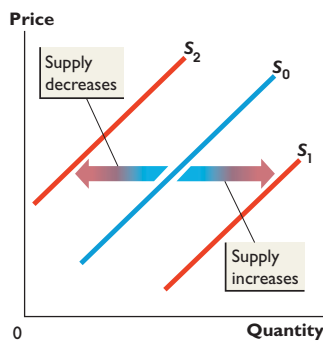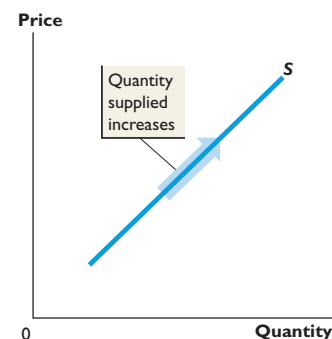
Solutions to Practice Problems

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. An expected rise in the 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

The cut in labor costs with no change in the wage rate is an increase in productivity, which will increase GM's supply of vehicles.

FIGURE 1

FIGURE 2

4.3 MARKET EQUILIBRIUM

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

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 a situation in 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 a situation in 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

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.

■ FIGURE 4.9

Equilibrium Price and Equilibrium Quantity

MyEconLab Animation
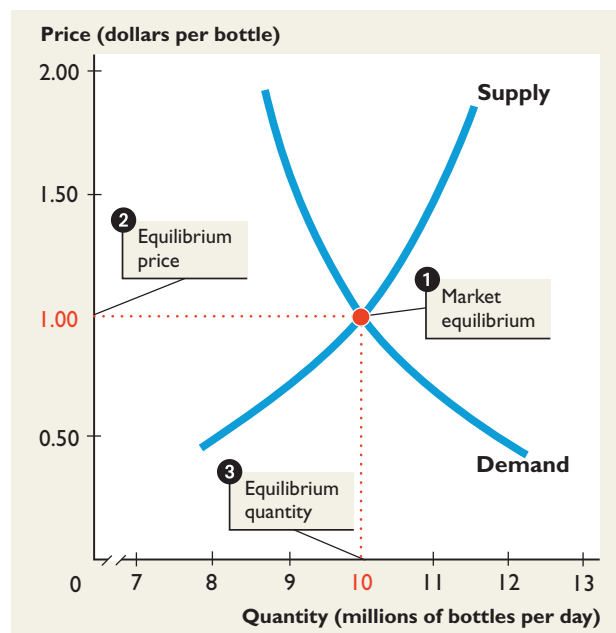
① Market equilibrium occurs at the intersection of the demand curve and the supply curve.

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

Price (dollars per bottle)

(a) Surplus and price falls

Price (dollars per bottle)

(b) Shortage and price rises
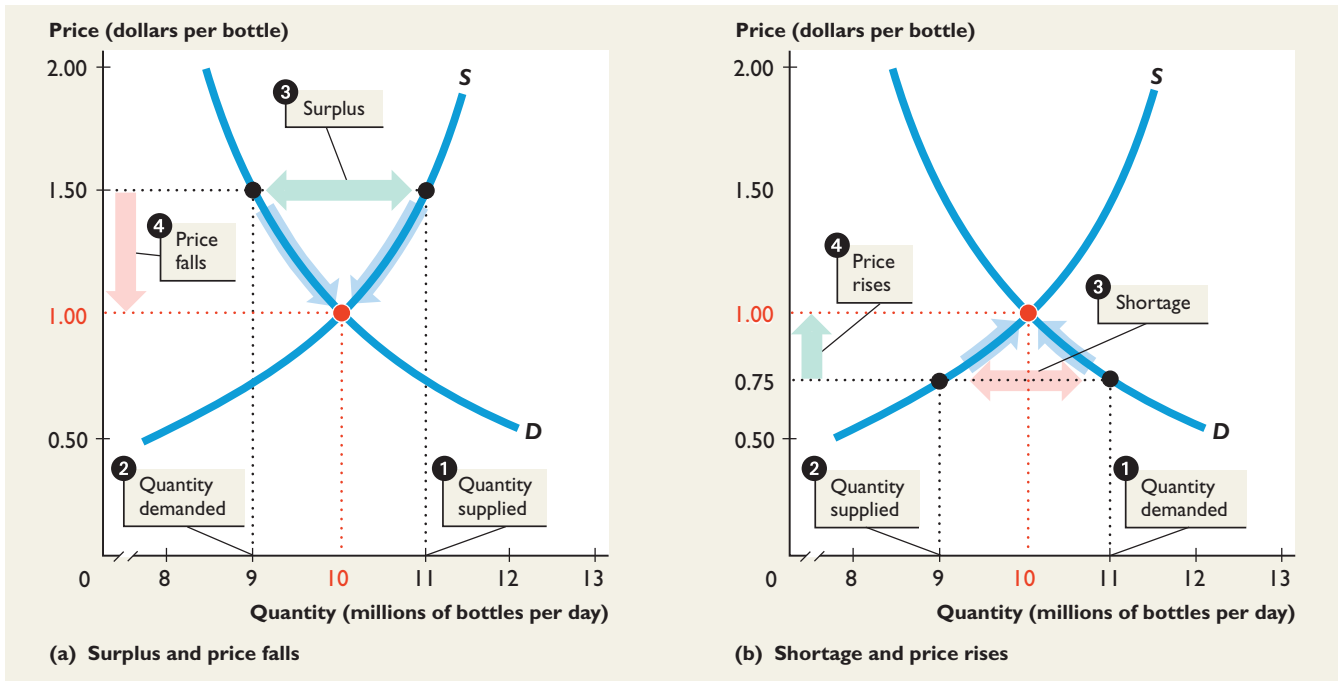
At $1.50 a bottle, ❶ the quantity supplied is 11 million bottles, ❷ the quantity demanded is 9 million bottles, ❸ the surplus is 2 million bottles, and ❹ the price falls.

At 75 cents a bottle, ❶ the quantity demanded is 11 million bottles, ❷ the quantity supplied is 9 million bottles, ❸ the shortage is 2 million bottles, and ❹ the price rises.

needed to restore equilibrium.

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 cents 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?

■ 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 cents 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

(b) A decrease in demand
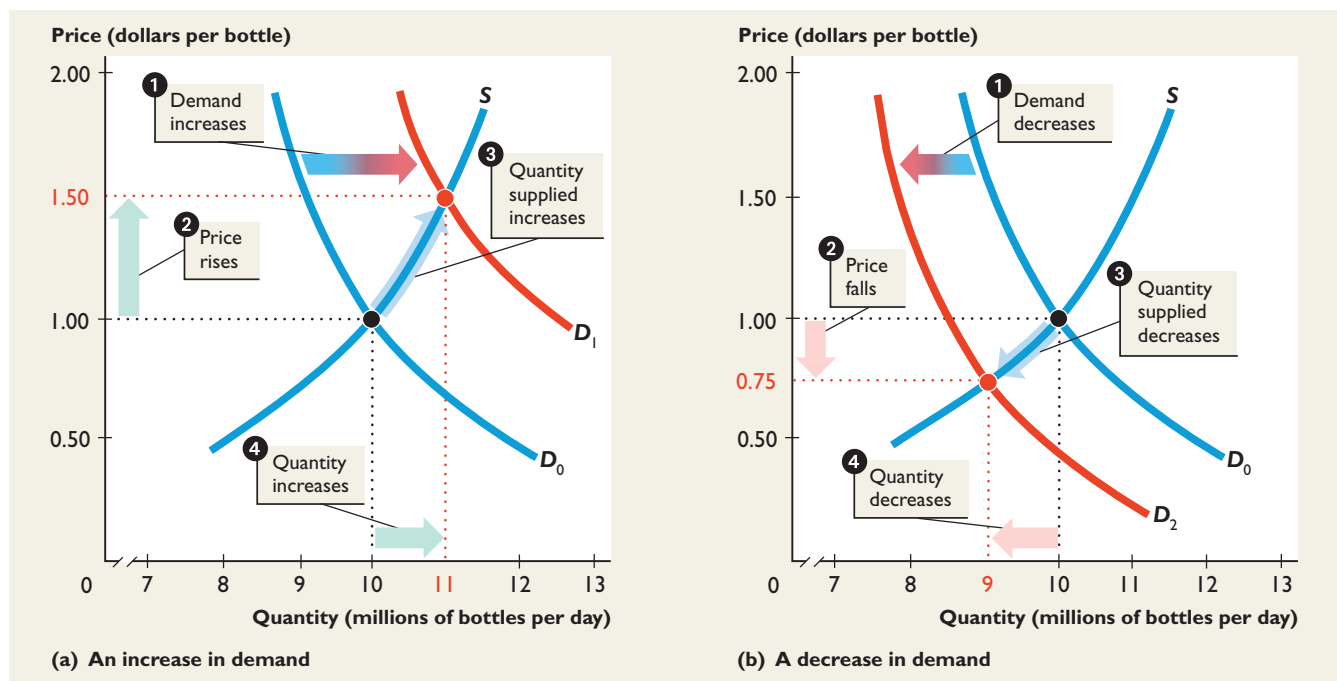
❶ An increase in demand shifts the demand curve rightward to D_1 and creates a shortage. ❷ The price rises, ❸ the quantity supplied increases, and ❹ the equilibrium quantity increases.

❶ A decrease in demand shifts the demand curve leftward to D_2 and creates a surplus. ❷ The price falls, ❸ the quantity supplied decreases, and ❹ the equilibrium quantity decreases.

■ 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 cents 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 to 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

(b) A decrease in supply
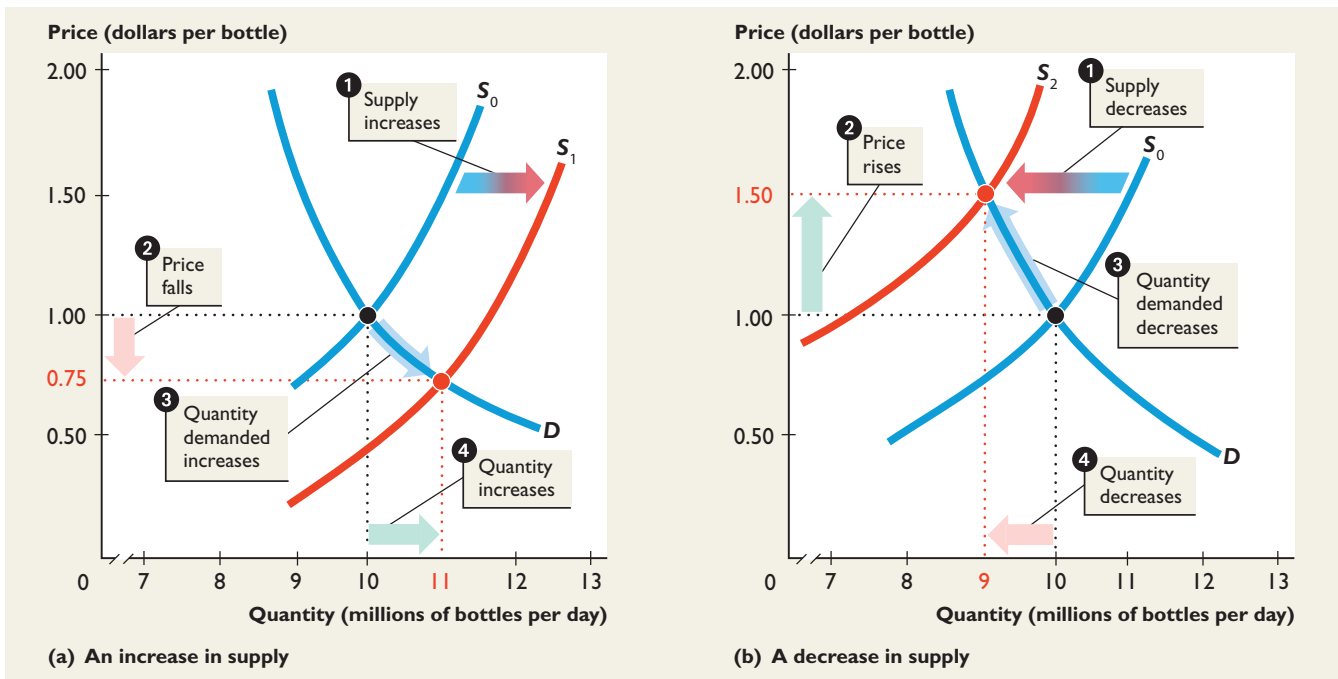
❶ An increase in supply shifts the supply curve rightward to S_1 and creates a surplus. ❷ The price falls, ❸ the quantity demanded increases, and ❹ the equilibrium quantity increases.

❶ A decrease in supply shifts the supply curve leftward to S_2 and creates a shortage. ❷ The price rises, ❸ the quantity demanded decreases, and ❹ the equilibrium quantity decreases.

EYE on the PRICE OF COFFEE
Why Did the Price of Coffee Soar in 2010 and 2011?

In January 2009, the price of coffee (the kind that you get at Starbucks and similar coffee shops called Arabica) was $1.25 a pound (point *A* in Figure 1) and by May 2011, it had risen to $3.00 a pound (point *B*). Why did the price of coffee soar? Figure 2, which shows the market for coffee, answers this question.

The demand curve *D* and the supply curve S_{09} determined the equilibrium price and quantity in 2009 at $1.25 a pound and 950 million pounds.

Heavy rain led to exceptionally low harvests in Colombia, Indonesia, Mexico, and Vietnam, which decreased the supply of coffee. The supply curve shifted leftward to S_{11}. The price increased to $3.00 a pound. The quantity demanded and equilibrium quantity decreased to 800 million pounds.

Price of coffee (dollars per pound)

① From January 2009 to May 2011, the price of coffee increased by 140 percent
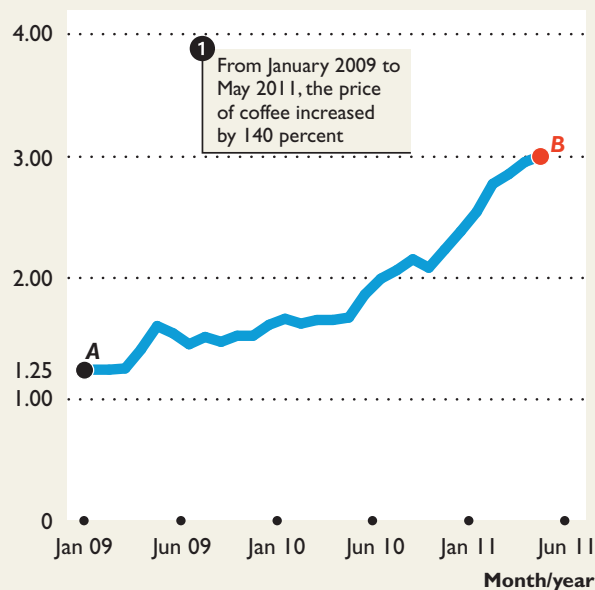
Figure 1 The price of coffee

Price (dollars per pound)

② A decrease in the supply of coffee ...

③ ... raised the price of coffee ...

④ ... and decreased the quantity of coffee demanded
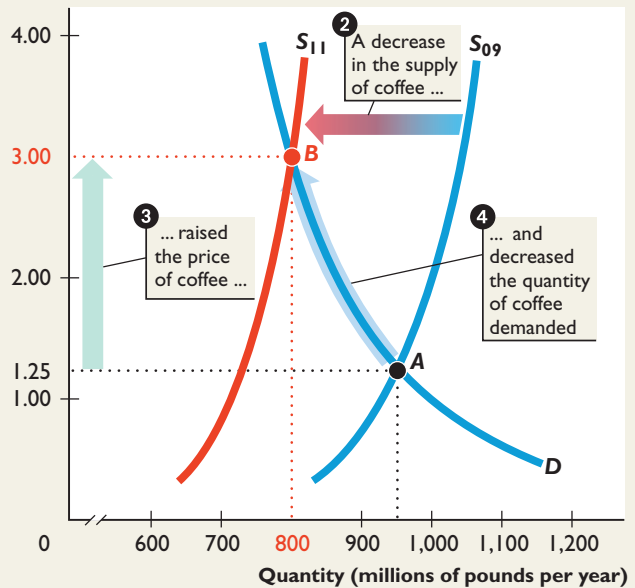
Figure 2 The market for coffee

EYE on YOUR LIFE
Using Demand and Supply

The demand and supply model is going to be a big part of the rest of your life!

First, you will use it again and again during your economics course. The demand and supply model is one of your major tools, so having a firm grasp of it will bring an immediate payoff.

But second, and 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 law of 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.

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■ 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. Figure 4.13 summarizes all the possible cases.

Increase in Both Demand and Supply

An increase in demand or an increase in supply increases the equilibrium quantity. So when demand and supply increase together, the *quantity increase*s. But the price rises when demand increases and falls when supply increases. So when demand and supply increase together, we can't say what happens to the price unless we know the magnitudes of the changes. 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(e) shows the case when supply increases by the same amount as demand increases, so the price remains unchanged.

Decrease in Both Demand and Supply

A decrease in demand or a decrease in supply decreases the equilibrium quantity. So when demand and supply decrease together, the *quantity decreases*. But the price falls when demand decreases and rises when supply decreases. So when demand and supply decrease together, we can't say what happens to the price unless we know the magnitudes of the changes. If demand decreases by more than supply decreases, the price falls. But if supply decreases by more than demand decreases, the price rises. Figure 4.13(i) shows the case when supply decreases by the same amount as demand decreases, so the price remains unchanged.

Increase in Demand and Decrease in Supply

An increase in demand or a decrease in supply raises the equilibrium price, so combined, these changes *raise the price*. But an increase in demand increases the quantity, and a decrease in supply decreases 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. If demand increases by more than supply decreases, the quantity increases. But if supply decreases by more than demand increases, the quantity decreases. Figure 4.13(h) shows the case when demand increases by the same amount as supply decreases, so the quantity remains unchanged.

Decrease in Demand and Increase in Supply

A decrease in demand or an increase in supply lowers the equilibrium price, so combined, these changes *lower the price*. But 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. If demand decreases by more than supply increases, the quantity decreases. But if supply increases by more than demand decreases, the quantity increases. Figure 4.13(f) shows the case when demand decreases by the same amount as supply increases, so the quantity remains unchanged.

For the cases in Figure 4.13 where you "can't say" what happens to price or quantity, make some examples that go in each direction.

■ **FIGURE 4.13**

The Effects of All the Possible Changes in Demand and Supply   MyEconLab Animation
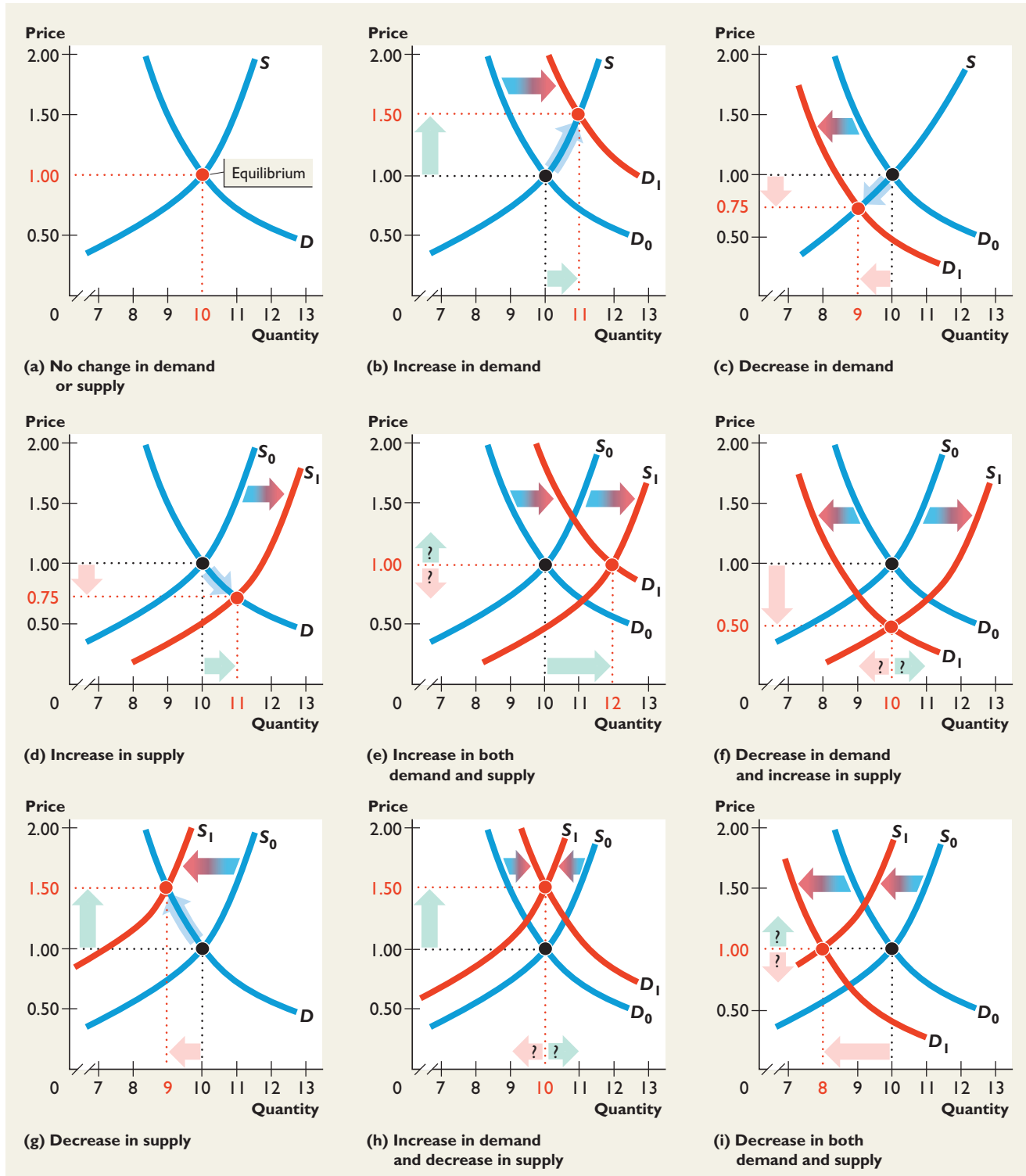
(a) **No change in demand or supply**

(b) **Increase in demand**

(c) **Decrease in demand**

(d) **Increase in supply**

(e) **Increase in both demand and supply**

(f) **Decrease in demand and increase in supply**

(g) **Decrease in supply**

(h) **Increase in demand and decrease in supply**

(i) **Decrease in both demand and supply**

TABLE 1

Price (dollars per carton)	Quantity demanded	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

FIGURE 1

FIGURE 2
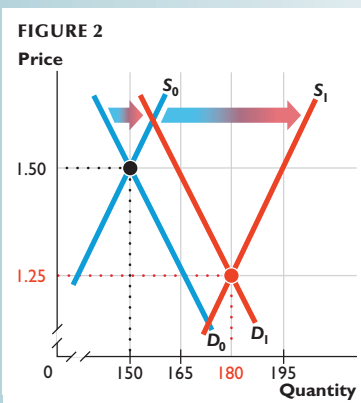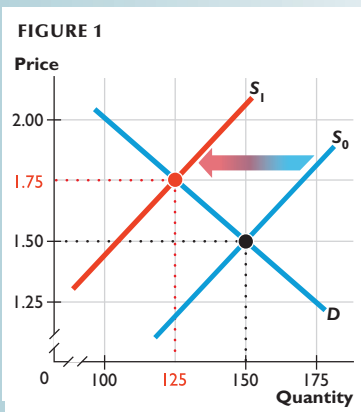
CHECKPOINT 4.3

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.

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

After wild weather, higher food prices on horizon

After heavy rain this year, the corn harvest will be less than expected while the demand for corn will continue to increase. Food prices will continue to rise.

Source: npr, June 9, 2011

Using the demand and supply model explain why food prices are expected to rise.

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 corn harvest will decrease the supply of corn and shift the supply curve of corn leftward. The increase in the demand for corn will shift the demand curve rightward. The price of corn will rise. The higher price of corn will decrease the supply of food made from corn and raise the price of this food.

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

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, 99
Equilibrium quantity, 99
Inferior good, 89
Law of demand, 85
Law of market forces, 99
Law of supply, 92
Market demand, 87
Market equilibrium, 99
Market supply, 94

Normal good, 89
Quantity demanded, 85
Quantity supplied, 92
Substitute, 88
Substitute in production, 95
Supply, 92
Supply curve, 93
Supply schedule, 93

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.

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 breached 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

   Draw a graph to show the oil market in equilibrium. Suppose that OPEC members had agreed to increase production. Show on your graph, the effect of this decision on the market equilibrium.

Use the following information to work Problems **7** and **8**.

Pricier bread and cereal. Coming soon?
Wheat and corn prices surged about 10 percent last week and could hit the items in your grocery basket by mid-summer. It's a case of two extremes: dry weather conditions in parts of the southern United States and in Europe have sparked fears of a supply crunch of wheat, while supplies of corn are being threatened by flooding and heavy rain in the Midwest.
Source: CNN Money, May 19, 2011

7. Explain why the dry weather will lead to a rise in the price of bread.

8. Use graphs to show why the price of corn has risen and show its effect on the price of cereals.

TABLE 1

Price (dollars per pair)	Quantity demanded	Quantity supplied
	(pairs per day)	
60	1,000	400
70	900	500
80	800	600
90	700	700
100	600	800
110	500	900

Instructor Assignable Problems and Applications

1. If after heavy rain and low production, the weather improves and coffee growers enjoy bumper crops, how does
   • The demand for coffee change?
   • The supply of coffee change?
   • The price of coffee change?
   Illustrate your answer with a graphical analysis.

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?

Table 1 shows the demand and supply schedules for boxes of chocolates in an average week. Use this information to work Problems **4** and **5**.

4. If the price of chocolates is $17.00 a box, describe the situation in the market. Explain how market equilibrium is restored.

5. 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.

6. 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.

7. **Alabama food prices jump in May**
   Alabama Farmers Federation announced that food prices in May will increase. In previous unprofitable years, farmers reduced their herds with the result that in 2009 meat production will fall. Bacon is expected to rise by 32 cents a pound to $4.18 and steaks by 57 cents to $8.41 a pound.

   Source: *The Birmingham News*, May 21, 2009

   Explain why the reduction of herds will lead to a rise in meat prices today. Draw a graph to illustrate.

8. "As more people buy computers, the demand for Internet service increases and the price of Internet service decreases. The fall in the price of Internet service decreases the supply of Internet service." Is this statement true or false? Explain.

9. **Steel output set for historic drop**
   Steel producers expect to cut output by 10 percent in 2009 in response to cancelled orders from construction companies and car and household appliance producers.

   Source: *Financial Times*, December 28, 2008

   Does the cancellation of orders change the demand for steel, the quantity demanded, the supply of steel, or the quantity supplied? What happens to the equilibrium price of steel?

TABLE 1

Price (dollars per box)	Quantity demanded	Quantity supplied
	(boxes per week)	
13.00	1,600	1,200
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

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. rise in the wage rate paid to garment workers
    B. rise in the price of a denim skirt (a substitute for jeans)
    C. fall in the price of denim cloth
    D. new technology, which 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 cell phones, which of the following events increases the supply of cell phones?

    A. New technology lowers the cost of making a cell phone
    B. 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 used 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

Elasticities of Demand and Supply

5

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

1 Define the price elasticity of demand, and explain the factors that influence it and how to calculate it.

2 Define the price elasticity of supply, and explain the factors that influence it and how to calculate it.

3 Define the cross elasticity of demand and the income elasticity of demand, and explain the factors that influence them.

5.1   THE PRICE ELASTICITY OF DEMAND

A decrease in supply of gasoline brings a large rise in its price and a small decrease in the quantity that people buy. The reason is that buying plans for gasoline are not very responsive to a change in price. But an increase in the supply of airline services brings a small decrease in its price and a large increase in the quantity of air travel. In the case of air travel, buying plans are highly sensitive to a change in price. By knowing how sensitive or responsive buying plans are to price changes, we can predict how a given change in supply will change price and quantity.

But we often want to go further and predict by how much a price will change when an event occurs. To make more precise predictions about the magnitudes of price and quantity changes, we need to know more about a demand curve than the fact that it slopes downward. We need to know how responsive the quantity demanded is to a price change. 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. But we calculate percentage changes in a special way.

■ Percentage Change in Price

Suppose that Starbucks raises the price of a latte from $3 to $5 a cup. What is the percentage change in price? The change in price is the new price minus the initial price. 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

$$\text{Percentage change in price} = \left(\frac{\$5 - \$3}{\$3} \right) \times 100 = \left(\frac{\$2}{\$3} \right) \times 100 = 66.67 \text{ percent.}$$

Now suppose that Starbucks cuts the price of a latte from $5 to $3 a cup. Now what is the percentage change in price? The initial price is now $5 and the new price is $3, so the percentage change in price is calculated as

$$\text{Percentage change in price} = \left(\frac{\$3 - \$5}{\$5} \right) \times 100 = \left(\frac{-\$2}{\$5} \right) \times 100 = -40 \text{ percent.}$$

The same price change, $2, over the same interval, $3 to $5, is a different percentage change (different absolute value or magnitude) depending on whether the price rises or 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.*

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*What you learn in this chapter also applies to services and factors of production.

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:

$$\begin{aligned}\text{Percentage} \atop \text{change in price} &= \left(\frac{\$5 - \$3}{(\$5 + \$3) \div 2}\right) \times 100 = \left(\frac{\$2}{\$8 \div 2}\right) \times 100 \\[2mm] &= \left(\frac{\$2}{\$4}\right) \times 100 = 50 \text{ percent.}\end{aligned}$$

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 (absolute value or 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 a cup, the quantity demanded decreases from 15 cups to 5 cups an hour. The percentage change in the quantity demanded using the midpoint method is

$$\begin{aligned}\text{Percentage change} \atop \text{in quantity} &= \left(\frac{\text{New quantity} - \text{Initial quantity}}{(\text{New quantity} + \text{Initial quantity}) \div 2}\right) \times 100 \\[2mm] &= \left(\frac{5 - 15}{(5 + 15) \div 2}\right) \times 100 = \left(\frac{-10}{20 \div 2}\right) \times 100 \\[2mm] &= \left(\frac{-10}{10}\right) \times 100 = -100 \text{ percent.}\end{aligned}$$

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 change in the price and the percentage change in the quantity demanded, we use the absolute values or magnitudes of the percentage changes and we ignore the minus sign.

■ Elastic and Inelastic Demand

To determine the responsiveness of the quantity of Starbucks latte demanded to its price, we need to compare the two percentage changes we've just calculated. The percentage change in quantity is 100 and the percentage change in price is 50, so the percentage change in quantity demanded is twice the percentage change in price. If we collected data on the prices and quantities of a number of goods and services (and we were careful to check that other things had remained the same), we could calculate lots of percentage changes. Our calculations would fall into three groups: The percentage change in the quantity demanded might exceed the percentage change in price, equal the percentage change in price, or be less than the percentage change in price. Which of these three possibilities arises depends on the elasticity of demand:

Elastic demand
When the percentage change in the quantity demanded exceeds the percentage change in price.

- When the percentage change in the quantity demanded exceeds the percentage change in price, demand is **elastic.**

Unit elastic demand
When the percentage change in the quantity demanded equals the percentage change in price.

- 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.**

Inelastic demand
When the percentage change in the quantity demanded is less than the percentage change in 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.

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.

■ 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 it is defined, and the amount of time available to find a substitute for it.

FIGURE 5.1

The Range of Price Elasticities of Demand

Price (dollars per gallon)

① A close-to-zero percent price rise ...

② ... decreases the quantity demanded by a very large percentage

I ———————————————— D

③ The demand for water from a single spring is perfectly elastic

0   100   130
Quantity (gallons per month)

(a) Perfectly elastic demand

Price (dollars per PlayStation)

① A 10 percent price rise ...

③ The demand for Sony PlayStations is elastic

105
100
95

② ... decreases the quantity demanded by 20 percent

D

0   90 100 110   130
Quantity (PlayStations per month)

(b) Elastic demand

Price (dollars per trip)

① A 10 percent price rise ...

③ The demand for transportation is unit elastic

105
100
95

② ... decreases the quantity demanded by 10 percent

D

0   95 100 105   130
Quantity (trips per month)

(c) Unit elastic demand

Price (cents per pack)

110

① A 20 percent price rise ...

③ The demand for chewing gum is inelastic

100
90

② ... decreases the quantity demanded by 10 percent

D

0   95 100 105   130
Quantity (packs of gum per month)

(d) Inelastic demand

Price (cents per dose)

D

① A price rise of any percentage ...

② ... decreases the quantity demanded by zero percent

105
100
95

③ The demand for insulin is perfectly inelastic over this price range

0   100   130
Quantity (doses per day)

(e) Perfectly inelastic demand

---

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 a Starbucks latte is elastic because a New World latte is a good substitute for it. The demand for a broadly defined good is inelastic. For example, the demand for coffee is inelastic because tea is a poor substitute for it.

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.

■ 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 a cup and 15 cups an hour are demanded—the initial point in the figure. Then the price rises to $5 a cup 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
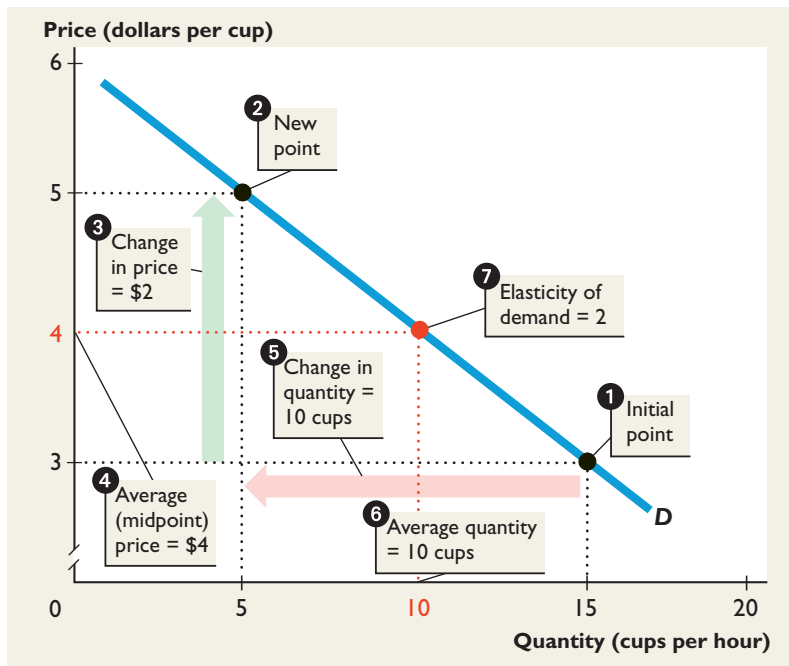
① At the initial point, the price is $3 a cup and the quantity demanded is 15 cups an hour.

② At the new point, the price is $5 a cup 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 cups ÷ 10 cups) × 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 a Starbucks latte 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 a Starbucks latte is elastic.

■ Interpreting the Price Elasticity of Demand Number

The number we've just calculated for a Starbucks latte is only an example. We don't have real data on the price and quantity. But suppose we did have real data and we discovered that the price elasticity of demand for a Starbucks latte is 2. What does this number tell us?

It tells us three main things:

1. The demand for Starbucks latte 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.

■ 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 a Starbucks latte 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.
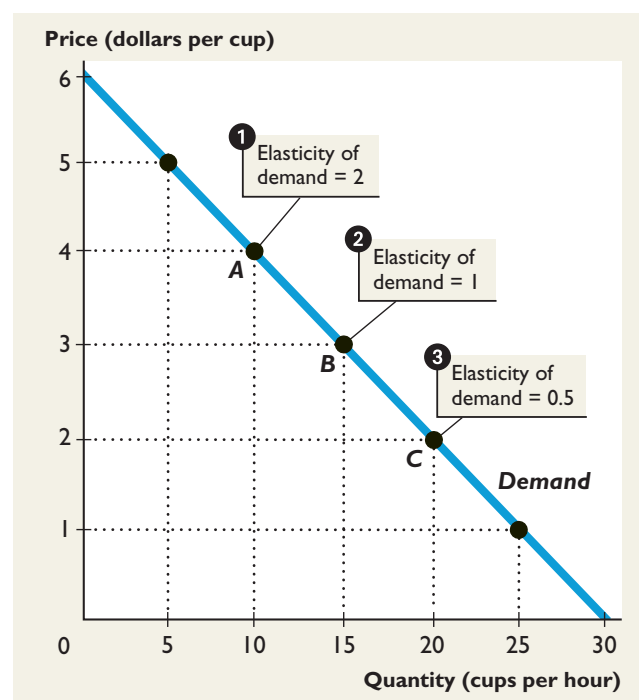
EYE on the GLOBAL ECONOMY
Price Elasticities of Demand

A rich 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. And as the world demand for food becomes

Percentage of income spent on food

Country	Value
Tanzania	62
India	56
Korea	40
Brazil	35
Greece	31
Spain	28
France	17
Germany	15
Canada	14
United States	12

Price elasticity of demand
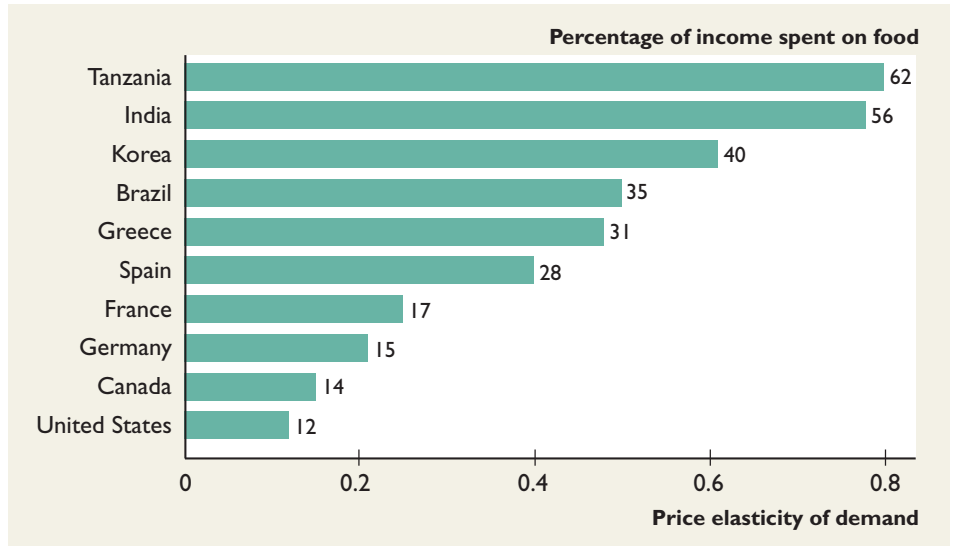
more and more inelastic, the fluctuations in the prices of food items will become larger.

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 page C1.
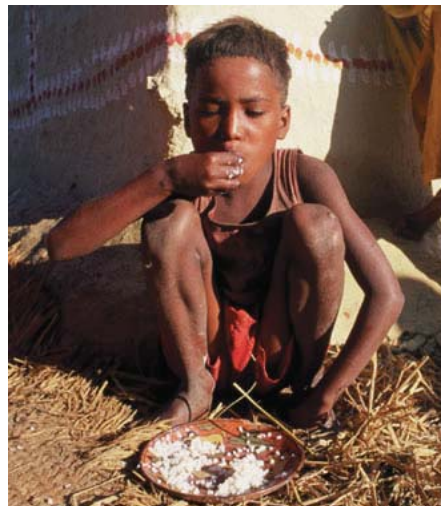
■ Total Revenue and the Price Elasticity of Demand

Total revenue is the amount spent on a good and received by its sellers 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 latte to illustrate total revenue. Figure 5.4(a) shows the total revenue from the sale of latte when the price is $3 a cup and the quantity of latte 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

Total revenue equals price multiplied by quantity. In part (a), when the price is $3 a cup, the quantity demanded is 15 cups an hour and total revenue equals $45 an hour. When the price rises to $5 a cup, the quantity demanded decreases to 5 cups an hour and total revenue decreases to $25 an hour. Demand is elastic.

In part (b), 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. Demand is inelastic.

(a) Total revenue and elastic demand: Starbucks latte

(b) Total revenue and inelastic demand: textbooks
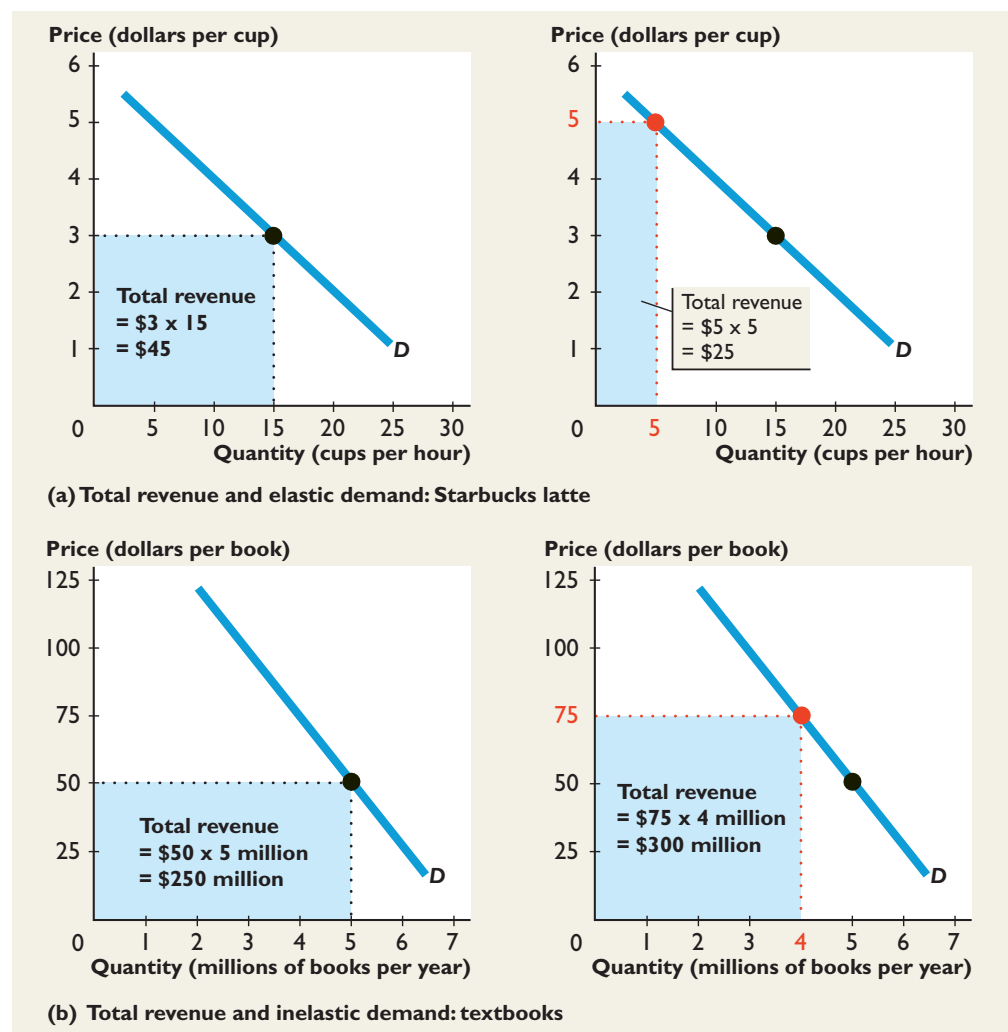
unchanged), we can estimate the price elasticity of demand. This method of estimating the price elasticity of demand is called the **total revenue test**.

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 and total revenue is $45 ($3 × 15). If the price of a latte rises to $5, the quantity demanded decreases to 5 cups an hour and total revenue *decreases* to $25 ($5 × 5).

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 is $250 million ($50 × 5 million). If the price of a textbook rises to $75, the quantity demanded decreases to 4 million textbooks a year and total revenue *increases* to $300 million ($75 × 4 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.

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).

EYE on the PRICE OF GAS
What Do You Do When the Price of Gasoline Rises?

If you are like most people, you complain when the price of gasoline rises, but you don't cut back very much on your gas purchases.

University of London economists Phil Goodwin, Joyce Dargay, and Mark Hanly studied the effects of a hike in the price of gasoline on the quantity of gasoline demanded and on the volume of road traffic.

By using data for the United States and a large number of other countries, they estimated that a 10 percent rise in the price of gasoline decreases the quantity of gasoline used by 2.5 percent within one year and by 6 percent after five years.

Price Elasticity of Demand
We can translate these numbers into price elasticities of demand for gasoline.

The short-run (up to one year) price elasticity of demand is 2.5 percent divided by 10 percent, which equals 0.25. The long-run (after five years) price elasticity of demand is 6 percent divided by 10 percent, which equals 0.6. Because these price elasticities are less than one, the demand for gasoline is inelastic.

When the price of gasoline rises, the quantity of gasoline demanded decreases but the amount spent on gasoline increases.

The effect of a rise in the price of gasoline on the volume of traffic is smaller than on the quantity of gasoline used.

A 10-percent rise in the price of gasoline decreases the volume of traffic by only 1 percent within one year and by 3 percent after five years.

How can the volume of traffic fall by less than the quantity of gasoline used? The answer is by switching to smaller, more fuel-efficient vehicles.

The price elasticity of demand for gasoline is low—the demand for gasoline is inelastic—because gasoline has poor substitutes, but it does have a substitute—a smaller vehicle.

■ Applications of the Price Elasticity of Demand

Does a frost in Florida bring a massive or a modest rise in the price of oranges? And does a smaller orange crop mean bad news or good news for orange growers? Knowledge of the price elasticity of demand for oranges enables us to answer these questions.

Orange Prices and Total Revenue

Economists have estimated the price elasticity of demand for agricultural products to be about 0.4—an inelastic demand. If this number applies to the demand for oranges, then

$$\text{Price elasticity of demand} = 0.4 = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}}.$$

If supply changes and demand doesn't, the percentage change in the quantity demanded equals the percentage change in the equilibrium quantity. 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 2.5 percent. The percentage change in the quantity demanded (1 percent) divided by the percentage change in price (2.5 percent) equals the price elasticity of demand (0.4).

So the answer to the first question is that when the frost strikes, the price of oranges will rise by a larger percentage than the percentage decrease in the quantity of oranges. But what happens to the total revenue of the orange growers?

The answer is again provided by knowledge of the price elasticity of demand. Because the price rises by a larger percentage than the percentage decrease in quantity, total revenue increases. A frost is bad news for consumers and those growers who lose their crops, but good news for growers who escape the frost.

A Florida frost is bad news for buyers of orange juice and for growers who lose their crops, but good news for growers who escape the frost.

Addiction and Elasticity

We can gain important 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 crack cocaine 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 to it. 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 large price increase. But it also increases the expenditure on drugs by addicts and increases the amount of crime that finances addiction.

CHECKPOINT 5.1

Define the price elasticity of demand, and explain the factors that influence it and how to calculate 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

Music giant chops price to combat downloads

In 2003, when music downloading first took off, Universal Music slashed the price of a CD from $21 to $15. The company said that it expected the price cut to boost the quantity of CDs sold by 30 percent, other things remaining the same.

Source: *Globe and Mail*, September 4, 2003

What was Universal Music's estimate of the price elasticity of demand for CDs? Was the demand estimated to be elastic or inelastic?

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 = Percentage change in the quantity demanded ÷ 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

Price elasticity of demand = Percentage change in the quantity demanded ÷ Percentage change in price. The percentage change in the price equals [($21 − $15)/($18)] × 100, which is 33.3 percent. The percentage change in the quantity is 30 percent. So Universal Music's estimate of the price elasticity of demand for CDs was 30 percent ÷ 33.3 percent, or 0.9. Because the percentage change in the quantity is less than the percentage change in the price, demand is estimated to be inelastic, which is what an elasticity of 0.9 means.

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.

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.

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.

■ Elastic and Inelastic Supply

The supply of a good might be

- Elastic
- Unit elastic
- Inelastic

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.

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.

■ 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

MyEconLab Animation

Price (dollars per ton)

1 A close-to-zero percent price rise …

2 … increases the quantity supplied by a very large percentage

3 The supply of silicon is perfectly elastic

S

0   100   130

Quantity (tons per month)

(a) Perfectly elastic supply

Price (dollars per book)

1 A 10 percent price rise …

S

105
100
95

3 The supply of textbooks is elastic

2 … increases the quantity supplied by 20 percent

0   90   100   110   130

Quantity (millions of books per year)

(b) Elastic supply

Price (dollars per pound)

1 A 10 percent price rise …

S

10.50
10.00
9.50

3 The supply of fresh fish is unit elastic

2 … increases the quantity supplied by 10 percent

0   95 100 105   130

Quantity (pounds per day)

(c) Unit elastic supply

Price (dollars per night)

S

110

1 A 20 percent price rise …

100

90

3 The supply of hotel rooms is inelastic

2 … increases the quantity supplied by 10 percent

0   95 100 105   130

Quantity (thousands of hotel rooms)

(d) Inelastic supply

Price (thousands of dollars per lot)

S

1 A price rise of any percentage …

2 … increases the quantity supplied by zero percent

105
100
95

3 The supply of beachfront lots is perfectly inelastic

0   100   130

Quantity (number of lots)

(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 the 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 the Wii and the price on eBay began to fall. The supply of Wii had become more elastic as production continued to expand.

Storage Possibilities

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 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.

Fresh strawberries must be sold before they deteriorate, so their supply is inelastic.

■ 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 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
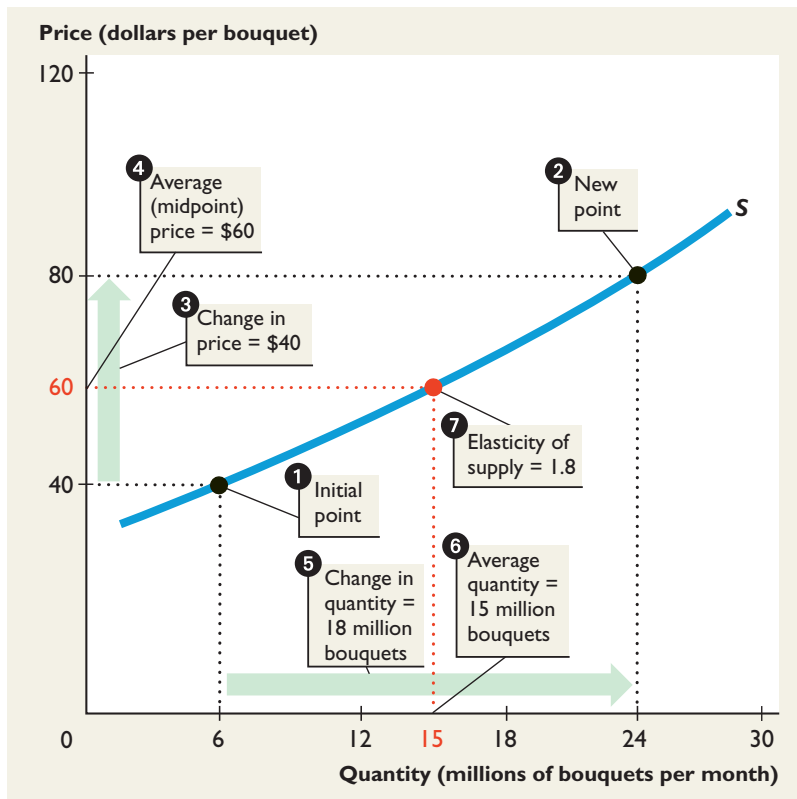
1 At the initial point, the price is $40 a bouquet and the quantity supplied is 6 million bouquets a month.

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 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 equals 120 percent ÷ 66.6 percent, which is 1.8.

CHECKPOINT 5.2

Define the price elasticity of supply, and explain the factors that influence it and how to calculate 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

Weak coal prices hit China's third-largest coal miner

The chairman of Yanzhou Coal Mining, Wang Xin, reported that the demand for coal has fallen by 11.9 percent to 7.92 million tons from 8.99 million tons a year earlier, despite the price falling by 10.6 percent.

Source: Dow Jones, April 27, 2009

Calculate the price elasticity of supply of coal. Is the supply of coal 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 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 = Percentage change in the quantity supplied ÷ 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 = Percentage change in the quantity supplied ÷ 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 coal decreased, so we can use these data to calculate the price elasticity of supply. The price elasticity of supply equals the percentage change in the quantity supplied divided by the percentage change in the price. The price elasticity of supply equals 11.9 percent divided by 10.6 percent, or 1.12. The quantity supplied fell by a larger percentage than the price, so the supply of coal is elastic, which is what a price elasticity of supply of 1.12 means.

5.3 CROSS ELASTICITY AND INCOME ELASTICITY

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:

$$\frac{\text{Cross elasticity}}{\text{of demand}} = \frac{\begin{array}{c}\text{Percentage change}\\\text{in quantity demanded of a good}\end{array}}{\begin{array}{c}\text{Percentage change in price of}\\\text{one of its substitutes or complements}\end{array}}.$$

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

$$\frac{\text{Cross elasticity}}{\text{of demand}} = \frac{-5 \text{ percent}}{-10 \text{ percent}} = 0.5.$$

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

$$\frac{\text{Cross elasticity}}{\text{of demand}} = \frac{+2 \text{ percent}}{-10 \text{ percent}} = -0.2.$$

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.

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.

---

*As before, these percentage changes are calculated by using the midpoint method.

■ **FIGURE 5.7**

Cross Elasticity of Demand

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*.
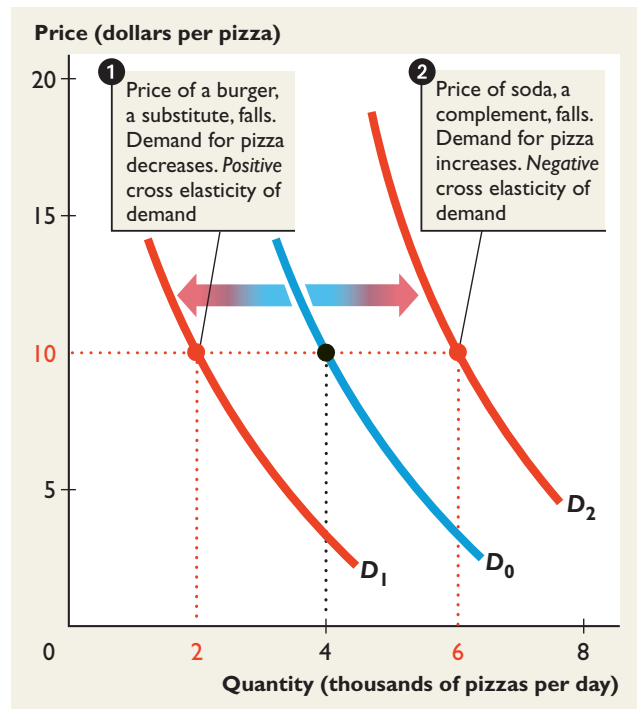
Figure 5.7 illustrates these two cross elasticities of demand for pizza. With the price of a pizza constant at $10, when the price of a burger falls, the demand for pizza decreases and the demand curve for pizza shifts leftward from D_0 to D_1. When the price of soda falls, the demand for pizza increases 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?

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:

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.

$$\text{Income elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in income}}.$$

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. The table 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; increasing share of our incomes will be spent on watching movies, eating out in restaurants, using public transporation and getting haircuts. Two other prominent items not shown in the table, items for which demand is income elastic, are health care and education. As our incomes grow, we can expect education and health care 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 page C1.

EYE on YOUR LIFE
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 the buyer's expenditure on a good is equal to the seller's total revenue, the total revenue test that the seller uses to estimate the price elasticity of demand for the good sold can also be used by a buyer.

You can determine whether your demand for a good is elastic, unit elastic, or inelastic by noting what happens to your total expenditure on the good 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 page 116.

Most likely, as we noted in the chapter opener, when the price of gasoline rises, you use almost as much as you did at the lower price. Gasoline has poor substitutes and your demand for gasoline is inelastic.

What do you do if the price of using your cell phone falls? Do you spend less on your cell phone, as you would if your demand for cell phone service is inelastic? Or do you spend more on your cell phone, which would indicate an elastic demand for cell phone service?

What about your iPod and iTunes? Is your demand for these items elastic or inelastic? And is your demand for textbooks elastic or inelastic? You can estimate all these elasticities.

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. Are goods *A* and *B* complements or substitutes? Describe how the demand for good *A* changes and calculate the cross elasticity of demand.

2. When income rises by 5 percent and other things remain the same, the quantity demanded of good *C* increases by 1 percent. Is good *C* a normal good or an inferior good? Describe how the demand for good *C* changes and calculate the income elasticity of demand for good *C*.

In the News

Rising incomes make China the world's largest luxury goods market

China is estimated to become the world's largest luxury goods market over the next decade, boosted by rising incomes and a transition from saving to spending culture.

Source: ibtimes.com, February 2, 2011

Are luxury goods normal goods or just not necessities? Explain your answer.

Solutions to Practice Problems

1. Goods *A* and *B* are substitutes because when the price of good *B* rises, the quantity demanded of good *A* increases. People switch from good *B* to good *A*. The demand for good *A* increases (Figure 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.

2. Good *C* is a normal good; as income rises, the quantity demanded increases. The demand for good *C* increases (Figure 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.

Solution to In the News

To know whether a good is a normal good, we need to calculate the income elasticity of demand. A normal good is a good that has a positive income elasticity of demand. The source of the increase in the sales of luxury goods is rising incomes and people spending their past savings. As people spend more, the quantity of luxury goods bought increases, so the income elasticity of demand for luxury goods is positive. Luxury goods are normal goods.

FIGURE 1

Price of good *A*

D_0 D_1

0   Quantity of good *A*

FIGURE 2

Price of good *C*

D_0 D_1

0   Quantity of good *C*

█ **CHAPTER SUMMARY**

Key Points

1 **Define the price elasticity of demand, and explain the factors that influence it and how to calculate 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 the price elasticity of supply, and explain the factors that influence it and how to calculate 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

Cross elasticity of demand, 129
Elastic demand, 114
Elastic supply, 124
Income elasticity of demand, 130
Inelastic demand, 114
Inelastic supply, 124

Perfectly elastic demand, 114
Perfectly elastic supply, 124
Perfectly inelastic demand, 114
Perfectly inelastic supply, 124
Price elasticity of demand, 112
Price elasticity of supply, 124

Total revenue, 120
Total revenue test, 121
Unit elastic demand, 114
Unit elastic supply, 124

FIGURE 1

Price (dollars per ticket)

Quantity (tickets per day)
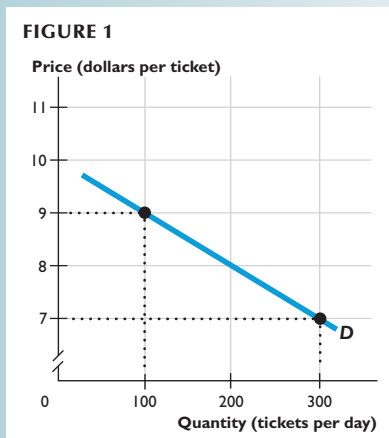
CHAPTER CHECKPOINT

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.

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. Which demand is income elastic? Which is income inelastic? Which are normal goods?

Use the following information to work Problems **8** and **9**.

Record U.S. corn crop, up 24%, is forecast

The USDA reported that world corn production will be 9.9 percent greater than last year's, while U.S. corn production will be 24 percent larger. The price of corn is expected to be 46 percent higher than last year's price.

Source: *Bloomberg News*, August 11, 2007

8. Calculate the U.S. price elasticity of supply of corn. Is this supply elastic?

9. Calculate the world price elasticity of supply of corn.

10. In May 2011, higher food prices forced consumers to cut spending.

Source: CNN Money, June 4, 2011

Is the demand for food elastic or inelastic? Explain your answer.

Instructor Assignable Problems and Applications

Use the following information to work Problems **1** and **2**.

Why the tepid response to higher gasoline prices?

Most studies report that when U.S. gas prices rise by 10 percent, the quantity purchased falls by 1 to 2 percent. In September 2005, the retail gasoline price was $2.90 a gallon, about $1.00 higher than in September 2004, but purchases of gasoline fell by only 3.5 percent.

Source: *The New York Times*, October 13, 2005

1. Calculate the price elasticity of demand for gasoline implied by what most studies have found.

2. Compare the elasticity implied by the data for the period from September 2004 to September 2005 with that implied by most studies. What might explain the difference?

3. When heavy rain ruined the banana crop in Central America, the price of bananas rose from $1 a pound to $2 a pound. Banana growers sold fewer bananas, but their total revenue remained unchanged. By how much did the quantity of bananas demanded change? Is the demand for bananas from Central America 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 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 must set high standards of conduct for producers to ensure that consumers gets a fair deal." Do you agree or disagree with each part of this statement? Explain how you might go about testing the parts of the statement that are positive and lay bare the normative parts.

Use the following information to work Problems **7** and **8**.

Almonds galore!

The quantity of almonds harvested in 2008–2009 was expected to increase by 22 percent, while total receipts of growers was expected to increase by 17 percent.

Source: Almond Board of California

7. Was the price of almonds expected to rise or fall? Did a change in the supply of or demand for almonds bring about this expected change in the price?

8. If the price of almonds changed as a result of a change in the supply of almonds, is the demand for almonds elastic or inelastic? Explain your answer.

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

Efficiency and Fairness of Markets

6

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.

6.1 ALLOCATION METHODS AND EFFICIENCY

Because resources are scarce, they must be allocated somehow among their competing uses. Doing nothing and leaving the allocation to chance is one method of allocation. The goal of this chapter is to evaluate the ability of markets to allocate resources efficiently and fairly—to allocate them in the social interest.

But trading in markets 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

Market price allocates resources to those who are willing and able to pay.

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 you buy most of what you consume in markets.

Two kinds of people decide not to pay the market price: those who can afford to pay but choose not to buy and those who are too poor and simply can't afford to pay.

For many goods and services, distinguishing between those who choose not to buy and those who can't afford to pay 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.

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 health care 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.

Contest

A contest allocates resources to a winner (or a group of winners). The most obvious contests are sporting events. Maria Sharapova and Serena Williams 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 Natalie Portman 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.

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 allo-

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.

Voting allocates resources in the way that the majority wants.

A contest allocates resources to the winner, in sport and business.

First-come, first-served allocates resources to the first in line.

cated 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 Equally

When a resource is shared equally, everyone gets the same amount of it. You per-haps 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.

Sharing allocates resources by mutual agreement.

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, some marathon organizers use lotteries to determine who gets to partic-ipate 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.

A lottery allocates resources to the one who draws the winning number.

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 nat-ural 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.

Personal characteristics allocate resources based on whom we like.

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 collec-tively allocate billions of dollars worth of resources annually. A large amount of

Force protects the rule of law and facilitates economic activity.

theft today is conducted by using sophisticated electronic methods that move resources from banks and thousands of innocent people.

But force plays a crucial positive role in allocating resources. It provides an effective method for the state to transfer wealth from the rich to the poor and 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

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*.

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.

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.

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*.

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 in 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.

Marginal benefit (units of other goods per pizza)

Marginal benefit curve

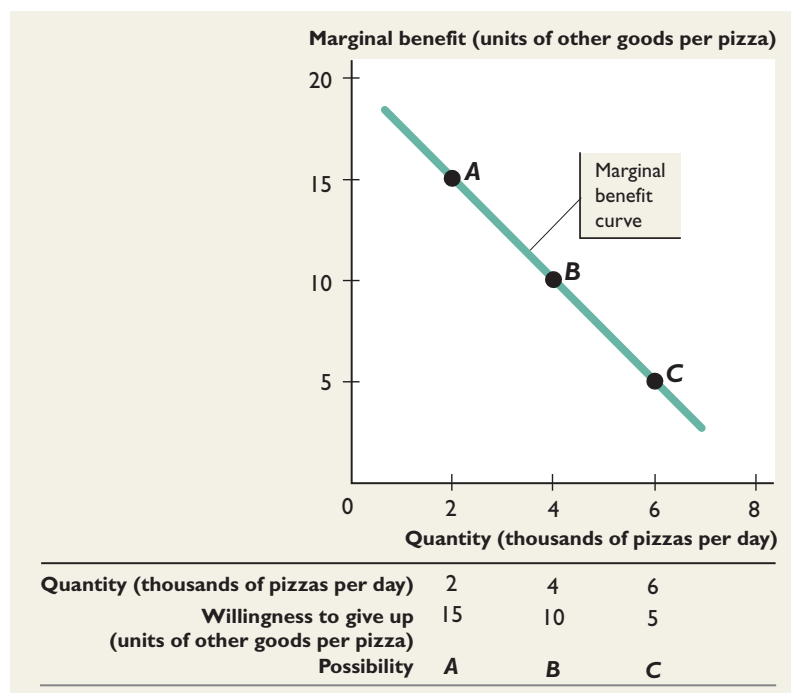| Quantity (thousands of pizzas per day)	2	4	6
Willingness to give up (units of other goods per pizza)	15	10	5
Possibility	*A*	*B*	*C*

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
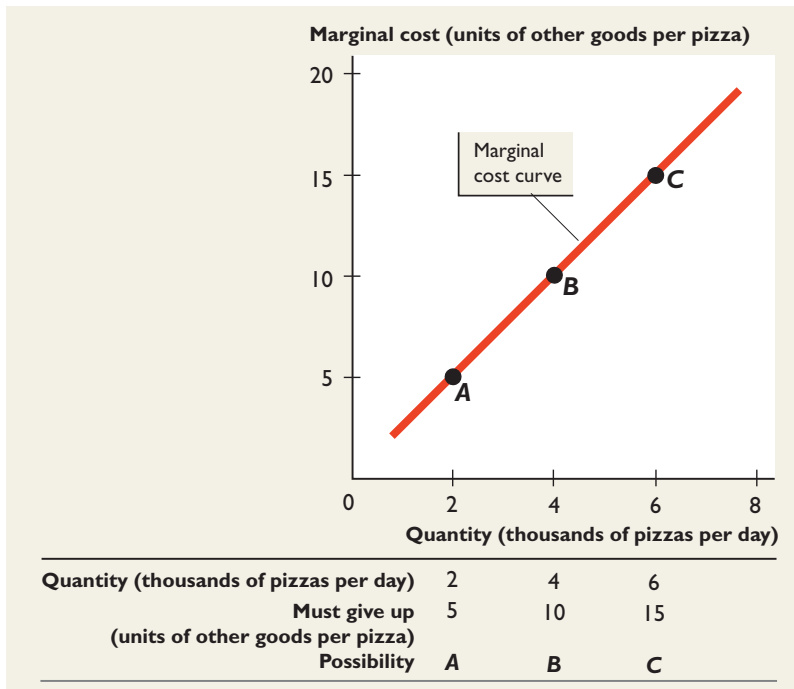
The table and the graph show the marginal cost of a pizza. Marginal cost is the opportunity cost of producing one more unit. It is derived from the *PPF* and is measured by the slope of the *PPF*.

Points *A*, *B*, and *C* in 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.

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*

■ **FIGURE 6.3**

The Efficient Quantity of Pizza

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 less of 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 of 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 less 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.

(a) On the PPF

(b) Marginal benefit equals marginal cost
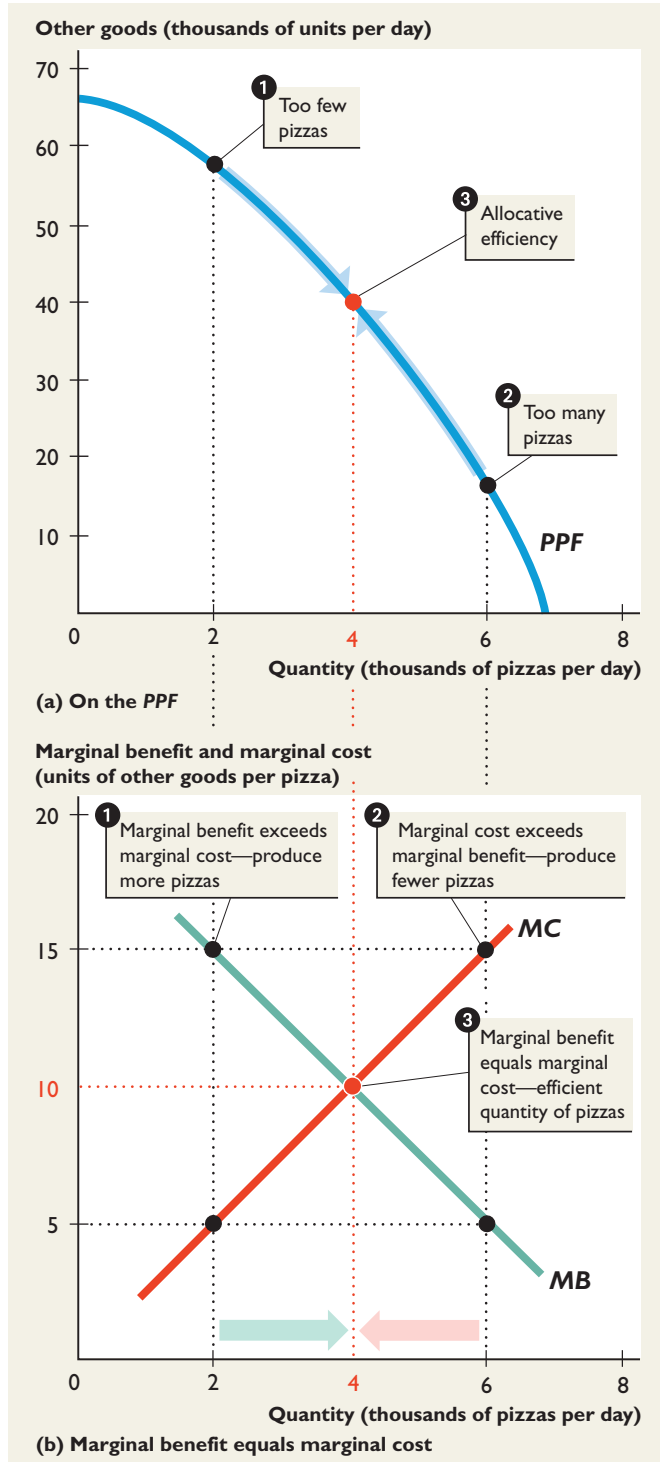
CHECKPOINT 6.1

Describe the alternative methods of allocating scarce resources and define and explain the features of an efficient allocation.

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.

In the News

AC/DC's "Black Ice" tour breaks records down under
The 40,000 tickets for the March 6 gig sold out in seven minutes—a record. Many people who camped out overnight missed getting a ticket.

Source: *WAToday*, May 25, 2009

What method was used to allocate AC/DC 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.

Solution to In the News

The concert organizer used first-come, first-served to allocate tickets. The allocation was efficient if the concert-goer's willingness to pay (the ticket price plus the opportunity cost of time spent in the line), which is also the marginal benefit, equaled the organizer's marginal cost of providing one more seat.
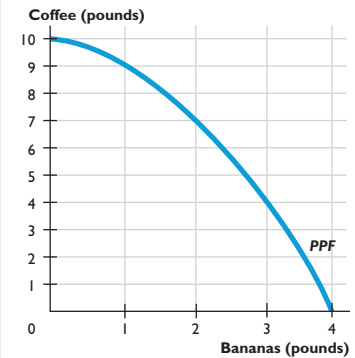
FIGURE 1

TABLE 1 MARGINAL BENEFIT AND MARGINAL COST

Bananas (pounds)	Willing to give up	Must give up
	(pounds of coffee per pound of bananas)	
1	3	1
2	2	2
3	1	3

FIGURE 2
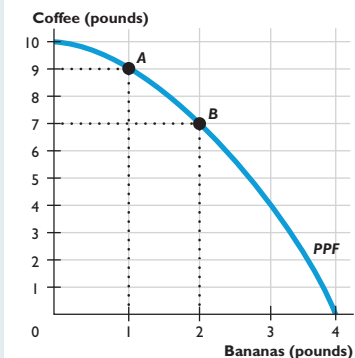
6.2   VALUE, PRICE, AND CONSUMER SURPLUS

To investigate whether a market is efficient, we need to understand the connection between demand and marginal benefit and between supply and marginal cost.
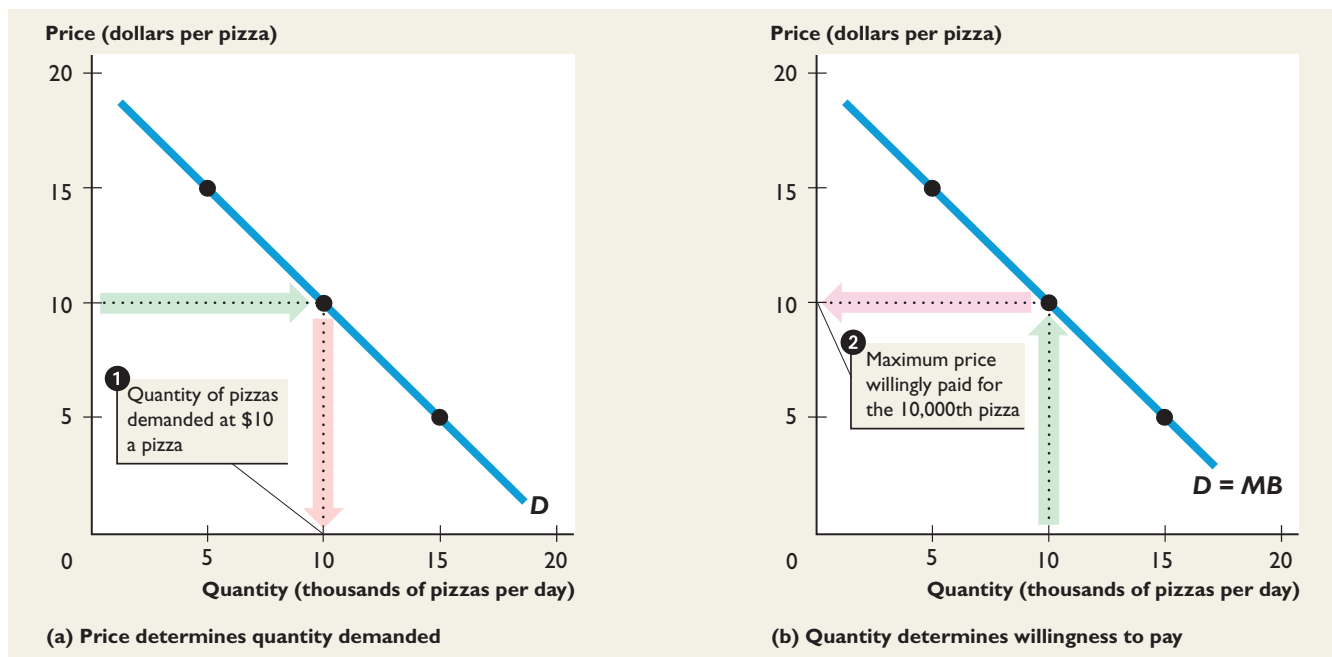
■ Demand and Marginal Benefit

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.

> **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

(b) Quantity determines willingness to pay

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.

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.

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 $(10,000 \times \$10) \div 2 = \$50,000$.)

The total benefit is the amount paid, $100,000 (blue rectangle), plus consumer surplus, $50,000 (green triangle), and is $150,000. Consumer surplus is the total benefit minus the amount paid, or net benefit to consumers.

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**

Demand and Consumer Surplus

MyEconLab Animation
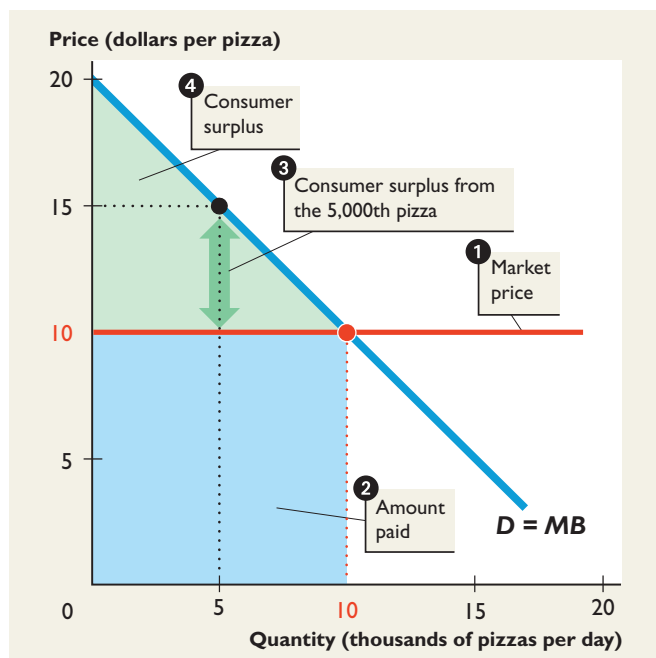
1 The market price of a pizza is $10.

2 At the market price, people buy 10,000 pizzas a day and spend $100,000 on pizza—the 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.

FIGURE 1

Price (dollars per DVD)
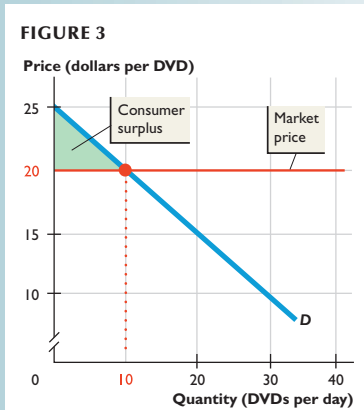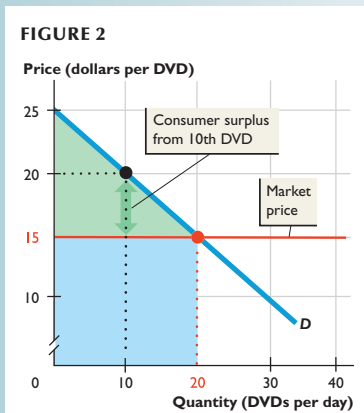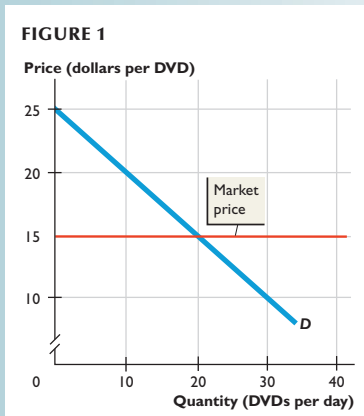
CHECKPOINT 6.2

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?

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

Price (dollars per DVD)

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 = $5 (the length of the green arrow in Figure 2).

2. The quantity of DVDs bought is 20 a day, and the consumer surplus is ($25 − $15) × 20 ÷ 2 = $100 (the green triangle in Figure 2). The amount spent on DVDs is the price multiplied by the quantity bought, which is $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 is $300 + $100 = $400.

3. If the price 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 to $25).

FIGURE 3

Price (dollars per DVD)

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

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
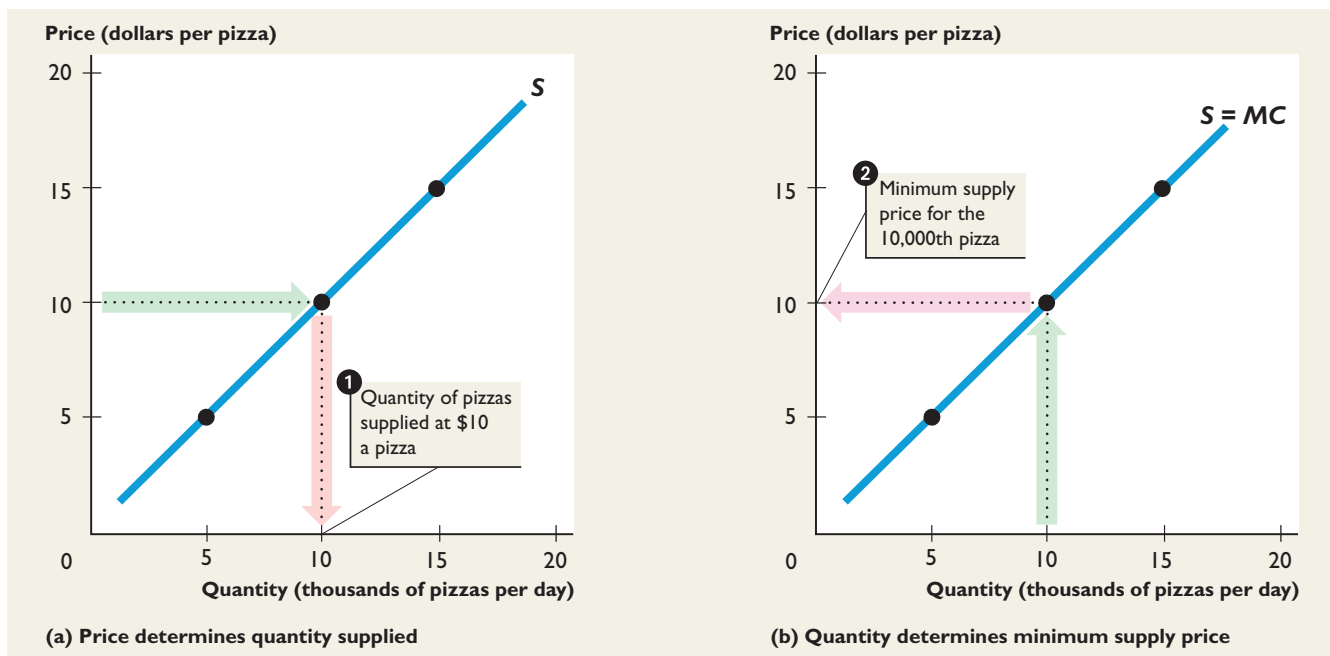
❶ The supply curve of pizza, S, shows the quantity of pizza supplied at each price, other things remaining the same. At $10 a pizza, the quantity supplied is 10,000 pizzas a day.

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 (blue triangle), and is $60,000 (the red area). 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.
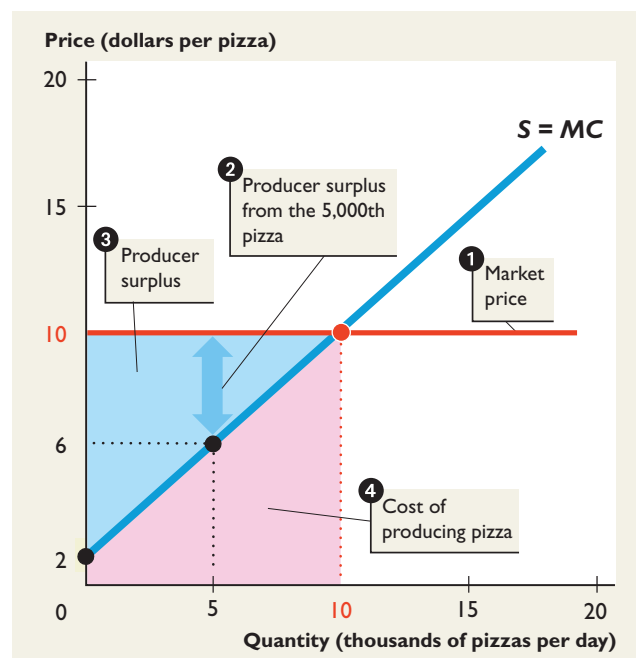
CHECKPOINT 6.3

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?

In the News

Is Australia's ski season headed for a wipeout?

The Australian dollar has soared 26% against the U.S. dollar since last June, making those foreign lift tickets cheaper than those in Australia, and travel agents report a jump in interest in travel to North American ski destinations like Vail and Aspen.

Source: *The Wall Street Journal*, June 6, 2011

As Australians switch from skiing in Australia and flock to Vail and Aspen, how will the Australian ski operators' producer surplus change? How will the Vail and Aspen ski operators' producer surplus change?

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. Total revenue is $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. 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).

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.

In Australia, the demand for ski tickets decreases, the price and quantity of tickets sold decreases, and Australian ski operators' producer surplus decreases.

In Vail and Aspen, the demand for ski tickets increases, the price and quantity of tickets sold increases, and ski operators' producer surplus increases.

MyEconLab

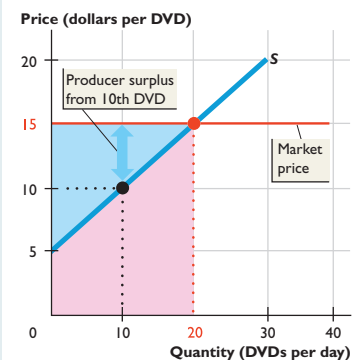You can work these problems in Study Plan 6.3 and get instant feedback.

FIGURE 1

FIGURE 2

FIGURE 3
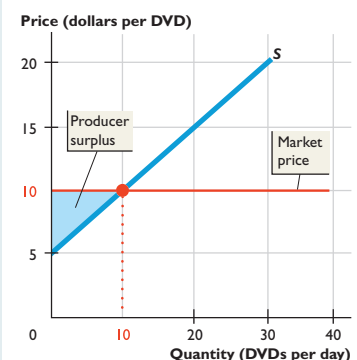
6.4   ARE MARKETS EFFICIENT?

Figure 6.8 shows the market for pizza. 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. The market forces that you studied in Chapter 4 (pp. 99–100) pull the pizza market to its equilibrium and coordinate the plans of buyers and sellers. But does this competitive equilibrium deliver the efficient quantity of pizza?

If the equilibrium is efficient, it does more than coordinate plans. It coordinates them in the best possible way. Resources are used to produce the quantity of pizza that people value most highly. It is not possible to produce more pizza without giving up some of another good or service that is valued more highly. And if a smaller quantity of pizza is produced, resources are used to produce some other good that is not valued as highly as the pizza that is forgone.

■ 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, the ❹ efficient quantity of pizza is produced. The sum of the ❺ consumer surplus and ❻ producer surplus is maximized.

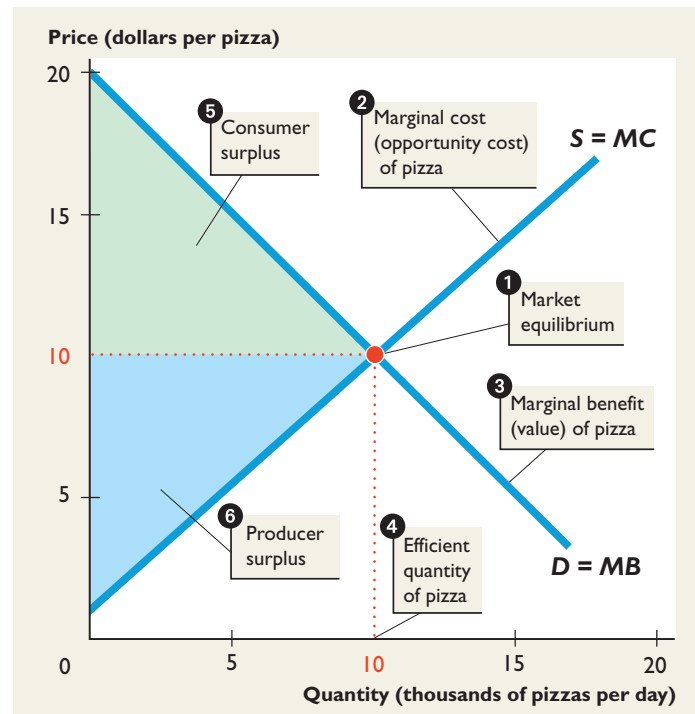This condition—marginal benefit equals marginal cost—is the condition that delivers an efficient use of resources. Because a competitive equilibrium allocates resources to the activities that create the greatest possible value, it is efficient.

■ 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 the influence of the invisible hand at work in the cartoon and in today's information economy.

The cold drinks vendor has both cold drinks and shade. He has 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. The transaction that occurs tells us that for shade, the reader's marginal benefit exceeds the vendor's marginal cost but for a cold drink, the vendor's marginal cost exceeds the reader's marginal benefit. The transaction creates consumer surplus and producer surplus. 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. In the third frame of the cartoon, both the consumer and the producer are better off than they were in the first frame. The umbrella has moved to its highest-valued use.

The market economy relentlessly performs the activity 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.
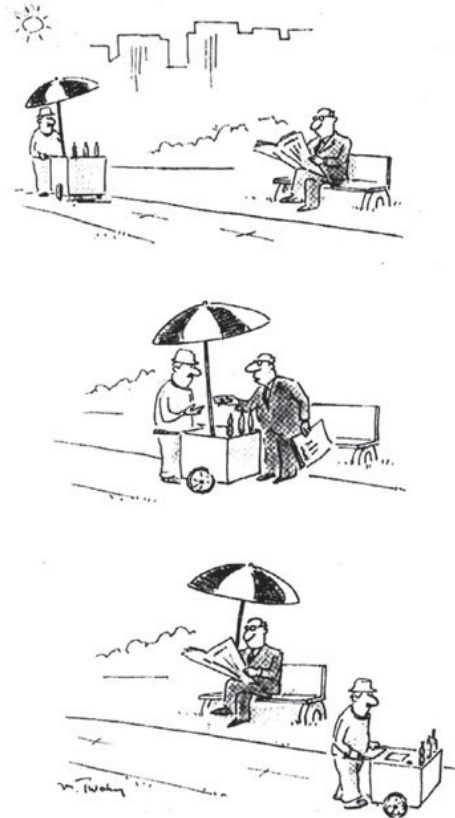
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Mike Twohy from cartoonbank.com. All Rights Reserved.

■ Market Failure

Markets do not always achieve an efficient outcome. We call a situation in which a market delivers an inefficient outcome one of **market failure**. Market failure can occur because either too little of an item is produced—underproduction—or too much is produced—overproduction.

Market failure
A situation in which the market delivers an inefficient outcome.

Underproduction

In Figure 6.9(a), the quantity of pizza produced is 5,000 a day. At this quantity, consumers are willing to pay $15 for a pizza that costs only $6 to produce. The quantity produced is inefficient—there is underproduction.

A **deadweight loss**, which is the decrease in total surplus that results from an inefficient underproduction or overproduction, measures the scale of the inefficiency. The area of the gray triangle in Figure 6.9(a) measures the deadweight loss.

Deadweight loss
The decrease in total surplus that results from an inefficient underproduction or overproduction.

Overproduction

In Figure 6.9(b), the quantity of pizza produced is 15,000 a day. At this quantity, consumers are willing to pay only $5 for a pizza that costs $14 to produce. By producing the 15,000th pizza, $9 is lost. Again, the gray triangle shows the deadweight loss. The total surplus is smaller than its maximum by the amount of the deadweight loss. The deadweight loss is borne by the entire society. It is not a loss for the producer and a gain for the consumers. It is a *social* loss.

■ **FIGURE 6.9**

Inefficient Outcomes

MyEconLab Animation

(a) Underproduction
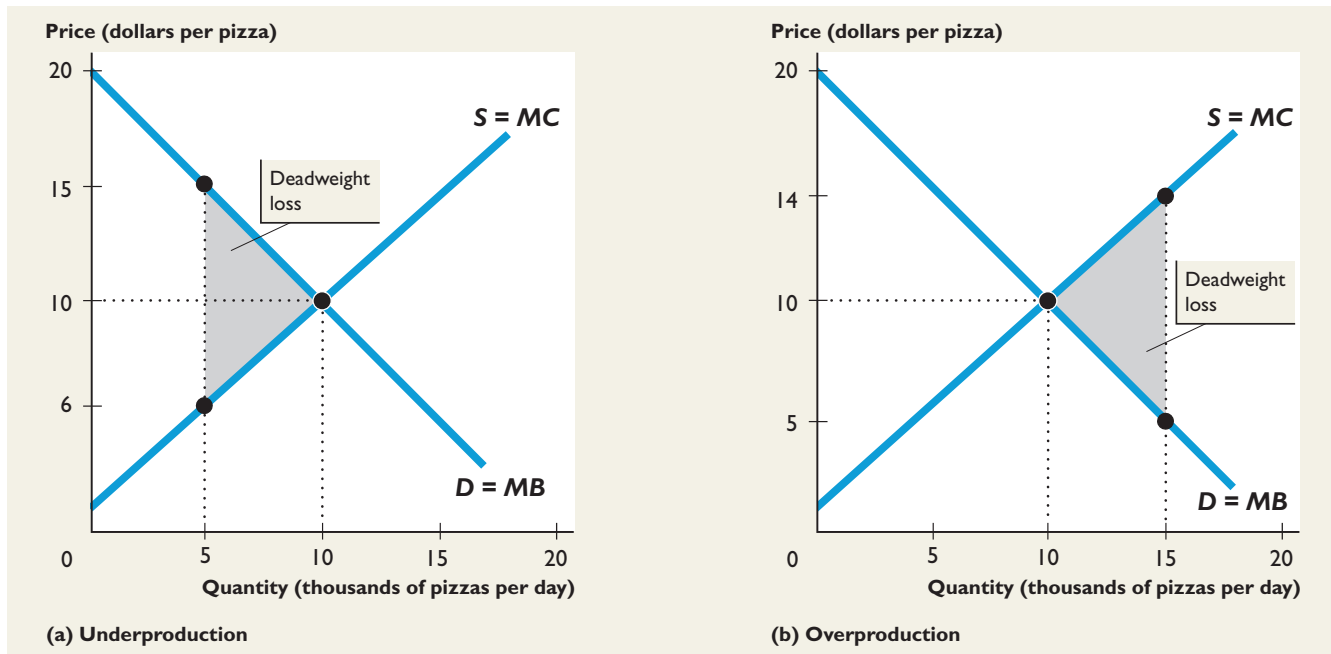
(b) Overproduction

If production is restricted to 5,000 pizzas a day, a deadweight loss (the gray triangle) arises. Total surplus is reduced by the area of the deadweight loss triangle. Underproduction is inefficient.

If production increases to 15,000 pizzas, a deadweight loss arises. Total surplus is reduced by the area of the deadweight loss triangle. Overproduction is inefficient.

■ 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 of their own use of a common resource that fall on others (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.**

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.

Transactions costs
The opportunity costs of making trades in a market.

■ 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

FIGURE 1

CHECKPOINT 6.4

Evaluate the efficiency of the alternative methods of allocating resources.

Practice Problems

Figure 1 shows the market for paper.
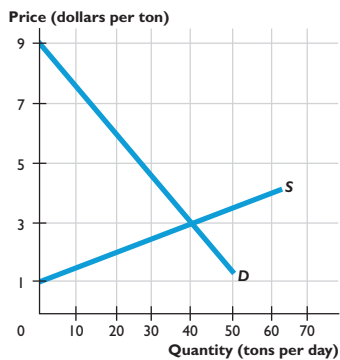
1. At the market equilibrium, what are consumer surplus, producer surplus, and total surplus? Is the market for paper efficient? Why or why not?

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? Why or why not? Shade the deadweight loss 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?

In the News

Senate votes to end ethanol subsidies
The Senate has voted to end the $6 billion a year in subsidies paid to the ethanol industry for the past three decades. Refiners would lose the 45-cent-a-gallon subsidy, and the tax on imported ethanol would be eliminated.

Source: *USA Today*, June 16, 2011

Describe the efficiency of the market for ethanol with the $6 billion subsidies in place. If the subsidies and taxes are eliminated, explain how the efficiency of the market for ethanol would change.

FIGURE 2
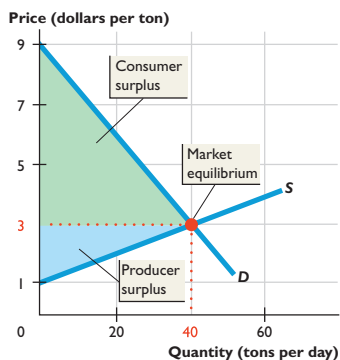
Solutions to Practice Problems

1. Market equilibrium is 40 tons a day at a price of $3 a ton (Figure 2). Consumer surplus = ($9 − $3) × 40 ÷ 2 = $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. The market is inefficient because marginal cost exceeds marginal benefit. Deadweight loss is the area of the gray triangle 1 in Figure 3.

3. This market is now inefficient because marginal benefit exceeds marginal cost. The deadweight loss is the area of the gray triangle 2 in Figure 3.

FIGURE 3

Solution to In the News

Subsidies to producers increase the supply of the good, which decreases the market price. The price received by producers equals the market price plus the subsidy per gallon, which results in overproduction and inefficiency. A deadweight loss arises. By eliminating the subsidies and taxes, overproduction will decrease. The market for ethanol will be more efficient, and the deadweight loss will decrease.
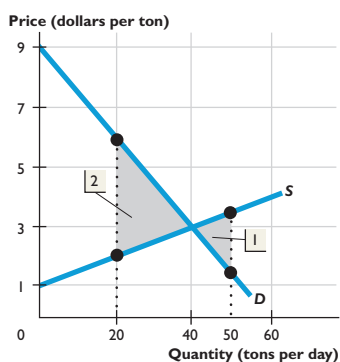
6.5 ARE MARKETS FAIR?

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, that 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.

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

Big tradeoff
A tradeoff between efficiency and fairness that recognizes the cost of making income transfers.

EYE on PRICE GOUGING
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 failure, 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 outcome* 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 on 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?

Price (dollars per unit)

① Market price rise with no price gouging law

② Deadweight loss from price gouging law

S

D_1

D_0

Quantity (units per day)
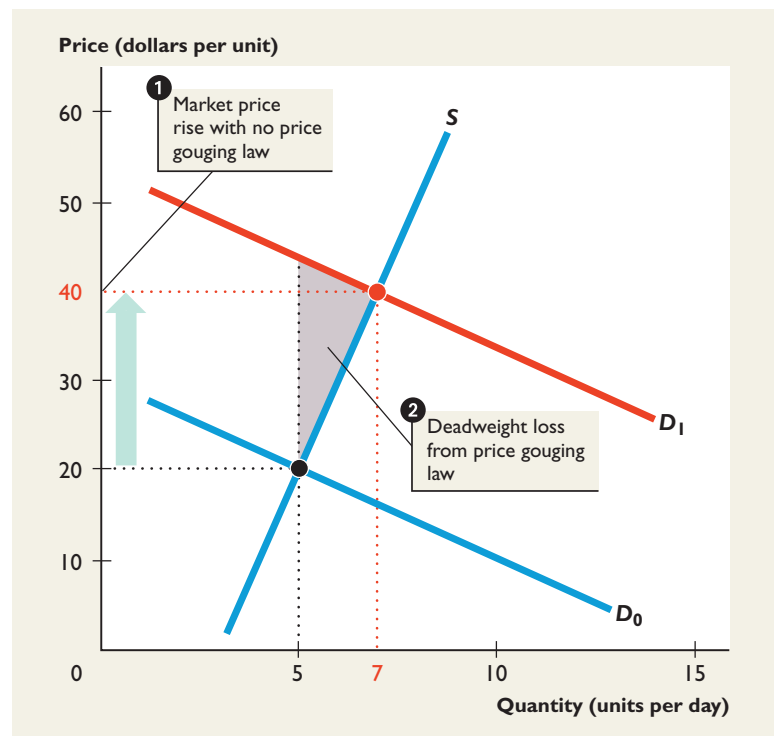
EYE on YOUR LIFE
Allocation Methods, Efficiency, and Fairness

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 capi-

tal. 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 people's income from capital discourages saving. It 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.

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

National parks to offer free-entry weekends
Interior Secretary Ken Salazar said he hoped American families would take the opportunity during these hard times to enjoy an affordable weekend vacation in our national parks. Most Americans live within an hour's drive of a national park.
Source: *Los Angeles Times*, June 3, 2009
Which families will be most likely to visit the national parks on the free weekends? Is the policy to waive the admission fair?

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. Two views of fairness: The rules view is that if the rule of one candle per family is followed and exchange is voluntary, then the outcome is fair. But the results view is that if the candles are allocated unequally, then the allocation is unfair.

Solution to In the News

Most of the families will be those who own a car and do not work on weekends. The idea of waiving the admission is to allow families to enjoy an affordable vacation in these hard times. If the families hit by the hard times are the ones that visit the national parks, then, in the fair result view, the policy is fair. But if families hit by the hard times are the ones who do not visit, then, in the fair result view, the policy is unfair. If the families who visit the national parks do so voluntarily, then, no matter which families visit, in the fair rules view, the policy is fair.

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 *results* and fair *rules.*
- Fair rules require private property rights and voluntary exchange, and fair results require income transfers from the rich to the poor.

Key Terms

Allocative efficiency, 141
Big tradeoff, 159
Command system, 139
Consumer surplus, 147

Deadweight loss, 155
Market failure, 155
Producer surplus, 150

Production possibilities frontier, 141
Total surplus, 153
Transactions costs, 157

CHAPTER CHECKPOINT

Study Plan Problems and Applications

At McDonald's, no reservations are accepted; at Puck's at the St. Louis Art Museum, reservations are accepted; at the Bissell Mansion restaurant, 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 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?

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.

Use the following information to work Problems **11** and **12**.

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

11. What method is used to allocate goods on eBay? How does an eBay auction influence consumer surplus from the good?

12. Does the seller receive a producer surplus? Are auctions on eBay efficient?

TABLE 1

Price (dollars per sandwich)	Quantity demanded	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 2

Price (dollars per bag)	Quantity demanded before flood	Quantity demanded during flood	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

Instructor Assignable Problems and Applications

1. Panic in paradise: Are high fares the new reality for Hawaii?

On March 31, 2008, Hawaii lost 15 percent of its air service as Aloha Airlines and the cheap-flight airline ATA suddenly shut down. Stranded travelers were offered flights to West coast cities at $1,000 one way. Within a month, the fare to west coast cities dropped to about $200 a round trip. Stranded travelers complained of price gouging.

Source: *USA Today*, April 23, 2008

Under what conditions would the $1,000 fare be considered "price gouging"? Under what conditions would the $1,000 fare be an example of the market price method of allocating scarce airline seats?

Table 1 shows the demand schedule for haircuts and the supply schedule of haircuts. Use Table 1 to work Problems **2** and **3**.

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. What is the change in consumer surplus, the change in producer surplus, and 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. New Zealand's private forests

In the early 1990s, the government auctioned half the national forests, converting these forests from public ownership to private ownership. The government's decision was an incentive to get the owners to operate like farmers—that is, take care of the resource and to use it to make a profit.

Source: *Reuters*, September 7, 2007

Was the timber industry efficient before the auction and did logging companies operate in the social interest or self-interest? What effect has private ownership had on efficiency of the timber industry?

TABLE 1

Price (dollars per haircut)	Quantity demanded	supplied
	(haircuts per day)	
0	100	0
10	80	0
20	60	20
30	40	40
40	20	60
50	0	80

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 rules view if everyone has equal opportunity
   B. in the results view if most resources are distributed to the poorest people
   C. in the rules view if owners of the resources are protected by property rights and all transfers of resources are voluntary
   D. in the results view if resources are transferred voluntarily so that everyone has the same quantity

Can the President repeal the laws of supply and demand?

Government Actions in Markets

7

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

1 Explain how taxes change prices and quantities, are shared between buyers and sellers, and create inefficiency.

2 Explain how a price ceiling works and show how a rent ceiling creates a housing shortage, inefficiency, and unfairness.

3 Explain how a price floor works and show how the minimum wage creates unemployment, inefficiency, and unfairness.

4 Explain how a price support in the market for an agricultural product creates a surplus, inefficiency, and unfairness.

7.1   TAXES ON BUYERS AND SELLERS

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 MP3 player 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 MP3 player and should pay the tax and those who claim that the seller profits and should pay the tax.

■ Tax Incidence

Tax incidence

The division of the burden of a tax between the buyer and the seller.

Tax incidence is the division of the burden of a tax between the buyer and the seller. We're going to find the incidence of a $10 tax on MP3 players with two different taxes: a tax on the buyer and a tax on the seller.

Figure 7.1 shows the market for MP3 players. With no tax, the equilibrium price is $100 and the equilibrium quantity is 5,000 players 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 red curve $D − tax$ tells us what the buyers are willing to pay to the sellers. The red curve, $D − tax$, lies $10 below the blue demand curve.

Market equilibrium occurs where the red $D − tax$ curve intersects the supply curve, S. The buyer pays the equilibrium net-of-tax price $95 plus the $10 tax: $105. The seller receives the net-of-tax price $95. The government collects a tax revenue of $10 a player on 2,000 players, 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 $S + tax$ curve 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.

In both cases, the buyer and the seller split the $10 tax and pay $5 each.

■ **FIGURE 7.1**

A Tax on MP3 Players   MyEconLab Animation

(a) Government taxes buyer

(b) Government taxes seller
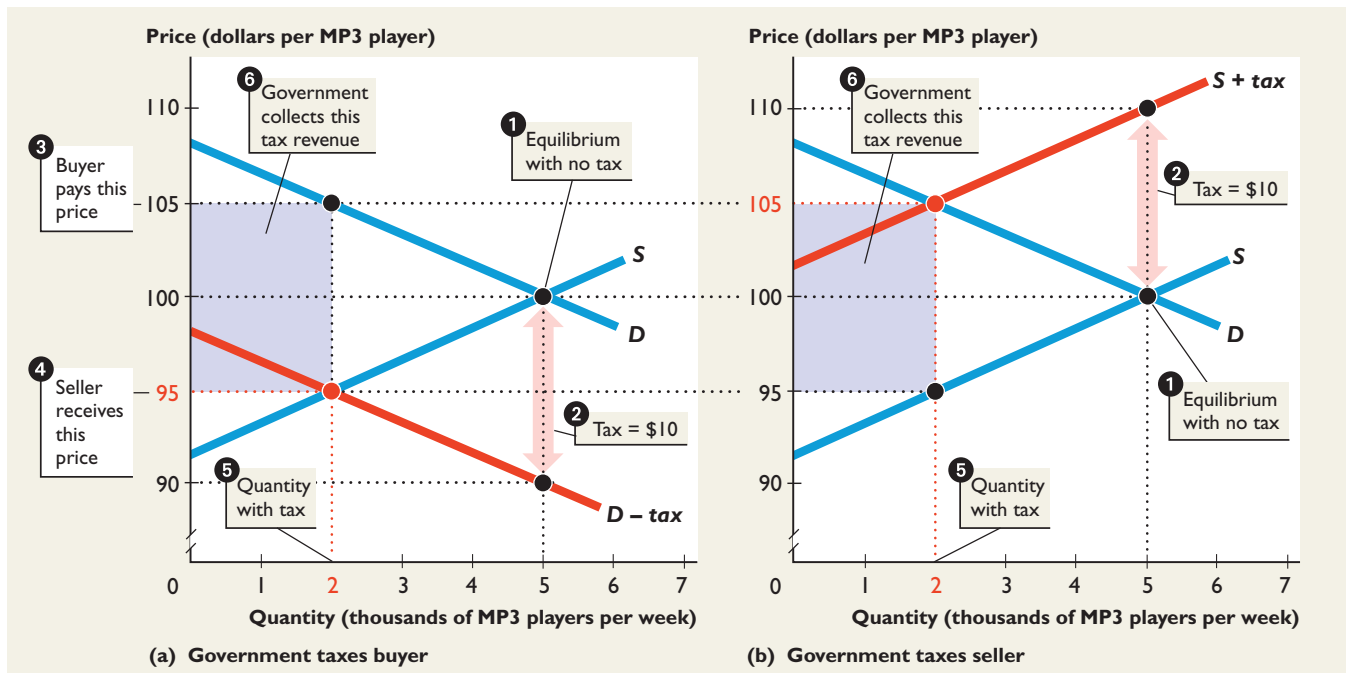
① In both parts of the figure, with no tax, the price of an MP3 player is $100 and 5,000 players a week are bought.

② In part (a), a $10 tax on buyers of MP3 players shifts the demand curve down to $D - tax$. and in part (b), a $10 tax on sellers of MP3 players shifts the supply curve up to $S + tax$.

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 players a week; and

⑥ The government collects tax revenue of $20,000 a week—the purple rectangle.

In both cases, the burden of the tax is split equally between the buyer and the seller—each pays $5 per player.

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 buyer and the seller share the burden of the tax equally. But in most cases, the burden 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 of each surplus becomes a deadweight loss—the gray area.

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 is $15,000 ($10 × 3,000 ÷ 2). The tax revenue is $20,000, so the excess burden is 75 percent of the tax revenue.

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.

■ Incidence, Inefficiency, and Elasticity

In the example of a $10 tax on MP3 players, 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

(b) Burden of tax
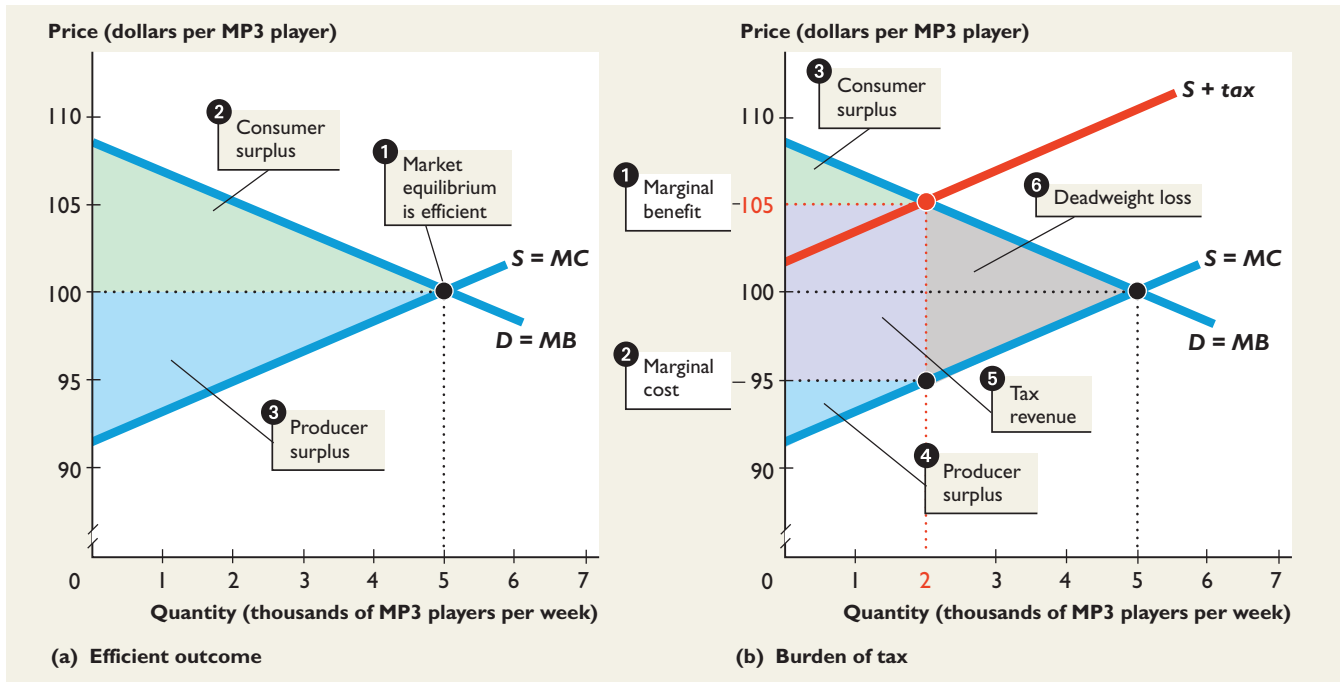
① The market is efficient with marginal benefit equal to marginal cost. Total surplus—the sum of ② consumer surplus (green area) and ③ producer surplus (blue area)—is at its maximum possible level.

A $10 tax drives a wedge between ① marginal benefit and ② marginal cost. ③ Consumer surplus and ④ producer surplus shrink by the amount of the ⑤ tax revenue plus the ⑥ 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 is 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.

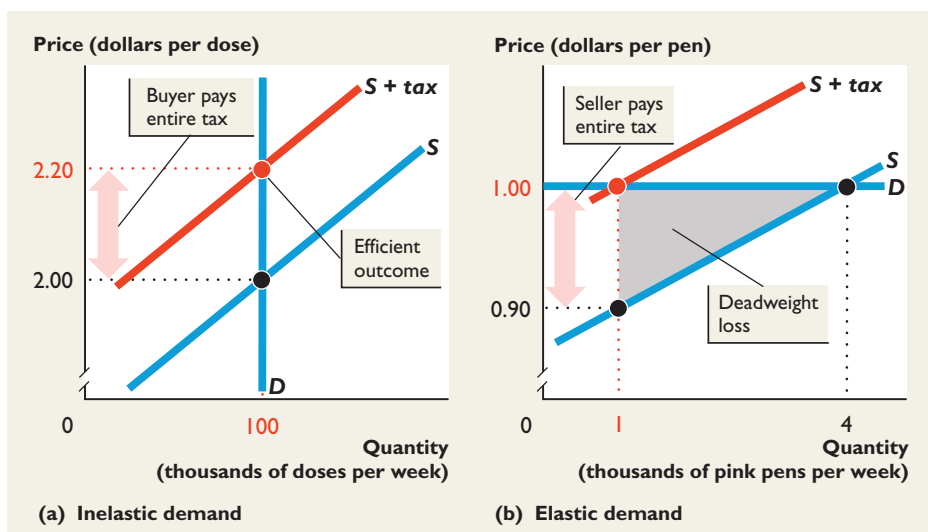#### Perfectly Inelastic Demand: Buyer Pays and Efficient

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 20¢ a dose tax 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 10¢ a pen tax leaves the price at $1 a pen, but

■ 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.

the quantity decreases to 1,000 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.
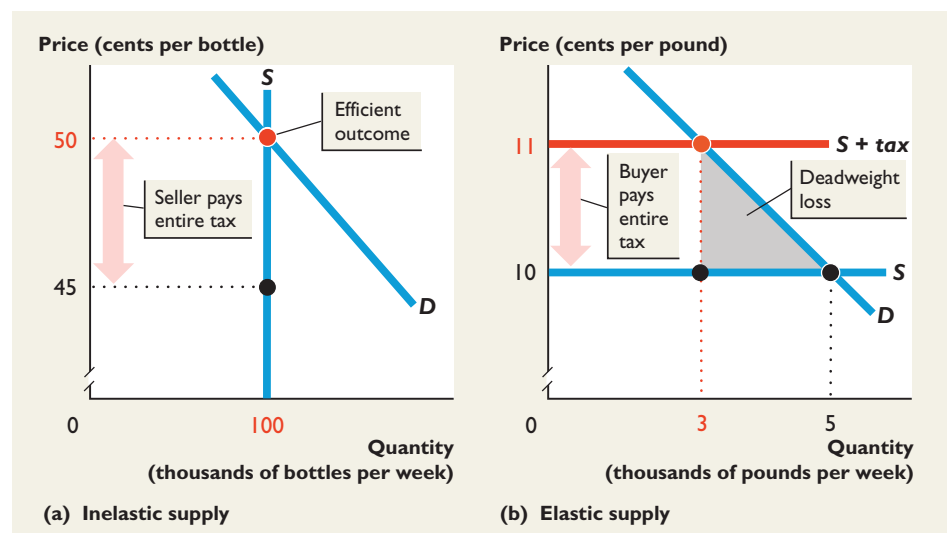
■ FIGURE 7.4

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

Explain how taxes change prices and quantities, are shared between buyers and sellers, and create inefficiency.

Practice Problems

Figure 1 shows the market for basketballs in which 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.

In the News

Biggest U.S. tax hike on tobacco takes effect
The tax on cigarettes has risen from 39¢ to $1.01 a pack—an increase of 62¢ a pack. Before the tax hike, cigarettes were $5 a pack. In the past, a price increase of 10 percent cut cigarette consumption by 4 percent. With this new tax, at least 1 million of the 45 million smokers are expected to quit.

Source: *USA Today*, April 3, 2009

Is the demand for cigarettes elastic or inelastic? Will the price rise to $5.62 a pack? Who pays most of the tax increase—smokers or tobacco companies?

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 (Figure 3). 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 4 million balls × $6 a ball ÷ 2. 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.

Solution to In the News

If a 10 percent price increase decreases consumption by 4 percent, the price elasticity of demand for cigarettes is 4/10, or 0.4. The demand for cigarettes is inelastic. With the demand inelastic, the 62¢ tax increase will not increase the price to $5.62. The price would rise to $5.62 only if the demand were perfectly inelastic. Buyers and sellers share the tax. Because demand is inelastic, buyers (smokers) will pay more of the 62¢ tax than the sellers (tobacco companies).

FIGURE 1
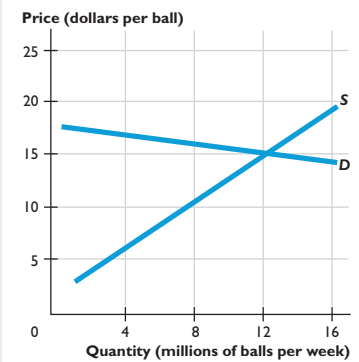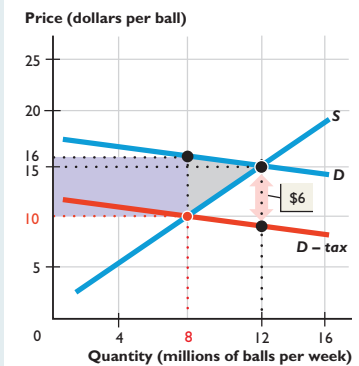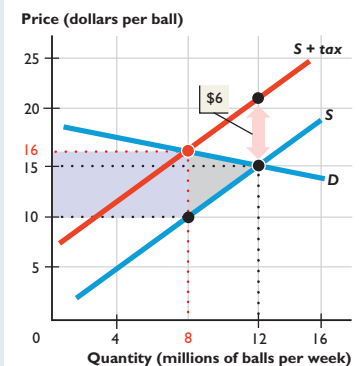

FIGURE 2

FIGURE 3

7.2   PRICE CEILINGS

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 **price ceiling** (also called a **price cap**) is a government regulation that places an *upper* limit on the price at which a particular good, service, or factor of production may be traded. 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. Demand and supply in the housing market determine the rent and the quantity of housing available.

Figure 7.5 illustrates the apartment rental market in Biloxi, Mississippi. The rent is $550 a month, and 4,000 apartments are rented.

Suppose that Biloxi apartment rents have increased by $100 a month in the past two years and that a Citizens' Action Group asks the mayor to roll rents back.

■ A Rent Ceiling

Rent ceiling
A regulation that makes it illegal to
charge more than a specified rent for
housing.

Responding to the demand, the mayor imposes 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.

❶ The market is in equilibrium when the quantity demanded equals the quantity supplied.

❷ The equilibrium price (rent) is $550 a month.
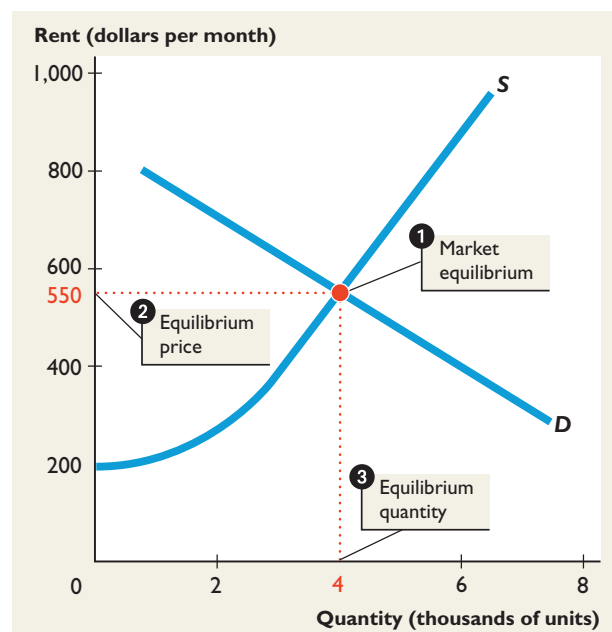
❸ The equilibrium quantity is 4,000 units of housing.

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.

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

Black market
An illegal market that operates alongside a government-regulated market.

■ **FIGURE 7.6**

A Rent Ceiling Creates a Shortage

MyEconLab Animation
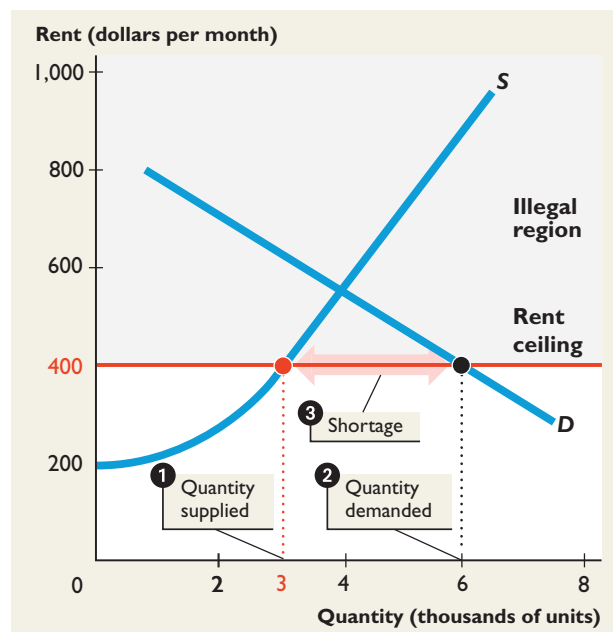
A rent ceiling is imposed below the equilibrium rent. In this example, the rent ceiling is $400 a month.

❶ The quantity of housing supplied decreases to 3,000 units.

❷ The quantity of housing demanded increases to 6,000 units.

❸ 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 and the maximum that a renter is willing to pay of $625.

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 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.

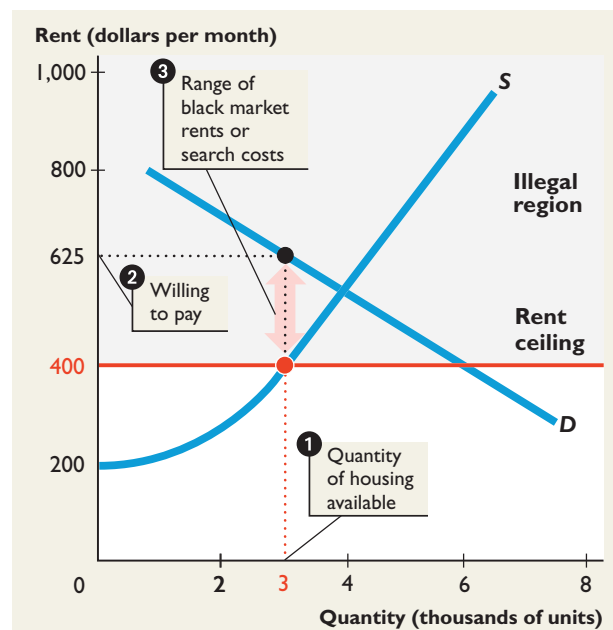### FIGURE 7.7

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.
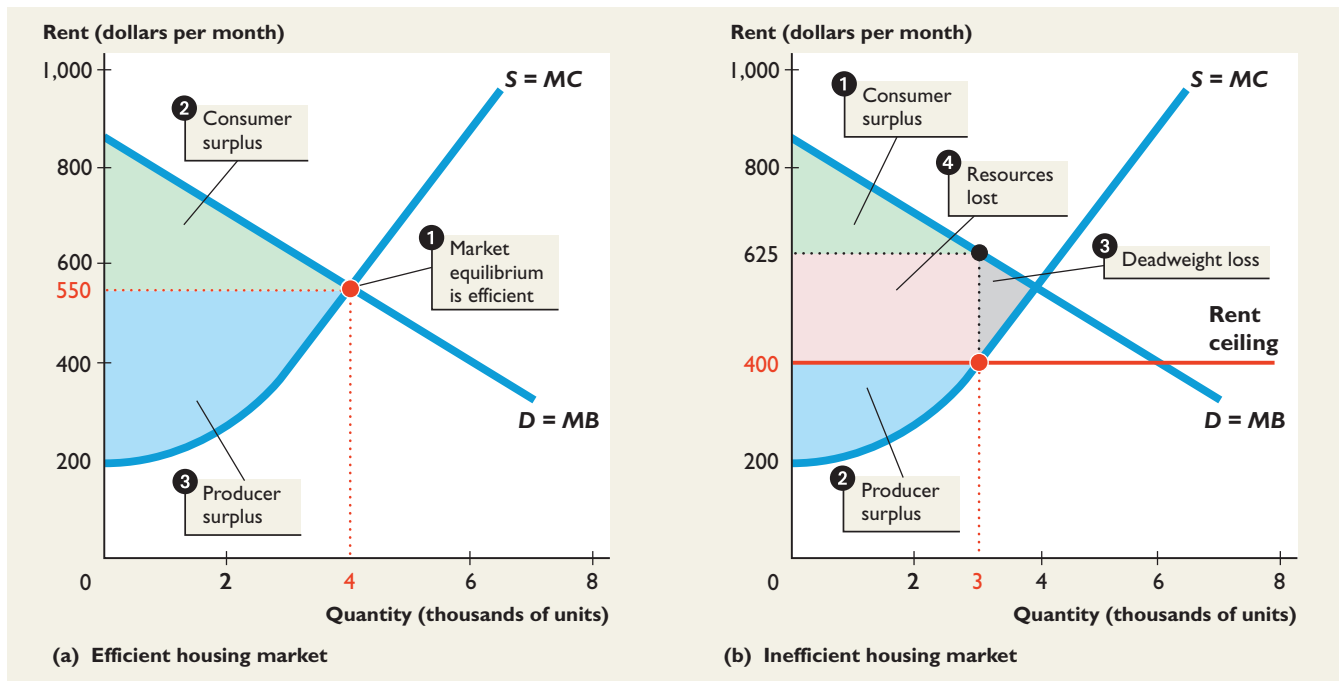
■ Are Rent Ceilings Efficient?

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. 153).

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 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. 159–161) that fairness is a complex idea about which there are two broad views: fair *results* versus fair *rules.* 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

Explain how a price ceiling works and show how a rent ceiling creates a housing shortage, inefficiency, and unfairness.

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. With a strictly enforced rent ceiling of $600 a month, is the housing market efficient? What is the deadweight loss? Is the housing market fair? Explain.

In the News

Rising oil prices worry U.S. finance chiefs
Tupperware's CFO says rising oil prices would cause the company to pay $15 million more for resin, which is based on oil, than it did a year ago. Resin prices are closely tied to the price of oil, which peaked at $114 a barrel in April.
Source: *The Wall Street Journal*, June 27, 2011

If the government puts a price cap on resin at today's price ($100 a barrel), explain why a shortage will occur. Which allocation method would most likely be used to distribute resin?

FIGURE 1

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 equals the area of the gray triangle, which is (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

Resin is made from oil, so if the price of oil increases, then the cost of making resin increases, and the supply of resin decreases. The equilibrium price of resin rises. The higher equilibrium price will exceed the price cap of $100 a barrel, and there is a shortage of resin. Resin will most likely be allocated by first-come, first-served. Alternatively, the government could ration resin, in which case it would be allocated by command.
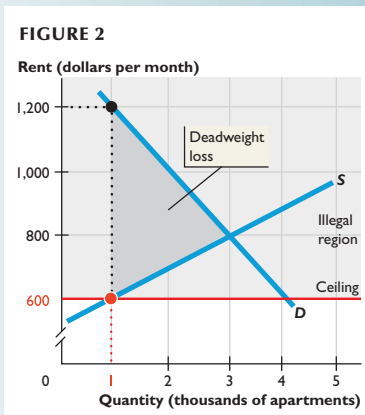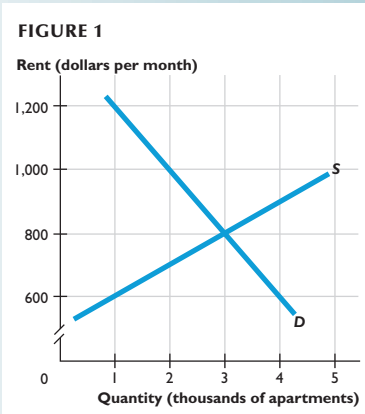
7.3 PRICE FLOORS

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.

A **price floor** is 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 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 $10 an hour, the quantity of fast-food servers demanded is zero. If A&W, Burger King, Taco Bell, McDonald's, Wendy's, and the other fast-food places had to pay servers $10 an hour, they wouldn't hire any. They would replace servers with vending machines! But at wage rates below $10 an hour, they would hire servers. At a wage rate of $5 an hour, firms would hire 5,000 servers.

On the supply side of the market, no one is willing to work for $2 an hour. To attract servers, firms must pay more than $2 an hour.

Equilibrium in this market occurs at a wage rate of $5 an hour with 5,000 people employed as servers.

Suppose that the government thinks that no one should have to work for a wage rate as low as $5 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.
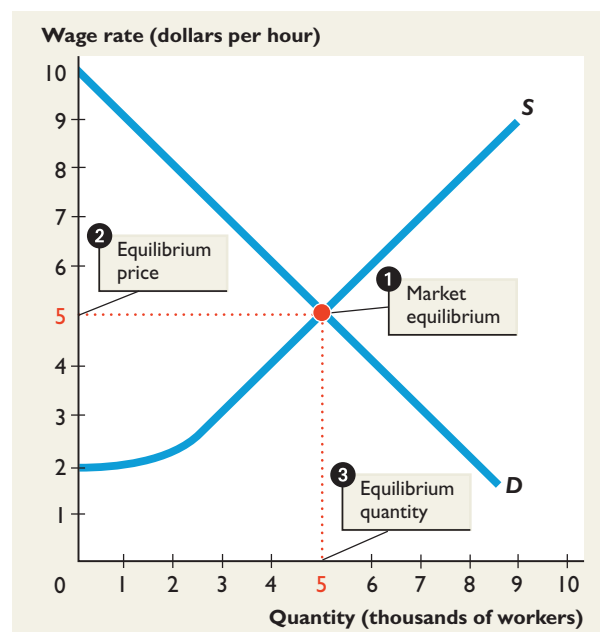
■ **FIGURE 7.9**

A Market for Fast-Food Servers

MyEconLab Animation

The figure shows the demand curve, *D*, and the supply curve, *S*, for fast-food servers.

❶ The market is in equilibrium when the quantity demanded equals the quantity supplied.

❷ The equilibrium price (wage rate) is $5 an hour.

❸ The equilibrium quantity is 5,000 servers.

■ The Minimum Wage

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 $5 an hour, and at this wage rate, firms hire 5,000 workers. If the government introduced a minimum wage below $5 an hour, nothing would change. The reason is that firms are already paying $5 an hour, and because this wage exceeds the minimum wage, the wage rate paid doesn't change. Firms continue to hire 5,000 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 $7 an hour. Figure 7.10 shows the effects of this law. Wage rates below $7 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 $7 an hour, they will hire only 3,000 workers. At the equilibrium wage rate of $5 an hour, firms hired 5,000 workers. So when the minimum wage is introduced, firms lay off 2,000 workers.

Minimum wage law
A government regulation that makes hiring labor services for less than a specified wage illegal.

FIGURE 7.10

A Minimum Wage Creates Unemployment

MyEconLab Animation
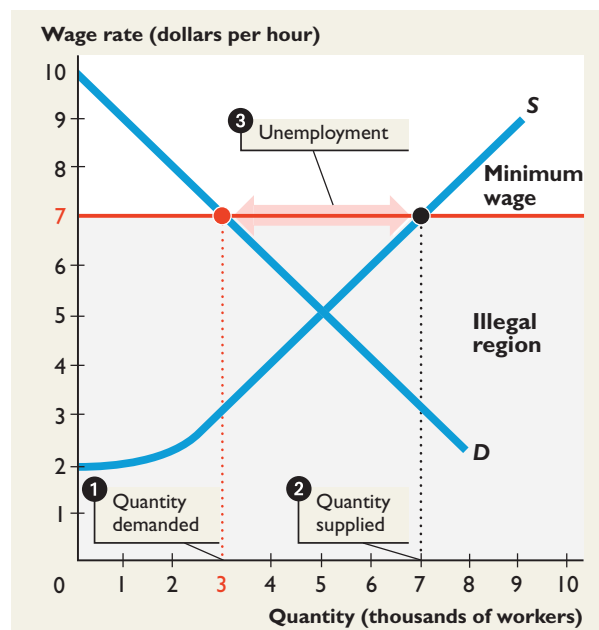
A minimum wage is introduced above the equilibrium wage rate. In this example, the minimum wage rate is $7 an hour.

1 The quantity of labor demanded decreases to 3,000 workers.

2 The quantity of labor supplied increases to 7,000 people.

3 4,000 people are unemployed.

But at a wage rate of $7 an hour, 2,000 people who didn't want to work for $5 an hour will now try to find work as servers. So at $7 an hour, the quantity supplied is 7,000 people. With 2,000 workers fired and another 2,000 looking for work at the higher wage rate, 4,000 people who would like to work as servers are unemployed.

The 3,000 jobs available must somehow be allocated among the 7,000 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 that pays $7 an hour, someone who is willing to work for $3 an hour (on the supply curve) would be willing to spend $4 an hour (the minimum wage rate of $7 an hour minus $3 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 $7 an hour and the lowest wage rate at which someone is willing to work, $3 an hour.

FIGURE 7.11

A Minimum Wage Creates Job Search and Illegal Hiring   MyEconLab Animation

The minimum wage rate is set at $7 an hour:

1 3,000 jobs are available.

2 The lowest wage rate for which someone is willing to work is $3 an hour. In a black market, illegal wage rates might be as low as $3 an hour.

3 The maximum that might be spent on job search is an amount equivalent to $4 an hour—the $7 they would receive if they found a job minus the $3 they are willing to work for.
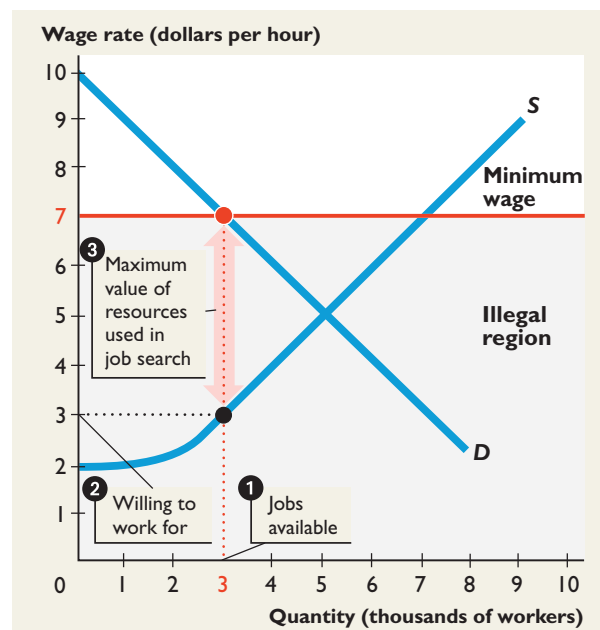
EYE on the U.S. ECONOMY
The Federal Minimum Wage

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 1991 in terms of what it would buy at 2011 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 increase 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.

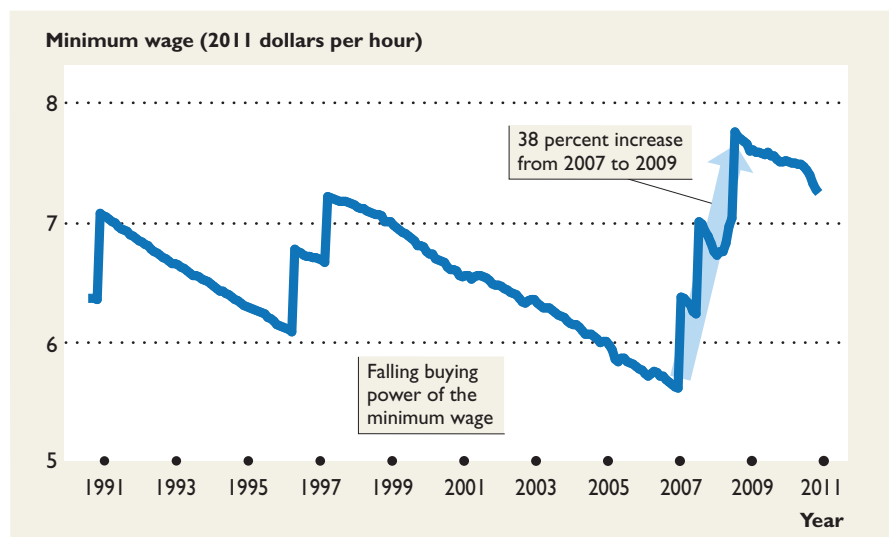(3)   Managers make a firm's operations more efficient.

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.

Minimum wage (2011 dollars per hour)

38 percent increase from 2007 to 2009

Falling buying power of the minimum wage

Year

■ 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 $7 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**

(b) **Inefficient labor market**
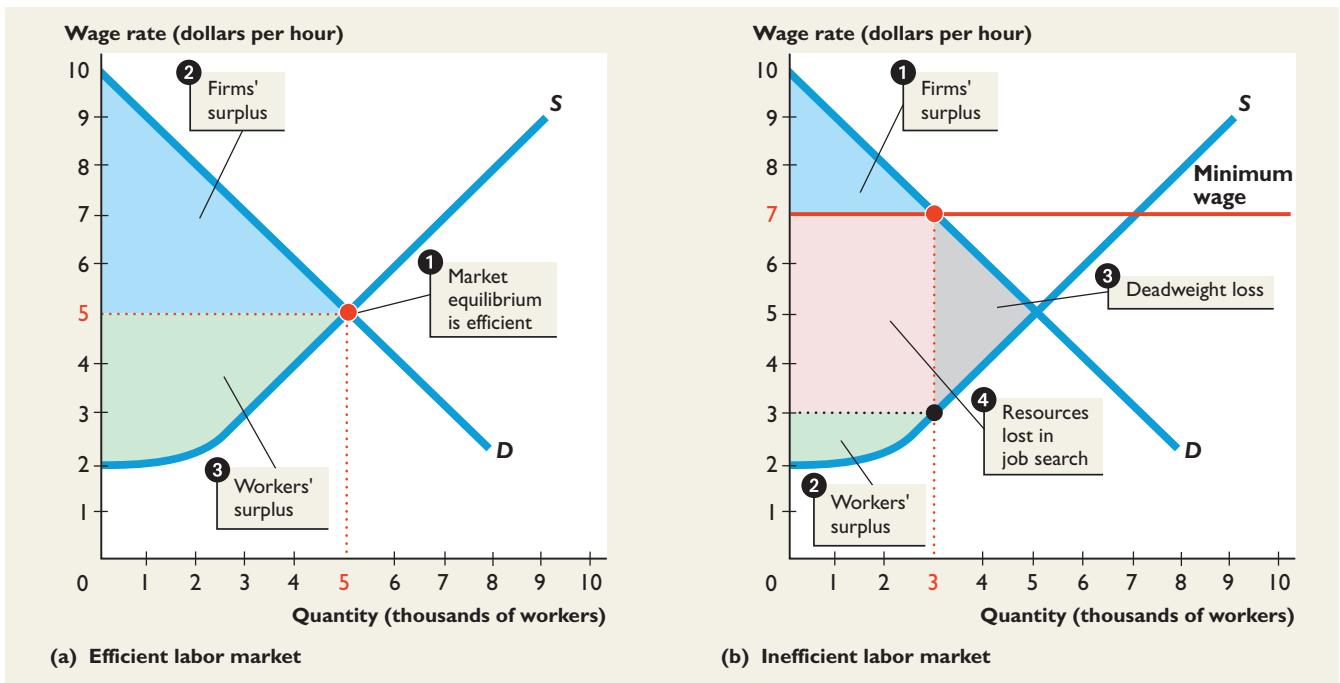
❶ The market equilibrium is efficient with marginal benefit equal to marginal cost. The sum of ❷ the firms' surplus (blue area) and ❸ workers' surplus (green area) is maximized.

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. Resources get used in costly job-search activity as each unemployed person keeps looking for a job—writing letters, making phone calls, going to interviews, and so on. The value of these resources might be as large as 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 unemployed end up worse off than they would be with no minimum wage—and those who get the 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.
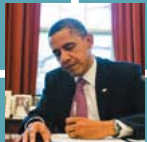
EYE on PRICE REGULATION
Can the President Repeal the Laws of Supply and Demand?

The President has a powerful pen, but one that holds no magical powers. When the President signs a Bill or an Executive Order to bring in a new law or regulation, the outcome is not always exactly what was intended. A mismatch between intention and outcome is almost inevitable when a law or regulation seeks to block the laws of supply and demand.

You've seen the problems created by the federal 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 to the President's desk for his signature, but you can see some of the problems that would have arisen if it had. Setting aside the difficult task of determining the President's compensation (does it include the use of the White House and Air Force One?), 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!

FIGURE 1

Wage rate (dollars per hour)

CHECKPOINT 7.3

Explain how a price floor works and show how the minimum wage creates unemployment, inefficiency, and unfairness.

Practice Problems

Figure 1 shows the market for tomato pickers in southern California.

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

Hong Kong introduces a minimum wage
Hong Kong's first minimum wage is set at $HK28 an hour—$HK5 less than labor unions wanted, but $HK5 more than the employers had offered. About 315,000 people will be affected by the new wage.

Source: *The Economist*, January 11, 2011

What will be the effects of the minimum wage if the employers' offer is equal to the equilibrium wage? What will be the effects of the minimum wage if the labor unions' demand is equal to the equilibrium wage?

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.

FIGURE 2

Wage rate (dollars per hour)

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 deadweight 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 results views of fairness.

Solution to In the News

If the employers' offer of $HK23 an hour is the equilibrium wage rate, then the minimum wage exceeds the equilibrium wage and some of the 315,000 workers will become unemployed. If the union's demand of $HK33 an hour is the equilibrium wage rate, then the minimum wage is below the equilibrium wage and the minimum wage has no effect on the quantity of labor employed.
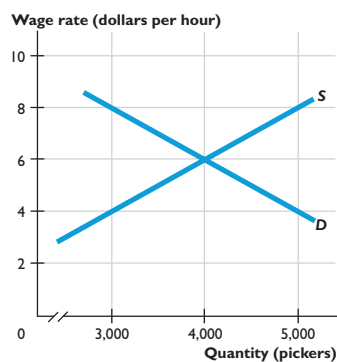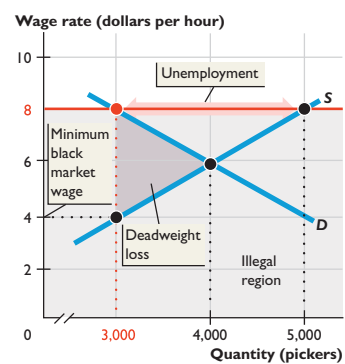
7.4   PRICE SUPPORTS IN AGRICULTURE

"The nation has got to eat," declared President George W. Bush when he asked Congress to spend $170 billion to support U.S. farmers. The United States is not alone among the advanced economies in spending billions of dollars each year on farm support. Governments in all the advanced economies do it, and none more than those of the European Union and Japan.

■ How Governments Intervene in Markets for Farm Products

The methods that governments use to support farms vary, but they almost always involve three elements:

- Isolate the domestic market from global competition
- Introduce a price floor
- Pay farmers a subsidy

Isolate the Domestic Market

A government can't regulate a market price without first isolating the domestic market from global competition. If the cost of production in the rest of the world is lower than that in the domestic economy and if foreign producers are free to sell in the domestic market, the forces of demand and supply drive the price down and swamp any efforts by the government to influence the price.

   To isolate the domestic market, the government restricts imports from the rest of the world.

Introduce a Price Floor

A price floor in an agricultural market is called a **price support,** because the floor is maintained by a government guarantee to buy any surplus output at that price. You saw that a price floor in the labor market—a minimum wage—creates a surplus of labor that shows up as unemployment. A price support in an agricultural market also generates a surplus. At the support price, the quantity supplied exceeds the quantity demanded. What happens to the surplus makes the effects of a price support different from those of a minimum wage. The government buys the surplus.

Price support
A price floor in an agricultural market maintained by a government guarantee to buy any surplus output at that price.

Pay Farmers a Subsidy

A **subsidy** is a payment by the government to a producer to cover part of the cost of production. When the government buys the surplus produced by farmers, it provides them with a subsidy. Without the subsidy, farmers could not cover their costs because they would not be able to sell the surplus.

   Let's see how a price support works.

Subsidy
A payment by the government to a producer to cover part of the cost of production.

■ Price Support: An Illustration

To see the effects of a price support, we'll look at the market for sugar beets. Both the United States and the European Union have price supports for sugar beets.

   Figure 7.13 shows the market. This market is isolated from rest-of-world influences. The demand curve, D, tells us the quantities demanded at each price in the domestic economy only. And the supply curve, S, tells us the quantity supplied at each price by domestic farmers.

Free Market Reference Point

With no price support, the equilibrium price is $25 a ton and the equilibrium quantity is 25 million tons a year. The market is efficient only if the price in the rest of the world is also $25 a ton. If the price in the rest of the world is less than $25 a ton, it is efficient for the domestic farmers to produce less and for some sugar beets to be imported at the lower price (lower opportunity cost) available in the rest of the world. But if the price in the rest of the world exceeds $25 a ton, it is efficient for domestic farmers to increase production and export some sugar beets.

Price Support and Subsidy

Suppose the government introduces a price support and sets the support price at $35 a ton. To make the price support work, the government agrees to pay farmers $35 for every ton of sugar beets they produce and can't sell in the market.

The farmers produce the quantity shown by the market supply curve. At a price of $35 a ton, the quantity supplied is 30 million tons a year, so production increases to this amount.

Domestic users of sugar beets cut back their purchases. At $35 a ton, the quantity demanded is 20 million tons a year, and purchases decrease to this amount.

Because farmers produce a greater quantity than domestic users are willing to buy, something must be done with the surplus. If the farmers just dumped the surplus on the market, you can see what would happen. The price would fall to that at which consumers are willing to pay for the quantity produced.

To make the price support work, the government buys the surplus. In this example, the government buys 10 million tons for $35 a ton and provides a subsidy to the farmers of $350 million.


■ **FIGURE 7.13**

The Domestic Market for Sugar Beets   MyEconLab Animation

The market for sugar beets is isolated from global competition.

❶ With no intervention, the competitive equilibrium price is $25 a ton and the equilibrium quantity is 25 million tons a year.

❷ The government intervenes in this market and sets a support price at $35 a ton.

❸ The quantity produced increases to 30 million tons a year.

❹ The quantity bought by domestic users decreases to 20 million tons a year.

❺ The government buys the surplus of 10 million tons a year and pays farmers a subsidy of $350 million.

❻ A deadweight loss arises.
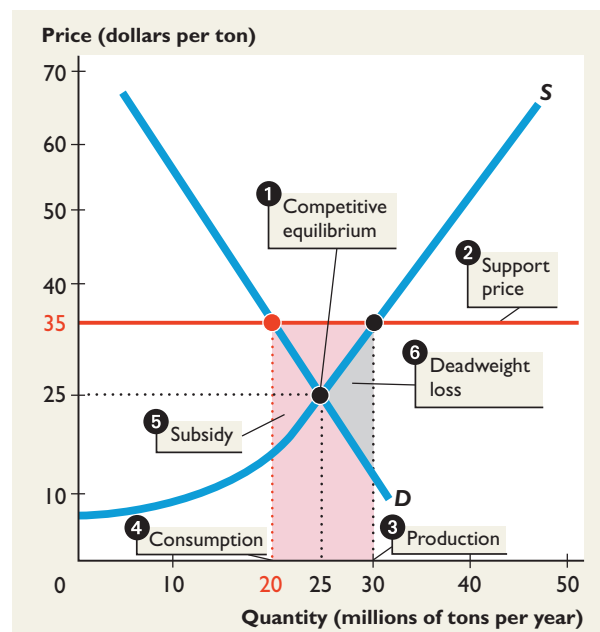
The price support increases farmers' total revenue. Without a subsidy, farmers would receive a total revenue of $625 million ($25 a ton multiplied by 25 million tons). With a subsidy, they receive a total revenue of $1,050 million ($35 a ton multiplied by 30 million tons).

The price support is inefficient because it creates a deadweight loss. Farmers gain but consumers, who are also the taxpayers who end up paying the subsidy, lose. And consumers' losses exceed the farmers' gains by the amount of the deadweight loss.

Effects on the Rest of the World

The rest of the world receives a double-whammy from price supports. First, import restrictions in advanced economies deny developing economies access to the food markets of the advanced economies. The result is lower prices and smaller farm production in the developing economies.

Second, the surplus produced in the advanced economies gets sold in the rest of the world. Both the price and the quantity produced in the rest of the world are depressed even further.

The subsidies received by U.S. farmers are paid not only by U.S. taxpayers and consumers but also by poor farmers in the developing economies.

We explore global markets in action in Chapter 8. There you will see other ways in which intervention in markets brings inefficiencies and redistributes the gains from trade.

EYE on YOUR LIFE
Price Ceilings and Price Floors

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 would be clocking up the 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 would never be 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 (price supports) in 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.
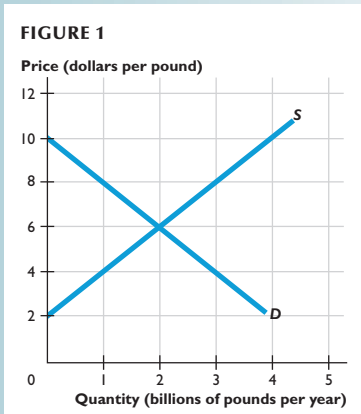
FIGURE 1

CHECKPOINT 7.4

Explain how a price support in the market for an agricultural product creates a surplus, inefficiency, and unfairness.

Practice Problems

Figure 1 shows the market for tomatoes.

1. What are the equilibrium price and quantity of tomatoes? Is the market for tomatoes efficient?

2. If the government introduces a price support at $8 per pound, what is the quantity of tomatoes produced, the quantity demanded, and the subsidy received by tomato farmers?

3. With a price support set at $8 per pound, is the market for tomatoes efficient? Who gains and who loses from the price support? What is the deadweight loss? Could the price support be regarded as being fair?

In the News

French farmers man the blockades in Brussels
Farmers want the dairy industry to guarantee a minimum (powdered) milk price of 300 euros a ton—against 210 euros a ton this month. Max Bottier, a dairy farmer in Normandy, said that he needs 300 euros a ton to break even.
                                                    Source: *The Times*, May 26, 2009

If a support price for milk is set at 300 euros a ton, how will the quantity of milk produced and the quantity bought by consumers change? Who buys the surplus? Will the European milk market be more or less efficient than it is today?
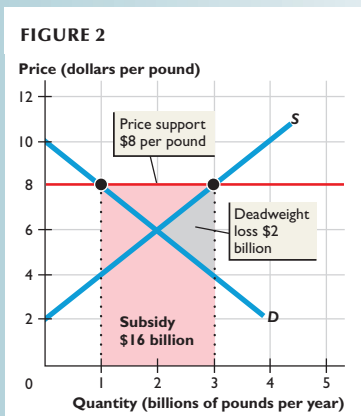
Solutions to Practice Problems

1. The equilibrium price is $6 a pound; the equilibrium quantity is 2 billion pounds. The market is efficient—marginal benefit equals marginal cost.

2. At a support price of $8 a pound, 3 billion pounds are produced and 1 billion pounds are demanded, so there is a surplus of 2 billion pounds (Figure 2). The subsidy is $8 per pound on 2 billion pounds, which is $16 billion.

3. The market is not efficient because at the quantity produced, the marginal benefit (on the demand curve) is less than the marginal cost (on the supply curve). Farmers gain. They produce more and receive a higher price on what they sell in the market as well as the government subsidy. Consumers/taxpayers lose. They pay more for tomatoes and pay taxes to fund the subsidy. The deadweight loss is $2 billion (the area of the gray triangle). 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.

FIGURE 2

Solution to In the News

The market price of powdered milk is 210 euros a ton. A support price of 300 euros a ton will increase the quantity supplied, decrease the quantity demanded, and create a surplus of milk. To maintain the price at 300 euros a ton, the government will have to buy the surplus at the support price. The market will be less efficient because it creates a deadweight loss.

<div style="background:red;color:white;">## CHAPTER SUMMARY</div>

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 show how a rent ceiling creates a housing shortage, inefficiency, and unfairness.

- 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 show how the minimum wage creates unemployment, inefficiency, and unfairness.

- 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 price support in the market for an agricultural product creates a surplus, inefficiency, and unfairness.

- A price support increases the quantity produced, decreases the quantity consumed, and creates a surplus.
- To maintain the support price, the government buys the surplus and subsidizes the producer.
- A price support benefits the producer but costs the consumer/taxpayer more than the producer gains—it creates a deadweight loss.
- A price support is inefficient and is usually unfair.

Key Terms

Black market, 175	Price ceiling, 174	Search activity, 176
Excess burden, 170	Price floor, 180	Subsidy, 187
Minimum wage law, 181	Price support, 187	Tax incidence, 168
Price cap, 174	Rent ceiling, 174	

TABLE 1

Price (dollars per month)	Quantity demanded	Quantity supplied
	(units per month)	
0	30	0
10	25	10
20	20	20
30	15	30
40	10	40

FIGURE 1

Price (dollars per month)
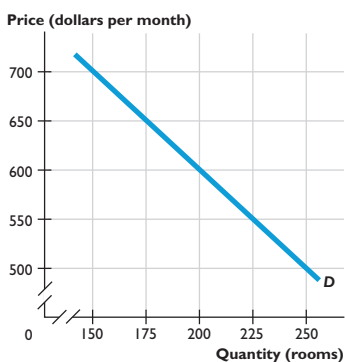
TABLE 2

Wage rate (dollars per hour)	Quantity demanded	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	Quantity supplied
	(pounds per week)	
1.00	5,000	2,000
2.00	4,500	2,500
3.00	4,000	3,000
4.00	3,500	3,500
5.00	3,000	4,000
6.00	2,500	4,500

CHAPTER CHECKPOINT

Study Plan Problems and Applications

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, which shows the demand for on-campus housing, to work Problems **4** to **6**. 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 price support for mushrooms of $6 per pound. Who gains and who loses? What are the quantity of mushrooms produced, the surplus of mushrooms, and the deadweight loss?

Use the following news clip to work Problems **9** and **10**.

Coal shortage at China plants

The government of China has set price controls on coal and gasoline in an attempt to shield poor families and farmers from rising world energy prices. Chinese power plants have run short of coal, sales of luxury, gas-guzzling cars have increased, and gasoline consumption has risen. Oil refiners are incurring losses and plan to cut production.

Source: CNN, May 20, 2008

9. Are China's price controls price floors or price ceilings? Draw a graph to illustrate the shortages of coal and gasoline created by the price controls.

10. Explain how China's price controls have changed consumer surplus, producer surplus, total surplus, and the deadweight loss in the markets for coal and gasoline. Draw a graph to illustrate your answer.

Instructor Assignable Problems and Applications

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 the quantity demanded at the pay cap, and the deadweight loss created. Also show the highest pay that an executive might be offered in a black market.

Use the following information to work Problems **2** and **3**.

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.

2. What is the price that buyers pay? How is the tax split between the buyer and the seller? What is the government's tax revenue?

3. On a graph, show the excess burden of this tax. Is this tax efficient?

4. Figure 1 shows the demand for and supply of chocolate bars. Suppose that 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?

Use the following information to work Problems **5** and **6**.

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.

5. Explain how the market for gasoline would react to this price ceiling if the oil-producing nations increased production and drove the equilibrium price of gasoline to $2.50 a gallon. Would the U.S. gasoline market be efficient?

6. 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?

7. Suppose the government introduced a ceiling on lawyers' fees. How would the amount of work done by lawyers, the consumer surplus of people who hire lawyers, and the producer surplus of law firms change? Would this fee ceiling result in an efficient and fair use of resources? Why or why not?

Use the following information to work Problems **8** and **9**.

Crop prices erode farm subsidy program
High corn and soybean prices mean farmers are making the most money in their lives. The reason: Grain prices are far too high to trigger payouts under the U.S. primary farm-subsidy program's "price support" formula. The market has done what Congress couldn't do and that is "slash farm subsidies."
Source: *The Wall Street Journal*, July 25, 2011

8. Draw a graph to illustrate the soybean market when the soybean price was low. Show the quantity of soybeans produced, the subsidy farmers received, and the deadweight loss created.

9. In the market for corn with a price support, explain why the corn price has risen and ended up being too high to "trigger payouts."

FIGURE 1

Price (dollars per bar)
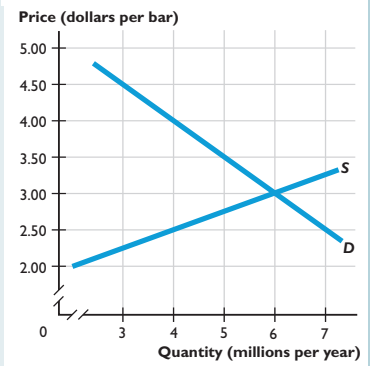
Multiple Choice Quiz

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 candy will be paid by _____.
    A. only buyers if the demand for candy is inelastic
    B. only sellers if the supply of candy is inelastic
    C. buyers and sellers if the demand for candy is elastic
    D. only buyers if the supply of candy is elastic

3. A price ceiling imposed below the equilibrium price _____.
    A. creates a black market in which the price might equal or exceed the equi-
       librium 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 support price set above the equilibrium price _____.
    A. creates a shortage, increases farmers' total revenue, and is efficient
    B. creates a surplus, which the government buys and dumps on the rest of
       the world to keep the U.S. price equal to the support price
    C. is inefficient because farmers' marginal cost exceeds U.S. consumers' mar-
       ginal benefit
    D. is efficient because farmers' marginal cost equals U.S. consumers' mar-
       ginal benefit

8. Choose the best statement.
    A. A subsidy to peanut growers lowers peanut growers' costs, lowers the
       market price of peanuts, and increases the demand for peanuts.
    B. A price support for peanut growers is a guaranteed price for peanuts,
       which increases the quantity of peanuts produced.
    C. A price support and a subsidy to peanut growers will make the peanut
       market more efficient if the support price is below the market price.
    D. For a support price set above the equilibrium price to increase peanut
       growers' incomes, they must also receive a subsidy.