

Student Edition Sample Chapter: Microeconomics

AP<sup>®</sup>  
EDITION

23rd Edition

# economics

McConnell | Brue | Flynn



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Graw  
Hill

23rd Edition

# economics

McConnell | Brue | Flynn



# **Economics**

**AP<sup>®</sup> Edition**

**Twenty-Third Edition**

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ECONOMICS, TWENTY-THIRD EDITION

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# ABOUT THE AUTHORS

To Mac and Mem, Terri and Craig, and past instructors.



Campbell R. McConnell/  
McGraw Hill

**CAMPBELL R. MCCONNELL** earned his Ph.D. at the University of Iowa after receiving degrees from Cornell College and the University of Illinois. He taught at the University of Nebraska–Lincoln from 1953 until his retirement in 1990. He was also coauthor of *Contemporary Labor Economics* and *Essentials of Economics*. He was a recipient of both the University of Nebraska Distinguished Teaching Award and the James A. Lake Academic Freedom Award and served as president of the Midwest Economics Association. Professor McConnell was awarded an honorary Doctor of Laws degree from Cornell College in 1973 and received its Distinguished Achievement Award in 1994. He was also a jazz expert and aficionado until his passing in 2019.



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**STANLEY L. BRUE** did his undergraduate work at Augustana College (South Dakota) and received its Distinguished Achievement Award in 1991. He received his Ph.D. from the University of Nebraska–Lincoln. He is retired from a long career at Pacific Lutheran University, where he was honored as a recipient of the Burlington Northern Faculty Achievement Award. Professor Brue has also received the national Leavey Award for excellence in economics education. He has served as national president and chair of the Board of Trustees of Omicron Delta Epsilon International Economics Honorary. He is coauthor of *Economic Scenes*, fifth edition (Prentice-Hall); *Contemporary Labor Economics*, twelfth edition; *Essentials of Economics*, fourth edition; and *The Evolution of Economic Thought*, eighth edition (Cengage Learning). For relaxation, he enjoys international travel, attending sporting events, and going on fishing trips.



Sean M. Flynn/McGraw Hill

**SEAN M. FLYNN** did his undergraduate work at the University of Southern California before completing his Ph.D. at U.C. Berkeley, where he served as the Head Graduate Student Instructor for the Department of Economics after receiving the Outstanding Graduate Student Instructor Award. He teaches at Scripps College (of the Claremont Colleges) and is the author of *Economics for Dummies*, third edition (Wiley); *Essentials of Economics*, fourth edition; and *The Cure That Works: How to Have the World's Best Healthcare—at a Quarter of the Price* (Regnery). His research interests include behavioral finance, behavioral economics, and health care economics. An accomplished martial artist, Sean has coached five of his students to national championships and is the author of *Understanding Shodokan Aikido*. Other hobbies include running, traveling, and cooking.

## AP Contributor: Student Edition

**ERIC DODGE** holds the Zeddies Chair in Economics and is a professor of economics at Hanover College in Hanover, Indiana. At Hanover College, Indiana’s oldest private college, he teaches courses in Principles and Intermediate Microeconomics, Environmental Economics, Labor Economics, Introduction to Sustainability, and Econometrics. He is the author of *5 Steps to a 5: Microeconomics* and *5 Steps to a 5: Macroeconomics* and co-author with Melanie Fox of *Economics Demystified*. For over twenty years, he has served as a faculty consultant for the AP Economics program, and as an AP Reader, Table Leader, and Question Leader for the AP Economics reading. A native of Portland, Oregon, he received his bachelor’s degree in Business Administration from the University of Puget Sound and his master’s and doctoral degrees in Economics from the University of Oregon. He enjoys the outdoors, growing tomatoes, and dropping dad jokes on his unsuspecting kids. He splits his time between Madison and West Lafayette, Indiana and is married to Melanie Fox, with sons Eli, Max, and Theo.



Eric Dodge/Eric Dodge

## AP Contributors: Teacher Manual

**JULIE MEEK** holds a Master’s Degree in Economics Education from the University of Delaware and a Master’s Degree in Secondary Education from the University of North Texas. She has taught at Plano East Senior High school since 1997. Plano East Senior High school is a large suburban school located in Plano just north of Dallas, Texas. Julie started teaching AP Economics in 2003 and has been an AP Macroeconomics grader as well as a table leader and question leader at the AP Reading. In 2016, Julie became an AP workshop consultant presenting at seminars and Advanced Placement Summer Institutes for new and experienced teachers. As a grader of the AP Macroeconomics exam, she has had the opportunity for exceptional professional development. Using this experience, she has developed pedagogical strategies for skill and knowledge acquisition to share by writing the AP Skills Practice features in the student edition and updating the AP Teacher Manual.

**MARTHA SEVETSON RUSH** has been teaching AP Macroeconomics and AP Microeconomics since 1997. She has been an AP Reader in both Macroeconomics (2007–2014) and Macroeconomics (2015–Present), and has served on the College Board’s AP Microeconomics Curriculum Design and Assessment Committee and Economics Instructional Design Committee, as well as serving as a College Board consultant since 2015.



# PREFACE

Welcome to the 23rd edition of *Economics*, AP Edition, America’s most innovative—and popular—economics learning resource.

We are pleased to present teachers and students with comprehensive revisions, insightful new content, and additions to both our digital resources and our industry-leading ancillary materials.

From real-life examples to cutting-edge learning resources, our modern approach makes learning and applying economics easier for both students and teachers.

- For students, *Economics* offers a student-centered learning environment that presents the subject matter in new and engaging ways.
- For teachers, a full and supportive instructional support package does the heavy lifting regarding basic concepts and ideas so teachers can focus their attention on helping students achieve the knowledge and skills needed for success in their AP Micro- or Macroeconomics course.

It is our sincere hope that our 23rd edition will continue to promote rapid learning and deep understanding. We have worked hard to ensure that *Economics* is comprehensive, analytical, and challenging—yet fully accessible to a wide range of students. Where needed, an extra sentence of explanation is provided. Brevity at the expense of clarity is false economy.

**Sean M. Flynn**

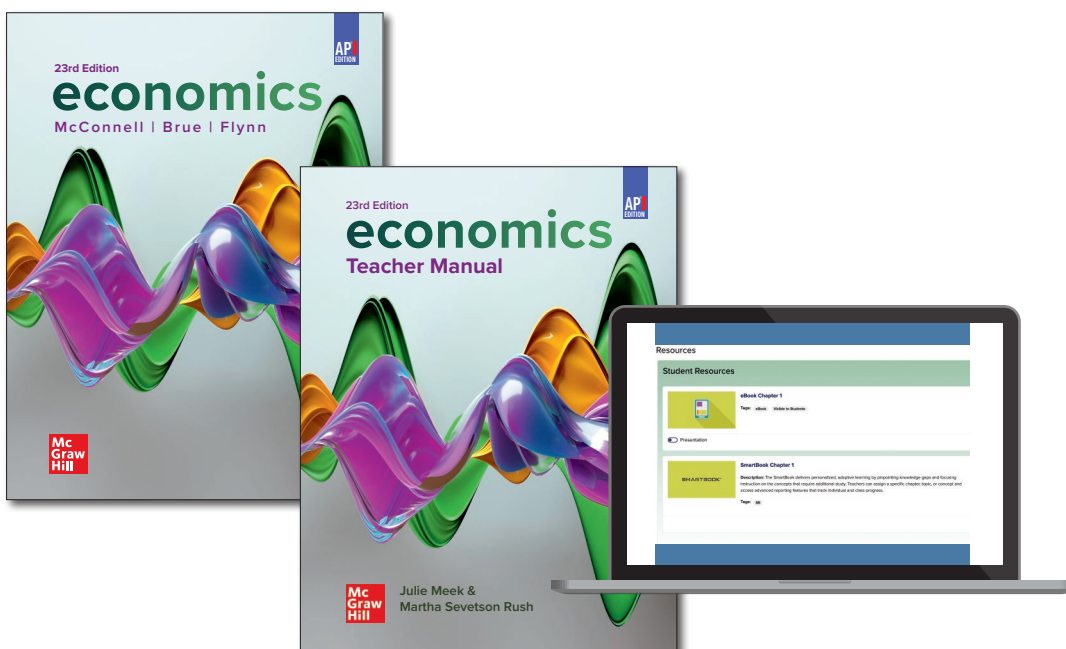
**Stanley L. Brue**

# The Most Trusted Source for AP Success

## A Student-Centered Approach

McConnell has always put students at the center of every revision and the new edition of *Economics* is no exception. Extensive market feedback and a keen focus on optimizing student outcomes drove this revision. Nearly every element—from the work itself to the digital tools and resources—has been updated and optimized for today’s AP students.

- **Unit and chapter content is laser-focused** on AP topics and learning objectives to ensure full coverage of both the AP Micro- and Macroeconomics frameworks.
- **The new, student-friendly design** makes the core text more accessible to high school students.
- **A complete split between AP Microeconomics and AP Macroeconomics** ensures the precise coverage of introductory topics based on the Course and Exam Descriptions.
- **New AP-style multiple choice and free response questions** are available at the end of each chapter and unit to give students even more practice.
- **SmartBook® has been updated and enhanced**, making our adaptive reading experience more personal, more accessible, and more productive for students anytime, anywhere, and on any device.
- **We have extended our ongoing efforts to accommodate the fast-paced, nonlinear learning style of contemporary students** by streamlining paragraphs, highlighting key examples, and introducing additional Key Graphs. These changes will help digital natives quickly scan for key concepts and core material. Scores of newly added headers, Quick Review boxes, and bullet points will assist them in rapidly identifying the most important ideas and information.



## Complete Alignment to the AP Frameworks

Decades of work by dedicated practitioners continues to enhance the user experience through the clear treatment of economic concepts, balanced coverage, patient explanations, and currency of information. Our new AP Edition builds on past strengths by keeping the tried-and-true core content while reorganizing the sequence to match the Micro- and Macroeconomics Course and Exam descriptions and adding a robust selection of AP-focused practice and activities to support student success.

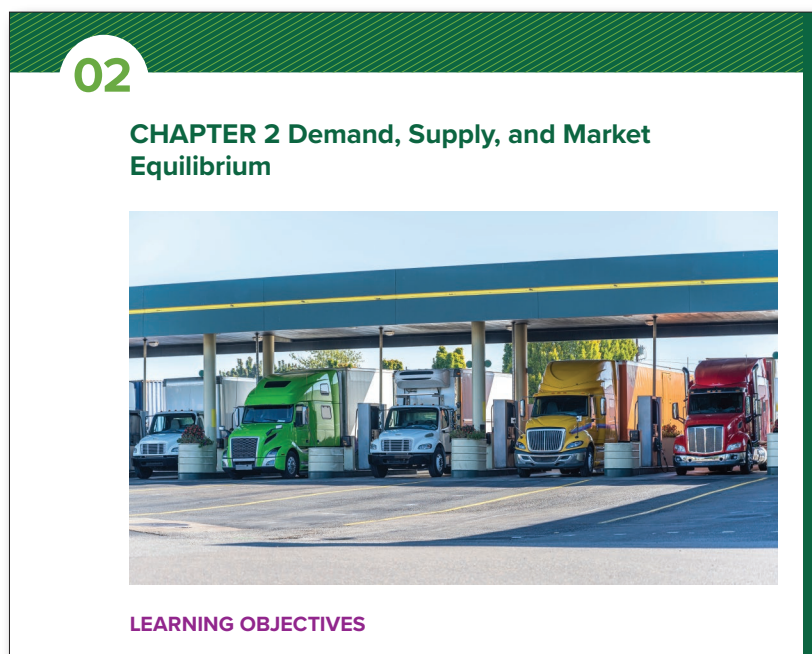
## Easy visual cues distinguish the content specific to each course

We've made it simple for teachers and students to find the course content they need by creating a complete micro/macro split. Each course is color coded for ease of use. Guidance on content overlap is provided in the AP Teacher Manual for those teaching both courses.



◀ **Microeconomics** chapters are indicated by the purple border and shading.

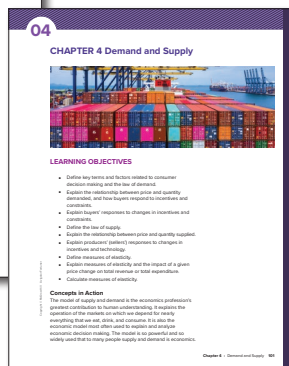
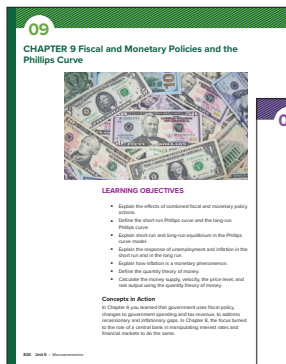
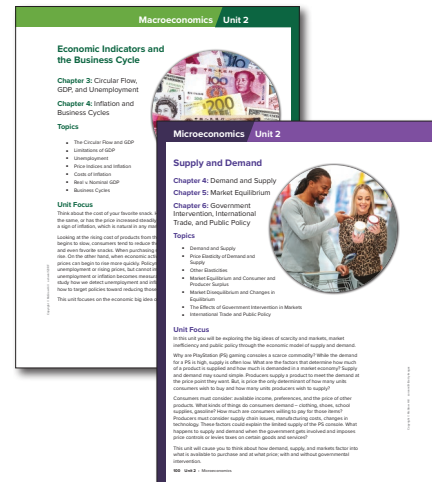
**Macroeconomics** chapters are indicated by the green border and shading. ▶



## Intuitive Organization

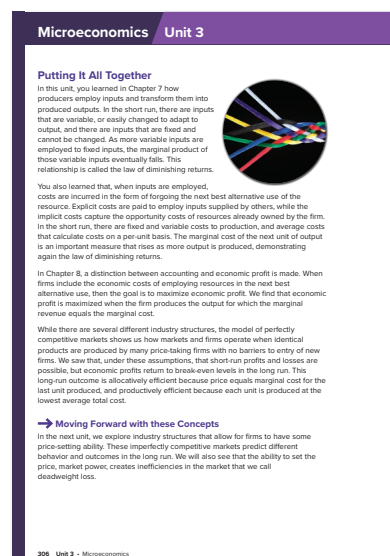
Course content is divided into units and chapters, matching the organization and structure of the AP Micro- and Macroeconomics frameworks. Features ensure instruction, practice, and mastery are discretely focused on the expectations of the AP course outcomes and, ultimately, exam success.

Each unit opens with the list of **AP Topics** and a **Unit Focus** that hooks students' attention and sets the stage for content to gain student buy-in right away.



Chapters list the **AP Learning Objectives** and begin with a **Concepts in Action** introduction to help students connect with the practical application of economic concepts.

**Putting It All Together** features at the end of each unit show students how the content works together to extend their understanding.

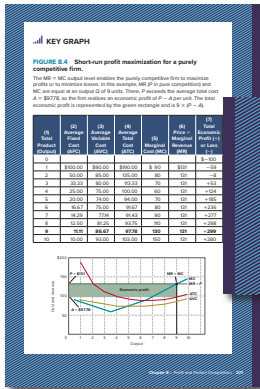


**Moving Forward with These Concepts** sections inform students about other places in their study of economics where these concepts will reappear – perhaps with a different focus.



## Comprehensive Explanations at an Appropriate Level

Teachers can assign topics with the confidence that their students can independently read and comprehend the thorough-yet-accessible narrative. Multiple check points and learning aids support understanding and application, especially for the most challenging concepts.



**QUICK QUIZ FOR FIGURE 8.4**

- Curve MR is horizontal because:
  - product price falls as output increases.
  - the law of diminishing marginal utility is at work.
  - the market demand for this product is perfectly elastic.
  - the firm is a price taker.
- At a price of \$10 and 7 units of output:
  - MR exceeds MC, and the firm should expand its output.
  - total revenue is less than total cost.
  - AVC exceeds ATC.
  - the firm would earn only a normal profit.

► **Detailed Graphs** throughout the book help students visually grasp economic concepts and models. **Key Graphs** have self-contained Quick Quizzes to help students comprehend and apply essential models.

► **Quick Review** sections reexamine concepts in a clear and concise manner, providing the perfect study tool for chapter quizzes, tests, and the AP Exam.

### QUICK REVIEW 8.2

- ✓ A firm will choose to produce if it can at least break even and then generate a normal profit.
- ✓ Profit is maximized, or loss minimized, at the output at which marginal revenue (or price in pure competition) equals marginal cost, provided that price exceeds variable cost at that output level.
- ✓ If the market price is below the minimum average variable cost, the firm will minimize its losses by shutting down.

**AP Economics Skills Practice**

**Skill 4.A:** Draw an accurately labeled graph or visual to represent an economic model or situation.

You have already practiced Skill 2.A earlier in this chapter. Now you will extend your understanding of how to show your knowledge on an accurately labeled graph. You are often asked to graph an economic concept or principle and asked to explain the cause of the situation, using two skills in this free response.

**On the AP Exam**

For example, answer this sample free response question. Begin by identifying the model or market that is required. Remember the correct labeling system for that model or market, in this case labeling the graphs.

Assume that the market for granting cards is perfectly competitive. Currently the granting card firms are in long-run equilibrium.

- Draw a correctly labeled graph of the granting card market and graph of a typical granting card firm.
- On your graphs in part a, indicate the following:
  - The market equilibrium price,  $P$ , and quantity,  $Q$ .
  - The firm's quantity,  $Q_{firm}$ .
  - Shade the firm's area of economic profit.

Remember that perfect competition requires side-by-side graphs. Be careful to label which is the market graph and which is the firm graph. You MUST connect the two graphs by the market price creating the firm's MR (MR = D = AR = P) in a necessary division. For the firm the market price is MR (marginal revenue). D = demand, AR = average revenue, and P = price.

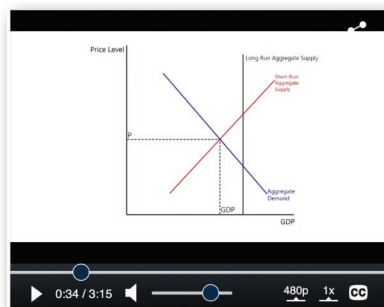
Correctly labeled graph:

Remember that the area of profit is price minus ATC times the quantity. So, both the price and ATC are found along the quantity of output line.

► **New AP Skills Practice** features include explanation and practical application of the AP Economics Skills, including graphing and explaining concept chains. Students will benefit from these reminders of the skills that will be assessed on the AP Exam.

## Extend Student Learning with Digital Resources

The new **Adaptive Econ Prep: Math and Graphing** tool gives students math remediation and experience with the graphing fundamentals that are prerequisites to success.



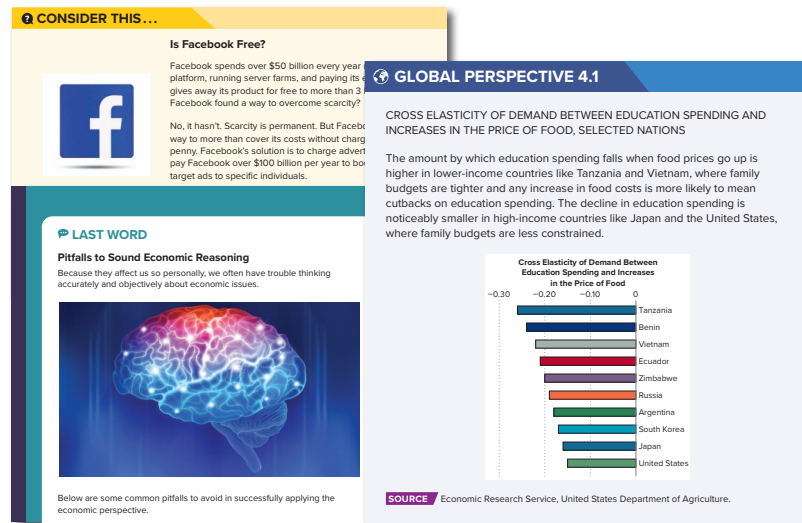
► **Connect the Dots** videos help students with challenging concepts such as externalities, exchange rates, and the loanable funds market.

### Chapters / Modules

- Select All (7 Chapters / Modules)
- Trade
- Production Possibilities
- Law of Demand and the Demand Curve
- Law of Supply and the Supply Curve
- Equilibrium Price and Quantity
- Price Elasticity Coefficient and Formula
- Cross Elasticity and Income Elasticity of Demand

## Connecting to Students' Everyday Lives

Students absorb economic theory most easily when it directly relates to their experiences and is exemplified with current examples. To that end, the 23rd edition covers many topics and events that reflect the issues of the day.



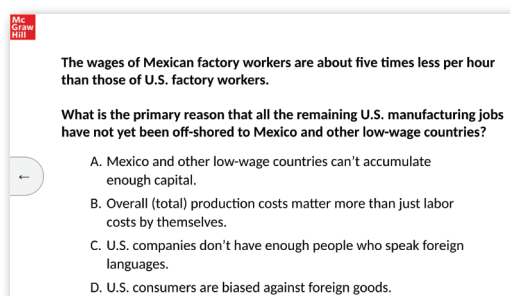
▶ The **Consider This...**, **Last Word**, and **Global Perspective** features drive home key ideas in an accessible, student-friendly manner.

## Extend Student Learning with Digital Resources



▶ The **ECON Everyday Blog** saves teachers time by bringing current, student-centered content into their courses. Short articles written for AP-level students are available in the digital resources, and tagged by topic to make them easily searchable. Discussion questions help teachers drive the conversation forward.

**Application-Based Activities (ABAs)** are immersive decision-making simulations that put students into the role of everyday economists. Students practice their economics thinking and problem-solving skills as they apply course concepts to interactive digital scenarios.



▶ **Guided Peer Instruction** activities are student-led and allow students to apply their own learning to teach others in a way that more than doubles understanding relative to lecture-based formats.

## Focused AP Test Practice and Prep

2. Refer to the graph depicting U.S. domestic market for corn. How many bushels of corn, if any, will the United States export or import at a world price of \$1, \$2, \$3, \$4, and \$5? Use this information to construct the U.S. export supply curve and import demand curve for corn. Suppose that the only other corn-producing nation is France, where the domestic price is \$4. Which country will export corn, and which country will import it?

**AP Exam Practice**

**Multiple Choice**

Directions: Each of the questions or incomplete statements below is followed by five answers or completions. Select the one that is best in each case.

1. When an excise tax is imposed on a competitive market with no externalities, deadweight loss occurs because

- consumers pay a higher price per unit than they did before the tax.
- the quantity exchanged is less than the quantity where the marginal benefit equals the marginal cost to society.
- producers receive a lower price per unit than they did before the tax.
- the government collects tax revenue.
- the total net benefit to society remains unchanged.

2. When a price floor is created in competitive markets, we expect to see

- a transfer of producer surplus to consumer surplus.
- the collection of government revenue.
- an increase in total surplus to society.
- a persistent surplus of goods or service.
- lower prices for consumers.

208 Unit 2 - Microeconomics

**AP Exam Practice**

Question 10 refers to the following graph.

10. If an excise tax of  $(P_2 - P_1)$  dollars is placed on the production of each unit, government tax revenue is equal to:

- $\frac{1}{2} \times (P_2 - P_1) \times Q_1$
- $\frac{1}{2} \times (P_2 - P_1) \times Q_2$
- $\frac{1}{2} \times (P_2 - P_1) \times (Q_2 - Q_1)$
- $\frac{1}{2} \times (P_2 - P_1) \times Q_3$
- $P_2 \times Q_1$

**Free Response**

Directions: Respond to all parts of the question. Use correctly-labeled diagrams, if useful or required, in explaining your answers. A correctly-labeled diagram must have all axes and curves clearly labeled and must show directional changes.

1. The market for poppies in Sauna City is competitive and in equilibrium.

- Draw a correctly-labeled graph of the market for poppies, labeling the equilibrium price  $P_m$  and equilibrium quantity  $Q_m$ .
- At the equilibrium price and quantity, the price elasticity of demand is equal to 2.0 and the price elasticity of supply is equal to 0.50. If the price of poppies fell by 7%, would total spending on poppies rise, fall, or remain the same? Explain.

Chapter 6 - Government Intervention, International Trade, and Public Policy 213

AP Exam Practice includes multiple-choice and free-response questions matching the style and rigor of the AP Exams. Including the complete Practice Exams at the end of the book, these question sets provide students with ample practice.

## Extend Assessment Opportunities with Digital Resources

Digital Test Banks include AP-style multiple-choice and free-response questions and content review questions for mastery.

**Question 26**

Short Free-Response Question

Directions: Respond to all parts of the question. Include correctly-labeled diagrams, if useful or required, in explaining your answers. A correctly-labeled diagram must show all axes and curves clearly labeled and must show directional changes.

Assume a closed economic system in which there is neither foreign trade nor a government sector.

- Construct a correctly-labeled circular flow diagram that illustrates each of the following:
  - money flow and exchange of goods and services between households and businesses
  - money flow and exchange of factors of production between households and businesses
- Label each market in the model.

Instructions

1000 of 1000 words remaining

**Microeconomics Unit 1 Basic Economic Concepts**

**Unit 1 Overview**

Unit 1 introduces the fundamental economic problem: Resources are scarce, while human needs and wants are unlimited. Therefore, individuals and societies must make choices. The unit starts with a focus on scarcity and the opportunity costs of decisions. The production possibilities curve model is introduced and used to illustrate opportunity cost, productive efficiency, inefficiency, and growth. Next, the theory of comparative advantage is described, with a focus on calculating how trading partners should specialize and trade to maximize total production, as well as determining mutually beneficial terms of trade. The unit concludes with an exploration of economic decision making, focusing on a cost-benefit analysis. Some economic decisions are undertaken by comparing total benefits with total costs, and other decisions permit decision makers to compare marginal benefits with marginal costs. An introduction to the key assumptions associated with consumer choice theory, such as diminishing marginal utility and budget constraints, culminates in this section with the concept of marginal utility per dollar, which allows consumers to allocate their limited income according to the utility-maximizing rule.

AP Unit Reviews provide a concise overview of each unit's content for quick review.

Complete Digital and Printable Practice Exams (two for each course) allow teachers to assign in their preferred mode and set AP Exam-like parameters for a realistic testing experience.

**SECTION I MULTIPLE-CHOICE QUESTIONS**  
60 QUESTIONS TIME: 70 MINUTES

Directions: Each of the questions or incomplete statements below is followed by five answers or completions. Select the one that is best in each case.

1. The graph shows the production possibilities curve for an economy in which both pizzas and industrial robots are produced. Given this graph, which of the following must be true?

- Point D is allocatively efficient.
- Point W is productively inefficient.
- Point C is productively efficient.
- Point B is preferable to Point D.
- Opportunity costs are constant.

## Power Up the Test Prep with 5 Steps to a 5

The number-one choice for AP teachers, 5 Steps to a 5 test prep guides are now available as an add-on for your AP Micro- or Macroeconomics course.



Both **5 Steps to a 5: AP Macroeconomics** and **5 Steps to a 5: AP Microeconomics** are robust in-class resources that reinforce critical concepts, offer extensive AP Exam practice, and help students walk into test day feeling prepared and confident.

Each workbook includes:

- Full-length practice tests that align with the latest College Board requirements,
- hundreds of practice exercises with answer explanations,
- an overview of all the most important AP Micro- and Macroeconomics topics,
- and proven test-taking strategies from veteran AP teachers.

### Review and Test Prep You Can Trust

5 Steps guides are useful tools throughout the school year, and each begins with a diagnostic test to determine students' strengths and challenges.

Take the Diagnostic Exam < 23

**Diagnostic Exam: AP Macroeconomics**

**SECTION I**  
Time—70 Minutes  
60 Questions

For the following multiple-choice questions, select the best answer choice and record your choice on the answer sheet provided.

1. Which of the following is an example of capital as an economic resource?  
(A) A cement mixer  
(B) A barrel of crude oil  
(C) A registered nurse  
(D) A share of corporate stock  
(E) A bachelor's degree

Figure D.1

Question 2 is based on the production possibilities of two nations that can produce both crepes and paper.

| NATION X |       | NATION Y |       |
|----------|-------|----------|-------|
| Crepes   | Paper | Crepes   | Paper |
| 0        | 3     | 0        | 5     |
| 9        | 0     | 5        | 0     |

3. Using Figure D.1, which of the following movements would be described as economic growth?  
(A) W to X  
(B) X to Y  
(C) W to Y  
(D) Z to W  
(E) X to Z

Day 64

**NAME THAT CURVE!**

The following short-run cost curves are unrammed. Your job is to correctly identify them, without the use of your books and/or class notes.

295

### Bellringers for Every Day of the Year

5 Minutes to a 5 is a group of 180 five-minute activities that reinforce the most vital course material and give students the edge they need.

### Time-saving Teacher Resources

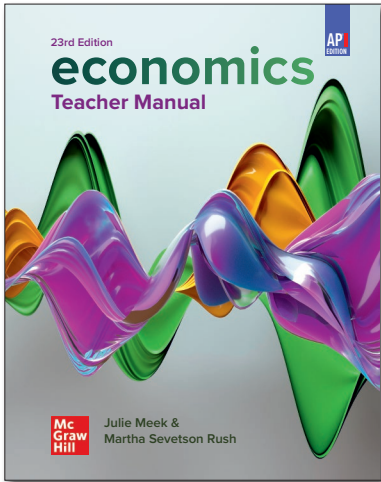
A teacher manual is included with each guide to help maximize classroom time, give tips on curriculum management, and help build a strategy for the entire school year.

| Semester Pacing Schedule                                 |           |                     |                            |
|--|-----------|---------------------|----------------------------|
| TOPICS   | % OF EXAM | PACING              | 5 STEPS TO A 5             |
| Unit 1: Basic Economic Concepts                          | 15–10%    | 8–10 Class Periods  | Chapter 5 pp. 51–64        |
| Unit 2: Economic Indicators and the Business Cycle       | 12–17%    | 9–11 Class Periods  | Chapters 6 & 7 pp. 65–100  |
| Unit 3: National Income and Price Determination          | 17–27%    | 10–12 Class Periods | Chapters 8 & 9 pp. 101–133 |
| Unit 4: Financial Sector                                 | 18–23%    | 11–13 Class Periods | Chapter 9 pp. 114–133      |
| Unit 5: Long Run Consequences and Stabilization Policies | 20–30%    | 8–10 Class Periods  | Chapter 10 pp. 134–148     |
| Unit 6: Open Economy—International Trade and Finance     | 10–13%    | 5–7 Class Periods   | Chapter 11 pp. 149–168     |
| Year-Long Pacing Schedule                                |           |                     |                            |
| TOPICS   | % OF EXAM | PACING              | 5 STEPS TO A 5             |
| Unit 1: Basic Economic Concepts                          | 15–10%    | 16–20 Class Periods | Chapter 5 pp. 51–64        |
| Unit 2: Economic Indicators and the Business Cycle       | 12–17%    | 18–22 Class Periods | Chapters 6 & 7 pp. 65–100  |
| Unit 3: National Income and Price Determination          | 17–27%    | 20–24 Class Periods | Chapters 8 & 9 pp. 101–133 |
| Unit 4: Financial Sector                                 | 18–23%    | 22–26 Class Periods | Chapter 9 pp. 114–133      |
| Unit 5: Long Run Consequences and Stabilization Policies | 20–30%    | 16–20 Class Periods | Chapter 10 pp. 134–148     |
| Unit 6: Open Economy—International Trade and Finance     | 10–13%    | 10–14 Class Periods | Chapter 11 pp. 149–168     |

Visit [mheonline.com/5Steps](http://mheonline.com/5Steps) for more information.



## Robust AP Teacher Manual



The updated AP Teacher Manual by Julie Meek builds upon the work of Martha Sevetson Rush and includes additional features and a new organization that matches the reorganized Student Edition. The manual is available in print and an online version is included with the digital resources.

### Key features include:

- **Sample syllabi** and **pacing guides** for each course
- **Unit and chapter overviews** featuring advice for teaching the content of each course and guidance if teaching both Micro- and Macroeconomics
- **Chapter-level** features, such as:
  - **Addressing the AP Framework** highlighting the Topics and Skills
  - **Exam Focus** explaining where chapter content commonly appears on the AP Economics Exams
  - **Teaching Suggestions** that contain both **Strategies** and **Stumbling Blocks** to help students gain mastery
  - Leveled **English Learner** support
  - Complete **answers and explanations** for all discussion questions, problems, and AP Exam Practice in the Student Edition
  - See page xviii for a full list of teacher resources.

## A NOTE ON ACCESSIBILITY

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# Personalized, Dynamic Digital Resources

## Your Online Course on my.mheducation.com

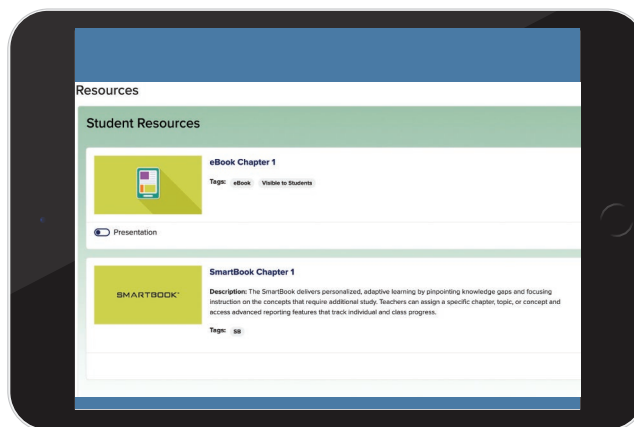
*Economics* is enriched with digital resources including videos illustrating concepts and processes, interactivities, discussion ideas, and adaptive learning tools that provide students with an opportunity to contextualize and apply their understanding.

### For Students

#### More Practice. More Interactivity. More Opportunities.

Resources for students include:

- Interactive eBook and adaptive SmartBook
- Guided Peer Instruction
- Math Prep
- Economics Everyday Blog
- Application-Based Activities
- Adaptive Econ Prep – Math and Graphing
- Connect the Dots Videos
- Economics and Ethics
- AP Practice and Test Prep
- Two Full Practice Exams for Each Course

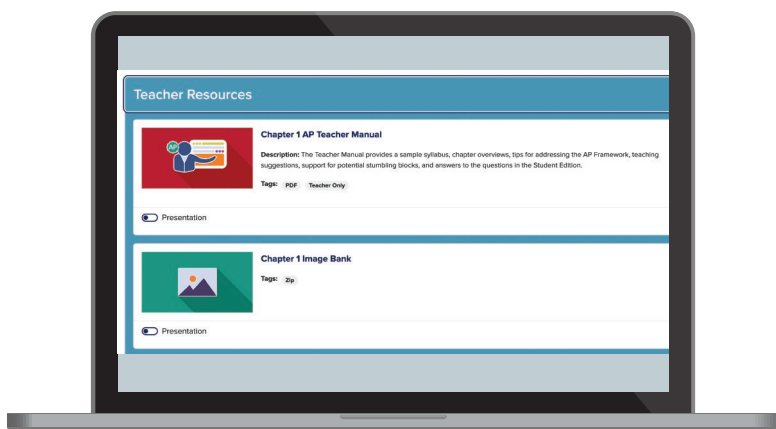


### For Teachers

#### More Support. More Data. More Enhancements.

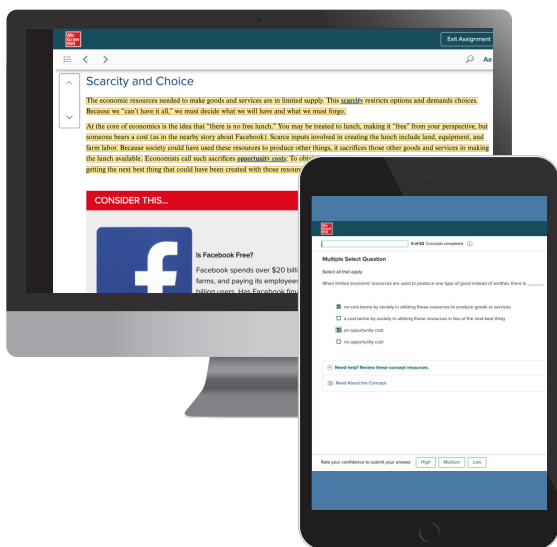
Resources for teachers include:

- Complete AP Teacher Manual for Micro- and Macroeconomics
- Benchmarks and Pacing
- AP Suggested Assignments
- Micro- and Macroeconomics complete correlations
- Accessible PowerPoint Presentations
- Chapter-level Content Quizzes and Assessments
- Chapter-level AP Exam-style Practice Questions
- English Learner Activities
- Digital Image Library
- Complete Answer Keys



## Adaptive Learning with SmartBook®

SmartBook® delivers personalized, adaptive learning tailored to each student's individual needs by pinpointing knowledge gaps and focusing instruction on the concepts that require additional study. Teachers can assign a specific chapter, topic, or concept and access advanced reporting features that track individual and class progress with actionable insights to inform in-class instruction.



### For Students

#### More Personalized. More Productive. More Accessible.

As students move through the material, multiple data points are captured to sequence and pace learning for each student's unique needs.

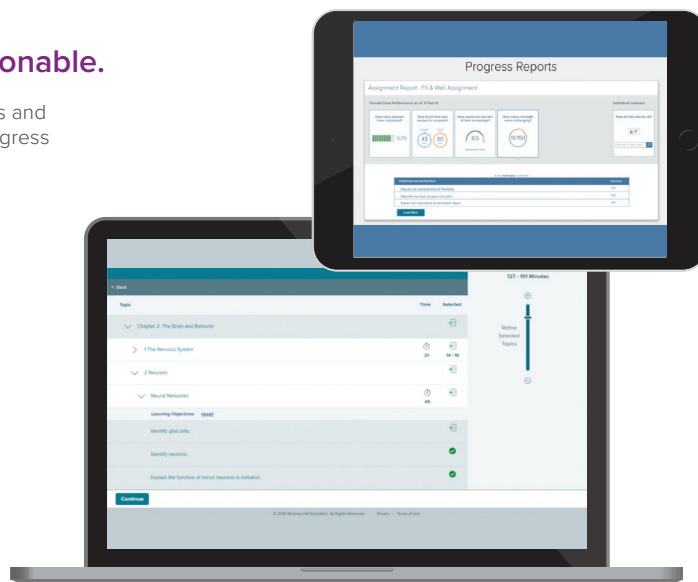
- **Focused Instruction:** Yellow highlights help students easily identify their assigned learning concepts.
- **Targeted Remediation:** Blue highlights bring focus to the contents and concepts that require additional study.
- **Meaningful Practice:** Practice sets with instant feedback allow students to ask for guidance and rate their confidence level.
- **Recharged Learning:** Students can recharge their learning by accessing previously completed assignments with personalized recommendations.
- **Mobile Ready:** Assignments are accessible both online and offline with the *ReadAnywhere* app.

### For Teachers

#### More Control. More Prepared. More Actionable.

Teachers can organize assignments to suit their students' needs and align to their course outcomes while easily tracking student progress at the individual and/or class level.

- **Flexible Assignments:** Assign homework down to the sub-topic level and time-on-task.
- **Manageable Content:** Assign content across multiple chapters to establish the context for the learning ahead and make connections between chapters, topics, and concepts.
- **Results-based Support:** Provide personalized review assignments that target each student's areas of weakness, better preparing them for upcoming assessments.
- **Actionable Reports:** Advanced reporting features track individual and class progress with data-driven insights.



## Truly Aligned to the Course and Exam Descriptions

### AP Edition Chapter-by-Chapter Changes

Each chapter of *Economics*, AP Edition, contains data updates and numerous revised examples that will be fresh and relevant for today's students. Chapter-specific updates include new boxed features additional Key Graphs, and substantial revisions to the core content.

As mentioned earlier, we have reorganized the content to match the scope and sequence of the Microeconomics and Macroeconomics Course and Exam Descriptions and a complete micro/macro split. We have also added new material to keep the book current and hone the focus on AP content. Specific changes include:

***Microeconomics Chapter 1: Scarcity, Resource Allocation, and Economic Systems*** features updated examples, a revised presentation of capital (and, thus, investment) that highlights the fact that “capital” includes intangible intellectual capital as well as physical capital, and a streamlined presentation of the circular flow model. By popular demand, we have also brought back the Last Word about faulty economic reasoning that appeared in several earlier editions.

***Microeconomics Chapter 2: Production Possibilities and Trade*** contains extensive data updates, a new Key Word (*trade*), and a highly revised and substantially more intuitive presentation of absolute and comparative advantage.

***Microeconomics Chapter 3: Cost-Benefit Analysis and Choice*** contains significant new material on cost-benefit analysis including detailed scenarios.

***Microeconomics Chapter 4: Demand and Supply*** includes several new examples and new material on how network and congestion effects shift demand curves.

***Microeconomics Chapter 5: Market Equilibrium*** contains new material on how changes in supply and demand affect consumer and producer surplus and the role that elasticity plays in the changes. Also, a new Last Word on how rapid shifts in supply and demand prompted dramatic price changes and shortages during the COVID-19 pandemic.

***Microeconomics Chapter 6: Intervention, International Trade, and Public Policy*** includes new material on subsidies and the deadweight loss created with interventions made on efficient market outcomes.

***Microeconomics Chapter 7: Businesses and the Costs of Production*** includes an improved definition of explicit costs, several updated examples, a more intuitive explanation of sunk costs, and a new Last Word on cloud computing and economies of scale.

***Microeconomics Chapter 8: Profit and Perfect Competition*** features several new examples, a clarified explanation of the  $P = MC$  rule for competitive profit maximization, and a new Consider This about the decreasing-cost characteristics of the lithium-ion battery industry on which electric cars depend. There is also a new



Last Word on how firms in various industries implemented the short-run shutdown condition during the COVID-19 pandemic.

***Microeconomics Chapter 9: Monopoly and Price Discrimination*** has several new examples and an expanded treatment of network effects as a cause of monopoly power.

***Microeconomics Chapter 10: Monopolistic Competition, Oligopoly, and Game Theory*** contains several new examples, revised Key Word definitions, a new Last Word on how the worldwide credit-card oligopoly engages in nonprice competition via credit-card rewards programs, and brief clarifications of the role of advertising in shifting and tilting the demand curves of monopolistically competitive firms.

***Microeconomics Chapter 11: Factor Markets*** contains data updates, new examples, and wording improvements to enhance clarity.

***Microeconomics Chapter 12: Market Failures, Externalities, and Public Goods*** contains a new introduction of the concepts of how marginal social benefits and costs differ from marginal private benefits and costs and includes coverage of how negative externalities can come from consumption, and positive externalities can come from production. Several updates in both the text and in figures emphasize the concepts of maximum willingness to pay (demand curve) and minimum willingness to accept (supply curve), thereby enhancing student understanding of both consumer and producer surplus as well as the efficiency losses that result from over- and under-production.

***Microeconomics Chapter 13: Government Intervention and Inequalities*** contains new material on how price controls can improve efficiency in monopoly product markets or monopsony labor markets. The distinction is made between per-unit taxes and lump-sum taxes and demonstrates that lump-sum taxes do not affect a firm's output decision, while a per-unit tax does. This chapter's Last Word on Universal Basic Income has also been heavily revised due to the natural experiment provided by those enhanced and extended unemployment benefits.

***Macroeconomics Chapter 1: Scarcity, Production Possibilities, and Trade*** features updated examples, a revised presentation of capital (and, thus, investment) that highlights the fact that "capital" includes intangible intellectual capital as well as physical capital, and contains extensive data updates, and a highly revised and substantially more intuitive presentation of absolute and comparative advantage.

***Macroeconomics Chapter 2: Demand, Supply, and Market Equilibrium*** contains a new Last Word on how rapid shifts in supply and demand prompted dramatic price changes and shortages during the COVID-19 pandemic.

***Macroeconomics Chapter 3: Circular Flow, GDP, and Unemployment*** benefits from data updates, revisions to our presentation of the income and allocation approaches to totaling up GDP, and a revised presentation of why financial transactions are excluded from GDP and a streamlined presentation of the circular flow model.

**Macroeconomics Chapter 4: Inflation and Business Cycles** has extensive data updates and new material that relates the chapter's key concepts to the COVID-19 recession.

**Macroeconomics Chapter 5: Aggregate Demand and Aggregate Supply** contains additional explanation of the equilibrium in the AD-AS model, improved definitions of two Key Words (*short-run aggregate supply* and *long-run aggregate supply*) as well as substantial new material relating the AD-AS model to the COVID-19 recession.

**Macroeconomics Chapter 6: Fiscal Policy, Deficits, and Debts** incorporates several discussions of fiscal policy before and during the COVID-19 pandemic, especially with respect to the sheer magnitude of the stimulus but also with respect to other things, like how unusual the stimulus was in not having any recognition lag and, compared with typical recessions, hardly any administrative or operational lag, either.

**Macroeconomics Chapter 7: Money and Interest Rates** combines and streamlines coverage of money and other financial assets, including how interest rates serve as the opportunity cost of holding money. We have added discussions of debit cards as a means of accessing checkable deposits, electronic cash-transfer systems like PayPal and Venmo, and a new Last Word about cryptocurrencies, including Bitcoin and central-bank digital currencies. Please also note the subtle but profound revisions that were necessitated by the Fed's changing the definitions of the *M1* and *M2* measures of the money supply such that noncheckable savings deposits are now part of *M1* rather than *M2*. That definitional adjustment has produced the strange result that *M2* is now only about 5 percent larger than *M1* (whereas, previously, *M2* had always been at least triple the size of *M1*).

**Macroeconomics Chapter 8: Money Markets and Monetary Policy** is presented in both the traditional and current frameworks to better match the AP curriculum. The traditional treatment of monetary policy begins with a fractional reserve banking system in which the central bank prescribes a reserve requirement. In such a "limited reserves" system, the central bank can expand or contract the money supply, most often by buying or selling government securities to commercial banks. The chapter then describes how central banks, like the Federal Reserve, devised new monetary tools to combat the immense challenges posed by the 2008 Great Recession. The result of these new tools is a banking system described as having "ample reserves" and the elimination of the reserve requirement. In this system the central bank uses administrated interest rates to move the "policy rate," the federal funds rate in the U.S., higher or lower. When the policy rate increases, it acts as an incentive to reduce the amount of money circulating in the economy. When the policy rate decreases, it incentivizes a greater amount of money in circulation. The coverage of both limited reserves and ample reserves banking systems is a way of allowing teachers and students to adapt to the transition of the curriculum between monetary policy before and after the upheaval of 2008–2010.

**Macroeconomics Chapter 9: Short-Run Policy and the Phillips Curve** contains new material that stresses the short-run impact of fiscal and monetary policy and the tradeoff between higher unemployment rates and lower inflation rates, before introducing the Phillips Curve.

***Macroeconomics Chapter 10: Economic Growth*** contains numerous data updates and several wording improvements for clarity. The chapter is organized so that students understand the connection between the macroeconomy and budget deficits or surpluses and the debate over whether a growing national debt affects long-run economic growth through changes to the market for loanable funds.

***Macroeconomics Chapter 11: The Balance of Payments and Exchange Rates*** offers extensive data updates, various edits for concision and clarity, and a new Last Word describing the Exchange Rate Trilemma. The chapter introduces foreign exchange and markets for currency, demonstrating how a currency can increase in price (appreciate) or decrease (depreciate) due to changes to either the demand or supply of that currency.

***Macroeconomics Chapter 12: International Trade*** contains significant new content to address how the College Board presents the connection between fiscal and monetary policies, currency markets, and balance of payment accounts. Through additional examples and graphs, more clarification is provided for the relationship between two currency markets. It is shown that when the demand for one currency rises (it appreciates), there must be an increased supply of the other currency (it depreciates), causing a reciprocal change in value of each.

## REVIEWERS

The 23rd edition has also greatly benefited from a number of perceptive faculty reviews. The reviewers, listed in the next section, were a rich source of suggestions for this revision. To each of you, and to any others we may have inadvertently overlooked, thank you for your considerable help in improving *Economics*.

### Reviewers supporting the 23rd Edition:

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Joseph Zitka, *Pellissippi State Community College*

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## About the AP Micro- and Macroeconomics Courses and Exams

### Course Structure

The Advanced Placement (AP) program was created by the College Board. The AP Microeconomics and AP Macroeconomics courses each have a separate AP Exam. The exams are written by Test Development Committees, which consist of university Economics professors and high school teachers with experience teaching AP Economics courses. Test questions are written to measure understanding of the content and skills included in the Course and Exam Descriptions published by the College Board. The College Board audits high school courses with the AP designation to ensure the high school curriculum meets standards equivalent to introductory college Economics courses.

Microeconomics and Macroeconomics are typically two, one-semester courses that explore different aspects of economic reasoning and applications. Microeconomics focuses on economic decisions made by individual households—as consumers and as suppliers of inputs like labor—and by firms—as suppliers of output and demanders of inputs. Macroeconomics considers behavior in the aggregate economy and economic performance. Particular attention is paid to macroeconomic challenges with unemployment, inflation, and economic growth. International finance is addressed in the Macroeconomics course, while international trade is included in both the Microeconomics and Macroeconomics courses.

### Understanding by Design©

The AP Microeconomics and Macroeconomics courses are organized using the Understanding by Design© Framework. In each course, the content is designed to spiral Big Ideas about economics—such as “Competitive markets bring together buyers and sellers to exchange goods and services for mutual gain”—throughout the semester. Each course is divided into six units with specific topics, learning objectives, and essential knowledge items. In addition, each course has the same four categories of economics skills:

- Principles and Models: Define economic principles and models.
- Interpretation: Explain given economic outcomes.
- Manipulation: Determine outcomes of specific economic situations.
- Graphing and Visuals: Model economic situations using graphs or visual representations.

Each question on the AP Exams will measure one of these skills as well as content knowledge. Graphing skills are assessed only in the free-response section of the exams.

### About the AP Micro- and Macroeconomics Exams

The AP Microeconomics Exam and AP Macroeconomics Exam are entirely separate exams. Each exam is scheduled for two hours and ten minutes, on separate test days. Students are given 70 minutes to answer 60 multiple-choice questions. Then,

after a 10-minute reading period, students have 50 minutes to write answers to three free-response questions, one worth 10 points and two worth 5 points each. The multiple-choice section accounts for two-thirds of the score (66.65 percent), and the free-response section provides the other one-third of the score (33.35 percent).

| Summary of AP Exam Format |  |  |
|---------------------------|--|--|
| Section 1                 | <b>Multiple Choice</b><br>60 Questions<br>Time: 70 Minutes<br>Weight: 66.65% of Exam   | <ul style="list-style-type: none"> <li>• Four-function calculators are allowed in this section.</li> <li>• Use a #2 pencil with a very good eraser for this section.</li> </ul>  |
|                           | 10 minute required reading period  |  |
| Section 2                 | <b>Free Response</b><br>Question 1: Long (10 points)<br>Question 2: Short (5 points)<br>Question 3: Short (5 points)<br>Time: 50 minutes<br>Weight: 33.35% of Exam | <ul style="list-style-type: none"> <li>• There is a 10-minute required reading period before writing the answers to the 3 FRQs. This time can also be used to begin outlining answers.</li> <li>• Four-function calculators are allowed in this section. Use blue or black ink in this section.</li> <li>• The long FRQ represents 50% of the FRQ score, each of the two short FRQs represent 25% of the score.</li> </ul> |

### Breakdown of AP Exam Questions by Unit

| Percentage of Questions | Units in AP Microeconomics                          |
|-------------------------|---|
| 12–15%                  | Basic Economic Concepts                             |
| 20–25%                  | Supply and Demand                                   |
| 22–25%                  | Production, Cost, and the Perfect Competition Model |
| 15–22%                  | Imperfect Competition                               |
| 10–13%                  | Factor Markets                                      |
| 8–13%                   | Market Failure and the Role of Government           |

| Percentage of Questions | Units in AP Macroeconomics                     |
|-------------------------|--|
| 5–10%                   | Basic Economic Concepts                        |
| 12–17%                  | Economic Indicators and the Business Cycle     |
| 17–27%                  | National Income and Price Determination        |
| 18–23%                  | Financial Sector                               |
| 20–30%                  | Long-Run Consequences of Stabilization Policy  |
| 10–13%                  | Open Economy – International trade and Finance |

## Grading the AP Exam

The multiple-choice section of the AP Exam is scored electronically, whereas readers grade the FRQs. The College Board then applies a weighted formula and combines the raw multiple-choice and free-response scores to create a composite score out of 90 points. Finally, a conversion factor is used to award the student one of five final scores, with a 5 being extremely well qualified and a 1 being no recommendation. The score required to achieve a 5, 4, or 3 varies with each test administration.

A passing score on either exam can provide college credit for institutions that accept AP credit, but colleges and universities differ markedly in requirements and credits offered. Some schools accept a score of 3 for credit, whereas other schools may require a 4 or a 5 in order to receive credit. Some schools require passing scores on both AP Exams to receive credit for either course.

## Answering Multiple-Choice Questions

The multiple-choice questions can include a wide range of information, including definitions and applications of principles, calculations, interpretations of graphs, explanations of the causes or results of an economic action, and choosing an appropriate economic policy to deal with an economic event.

Four-function calculators can be used during the AP Economics Exams. Generally, the math involved in multiple-choice questions is simple enough that if you understand the formulas, the answer will be clear. For example, reserve requirement ratios tend to be 5%, 10%, 20%, or 25% to make it easy for you to calculate money multipliers. The opportunity costs involved in calculating comparative advantage will reduce to numbers that are easy to compare.

**Answer every question.** Each question has five potential answers labeled A-E. Each correct answer is worth one point, while questions left blank earn no points.

The College Board will assess no penalty for wrong answers. Although you will earn no credit for a wrong answer, you will not face any additional penalty for guessing. So, it is in your best interest to answer every question on the AP Exam. It is also best to answer questions in the order they appear, rather than skipping questions throughout the test. You do not want to risk skipping a line and mismarking subsequent answers.

Make a note of answers you want to go back and re-view after you've finished, but do not skip a question entirely. Carefully erase corrections completely.

**Don't second-guess yourself.** Be careful not to overanalyze questions. In many cases, the answer may seem to be too obvious when it is correct. The AP Exam questions are designed to test information you should have learned in the course, not reach for the most obscure concepts. Although some questions will test your ability to discern concepts (for example, the difference between a change in demand and a change in quantity demanded), they are not designed to trick you if you understand those concepts.

With that in mind, also remember that several of the test questions will be written at a high level in order to identify students deserving scores of 4 and 5. You may face

test questions about concepts you have not studied or do not remember, but it is still important to answer every question. If you can eliminate a couple of obviously wrong answers, you are that much closer to a correct answer.

**Look for clues in key terms.** Watch carefully for key terms in a question that can help you rule out incorrect answers. For example, “long run” and “short run” result in different graphs for firms entering and exiting the industry in Microeconomics, and a different slope for aggregate supply and Phillips Curves in Macroeconomics. The terms nominal and real can help you differentiate the effects of inflation. If you pay careful attention to the terms, you may be able to rule out two or more potential answers.

**Sketch graphs.** For questions regarding graphical analysis, quickly draw a graph to visualize the answer— even on the multiple-choice section. Do not rely just on your memory; seeing the graph can help you remember or determine, for example, the relative locations of the average total cost and average variable cost curves, or how a change in aggregate demand affects real output and price levels. It is important to use these visual aids to avoid simple mistakes.

**Pace yourself.** It is important to watch your pace as you move through the questions. You have just over one minute to answer each question. Some questions, such as definitions, can be answered quickly, whereas others may require deeper analysis or time to draw a graph to find the answer. The key is to keep moving and keep an eye on the time. If you finish early, double check that you have answered every question on your answer sheet, and then review the questions you noted to review one last time.

## Answering Free-Response Questions

The free-response questions (FRQs) include a wide range of information; however, this section will always include some questions that test graphing skills. You should expect to draw, manipulate, and interpret a variety of graphs. Any questions requiring calculations in the free-response section will require you to show your work. That means starting from the formula or equation and performing the arithmetic required to obtain your answer.

**Format of AP Economics FRQs.** AP Economics responses are quite different from the formal essays written for some other AP subjects requiring thesis statements and five-paragraph development structures. AP Economics FRQs generally consist of a series of questions and sub-questions that can be answered in several sentences, or in some cases simply a word or number. Responses should directly answer the questions asked.

Both AP Economics Exams use the same five task verbs to guide student responses:

- **Identify** (or an interrogatory word like What? Which? or Will?) requires a specific, brief response with no elaboration or explanation.
- **Explain** requires additional information about how or why an outcome occurs using evidence or reasoning. Graphs and symbols are acceptable as part of the explanation.

- **Calculate** requires you to perform mathematical steps to arrive at a response and show your work.
- **Draw** a correctly labeled graph requires a graph to answer the question. Clear, accurate labels are required. Draw a large graph, and then make it easy for a reader to interpret it.
- **Show/Label/Plot/Indicate** requires you to visually represent an economic situation using your correctly labeled graph. Label equilibrium points by extending dotted lines to the axes (not internal labels). Clearly show directional changes when relevant.

Keep in mind the economic concept of efficiency and apply it to your free-response writing. Be complete—but be efficient about it. Directly answer the question asked and explain why that answer is correct. The best answers use the appropriate terms and the clearest language to explain the situation, causes and effects, and reasoning. The readers (scorers) want to see a clear analysis and your understanding. Remember that the readers want to award you points for every correct portion of your responses. To that end, use your best handwriting to make it easy for the reader to find and read your answers, so you can earn all the points you deserve.

**Ten-minute Reading Period.** At the beginning of the free-response portion of the AP Exam, you will have a ten-minute reading period. Use that time to very carefully review each of the three FRQs. Focus on the verbs in the FRQs, explained above. Start to sketch graphs and write notes right on the question page, so you can outline your answers. (Be sure you copy final graphs onto the designated answer pages, or they will not be counted.)

**Stay organized.** Organization is essential for a good free-response answer. Be sure to answer the questions in the order they are asked, and directly answer the question that was asked. For example, if the question asks you what will happen to employment, do not explain what you think will happen to the unemployment rate; answer about employment.

As with the multiple-choice section, in the free-response section readers give you points for correct answers, rather than subtract points for incorrect answers. If necessary, guess on such questions as: What will happen to the price? What will happen to exports? What will happen to the number of workers hired? The only possible answers are “increase,” “decrease,” or “no change,” so make your best guess even if you are not entirely sure of the answer.

However, if the question asks about a specific policy solution such as an open-market operation, and you answer by discussing changes in the discount rate, even if your answer pertaining to the discount rate is correct, you will not earn the point because you did not answer the question that was asked.

**Link concepts.** In writing your answers, it is critical to make linkages between concepts. This is one issue readers have consistently identified as a weakness in the responses they score. In Microeconomics, for example, why does an increase in the price of strawberries lead to an increase in the demand for grapes? In Macroeconomics, why does an increase in the money supply cause an increase

in new home sales? Be sure to explain how a change in one factor affects other factors, and then include the step-by-step mechanisms that cause those changes to happen.

**Draw graphs carefully.** It is important to look for details in the FRQ that will help you draw your graphs correctly. Be careful to label every axis and curve and show any curve shifts and equilibrium. Look for terms such as short run and long run. A Micro question may ask you to draw a graph showing a firm making an initial short-run profit. Drawing a graph in long-run equilibrium instead will cost you easy points. In the same way, a Macro question may ask you to draw a graph illustrating an economy in short-run equilibrium at less than full-employment output. In order to illustrate that lower output, you will have to draw a vertical long-run aggregate supply curve to the right of current equilibrium.

**Pace yourself.** You should try to complete the long FRQ in 25 minutes, leaving 25 minutes to finish the two short FRQs. When you have finished all three FRQs, re-read each question and sub-question to be sure you have answered every single part of the question.

## Practice Questions

General information about the course and exam is available at AP Central, as are links to the most recent FRQs and scoring guidelines.

Link to AP Microeconomics Exam:

<https://apcentral.collegeboard.org/courses/ap-micro-economics/exam>

Link to AP Macroeconomics Exam:

<https://apcentral.collegeboard.org/courses/ap-macro-economics/exam>

If you scroll down either site, you will find an arrow linking to FRQs from earlier years. A great way to test your knowledge of AP Microeconomics and AP Macroeconomics is to take these past tests. They are excellent preparation for taking the AP Economics Exams. In addition, your teacher can provide access to AP Classroom, which has additional practice multiple-choice questions. Your teacher must select and assign the questions; students are not able to access AP Classroom on their own.

There are also complete micro- and macroeconomics practice exams at the end of this book and two additional complete practice exams for both courses in your digital resources.





## Supply and Demand

**Chapter 4:** Demand and Supply

**Chapter 5:** Market Equilibrium

**Chapter 6:** Government Intervention, International Trade, and Public Policy

### Topics

- Demand and Supply
- Price Elasticity of Demand and Supply
- Other Elasticities
- Market Equilibrium and Consumer and Producer Surplus
- Market Disequilibrium and Changes in Equilibrium
- The Effects of Government Intervention in Markets
- International Trade and Public Policy



### Unit Focus

In this unit you will be exploring the big ideas of scarcity and markets, market inefficiency and public policy through the economic model of supply and demand.

Why are PlayStation (PS) gaming consoles a scarce commodity? While the demand for a PS is high, supply is often low. What are the factors that determine how much of a product is supplied and how much is demanded in a market economy? Supply and demand may sound simple. Producers supply a product to meet the demand at the price point they want. But, is price the only determinant of how many units consumers wish to buy and how many units producers wish to supply?

Consumers must consider: available income, preferences, and the price of other products. What kinds of things do consumers demand – clothing, shoes, school supplies, gasoline? How much are consumers willing to pay for those items? Producers must consider supply chain issues, manufacturing costs, changes in technology. These factors could explain the limited supply of the PS console. What happens to supply and demand when the government gets involved and imposes price controls or levies taxes on certain goods and services?

This unit will cause you to think about how demand, supply, and markets factor into what is available to purchase and at what price; with and without governmental intervention.

## CHAPTER 4 Demand and Supply



### LEARNING OBJECTIVES

- Define key terms and factors related to consumer decision making and the law of demand.
- Explain the relationship between price and quantity demanded, and how buyers respond to incentives and constraints.
- Explain buyers' responses to changes in incentives and constraints.
- Define the law of supply.
- Explain the relationship between price and quantity supplied.
- Explain producers' (sellers') responses to changes in incentives and technology.
- Define measures of elasticity.
- Explain measures of elasticity and the impact of a given price change on total revenue or total expenditure.
- Calculate measures of elasticity.

### Concepts in Action

The model of supply and demand is the economics profession's greatest contribution to human understanding. It explains the operation of the markets on which we depend for nearly everything that we eat, drink, and consume. It is also the economic model most often used to explain and analyze economic decision making. The model is so powerful and so widely used that to many people supply and demand is economics.

This chapter explains how the model is built by incorporating the behavior of buyers (demand) with the behavior of sellers (supply) and how both halves of the market respond differently to changes in the price. The chapter also introduces the concept of elasticity, a measure of how responsive or sensitive buyers and sellers are to small changes in the price.

## Markets

Markets bring together buyers (“demanders”) and sellers (“suppliers”). Everyday consumer markets include the corner gas station, Amazon.com, and the local bakery shop. The New York Stock Exchange and the Chicago Board of Trade are markets in which buyers and sellers from all over the world exchange bonds, stocks, and commodities. In labor markets, new college graduates “sell” and employers “buy” specific labor services. Ride-sharing apps such as Uber and Lyft match people who want to buy rides with people who want to sell rides.

Some markets are local; others are national or international. Some are highly personal, involving face-to-face contact between demander and supplier; others are faceless, with buyer and seller never seeing or knowing each other.

To keep the concepts simple, we will focus on markets in which large numbers of independently acting buyers and sellers come together to buy and sell standardized products. Markets with these characteristics are the economy’s most highly competitive markets. They include the wheat market, the stock market, and the market for foreign currencies. All such markets involve demand, supply, price, and quantity. As you will soon see, the price is “discovered” through the interacting decisions of buyers and sellers.

## Demand

**Demand** is a schedule (table of numbers) or a curve that shows the various amounts of a product consumers are willing and able to purchase at each of a series of possible prices during a specified period of time, *other things equal*. The table in Figure 4.1 is a hypothetical **demand schedule** for a *single consumer* purchasing gallons of gasoline.

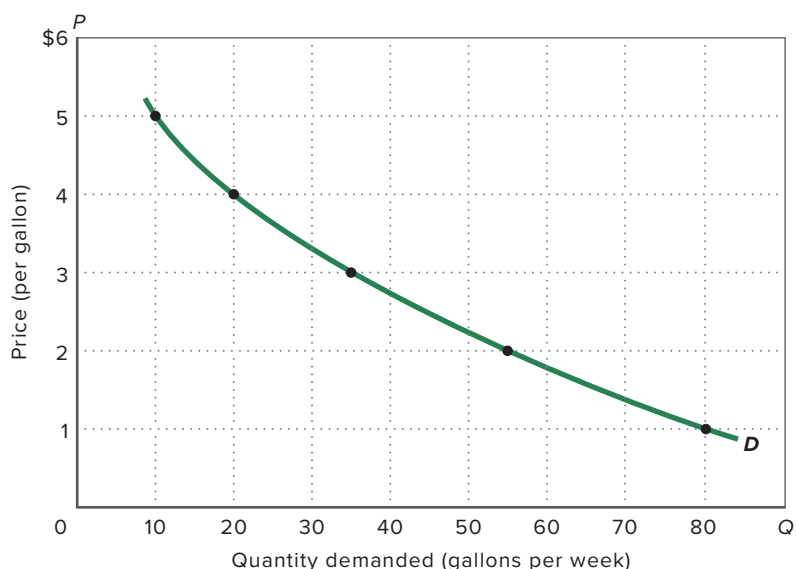
Because price and quantity demanded are inversely related, an individual’s demand schedule will graph as a downward sloping curve such as *D*. Other things equal, consumers will buy more of a product as its price declines and less of the product as its price rises. (Here and in later figures, *P* stands for price and *Q* stands for quantity demanded or supplied.)

The table reveals the relationship between the various prices of gasoline and the quantity (amount) of gasoline a particular

**demand** A schedule or curve that shows the various amounts of a product that consumers are willing and able to purchase at each of a series of possible *prices* during a specified period of time.

**demand schedule** A table of numbers showing the amounts of a *good* or *service* buyers are willing and able to purchase at various *prices* over a specified period of time.

**FIGURE 4.1** An individual buyer's demand for gasoline



| Demand for Gasoline |                                     |
|---------------------|-------------------------------------|
| Price per Gallon    | Quantity (Amount) Demanded per Week |
| \$5                 | 10                                  |
| 4                   | 20                                  |
| 3                   | 35                                  |
| 2                   | 55                                  |
| 1                   | 80                                  |

consumer is willing and able to purchase at each price. We say “willing and able” because willingness alone is not effective in the market. You may be willing to buy a \$4000 television set, but if that willingness is not backed by the necessary dollars, it will not be reflected in the market. In the table in Figure 4.1, if the price of gasoline is \$5 per gallon, our consumer is willing and able to buy 10 gallons per week; if the price is \$4, the consumer is willing and able to buy 20 gallons per week; and so forth.

The table does not show which of the prices will actually exist in the gasoline market. The price depends on the interaction between demand and supply. Demand is simply a statement of a buyer’s plans, or intentions, with respect to purchasing a product.

To be meaningful, the quantities demanded at each price must relate to a specific period—a day, a week, a month. Saying “A consumer will buy 10 gallons of gas at \$5 per gallon” is economically meaningless. Saying “A consumer will buy 10 gallons of gas *per week* at \$5 per gallon” is meaningful. Unless a specific time period is stated, we do not know whether the demand for a product is large or small.



**law of demand** The principle that, other things equal, an increase in a product's *price* will reduce the quantity of it demanded, and conversely a decrease in price.

**income effect** A change in the quantity demanded of a product that results from a change in the product's price, resulting in a change in real income (purchasing power).

**substitution effect** A change in the quantity demanded of a consumer good that results from a change in the good's price, resulting in a change in its relative expensiveness.

## Law of Demand

Other things equal, as price falls, the quantity demanded rises, and as price rises, the quantity demanded falls. This is a *negative* or inverse relationship between the product's price and quantity demanded. Economists call this relationship the **law of demand**.

The other-things-equal assumption is critical here. Many factors other than the product price affect the amount purchased. For example, the quantity of Nike sports shoes purchased will depend on the price of Nikes *and* on the prices of shoes produced by Converse, Vans, and other shoe companies. The law of demand in this case says that fewer Nikes will be purchased if the price of Nikes rises while the prices of Converse and Vans remain constant. In short, if the *relative price* of Nikes rises, fewer Nikes will be bought. However, if the price of Nikes and the prices of all other competing shoes increase by some amount, consumers may buy more, fewer, or the same number of Nikes. To isolate the demand for Nikes, you have to hold other things equal.

What causes an inverse relationship between price and quantity demanded? Three reasons are explained from simple to complex:

- The law of demand is consistent with common sense. People usually buy more of a product at a low price than at a high price. Price, however, deters consumers. The higher the price, the less of a product they will buy; the lower the price, the more they will buy. Businesses conduct “clearance sales” to liquidate unsold items firmly supports the law of demand.
- In any specific time period, each buyer of a product will derive less satisfaction (or benefit, or utility) from each successive unit of the product consumed. For example, the second hamburger will yield less satisfaction than the first, and the third less than the second. That is, consumption is subject to diminishing marginal utility. Because successive units of a particular product yield less and less marginal utility, consumers will buy additional units only if the price of those units is progressively reduced.
- We can also explain the law of demand in terms of income and substitution effects. The **income effect** indicates that a lower price increases the purchasing power of a buyer's money income, enabling the buyer to purchase more of a product than before. A higher price has the opposite effect. The **substitution effect** suggests that buyers have an incentive to substitute a product whose price has fallen in place of other products whose prices have remained the same. The substitution occurs because the product whose price has fallen is now “a better deal” relative to the other products, whose prices remain unchanged.

This example shows the difference between income effect and substitution effect. A decline in chicken prices will increase the purchasing power of consumer incomes, enabling people to buy more chicken (the income effect). At a lower price, chicken is more attractive, and consumers tend to substitute it for pork, beef, and fish (the substitution effect). The income and substitution effects combine to make consumers able and willing to buy more of a product at a lower price than at a higher price.

## The Demand Curve

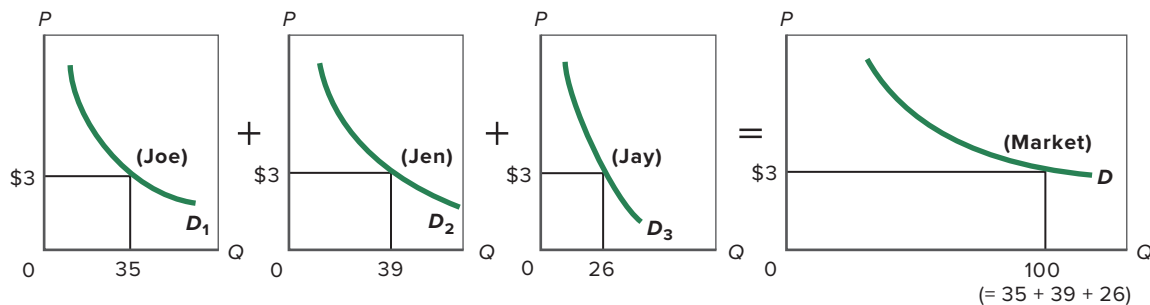
The inverse relationship between price and quantity demanded for any product can be represented on a simple graph with quantity demanded on the horizontal axis and price on the vertical axis. The graph in Figure 4.1 plots the five price-quantity data points listed in the accompanying table and connects the points with a smooth curve, labeled *D*. This curve is called a **demand curve**. Its downward slope reflects the law of demand—people buy more of a product, service, or resource as its price falls, other things equal.

**demand curve** A curve that illustrates the *demand* for a product by showing how each possible *price* (on the *vertical axis*) is associated with a specific *quantity demanded* (on the *horizontal axis*).

## Market Demand

So far, we have concentrated on just one consumer. But competition requires more than one buyer in each market. By adding the quantities demanded by all consumers at each possible price, we can get from *individual* demand to *market* demand. If there are just three buyers in the market, as represented in the table in Figure 4.2, it is relatively easy to determine the total quantity demanded at each price. Figure 4.2 shows the graphical

**FIGURE 4.2** Market demand for gasoline, three buyers.



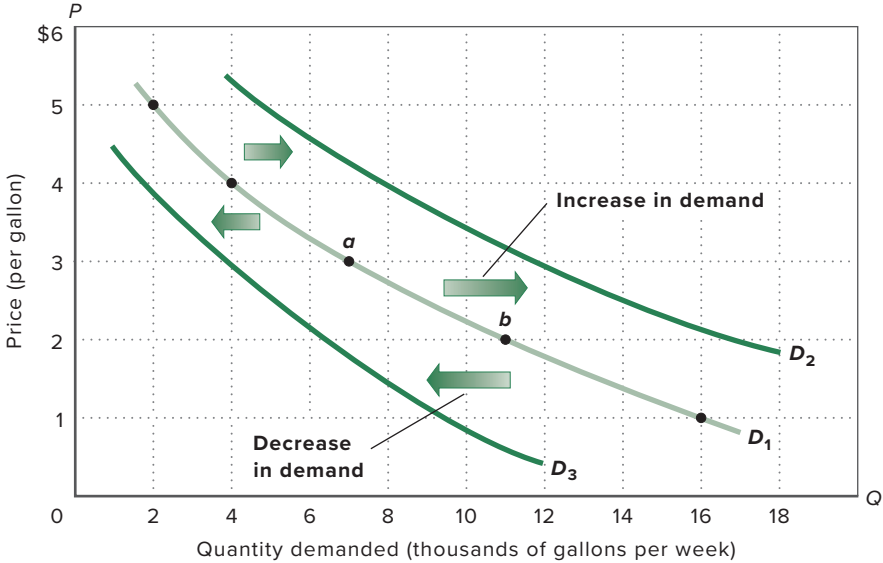
| Market Demand for Gasoline, Three Buyers |                   |   |     |   |     |                                  |
|--|-------------------|---|-----|---|-----|----------------------------------|
| Price per Gallon                         | Quantity Demanded |   |     |   |     | Total Quantity Demanded per Week |
|  | Joe               |   | Jen |   | Jay |                                  |
| \$5                                      | 10                | + | 12  | + | 8   | = 30                             |
| 4  | 20                | + | 23  | + | 17  | = 60                             |
| 3  | 35                | + | 39  | + | 26  | = 100                            |
| 2  | 55                | + | 60  | + | 39  | = 154                            |
| 1  | 80                | + | 87  | + | 54  | = 221                            |

summing procedure: At each price we sum horizontally the quantities demanded by Joe, Jen, and Jay to obtain the total quantity demanded at that price. We then plot the price and the total quantity demanded as one point on the market demand curve. At the price of \$3, for example, the three individual curves yield a total quantity demanded of 100 gallons (35 + 39 + 26).

The market demand curve  $D$  is the horizontal summation of the individual demand curves ( $D_1$ ,  $D_2$ , and  $D_3$ ) of all the consumers in the market. At the price of \$3, for example, the three individual curves yield a total quantity demanded of 100 gallons (35 + 39 + 26).

Competition, of course, ordinarily entails many more than three buyers of a product. For simplicity, we suppose that all the buyers in a market are willing and able to buy the same amounts at each possible price. Then we just multiply those amounts by the number of buyers to obtain the market demand. That is how we arrive at the demand schedule and demand curve  $D_1$  in Figure 4.3 for a market of 200 gasoline buyers, each with the quantity demanded shown in the table in Figure 4.1.

**FIGURE 4.3** Changes in the demand for gasoline.



| Market Demand for Gasoline, 200 Buyers, (D1) |                                      |
|--|--------------------------------------|
| (1) Price per Gallon                         | (2) Total Quantity Demanded per Week |
| \$5  | 2,000                                |
| 4  | 4,000                                |
| 3  | 7,000                                |
| 2  | 11,000                               |
| 1  | 16,000                               |

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A change in one or more of the determinants of demand causes a change in demand. An increase in demand is shown as a shift of the demand curve to the right, as from  $D_1$  to  $D_2$ . A decrease in demand is shown as a shift of the demand curve to the left, as from  $D_1$  to  $D_3$ . These changes in demand are to be distinguished from a change in quantity demanded, which is caused by a change in the price of the product, as shown by a movement from point  $a$  to point  $b$  on fixed demand curve  $D_1$ .

In constructing a demand curve such as  $D_1$  in Figure 4.3, economists assume that price is the most important influence on the amount of any product purchased. But other factors can and do affect purchases. These **determinants of demand** are assumed to be constant when a demand curve like  $D_1$  is drawn. When any of these determinants change, the demand curve will shift to the right or left. This is why determinants of demand are also called *demand shifters*.

Basic determinants of demand: (1) consumer taste (preference), (2) the number of buyers in the market, (3) consumer income, (4) the prices of related goods, and (5) consumer expectations.

## Changes in Demand

A change in one or more of the determinants of demand will change the demand data (the demand schedule) in the table accompanying Figure 4.3 and therefore the location of the demand curve. A change in the demand schedule or, graphically, a shift in the demand curve, is called a *change in demand*.

If consumers collectively desire to buy more gasoline at each possible price than is reflected in column 2 in the table in Figure 4.3, that *increase in demand* shifts the demand curve to the right, say, from  $D_1$  to  $D_2$ . Conversely, a *decrease in demand* occurs when consumers buy less gas at each possible price than is indicated in column 2. The leftward shift of the demand curve from  $D_1$  to  $D_3$  in Figure 4.3 shows that situation.

Now let's see how changes in each determinant affect demand.

**Tastes** A favorable change in consumer tastes (preferences) for a product—a change that makes the product more desirable—means that more of it will be demanded at each price. Demand will increase; the demand curve will shift right. An unfavorable change in consumer preferences will decrease demand, shifting the demand curve to the left.

New products may affect consumer tastes. For example, the introduction of Instagram and Snapchat greatly decreased the demand for Facebook among teens. Consumer concerns over obesity increased the demand for low-calorie beverages and fresh fruit while decreasing the demand for beef and whole milk. Recently, the demand for vegan food and clean energy has increased, driven by a change in preferences.

### determinants of demand

Factors other than *price* that determine the quantities demanded of a *good* or *service*. Also referred to as “demand shifters” because changes in the determinants of demand will cause the *demand curve* to shift either right or left.

**Number of Buyers** An increase in the number of buyers in a market is likely to increase demand; a decrease in the number of buyers will probably decrease demand.

An obvious way that changes in the number of consumers can affect demand is to change the number of potential consumers.

- The rising number of older persons in the United States, for example, has increased the demand for motor homes, medical care, and retirement communities.
- In contrast, out-migration from many small rural communities has reduced their populations and thus the demand for housing, home appliances, and auto repair in those towns.

A more subtle way in which changes in the number of buyers can affect demand is through network effects and congestion effects.

A *network effect* happens when the value of a product increases as more people use it. This is true for things such as cell phones and social apps. Having a cell phone or an Instagram account would not be of any value if you were the only person using a cell phone network or Instagram. There would be nobody to connect to! However, as more people join either of those networks, the more valuable they become and thus the greater the number of people who wish to use them. The result is an increase in demand and a rightward shift of the demand curve.

A *congestion effect* happens when the value of a product decreases as more people use it. This is illustrated in people driving on a highway or streaming data on a Wi-Fi network with limited bandwidth. The more people driving on the highway during rush hour or simultaneously streaming data on a wi-fi network, the worse the user experience as congestion increases and the physical or network traffic slows to a crawl. In these situations, as quality declines, fewer people wish to use the product, and demand shifts to the left.

**Income** For most products, a rise in income causes an increase in demand. Consumers typically buy more steaks, furniture, and electronic equipment as their incomes increase. Conversely, the demand for such products declines as their incomes fall. Products whose demand varies directly with money income are called *superior goods*, or **normal goods**.

Although most products are normal goods, there are some exceptions. As incomes increase beyond some point, the demand for used clothing, retread tires, and third-hand automobiles may decrease because the higher incomes enable consumers to buy new versions of those products. Similarly, rising incomes may cause the demand for charcoal grills to decline as wealthier consumers switch to gas grills. Goods whose demand varies inversely with money income are called **inferior goods**.

**normal good** A good or service whose consumption increases when *income* increases and falls when income decreases, other things equal.

**inferior good** A good or service whose consumption declines as *income* rises, other things equal.

**Prices of Related Goods** A change in the price of a related good may either increase or decrease the the product’s demand, depending on if the related good is a substitute or a complement.

**Substitute goods** Products or services that can be used in place of each other are **substitute goods**. When the price of one falls, the demand for the other product falls; conversely, when the price of one product rises, the demand for the other product rises.

**Complementary goods** Products and services that are used together are **complementary goods**. When the *price* of one falls or rises, the demand for the other increases or decreases.

**Substitutes** Häagen-Dazs ice cream and Ben & Jerry’s ice cream are substitute goods or, simply, *substitutes*. When two products are substitutes, an increase in the price of one will increase the demand for the other. Conversely, a decrease in the price of one will decrease the demand for the other. For example, when the price of Häagen-Dazs ice cream rises, consumers will buy less of it and increase their demand for Ben & Jerry’s ice cream. The two brands are *substitutes in consumption*.

**Complements** Because complementary goods (*complements*) are used together, they are typically demanded jointly. Examples include computers and software, and snowboards and lift tickets. If the price of a complement (for example, snowboards) rises, the demand for the related good (lift tickets) declines. Conversely, if the price of a complement (computers) falls, the demand for a related good (software) increases.

**Unrelated Goods** The vast majority of goods are not related to one another and are called *independent goods*. Examples are butter and golf balls, potatoes and automobiles, and bananas and wristwatches. A change in the price of one has little or no effect on the demand for the other.

**substitute good** A good that can be used in place of another good

**complementary good**  
A good that is used together with another good



**Consumer Expectations** Changes in consumer expectations may shift demand. An expectation of higher future prices may cause consumers to buy now in order to “beat” the anticipated price hike, thus increasing current demand. That is often what happens in “hot” real-estate markets. Buyers rush in because they think the price of homes will continue to escalate rapidly.

Some buyers fear being “priced out of the market” and therefore not obtaining the houses they desire. Other buyers (speculators) think they can sell the houses at a higher price. These expectation-driven buyers increase the demand for houses.

Similarly, a change in expectations concerning future income may prompt consumers to change their current spending. For example, first-round NFL draft choices may splurge on new luxury cars in anticipation of lucrative professional football contracts, or workers who become fearful of losing their jobs may reduce their demand for vacation travel.

In summary, an *increase* in demand—the decision by consumers to buy larger quantities of a product at each possible price—may be caused by:

- A favorable change in consumer tastes.
- An increase in the number of buyers.
- Rising incomes if the product is a normal good.
- Falling incomes if the product is an inferior good.
- An increase in the price of a substitute good.
- A decrease in the price of a complementary good.
- A new consumer expectation that either prices or income will be higher in the future.

These generalizations can also be reversed to explain a *decrease* in demand. Table 4.1 provides additional illustrations of the determinants of demand.

## Changes in Quantity Demanded

A change in demand must not be confused with a change in *quantity* demanded.

Recall that “demand” is a schedule or a curve. So, a **change in demand** implies a change in the schedule and a corresponding shift of the curve.

A change in demand occurs when a consumer’s state of mind about purchasing a product has changed in response to a change in one or more of the determinants of demand. Graphically, a change in demand is a shift of the demand curve to the right (an increase in demand) or to the left (a decrease in demand).

In contrast, a **change in quantity demanded** is a movement from one point to another point— from one price-quantity combination to another—along a fixed demand curve or schedule. The cause of such a change is an increase or decrease in the price of the product under consideration. In the table in Figure 4.3, for example, a decline in the price of gasoline from \$5 to \$4 will increase the quantity demanded from 2,000 to 4,000 gallons.

**change in demand** A movement of an entire *demand curve* (or of the numerical entries in a demand schedule) such that the *quantity demanded* changes at every particular *price*; caused by a change in one or more of the *determinants of demand*.

**change in quantity demanded** A change in the *quantity demanded* along a fixed *demand curve* (or within a fixed demand schedule) as a result of a change in the *price* of the product.

**TABLE 4.1** Determinants of Demand: Factors That Shift the Demand Curve

| Determinant                           | Examples   |
|---------------------------------------|--|
| Change in buyer tastes                | Physical fitness rises in popularity, increasing the demand for jogging shoes and bicycles; smartphone use rises, reducing the demand for desktop and laptop computers; healthy eating increases in popularity, raising the demand for low-calorie foods.  |
| Change in number of buyers            | A decline in the birthrate reduces the demand for children’s toys; an additional 600 million people on Snapchat makes it a more attractive communications network; the migration of Californians to Colorado increases the demand for housing in Denver.   |
| Change in income                      | A rise in incomes increases the demand for normal goods such as restaurant meals, sports tickets, and smartphones; while reducing the demand for inferior goods such as turnips, bus passes, and cheap wine.   |
| Change in the prices of related goods | A reduction in airfares reduces the demand for train transportation (substitute goods); a decline in the price of printers increases the demand for ink cartridges (complementary goods).  |
| Change in consumer expectations       | Inclement weather in South America creates an expectation of higher future coffee bean prices, thereby increasing today’s demand for coffee beans. The expectation that other consumers will rush to buy toilet paper next week as a hurricane approaches causes many consumers to increase their purchases of toilet paper this week. |

Be sure you can identify the corresponding movement between those two points along fixed demand curve  $D_1$  in Figure 4.3.

Let’s review. In Figure 4.3 the shift of the demand curve  $D_1$  to either  $D_2$  or  $D_3$  is a “change in demand.” But the movement from point  $a$  to point  $b$  on curve  $D_1$  represents a “change in quantity demanded.” In this latter case, demand has not changed; it is the entire curve  $D_1$ , which remains fixed in place as we move from point  $a$  to point  $b$ .

### QUICK REVIEW 4.1

- ✓ Demand is a schedule or a curve showing the amount of a product that buyers are willing and able to purchase, in a particular time period, at each possible price in a series of prices, holding other things equal.
- ✓ The law of demand states that, other things equal, the quantity of a good purchased varies inversely with its price.
- ✓ The demand curve shifts because of changes in: (a) consumer tastes; (b) the number of buyers in the market; (c) consumer income; (d) the prices of substitute or complementary goods; and (e) consumer expectations.
- ✓ A change in demand is a shift of the demand curve; a change in quantity demanded is a movement from one point to another on a fixed demand curve.

## Supply

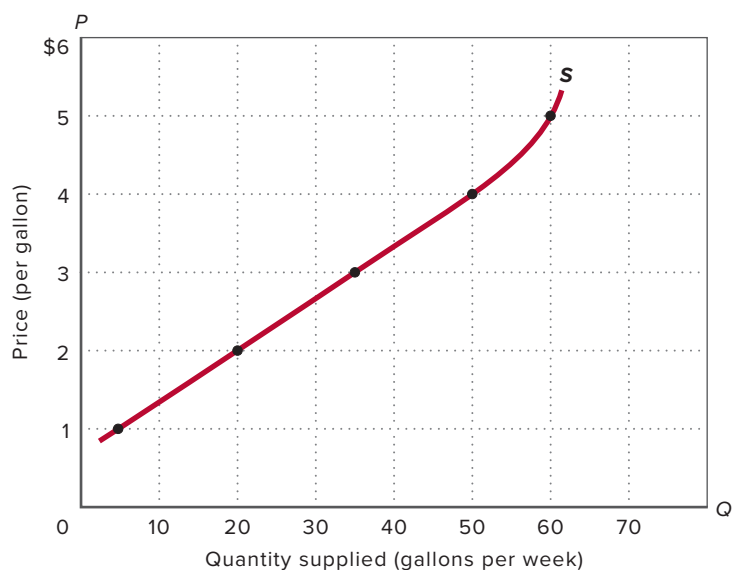
**Supply** A schedule or curve that shows the various amounts of a product that producers are willing and able to make available for sale at each of a series of possible *prices* during a specified period of time.

**Supply schedule** A table of numbers showing the amounts of a *good* or *service* producers are willing and able to make available for sale at each of a series of possible *prices* during a specified period of time.

**Supply** is a schedule or curve showing the various amounts of a product that producers are willing and able to make available for sale at each of a series of possible prices during a specific period, other things equal. The table in Figure 4.4 is a hypothetical **supply schedule** for a single supplier (producer) of gasoline. It shows the quantities of gasoline that are supplied at various prices, other things equal.

Because price and quantity supplied are directly related, the supply curve for an individual supplier graphs as an upsloping curve. Other things equal, suppliers (producers) will offer more of a product for sale as its price rises and less of the product for sale as its price falls.

**FIGURE 4.4** An individual supplier's supply of gasoline.



| Supply of Gasoline |                                     |
|--------------------|-------------------------------------|
| Price per Gallon   | Quantity (Amount) Supplied per Week |
| \$5                | 60                                  |
| 4                  | 50                                  |
| 3                  | 35                                  |
| 2                  | 20                                  |
| 1                  | 5                                   |

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## Law of Supply

The table in Figure 4.4 shows that a positive or direct relationship prevails between price and quantity supplied. As price rises, the quantity supplied rises; as price falls, the quantity supplied falls. This relationship is called the **law of supply**. Other things equal, firms will produce and offer for sale more of their product at a high price than at a low price.

Price is an obstacle from the standpoint of the consumer, who is on the paying end. The higher the price, the less the consumer will buy. The supplier, though, is on the receiving end of the product's price. To a supplier, price represents *revenue*, which serves as an incentive to produce and sell a product. The higher the price, the greater this incentive and the greater the quantity supplied. This, again, is basically common sense.

Consider oil producers and refiners who must decide how much gasoline to supply. As the price of gasoline rises, as shown in the table in Figure 4.4, they will find it profitable to increase production since the higher price will cover the higher costs associated with added production, such as drilling deeper wells, hiring more workers, paying for added shipping and distribution. The result is more gasoline as the price of gasoline rises.

Now, consider manufacturers more broadly. Beyond a particular quantity of production, manufacturers usually encounter increases in *marginal cost*—the added cost of producing one more unit of output. Certain productive resources—in particular, the firm's plant and machinery—cannot be expanded quickly. Therefore, the firm uses more of other resources, such as labor, to produce more output. But, as labor becomes more abundant relative to the fixed plant and equipment, the additional workers have relatively less space and access to equipment. For example, the added workers may have to wait to gain access to machines. As a result, each added worker produces less added output, and the marginal cost of successive units of output rises accordingly. The firm will not produce the more costly units unless it receives a higher price for them. Again, price and quantity supplied are directly related; they increase together along a supply curve or schedule.

## The Supply Curve

As with demand, it is convenient to represent individual supply graphically. In Figure 4.5, curve *S* is the **supply curve** that corresponds with the price–quantity data listed in the accompanying table. The upward slope of the curve reflects the law of supply—producers offer more of a good, service, or resource for sale as its price rises.

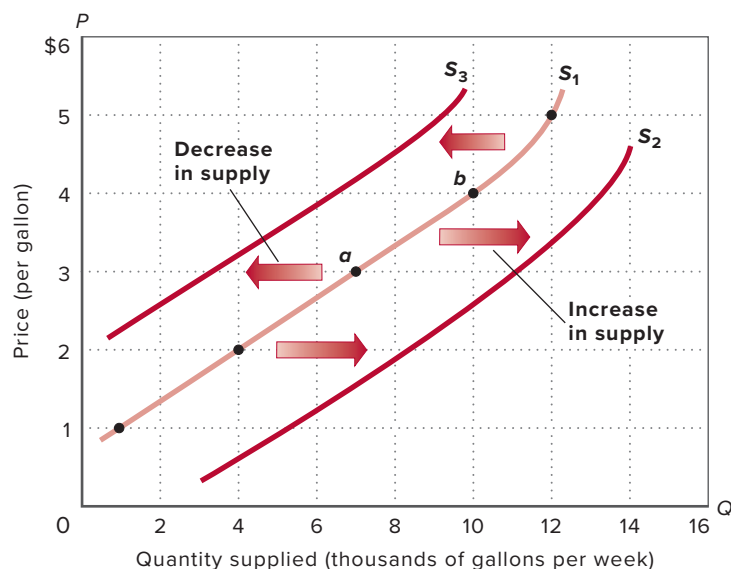
A change in one or more of the determinants of supply causes a change in supply. An increase in supply is shown as a rightward shift of the supply curve, as from  $S_1$  to  $S_2$ . A decrease in supply is

**Law of supply** The principle that, other things equal, an increase in the *price* of a product will increase the quantity of it supplied, and conversely for a price decrease.

**Supply curve** A curve that illustrates the *supply* for a product by showing how each possible *price* (on the *vertical axis*) is associated with a specific *quantity supplied* (on the *horizontal axis*).



**FIGURE 4.5** Changes in the supply of gasoline.



| Market Supply of Gasoline, 200 Producers, (S1) |                                      |
|--|--------------------------------------|
| (1) Price per Gallon                           | (2) Total Quantity Supplied per Week |
| \$5  | 12,000                               |
| 4  | 10,000                               |
| 3  | 7,000                                |
| 2  | 4,000                                |
| 1  | 1,000                                |

depicted as a leftward shift of the curve, as from  $S_1$  to  $S_3$ . In contrast, a change in the *quantity supplied* is caused by a change in the product’s price and is shown by a movement from one point to another, as from  $b$  to  $a$  on fixed supply curve  $S_1$ .

### Market Supply

To derive market supply from individual supply, we add the quantities supplied by each producer at each price. That is, we “horizontally add” the supply curves of the individual producers. The price–quantity data supplied in the table accompanying Figure 4.5 are for an assumed 200 identical producers in the market, each willing to supply gasoline according to the supply schedule shown in Figure 4.4. Curve  $S_1$  in Figure 4.5 is a graph of the market supply data. Note that the values of the axes in Figure 4.5 are the same as those used in our graph of market demand (Figure 4.4). The only difference is the label on the horizontal axis is changed from “quantity demanded” to “quantity supplied.”



## Determinants of Supply

In constructing a supply curve, we assume that price is the most significant influence on the quantity supplied of any product. But other factors can and do affect supply. The supply curve is drawn on the assumption that these other factors do not change. If one of them does change, a *change in supply* will occur, and the entire supply curve will shift.

The basic **determinants of supply** are (1) resource prices, (2) technology, (3) taxes and subsidies, (4) prices of other goods, (5) producer expectations, and (6) the number of sellers in the market. A change in one or more determinants of supply, or *supply shifters*, will shift the product's supply curve right or left. A shift to the *right*, from  $S_1$  to  $S_2$  in Figure 4.5, signifies an *increase* in supply: Producers supply larger quantities of the product at each possible price. A shift to the *left*, from  $S_1$  to  $S_3$ , shows a *decrease* in supply: Producers offer less output at each price.

## Changes in Supply

Let's consider how changes in each determinant affects supply. The key idea is that costs are a major factor underlying supply curves; anything that affects costs usually shifts the supply curve.

**Resource Prices** The resources' prices used in the production process help set a firm's production costs. Higher *resource* prices raise production costs and, assuming a particular product price, squeeze profits. That reduction in profits reduces firms' incentive to supply output at each product price. For example, an increase in the price of sand, crushed rock, or cement will increase the production cost of concrete and reduce its supply.

In contrast, lower *resource* prices reduce production costs and increase profits. So, when resource prices fall, firms supply greater output at each product price. For example, a decrease in the price of iron ore will decrease the price of steel.

**Technology** Improvements in technology (techniques of production) enable firms to produce units of output with fewer

## Determinants of supply

Factors other than *price* that determine the quantities supplied of a *good* or *service*. Also referred to as "supply shifters" because changes in the determinants of supply will cause the *supply curve* to shift either right or left.

resources. Because resources are costly, using fewer of them lowers production costs and increases supply. For example: Technological advances in producing computer monitors greatly reduced their cost. Thus, manufacturers now offer more monitors now at various prices because the supply of monitors increased.

**Taxes and Subsidies** Businesses treat most taxes as costs. An increase in sales or property taxes will increase production costs and reduce supply. In contrast, subsidies are “taxes in reverse.” If the government subsidizes the production of a good, the subsidy in effect lowers the producers’ costs and increases supply.

**Prices of Other Goods** Firms that produce a particular product, for example soccer balls, can sometimes use their plant and equipment to produce alternative goods, such as basketballs or volleyballs. If the prices of those other goods increase, soccer ball producers may switch production to those other goods to increase profits. This *substitution in production* would decrease the supply of soccer balls. Alternatively, when the prices of basketballs and volleyballs decline relative to the price of soccer balls, producers of those goods may decide to produce more soccer balls instead.

**Producer Expectations** Expectations about a product’s future price may affect the producer’s current willingness to supply that product. Farmers anticipating a higher wheat price in the future might withhold some of their current wheat harvest from the market, thereby causing a decrease in the current supply of wheat. In contrast, in many manufacturing industries, the expectation that selling prices will increase in a few months may induce firms to add another shift of workers or to expand their production facilities, causing current supply to increase.

**Number of Sellers** All other things equal, the larger the number of suppliers, the greater the market supply. As more firms enter an industry, the supply curve shifts to the right. Conversely, the smaller the number of firms in the industry, the less the market supply. As firms leave an industry, the supply curve shifts to the left. Example: Before Uber, Lyft, and other ride-sharing apps, cities restricted the number of taxi licenses, thereby restricting the number of drivers who could legally provide rides. When Uber and other ride-sharing services made their debut, millions of additional drivers and their cars became available worldwide, massively increasing the supply of rides.

Table 4.2 is a checklist of the determinants of supply, along with additional illustrations.

## Changes in Quantity Supplied

The difference between a change in supply and a change in quantity supplied parallels the difference between a change in demand and a change in quantity demanded. Because supply is a schedule or curve, a **change in supply** means a change in the schedule and a shift of the curve. An increase in supply shifts the

**change in supply** A movement of an entire *supply curve* (or of the numerical entries in a schedule) such that the *quantity supplied* changes at every particular *price*; caused by a change in one or more of the *determinants of supply*.

**TABLE 4.2** Determinants of Supply: Factors That Shift the Supply Curve

| Determinant                     | Examples  |
|---------------------------------|---|
| Change in resource prices       | A decrease in microchip price increases the computer supply; an increase in crude oil price reduces gasoline supply.  |
| Change in technology            | The development of lower-cost space-launch technology increases the supply of satellite broadband; improvements in artificial intelligence increase the supply of customer-service chatbots.  |
| Changes in taxes or subsidies   | An increase in gasoline excise tax reduces gasoline supply; a decline in state college subsidies reduces the higher education supply; tax credits (subsidies) for childcare increase day care center number; a tax on spa services reduces salon and spa numbers. |
| Change in prices of other goods | An increase in the price of cucumbers decreases the supply of watermelons; an increase in the price of alcohol-based hand sanitizers causes a decrease in the supply of isopropyl alcohol.  |
| Change in producer expectations | An expectation of a substantial rise in future lumber prices decreases the supply of logs today; the belief that gasoline prices will fall next year increases the supply of oil this year.   |
| Change in number of suppliers   | An increase in the number of Chipotle stores increases the supply of burritos; the formation of women's professional basketball leagues increases the supply of women's professional basketball games.  |

curve to the right; a decrease in supply shifts it to the left. The cause of a change in supply is a change in one or more of the determinants of supply.

A **change in quantity supplied** is a movement from one point to another along a fixed supply curve. The cause of this movement is a change in the price of the specific product being considered.

Consider supply curve  $S_1$  in Figure 4.5. A decline in the gasoline price from \$4 to \$3 decreases the quantity of gasoline supplied per week from 10,000 to 7,000 gallons. The movement from point  $b$  to point  $a$  along  $S_1$  is a change in quantity supplied. Supply is the full schedule of prices and quantities shown, and this schedule does not change when the price of gasoline changes.

So, demand curves depict the negative relationship between price and quantity demanded, while supply curves depict the positive relationship between price and quantity supplied.

In this section of the chapter, we explain elasticity, an important concept that helps us answer such questions as: Why do the buyers of some products respond to price increases by substantially reducing their purchases while the buyers of other products respond by cutting back their purchases only slightly? Why does the demand for some products (for example, books) rise a great deal when household income increases while the demand for other products rises just a little? In short, elasticity tells us the degree to which changes in prices and incomes affect

**change in quantity supplied**

A change in the *quantity supplied* of a product along a fixed *supply curve* (or within a fixed supply schedule) as a result of a change in the product's *price*.



### Skill 1.B: Identify an economic concept, principle, or model illustrated by an example.

You have already practiced Skill 1.A in Chapter 1 and Skill 1.C in Chapter 2. Now you will extend your understanding of how to identify an economics concept, principle, or model that is illustrated by an example. On the exam, examples usually include concepts, principles, and models such as supply and demand in action. Try using an example such as a scarce or expensive product to identify changes in supply or demand when you discuss in an everyday situation with your friends and family.

#### On the AP Exam

For example, examine this sample exam question on the concept of supply. Here, recognize the concept being used in this scenario to determine which example will cause an increase in the egg supply.

Which of the following best represents an increase in the supply of eggs?

- (A) The price of eggs increases.
- (B) A new avian flu causes large problems for chicken farmers.
- (C) The price of bacon dramatically increases.
- (D) Scientists find a way to increase egg production by 20%.
- (E) Workers in the egg production facilities receive a 20% pay increase.

What is the correct answer?

All options in this question illustrated an increase in something. You weighed each option to determine which one would lead to an increase in the supply of eggs. You had to look at each individual example provided in the answer choices to identify the concept of supply as it pertains to egg production.

Correct answer is **(D)**

## QUICK REVIEW 4.2

- ✓ A supply schedule or curve shows that, other things equal, the quantity of a good supplied varies directly with its price.
- ✓ The supply curve shifts because of changes in (a) resource prices, (b) technology, (c) taxes or subsidies, (d) prices of other goods, (e) expectations of future prices, and (f) the number of suppliers.
- ✓ A change in supply is a shift of the supply curve; a change in quantity supplied is a movement from one point to another along a fixed supply curve.

supply and demand. Sometimes the responses are substantial, other times minimal or non-existent.

## Price Elasticity of Demand

According to the *law of demand*, other things equal, consumers will buy more of a product when its price declines and less when its price increases. But how much more or less will they buy? The amount varies from product to product and over different price ranges for the same product. It also may vary over time. For example, a firm contemplating a price hike wants to know how consumers will respond. If they remain highly loyal and continue to buy, the firm's revenue will rise. But if consumers defect en masse to other products, the firm's revenue will tumble.

Consumers' responsiveness (or sensitivity) to a price change is measured by a product's **price elasticity of demand**. For some products—for example, restaurant meals—consumers are highly responsive to price changes. That is, modest price changes cause very large changes in the quantity purchased. The demand for such products is *relatively elastic*, or simply *elastic*.

For other products, toothpaste for example, consumers are much less sensitive to price changes. For those products, even substantial price changes cause only small changes in the amount purchased. The demand for such products is *relatively inelastic* or simply *inelastic*.

### price elasticity of demand

The ratio of the percentage change in *quantity demanded* of a product or *resource* to the percentage change in its *price*; a measure of the responsiveness of buyers to a change in the price of a product or resource.

## The Price-Elasticity Coefficient and Formula

Economists measure the degree to which demand is price elastic (price sensitive) or inelastic (price insensitive) with the coefficient  $E_d$ , defined as

$$E_d = \frac{\text{percentage change in quantity demanded of product X}}{\text{percentage change in price of product X}}$$

The percentage changes in the equation are calculated by dividing the *change* in quantity demanded by the original quantity demanded and by dividing the *change* in price by the original price. So, we can restate the formula as

$$E_d = \frac{\text{change in quantity demanded of X}}{\text{original quantity demanded of X}} \div \frac{\text{change in price of X}}{\text{original price of X}}$$

**Using Averages** An annoying problem arises in computing the price-elasticity coefficient. A price change from, say, \$4 to \$5 along a demand curve is a 25 percent ( $\$1/\$4$ ) increase, but the opposite price change from \$5 to \$4 along the same curve is a 20 percent ( $\$1/\$5$ ) decrease. Which percentage change in price should we use in the denominator to compute the price-elasticity coefficient? And when quantity changes, for example, from 10 to 20, there's a 100 percent ( $10/10$ ) increase. But when quantity falls from 20 to 10 along the same demand curve, there's a 50 percent



(10/20) decrease. Should we use 100 percent or 50 percent in the numerator of the elasticity formula? Elasticity should be the same whether price rises or falls!

**midpoint formula** A method for calculating *price elasticity of demand* or *price elasticity of supply* that averages the starting and ending *prices* and quantities when computing percentages.

The simplest solution is to use the **midpoint formula** which simply averages the two prices and the two quantities. That is,

$$E_d = \frac{\text{change in quantity}}{\text{sum of quantities}/2} \div \frac{\text{change in price}}{\text{Sum of prices}/2}$$

For the same \$5–\$4 price range, the midpoint formula yields \$4.50 [(\$5 + \$4)/2], and for the same 10–20 quantity range, the midpoint formula yields 15 units [(10 + 20)/2]. The percentage change in price is now \$1/\$4.50, or about 22 percent, and the percentage change in quantity is  $\frac{10}{15}$  or about 67 percent. So,  $E_d$  is about 3. All the price-elasticity coefficients that follow are calculated using this midpoint formula, which eliminates the “up versus down” problem.

**Using Percentages** Why use percentages rather than absolute amounts in measuring consumer responsiveness?

There are two reasons.

- First, if we use absolute changes, the choice of units will arbitrarily affect our impression of buyer responsiveness. To illustrate: If the price of a bag of popcorn at the softball game decreases from \$3 to \$2, and consumers increase their purchases from 60 to 100 bags, it will seem that consumers are quite sensitive to price changes and therefore that demand is elastic: A price change of 1 unit has increased the amount demanded by 40 units. But if we change the monetary unit from dollars to pennies, we find that a price change of 100 units (pennies) causes a quantity change of 40 units, which may falsely lead us to believe that demand is inelastic. We avoid this problem by using percentage changes.
- Second, by using percentages, we can correctly compare consumer responsiveness to changes in the prices of different products. It makes little sense to compare the effects on quantity demanded of (1) a \$1 increase in the price of a \$10,000 used car with (2) a \$1 increase in the price of a \$1 soft drink. Here, the price of the used car increases by 0.01 percent while the price of the soft drink increases by 100 percent. We can more sensibly compare the consumer responsiveness to price increases by using the percentage increase in price for both.

**Elimination of Minus Sign** We know from the downward sloping demand curve that price and quantity demanded are inversely related. Thus, the price-elasticity coefficient of demand  $E_d$  will always be a negative number. For example, if price declines, then quantity demanded will increase. This means that the numerator in our formula will be positive and the denominator negative, yielding

a negative  $E_d$ . For an increase in price, the numerator will be negative but the denominator positive, again yielding a negative  $E_d$ .

Economists usually ignore the minus sign and simply present the absolute value of the elasticity coefficient to avoid any ambiguity that might otherwise arise. People can become confused by saying that an  $E_d$  of  $-4$  is greater than an  $E_d$  of  $-2$ . We avoid this possible confusion when we say an  $E_d$  of  $4$  reveals greater elasticity than an  $E_d$  of  $2$ . Do so by ignoring the minus sign in the coefficient of price elasticity of demand and show only the absolute value.

## Interpretations of $E_d$

We can interpret  $E_d$ , the coefficient of price elasticity of demand, as follows.

**Elastic Demand** Demand is **elastic** if a specific percentage change in price in the denominator results in a larger percentage change in quantity demanded in the numerator. In such cases,  $E_d$  will be greater than 1. Example: Suppose that a 2 percent decline in the price of cut flowers in the denominator results in a 4 percent increase in quantity demanded in the numerator. Then demand for cut flowers is elastic and

$$E_d = \frac{.04}{.02} = 2$$

**Inelastic Demand** If a specific percentage change in price produces a smaller percentage change in quantity demanded, demand is **inelastic**. In such cases,  $E_d$  will be less than 1. Example: Suppose that a 2 percent decline in the price of coffee (the denominator) leads to only a 1 percent increase in quantity (the numerator). That implies that demand is inelastic and

$$E_d = \frac{.01}{.02} = 0.5$$

**Unit Elasticity** In some cases, a percentage change in price and the resulting percentage change in quantity demanded are the same. Example: Suppose that a 2 percent drop in the price of chocolate causes a 2 percent increase in quantity demanded. This case is termed **unit elasticity** because  $E_d$  is exactly 1, or unity. In this example,

$$E_d = \frac{.02}{.02} = 1$$

**Extreme Cases** When we say demand is “inelastic,” we do not mean that consumers are completely unresponsive to a price change. In that extreme situation, where a price change results in no change in the quantity demanded, we say that demand is *perfectly inelastic*. The price-elasticity coefficient is zero because there is no response to a price change. Approximate examples include an acute diabetic’s demand for insulin.

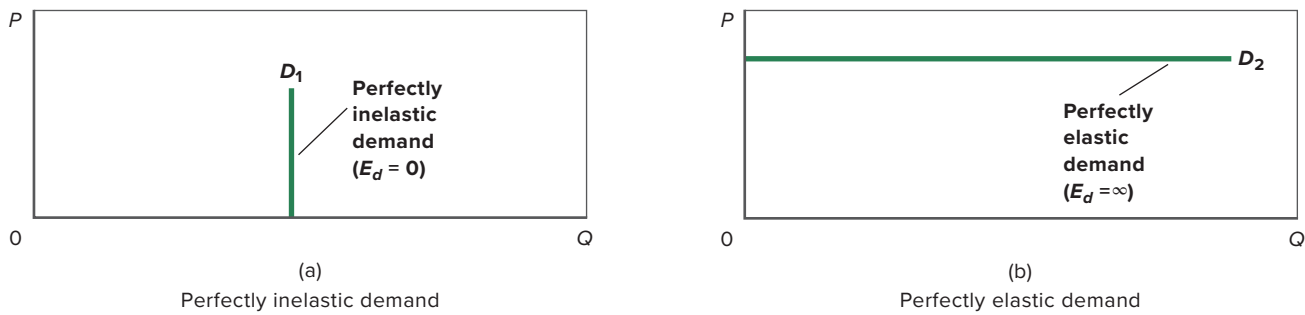
**elastic demand** Product or resource demand whose *price elasticity of demand* is greater than 1, so that any given percentage change in *price* leads to a larger percentage change in *quantity demanded*. As a result, quantity demanded is relatively sensitive to (elastic with respect to) price.

**inelastic demand** Product or resource demand for which the *price elasticity of demand* is less than 1, so that any given percentage change in *price* leads to a smaller percentage change in *quantity demanded*. As a result, quantity demanded is relatively insensitive to (inelastic with respect to price.)

**unit elasticity** Demand or supply for which the *elasticity coefficient* is equal to 1; means that the percentage change in the *quantity demanded* or *quantity supplied* is equal to the percentage change in *price*.



**FIGURE 4.6** Perfectly inelastic and elastic demands.



**perfectly inelastic demand**

Product or *resource* demand in which *price* can be of any amount at a particular quantity of the product or resource that is demanded; when the *quantity demanded* does not respond to a change in price; graphs as a vertical *demand curve*.

**perfectly elastic demand**

Product or *resource* demand in which *quantity demanded* can be of any amount at a particular product or resource *price*; graph is a horizontal *demand curve*.

A line parallel to the vertical axis, such as  $D_1$  in Figure 4.6(a), shows **perfectly inelastic demand** graphically.

Demand curve  $D_1$  in (a) represents perfectly inelastic demand ( $E_d = 0$ ). A price increase will result in no change in quantity demanded. Demand curve  $D_2$  in (b) represents perfectly elastic demand. A price increase will cause quantity demanded to decline from an infinite amount to zero ( $E_d = \infty$ ).

Conversely, when we say demand is “elastic,” we do not mean that consumers are completely responsive to a price change. In that extreme situation, where a small price reduction causes buyers to increase their purchases from zero to all they can obtain, the elasticity coefficient is infinite ( $\infty$ ), and we say that demand is **perfectly elastic**. A line parallel to the horizontal axis, such as  $D_2$  in Figure 4.6(b), shows perfectly elastic demand. You will see in Chapter 8 that perfectly elastic demand applies to firms that sell output in a purely competitive market.

**QUICK REVIEW 4.3**

- ✓ The price elasticity of demand coefficient  $E_d$  is the ratio of the percentage change in quantity demanded to the percentage change in price. The averages of the two prices and two quantities are used as the base references in calculating the percentage changes.
- ✓ When  $E_d$  is greater than 1, demand is elastic; when  $E_d$  is less than 1, demand is inelastic; when  $E_d$  is equal to 1, demand is of unit elasticity.

## The Total-Revenue Test

Firms want to know the effect of price changes on total revenue and thus on profits (total revenue minus total cost).

**Total revenue (TR)** is the total amount the seller receives from the sale of a product in a particular time period. It is calculated by multiplying the product price ( $P$ ) by the quantity sold ( $Q$ ).

$$TR = P \times Q$$

Graphically, total revenue is represented by the  $P \times Q$  rectangle lying below a point on a demand curve. At point a in Figure 4.7(a), for example, price is \$2, and quantity demanded is 10 units. So total revenue is \$20 ( $\$2 \times 10$ ), shown by the rectangle composed of the yellow and green areas under the demand curve. We know from basic geometry that we can find the area of a rectangle by multiplying the length of one side by the length of the other. Here, one side is “price” (with a length of \$2 per unit) and the other is “quantity demanded” (with a length of 10 units).

Total revenue and the price elasticity of demand are related. In fact, the easiest way to determine whether demand is elastic or inelastic is to employ the **total-revenue test**, which assesses what happens to total revenue when price changes:

- If total revenue changes in the opposite direction from price, demand is elastic.
- If total revenue changes in the same direction as price, demand is inelastic.
- If total revenue does not change when price changes, demand is unit-elastic.

### Elastic Demand

If demand is elastic, a decrease in price increases total revenue. Even though a lower price is received per unit, enough additional units are sold to more than make up for the lower price. For an example, look at demand curve  $D_1$  in Figure 4.7(a). At point a, total revenue is \$20 ( $\$2 \times 10$ ). If the price declines from \$2 to \$1 (point b), the quantity demanded becomes 40 units and total revenue is \$40 ( $\$1 \times 40$ ). As a result of the price decline, total revenue increases from \$20 to \$40. Total revenue has increased because the \$1 price decline applies to 10 units, with a consequent revenue loss of \$10 (the yellow area). But 30 more units are sold at \$1 each, resulting in a revenue gain of \$30 (the blue area). The overall result therefore is a net increase in total revenue of \$20 ( $\$30 - \$10$ ).

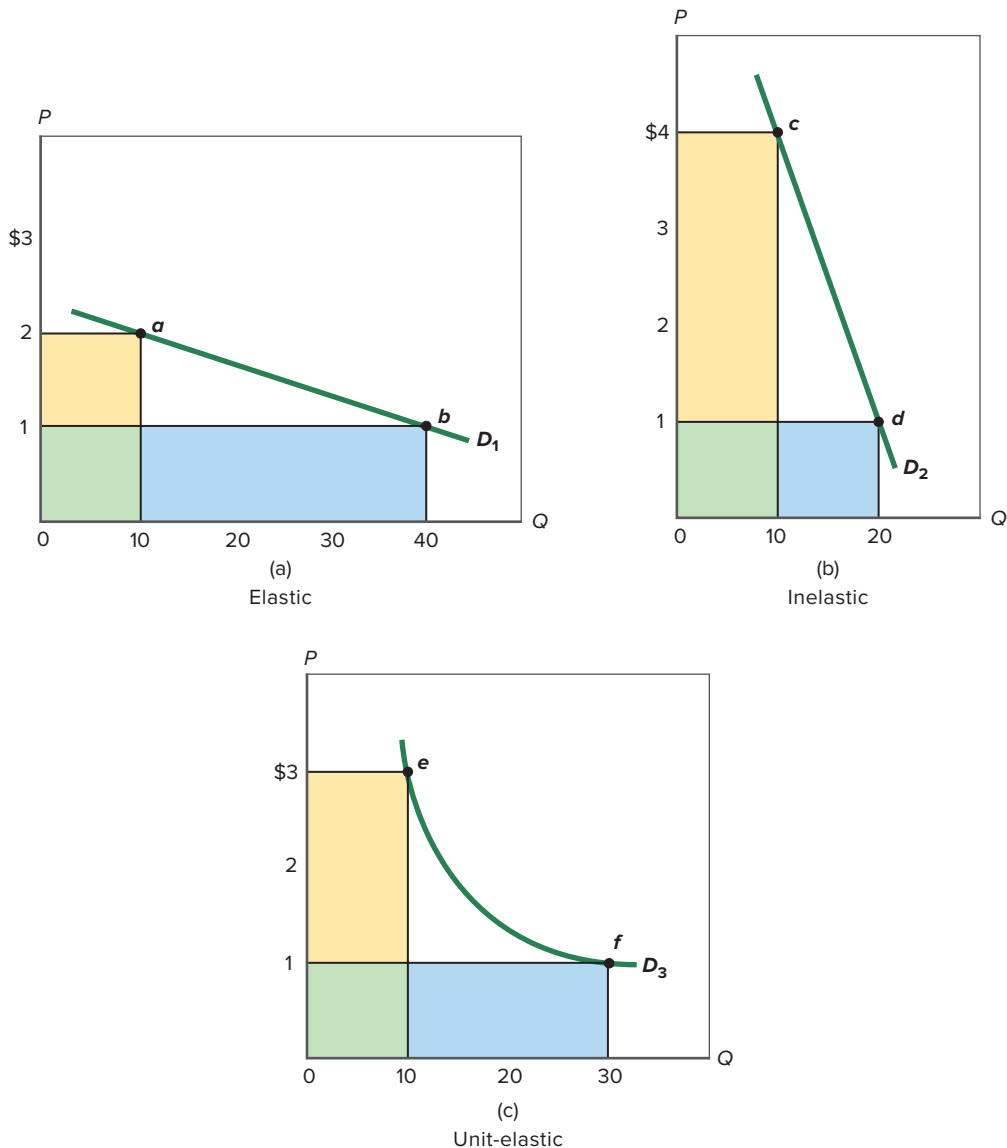
The analysis is reversible: If demand is elastic, a price increase reduces total revenue. The revenue gained from a higher price per unit will be more than offset by the revenue lost from the lower quantity sold.  $E_d$  is greater than 1, and the percentage change in quantity demanded is greater than the percentage change in price.

**total revenue (TR)** The total number of dollars received by a *firm* (or firms) from the sale of a product; equal to the total expenditures for the product produced by the firm (or firms); equal to the quantity sold (demanded) multiplied by the *price* at which it is sold.

**total-revenue test** A test to determine *elasticity of demand*. Demand is elastic if *total revenue* moves in the opposite direction from a *price* change; it is inelastic when it moves in the same direction as a price change; and it is of unitary elasticity when it does not change when price changes.

### FIGURE 4.7 The total-revenue test for price elasticity.

(a) Price declines from \$2 to \$1, and total revenue increases from \$20 to \$40. So, demand is elastic. The gain in revenue (blue area) exceeds the loss of revenue (yellow area). (b) Price declines from \$4 to \$1, and total revenue falls from \$40 to \$20. So, demand is inelastic. The gain in revenue (blue area) is less than the loss of revenue (yellow area). (c) Price declines from \$3 to \$1, and total revenue does not change. Demand is unit-elastic. The gain in revenue (blue area) equals the loss of revenue (yellow area).



### Inelastic Demand

If demand is inelastic, a price decrease reduces total revenue. The increase in sales does not fully offset the decline in revenue per unit, and total revenue declines. Look at demand curve  $D_2$  in Figure 4.7(b). At point  $c$  on the curve, price is \$4, and quantity demanded is 10 units. Thus, total revenue is \$40, shown by the combined yellow and green rectangle. If the price drops to \$1 (point  $d$ ), total revenue declines to \$20. Total revenue has declined because the loss of revenue (the yellow area) from the

lower unit price is larger than the gain in revenue (the blue area) from the accompanying increase in sales. Price has fallen, and total revenue has also declined.

Our analysis is again reversible: If demand is inelastic, a price increase will increase total revenue. So, other things equal, when price and total revenue move in the same direction, demand is inelastic.  $E_d$  is less than 1, and the percentage change in quantity demanded is less than the percentage change in price.

## Unit Elasticity

In the case of unit elasticity, an increase or a decrease in price leaves total revenue unchanged. The loss in revenue from a lower unit price is exactly offset by the gain in revenue from the accompanying increase in sales. Conversely, the gain in revenue from a higher unit price is exactly offset by the revenue loss from the accompanying decline in the amount demanded.

Look at demand curve  $D_3$  in Figure 4.7(c). At the price of \$3, 10 units will be sold, yielding total revenue of \$30. At the lower \$1 price, a total of 30 units will be sold, again resulting in \$30 of total revenue. The \$2 price reduction causes the revenue loss shown by the yellow area, but that loss is exactly offset by the revenue gain shown by the blue area. Total revenue does not change.

Other things equal, when price changes and total revenue remains constant, demand is unit-elastic (or unitary).  $E_d$  is 1, and the percentage change in quantity equals the percentage change in price.

Finally, note that unit elasticity implies the ultimate in reversibility. When demand is unit-elastic, both price increases and price decreases leave total revenue unchanged.

## Price Elasticity along a Linear Demand Curve

Although the demand curves in Figure 4.7 nicely illustrate the total-revenue test for elasticity, it is important to understand that elasticity typically *varies* along any given demand curve. The curve in Figure 4.7(c) is exceptional, with elasticity equal to 1 along the entire curve.

Refer to Table 4.3 and Figure 4.8 that show how elasticity varies over different price ranges of the same demand schedule or curve. Plotting the hypothetical data for movie tickets shown in columns 1 and 2 of Table 4.3 yields demand curve  $D$  in Figure 4.8. That demand curve is linear. But column 3 of the table shows that the price elasticity coefficient declines as we move from higher prices to lower prices. For all downward sloping straight-line and most other demand curves, demand is more price elastic toward the upper left (here, the \$5–\$8 price range) than toward the lower right (here, the \$4–\$1 price range).

**TABLE 4.3 Price Elasticity of Demand for Movie Tickets as Measured by the Elasticity Coefficient and the Total-Revenue Test**

| (1)<br>Total Quantity of<br>Tickets Demanded per<br>Week, Thousands | (2)<br>Price per Ticket | (3)<br>Elasticity<br>Coefficient ( $E_d$ ) | (4)<br>Total Revenue,<br>(1) × (2) | (5)<br>Total-Revenue<br>Test |
|---|-------------------------|--|------------------------------------|------------------------------|
| 1   | \$8                     | 5.00                                       | \$8,000                            | Elastic                      |
| 2   | 7                       | 2.60                                       | 14,000                             | Elastic                      |
| 3   | 6                       | 1.57                                       | 18,000                             | Elastic                      |
| 4   | 5                       | 1.00                                       | 20,000                             | Unit-elastic                 |
| 5   | 4                       | 0.64                                       | 20,000                             | Inelastic                    |
| 6   | 3                       | 0.38                                       | 18,000                             | Inelastic                    |
| 7   | 2                       | 0.20                                       | 14,000                             | Inelastic                    |
| 8   | 1                       |  | 8,000                              | Inelastic                    |

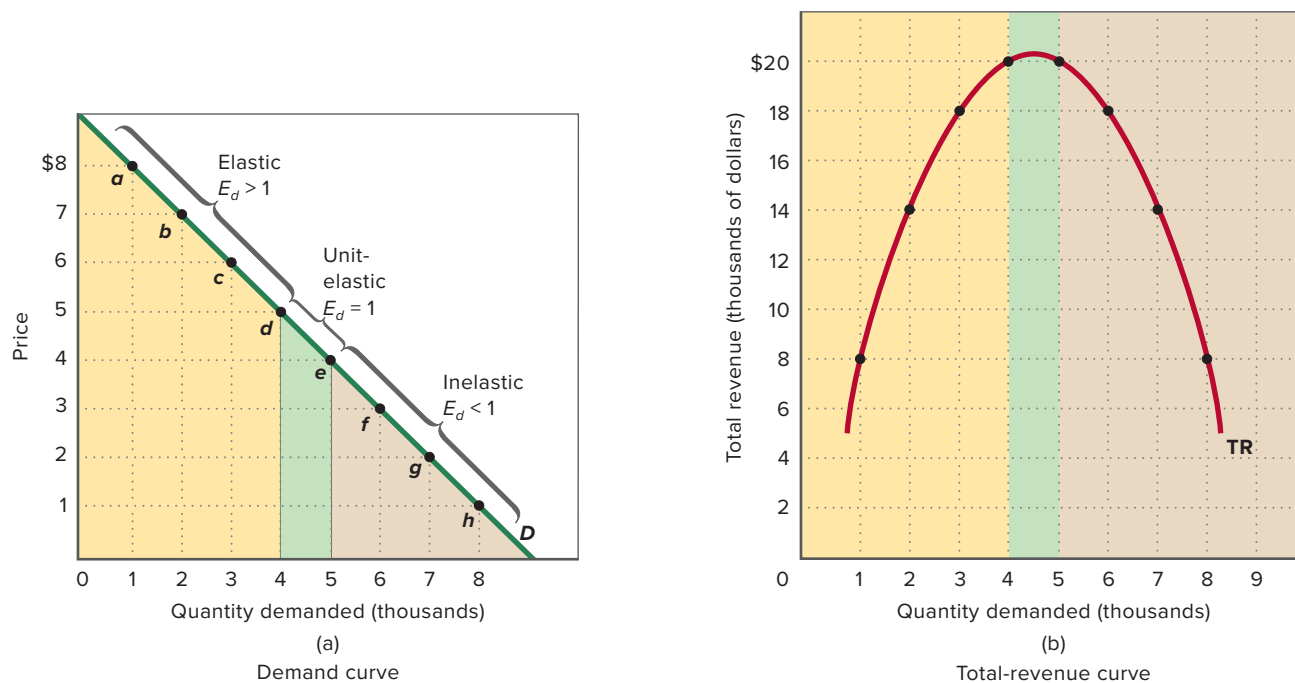
This is a consequence of the arithmetic properties of the elasticity measure. Specifically, in the upper-left segment of the demand curve, the percentage change in quantity is large because the original reference quantity is small. Similarly, the percentage change in price is small in that segment because the original reference price is large. The relatively large percentage change in quantity divided by the relatively small change in price yields a large  $E_d$ —an elastic demand.

The reverse holds true for the lower-right segment of the demand curve. Here, the percentage change in quantity is small because the original reference quantity is large; similarly, the percentage change in price is large because the original reference price is small. The relatively small percentage change in quantity divided by the relatively large percentage change in price results in a small  $E_d$ —an inelastic demand.

The demand curve in Figure 4.8(a) also illustrates that the slope of a demand curve—its flatness or steepness—is not a sound basis for judging elasticity. The catch is that slope is computed from absolute changes in price and quantity, while elasticity involves relative or percentage changes in price and quantity. The demand curve in Figure 4.8(a) is linear, which by definition means that the slope is constant throughout. But we have seen that the curve is elastic in its high-price (\$8–\$5) range and inelastic in its low-price (\$4–\$1) range. So please do not confuse slope and elasticity. Slope can be constant even while elasticity varies significantly along the length of a curve.

## FIGURE 4.8 The relation between price elasticity of demand for movie tickets and total revenue.

(a) Demand curve  $D$  is based on Table 4.3 and is marked to show that the hypothetical weekly demand for movie tickets is elastic at higher price ranges and inelastic at lower price ranges. (b) The total-revenue curve  $TR$  is derived from demand curve  $D$ . When price falls and  $TR$  increases, demand is elastic; when price falls and  $TR$  is unchanged, demand is unit-elastic; and when price falls and  $TR$  declines, demand is inelastic.



### Price Elasticity and the Total-Revenue Curve

Figure 4.8(b) plots the theater's total revenue per week that corresponds to each price-quantity combination indicated along demand curve  $D$  in Figure 4.8(a). The combination represented by point  $a$  yields total revenue of \$8,000 ( $\$8 \times 1,000$  tickets). Figure 4.8(b) plots this \$8,000 amount vertically at 1 unit (1,000 tickets) demanded. Similarly, the price-quantity-demanded combination represented by point  $b$  yields total revenue of \$14,000 ( $\$7 \times 2,000$  tickets). This amount is graphed vertically at 2 units (2,000 tickets) demanded. The ultimate result of such graphing is total-revenue curve  $TR$ , which first slopes upward, then reaches a maximum, and finally turns downward. This amount is graphed vertically at 2 units (2,000 tickets) demanded. The ultimate result of such graphing is total-revenue curve  $TR$ , which first slopes upward, then reaches a maximum, and finally turns downward.

Comparison of curves  $D$  and  $TR$  in Figure 4.8 sharply focuses the relationship between elasticity and total revenue. Lowering the ticket price in the elastic range of demand—for example, from \$8 to \$5—increases total revenue. Conversely, increasing the ticket price in that range reduces total revenue. In both cases, price and

**TABLE 4.4 Price Elasticity of Demand: A Summary**

| Absolute Value of Elasticity Coefficient | Demand Is:                        | Description   | Impact on Total Revenue of a: |                            |
|--|-----------------------------------|---|-------------------------------|----------------------------|
|  |                                   |   | Price Increase                | Price Decrease             |
| Greater than 1 ( $E_d > 1$ )             | Elastic or relatively elastic     | Quantity demanded changes by a larger percentage than does price  | Total revenue decreases       | Total revenue increases    |
| Equal to 1 ( $E_d = 1$ )                 | Unit- or unitary elastic          | Quantity demanded changes by the same percentage as does price    | Total revenue is unchanged    | Total revenue is unchanged |
| Less than 1 ( $E_d < 1$ )                | Inelastic or relatively inelastic | Quantity demanded changes by a smaller percentage than does price | Total revenue increases       | Total revenue decreases    |

total revenue change in opposite directions, confirming that demand is elastic.

The \$5–\$4 price range of demand curve *D* reflects unit elasticity. When price either decreases from \$5 to \$4 or increases from \$4 to \$5, total revenue remains \$20,000. In both cases, price changed while total revenue remained constant, confirming that demand is unit-elastic.

In the inelastic range of demand curve *D*, lowering the price—for example, from \$4 to \$1—decreases total revenue. Conversely, raising the price in the inelastic range boosts total revenue. In both cases, price and total revenue move in the same direction, confirming that demand is inelastic.

Table 4.4 summarizes the characteristics of price elasticity of demand.

## Determinants of Price Elasticity of Demand

Price elasticity of demand varies by situation. However, the following generalizations are often helpful.

**Substitutability** Generally, the more substitute goods that are available, the greater the price elasticity of demand. Various candy bar brands are generally substitutable for one another, making the demand for one brand of candy bar, for example, Snickers, highly elastic. Toward the other extreme, the demand for tooth repair is quite inelastic because there simply are no close substitutes when that procedure is required.

The elasticity of demand for a product depends on how narrowly the product is defined. Demand for Skechers sneakers is more elastic than the overall demand for shoes. Many other brands are readily substitutable for Skechers sneakers, but there are few, if any, good substitutes for shoes.



**Proportion of income** Other things equal, the higher the price of a good relative to consumers' incomes, the greater the price elasticity of demand. A 10 percent increase in the price of low-priced pencils or chewing gum amounts to a few more pennies spent from a consumer's income, and quantity demanded will probably decline only slightly. Thus, price elasticity for low-priced items tends to be low. But a 10 percent increase in the price of relatively high-priced products like automobiles or houses means additional expenditures of perhaps \$3,000 or \$30,000, respectively. These price increases are significant fractions of most families' annual incomes, and quantities demanded will likely diminish significantly. The price elasticities for such items tend to be high.

**Luxuries versus necessities** In general, price elasticity of demand is higher for luxury goods than it is for necessities. Electricity is generally regarded as a necessity; it is difficult to get along without it. A price increase will not significantly reduce the amount of lighting and power used in a household. Note electricity's very low price-elasticity coefficient in Table 4.5, which lists selected price elasticities of demand. An extreme case: A person does not decline an operation for acute appendicitis because the physician's fee has just gone up.

In contrast, vacation travel and jewelry are luxuries, which, by definition, can easily be forgone. If the prices of vacation travel and jewelry rise, consumers need not buy them and will suffer no great hardship without them.

What about the demand for a common product like salt? It is highly inelastic on three counts: Few good substitutes are available; salt is a negligible item in the family budget; and it is a "necessity" rather than a luxury.

**Time** Generally, product demand is more elastic over longer time periods. Consumers often need time to adjust to price changes. For example, when the price of a product rises, consumers need time to find and experiment with other products. Consumers may not immediately reduce their purchases very much when the price of beef rises by 10 percent, but in time they may shift to chicken, pork, or fish. A related consideration is product durability. Studies show that "short-run" demand for gasoline is more inelastic ( $E_d = 0.26$ ) than is "long-run" demand ( $E_d = 0.58$ ). In the short run, people are stuck with their present cars and trucks, but with rising gasoline prices they eventually replace them with smaller, more fuel-efficient gas-powered vehicles, or with gas-electric hybrids or fully electric cars. Some also switch to mass transit.

## Applications of Price Elasticity of Demand

Price elasticity of demand has great practical significance, as the following examples show.

**TABLE 4.5 Selected Price Elasticities of Demand**

| Product or Service            | Coefficient of Price Elasticity of Demand ( $E_d$ ) | Product or Service          | Coefficient of Price Elasticity of Demand ( $E_d$ ) |
|-------------------------------|---|-----------------------------|---|
| Newspapers                    | .10   | Milk                        | .63   |
| Electricity (household)       | .13   | Household appliances        | .63   |
| Bread                         | .15   | Movies                      | .87   |
| Major League Baseball tickets | .23   | Shoes                       | .91   |
| Telephone service             | .26   | Motor vehicles              | 1.14  |
| Sugar                         | .30   | Beef                        | 1.27  |
| Medical care                  | .31   | China, glassware, tableware | 1.54  |
| Eggs                          | .32   | Residential land            | 1.60  |
| Legal services                | .37   | Restaurant meals            | 2.27  |
| Automobile repair             | .40   | Lamb and mutton             | 2.65  |
| Clothing                      | .49   | Fresh peas                  | 2.83  |
| Gasoline                      | .58   |                             |   |

**SOURCE** Compiled from numerous studies and sources reporting price elasticity of demand.

**Large Crop Yields** The demand for most farm products is highly inelastic;  $E_d$  is perhaps 0.20 or 0.25. As a result, increases in the supply of farm products arising from a good growing season or from increased productivity tend to depress both the prices of farm products and the total revenues (incomes) of farmers. For farmers as a group, the inelastic demand for their products means that large crop yields may be undesirable. For policymakers, it means that achieving the goal of higher total farm income requires that farm output be restricted.

**Excise Taxes** The government pays attention to elasticity of demand when it selects goods and services to tax. If the government levies a \$1 excise tax on a product and 10,000 units are sold, then tax revenue will be \$10,000 ( $\$1 \times 10,000$  units sold). (An **excise tax** is a tax levied on the production of a specific product or on the quantity of the product purchased.) If the government raises the tax to \$1.50 and the resultant higher price reduce sales to 4,000 because of elastic demand, then tax revenue will decline to \$6,000 ( $\$1.50 \times 4,000$  units sold). Because a higher tax on a product with elastic demand will bring in less tax revenue, legislatures tend to tax products that have inelastic demand, such as gasoline.

**excise tax** A tax levied on the production of a specific product or on the quantity of the product purchased.

## ? CONSIDER THIS . . .



### The Southwest Effect

Southwest Airlines grew from three planes in 1967 to America's largest domestic airline by being committed to low prices and efficiency.

Since its inception, Southwest has also been committed to making air travel so inexpensive that people who could never afford to fly before finally can. That has led to the Southwest Effect, whereby ticket prices plunge after Southwest enters a new market and undercuts existing carriers. As just one example, the price of flying from Denver to Phoenix fell by 36.4 percent after Southwest began service out of Denver in 2006.

Those sharp price declines allow us to estimate price elasticity of demand, including for new passengers who could not afford to fly previously. When Southwest entered the market in three California cities, fares dropped by 50 percent while passenger traffic increased 200 percent, implying a highly elastic demand for air travel at those airports. And because "highly elastic demand" implies that "lower prices will increase total revenue," Southwest found those price declines very favorable indeed.

Its higher-cost rivals? Not so much. Nearly the entire increase in passenger traffic, revenue, and profits went to Southwest.

## QUICK REVIEW 4.4

- ✓ When price changes, total revenue will change in the opposite direction if demand is price-elastic, in the same direction if demand is price-inelastic, and not at all if demand is unit-elastic.
- ✓ Demand is typically elastic in the high-price (low-quantity) range of the demand curve and inelastic in the low-price (high-quantity) range of the demand curve.
- ✓ Price elasticity of demand is greater when (a) the number of substitutes available is larger; (b) the price of a product relative to one's budget or income is higher; (c) the extent to which the product is a luxury is greater; and (d) the time period involved is longer.

## Price Elasticity of Supply

Price elasticity also applies to supply. If the quantity supplied by producers is relatively responsive to price changes, supply is elastic. If it is relatively insensitive to price changes, supply is inelastic.

We measure the price elasticity or inelasticity of supply with the coefficient  $E_s$ , defined almost like  $E_d$  except that we substitute “percentage change in quantity supplied” for “percentage change in quantity demanded” as follows:

$$E_s = \frac{\text{percentage change in quantity supplied of product X}}{\text{percentage change in price of product X}}$$

For reasons explained earlier, the averages, or midpoints, of the before and after quantities supplied and the before and after prices are used as reference points for the percentage changes. Suppose an increase in the price of a good from \$4 to \$6 increases the quantity supplied from 10 units to 14 units. The percentage change in price would be  $2/5$ , or 40 percent, and the percentage change in quantity would be  $4/12$ , or 33 percent. Consequently,

$$E_s = \frac{0.33}{0.40} = 0.83$$

In this case, supply is inelastic because the price-elasticity coefficient is less than 1. If  $E_s$  is greater than 1, supply is elastic. If it is equal to 1, supply is unit-elastic.  $E_s$  is never negative because price and quantity supplied are directly related. Thus, there are no minus signs to drop, which we needed to do when calculating elasticity of demand.

### price elasticity of supply

the ratio of the percentage change in *quantity supplied* of a product or *resource* to the percentage change in its *price*; a measure of the responsiveness of producers to a change in the price of a product or resource.

The degree of **price elasticity of supply** depends on how quickly and easily producers can shift resources between alternative uses. The more easily and rapidly producers can shift resources between alternative uses, the greater the price elasticity of supply. Consider Christmas trees as an example. A firm’s response to an increase in the price of trees depends on its ability to shift resources from the production of other products (whose prices we assume remain constant) to the production of trees. Shifting resources takes time: The more time available, the greater the “shiftability.” So, we can expect a greater response, and therefore greater elasticity of supply, the longer a firm has to adjust to a price change.

In analyzing the impact of time on elasticity, economists distinguish among the immediate market period, the short run, and the long run.

## Price Elasticity of Supply: The Immediate Market Period

The **immediate market period** is the length of time over which producers are unable to respond to a change in price with a change in quantity supplied. Suppose the owner of a small farm brings to market one truckload of tomatoes that is the entire season's output. The supply curve for the tomatoes is perfectly inelastic (vertical); the farmer will sell the truckload whether the price is high or low. Why? Because the farmer can offer only this one truckload even if the price of tomatoes is much higher than anticipated. Tomatoes cannot be produced overnight. The farmer needs another full growing season to respond to a higher-than-expected price. Additionally, because the product is perishable, the farmer cannot withhold it from the market. If the price is lower than anticipated, the farmer will still sell the entire truckload.

The farmer's costs of production will not enter into this decision to sell. Though the price of tomatoes may fall far short of production costs, the farmer will nevertheless sell everything he brought to market to avoid a total loss through spoilage. In the immediate market period, both the supply of tomatoes and the quantity of tomatoes supplied are fixed. The farmer offers only one truckload no matter how high or low the price.

Figure 4.9(a) shows the farmer's vertical supply curve during the immediate market period. Supply is perfectly inelastic because the farmer does not have time to respond to a change in demand, say, from  $D_1$  to  $D_2$ . The resulting price increase from  $P_o$  to  $P_m$  simply determines which buyers get the fixed quantity supplied; it elicits no increase in output.

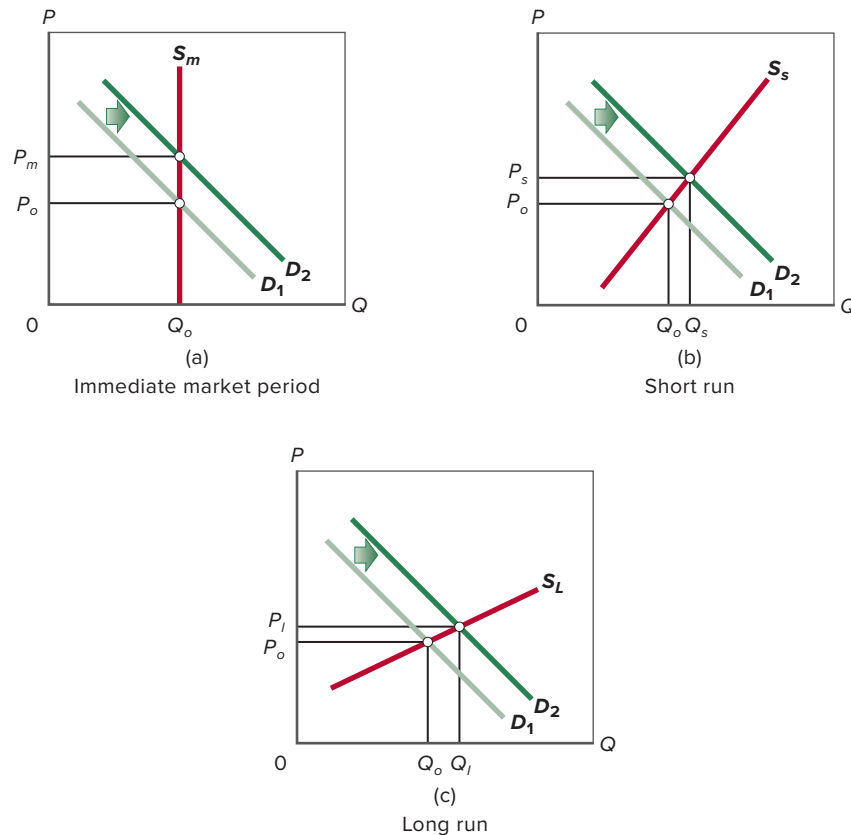
The greater the amount of time producers have to adjust to a change in demand, here from  $D_1$  to  $D_2$ , the greater will be their output response. (a) In the immediate market period, there is insufficient time to change output, and so supply is perfectly inelastic. (b) In the short run, plant capacity is fixed, but changing the intensity of its use can alter output; supply is therefore more elastic. (c) In the long run, all desired adjustments, including changes in plant capacity, can be made, and supply becomes still more elastic.

However, not all supply curves are perfectly inelastic immediately after a price change. If the product is not perishable and the price rises, producers may choose to increase quantity supplied by drawing down their inventories of unsold, stored goods. This will cause the market supply curve to attain some positive slope. For our tomato farmer, the immediate market period may be a full growing season; for producers of goods that can be inexpensively stored, there may be no immediate market period at all.

### **immediate market period**

the length of time during which the producers of a product are unable to change the quantity supplied in response to a change in price and in which there is a *perfectly inelastic supply*.

**FIGURE 4.9** Time and the elasticity of supply.



**short run** in *microeconomics*, a period of time in which producers are able to change the quantities of some but not all of the *resources* they employ; a period in which some resources (usually *plant*) are fixed and some are variable.

**long run** In *microeconomics*, a period of time long enough to enable producers of a product to change the quantities of all the resources they employ, so that all resources and costs are variable and no resources or costs are fixed.

### Price Elasticity of Supply: The Short Run

The **short run** in microeconomics is a period of time too short to change plant capacity but long enough to use the fixed-sized plant more intensively or less intensively. In the short run, our farmer’s plant (land and farm machinery) is fixed. But he does have time in the short run to cultivate tomatoes more intensively by applying more labor and more fertilizer and pesticides to the crop. The result is a somewhat greater output in response to increased demand; this greater output is reflected in a more elastic supply of tomatoes, as shown by the upward sloping  $S_s$  in Figure 4.9(b). Note now that the increase in demand from  $D_1$  to  $D_2$  is met by an increase in quantity (from  $Q_0$  to  $Q_s$ ), so there is a smaller price adjustment (from  $P_0$  to  $P_s$ ) than would be the case in the immediate market period. The equilibrium price is therefore lower in the short run than in the immediate market period.

### Price Elasticity of Supply: The Long Run

The **long run** in microeconomics is a time period long enough for firms to adjust their plant sizes and for new firms to enter (or existing firms to leave) the industry. In the “tomato industry,” for example, our farmer has time to acquire additional land and buy more machinery and equipment. Furthermore, other farmers may, over time, be attracted to tomato farming by the increased demand and higher price. Such adjustments create a larger

supply response, as represented by the more elastic supply curve  $S_j$  in Figure 4.9(c). The outcome is a smaller price rise ( $P_o$  to  $P_i$ ) and a larger output increase ( $Q_o$  to  $Q_i$ ) in response to the increase in demand from  $D_1$  to  $D_2$ .

There is no total-revenue test for elasticity of supply. Supply shows a positive or direct relationship between price and amount supplied; the supply curve slopes upward. Regardless of the degree of elasticity or inelasticity, price and total revenue always move together.

## Applications of Price Elasticity of Supply

Price elasticity of supply has widespread applicability, as the following examples show.

**Antiques and Reproductions** *Antiques Roadshow* is a popular PBS television program in which people bring antiques for appraisal by experts. Some people are pleased to learn that their old furniture or funky folk art is worth a large amount, say, \$30,000 or more.

The high price of antiques results from strong demand and limited, highly inelastic supply. Because genuine antiques cannot be reproduced, their quantity supplied either does not rise or rises only slightly as price goes up. The higher price might prompt the discovery of a few more remaining originals and thus add to the quantity available for sale, but this quantity response is usually quite small. So, the supply of antiques and other collectibles tends to be inelastic. For one-of-a-kind antiques, the supply is perfectly inelastic.

Factors such as increased population, higher income, and greater enthusiasm for collecting antiques have increased the demand for antiques over time. Because the supply of antiques is limited and inelastic, those increases in demand have greatly boosted the prices of antiques.

Contrast the inelastic supply of original antiques with the elastic supply of modern “made-to-look-old” reproductions. Such faux antiques are quite popular and widely available at furniture stores and knickknack shops. When the demand for reproductions increases, the firms making them simply boost production. Because the supply of reproductions is highly elastic, increased demand raises their prices only slightly.

**Volatile Gold Prices** The price of gold is quite volatile, sometimes shooting upward one period and plummeting downward the next. The main sources of these fluctuations are shifts in demand interacting with highly inelastic supply. Gold production is a costly and time-consuming process of exploration, mining, and refining. Moreover, the physical availability of gold is highly limited—all the gold ever mined would fit into a cube



roughly 21 meters (69 feet) on each side. For both reasons, increases in gold prices do not elicit substantial increases in quantity supplied. In addition, gold mining is costly to shut down and existing gold bars are expensive to store. Price decreases therefore do not produce large drops in the quantity of gold supplied. In short, the supply of gold is inelastic.

The demand for gold is partly derived from the demand for its uses, such as for jewelry, dental fillings, and coins. But people also demand gold as a speculative financial investment. They increase their demand for gold when they fear economic turmoil that might undermine the value of currency and other types of investment. They reduce their demand when events settle down. Because of the inelastic supply of gold, even relatively small changes in demand produce relatively large changes in price.

## Cross Elasticity and Income Elasticity of Demand

As we've seen, price elasticities measure the responsiveness of the quantity demanded or supplied of a good to a change in price. The *consumption* of a good is also affected by price changes and, additionally, by income changes.

### Cross Elasticity of Demand

The **cross elasticity of demand** measures the sensitivity of consumer purchases of one product (call it X) to a change in the price of some other product (call it Y). We calculate the coefficient of cross elasticity of demand  $E_{xy}$  as the percentage change in the consumption of X to the percentage change in the price of Y:

$$E_{xy} = \frac{\text{percentage change in quantity demanded of product X}}{\text{percentage change in price of product Y}}$$

Cross elasticity (also known as cross-price elasticity) allows us to quantify and more fully understand substitute and complementary goods, introduced earlier in this chapter. The coefficient of cross elasticity of demand can be either positive or negative.

**Substitute Goods** If cross elasticity of demand is positive, meaning that sales of X move in the same direction as a change in the price of Y, then X and Y are substitute goods. An example is Evian water (X) and Dasani water (Y). An increase in the price of Evian causes consumers to buy more Dasani, resulting in a positive cross elasticity. The larger the positive cross-elasticity coefficient, the greater is the substitutability between the two products.

**Complementary Goods** When cross elasticity is negative, we know that X and Y “go together”; an increase in the price of one decreases the demand for the other. So, the two are complementary goods. For example, a decrease in the price of

#### cross elasticity of demand

The ratio of the percentage change in *quantity demanded* of one good to the percentage change in the *price* of some other good. A positive coefficient indicates the two products are *substitute goods*; a negative coefficient indicates they are *complementary goods*.

smartphones will increase the number of smartphone cases that are purchased. The larger the negative cross-elasticity coefficient, the greater is the complementarity between the two goods.

**Independent Goods** A zero or near-zero cross elasticity suggests that the two products are unrelated or independent goods. An example is walnuts and wireless earbuds: We do not expect a change in the price of walnuts to have any effect on purchases of wireless earbuds, and vice versa.

**Application** The cross-elasticity coefficient is important to businesses and government. For example, suppose that the Coca-Cola Corporation is considering whether to lower the price of its Sprite brand. Before making its decision, it wants to know about the price elasticity of demand for Sprite, such as whether the price cut increase or decrease total revenue, but it is also interested in knowing if the increased sales of Sprite will come at the expense of its Coke brand. How sensitive are the sales of Coke to a change in the price of Sprite? By how much will the increased sales of Sprite “cannibalize” the sales of Coke? A low cross elasticity would indicate that Coke and Sprite are weak substitutes for each other and that a lower price for Sprite will have little effect on Coke sales.

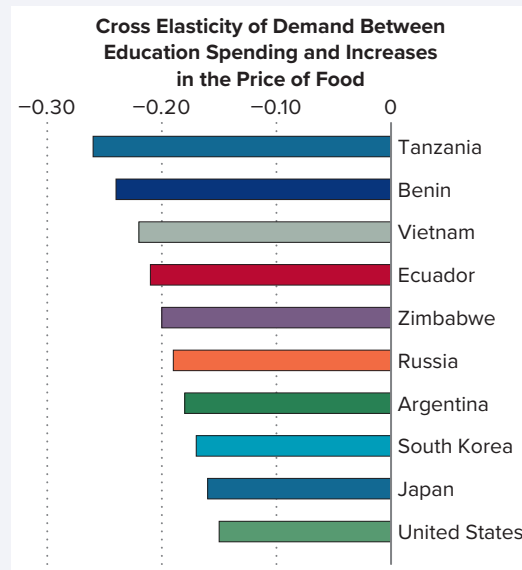
The government also uses the idea of cross elasticity of demand in assessing whether a proposed merger between two large firms will substantially reduce competition and therefore violate the antitrust laws. For example, the cross elasticity between Coke and Pepsi is high, making them strong substitutes. In addition, the Coca-Cola Corporation and its rival producer PepsiCo sell about 70 percent of all carbonated cola drinks consumed in the United States. Taken together, the high cross elasticities and the large market shares suggest that the government would likely block a merger between Coca-Cola Corporation and PepsiCo because the merger would substantially lessen competition. In contrast, the cross elasticity between cola and gasoline is low or zero. A merger between Coca-Cola Corporation and the Shell Oil Company would have a minimal effect on competition. So, the government would let that merger happen.

Global Perspective 4.1 presents, for several countries, the cross elasticity of demand that quantifies the responsiveness of household educational expenditures to a one-percent increase in the price of food. The poorer the country, the larger the decline in education spending.

## GLOBAL PERSPECTIVE 4.1

### CROSS ELASTICITY OF DEMAND BETWEEN EDUCATION SPENDING AND INCREASES IN THE PRICE OF FOOD, SELECTED NATIONS

The amount by which education spending falls when food prices go up is higher in lower-income countries like Tanzania and Vietnam, where family budgets are tighter and any increase in food costs is more likely to mean cutbacks on education spending. The decline in education spending is noticeably smaller in high-income countries like Japan and the United States, where family budgets are less constrained.



**SOURCE** Economic Research Service, United States Department of Agriculture.

**income elasticity of demand** The ratio of the percentage change in the *quantity demanded* of a good to a percentage change in consumer *income*; measures the responsiveness of consumer purchases to income changes.

### Income Elasticity of Demand

**Income elasticity of demand** measures the degree to which consumers respond to a change in their incomes by buying more or less of a particular good. The coefficient of income elasticity of demand  $E_i$  is determined with the formula.

$$E_i = \frac{\text{percentage change in quantity demanded}}{\text{percentage change in income}}$$

**Normal Goods** For most goods, the income-elasticity coefficient  $E_i$  is positive, meaning that more of those goods are demanded as incomes rise. Such goods are called normal or superior goods. But the value of  $E_i$  varies greatly among normal goods. For example, income elasticity of demand for automobiles is about +3.0, while income elasticity for most farm products is only about +0.2.

**Inferior Goods** A negative income-elasticity coefficient designates an inferior good. Generic items, bus travel, and used clothing can be considered inferior goods. Consumers decrease their purchases of inferior goods as incomes rise.

**Insights** Coefficients of income elasticity of demand provide insights into the economy. For example, when recessions (business downturns) occur and incomes fall, income elasticity of demand helps predict which products' demand will decline more rapidly.

Products with relatively high income-elasticity coefficients, such as automobiles ( $E_i = +3.0$ ), housing ( $E_i = +1.5$ ), and restaurant meals ( $E_i = +1.4$ ), are generally hit hardest by recessions. Those with low or negative income-elasticity coefficients are much less affected. For example, food products prepared at home ( $E_i = +0.2$ ) respond relatively little to income fluctuations. When incomes drop, purchases of food (and toothpaste and toilet paper) drop little compared to purchases of concert tickets, luxury vacations, and high-definition TVs. Products we view as essential tend to have lower income-elasticity coefficients than products we view as luxuries. When our incomes fall, we cannot easily eliminate or postpone the purchase of essential products.

Table 4.6 provides a convenient synopsis of the cross-elasticity and income-elasticity concepts.

Global Perspective 4.2 on the following page shows how the income elasticity of gasoline demand varies substantially across countries.

**TABLE 4.6 Cross and Income Elasticities of Demand**

| Value of Coefficient                           | Description  | Type of Good(s)    |
|--|--|--------------------|
| Cross elasticity:<br>Positive ( $E_{wz} > 0$ ) | Quantity demanded of W changes in same direction as change in price of Z             | Substitutes        |
| Negative ( $E_{xy} < 0$ )                      | Quantity demanded of X changes in opposite direction from change in price of Y       | Complements        |
| Income elasticity:<br>Positive ( $E_i > 0$ )   | Quantity demanded of the product changes in same direction as change in income       | Normal or superior |
| Negative ( $E_i < 0$ )                         | Quantity demanded of the product changes in opposite direction from change in income | Inferior           |



### Skill 2.C: Interpret a specific outcome using quantitative data or calculation.

Skill category 2, interpretation, you are asked to take one step beyond describing a concept, principle, or model and explain, or interpret, the cause of an economic outcome or explain an economic outcome based on quantitative data or calculations.

#### On the AP Exam

For example, examine this sample exam question focusing on elasticity of demand. First, you need to identify the economic concept, principle, or model in the question. In this case the question asks about the impact of a price change on quantity demanded, and therefore refers to elasticity of demand. Because the question gives the impact of the price change, then you must determine the cause.

You and your friends regularly attend your high school's football games. After attending the first two games, you notice that the price of a bottle of water has increased from \$1 to \$3. You discover sales of bottles of water have decreased from 500 per game to 450. Which of the following best explains the situation?

- (A) Perfectly inelastic demand for bottles of water.
- (B) Relatively inelastic demand for bottles of water.
- (C) Unit elastic demand for bottles of water.
- (D) Relatively elastic demand for bottles of water.
- (E) Perfectly elastic demand for bottles of water.

What is the correct answer?

To answer this question, you must interpret the data regarding the price and sales of bottles of water.

Consider the data provided that can be used to calculate the elasticity of demand. Elasticity of demand is percent change in quantity demanded divided by the percentage change in price; or you can use the midpoint formula.

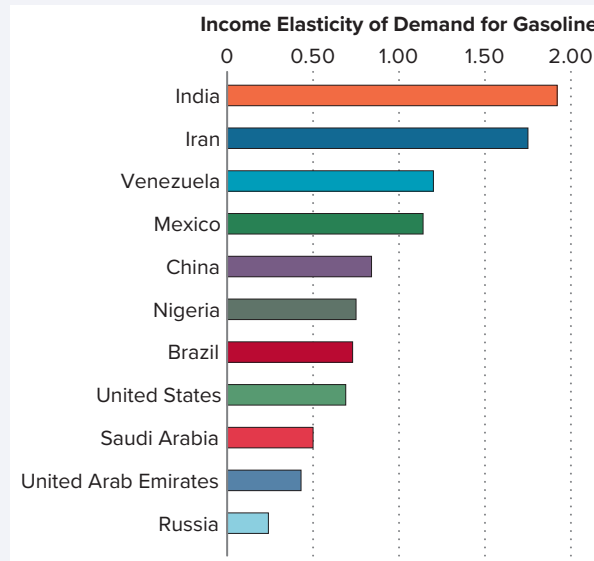
$$E_d = \frac{\text{change in quantity}}{\text{sum of quantities}/2} \div \frac{\text{change in price}}{\text{sum of prices}/2} = \frac{[(450 - 500)/500]}{[(\$3 - \$1)/\$1]}$$

Correct answer is **(B)**

## GLOBAL PERSPECTIVE 4.2

### INCOME ELASTICITY OF DEMAND FOR GASOLINE, SELECTED NATIONS

The income elasticity of gasoline demand varies widely across countries, with larger demand responses found in lower-income countries in which driving is a luxury for much of the population.



**SOURCE** U.S. Energy Information Administration.

## QUICK REVIEW 4.5

- ✓ Price elasticity of supply measures the sensitivity of suppliers to changes in the price of a product. The price-elasticity-of-supply coefficient  $E_s$  is the ratio of the percentage change in quantity supplied to the percentage change in price. The elasticity of supply varies directly with the amount of time producers have to respond to the price change.
- ✓ The cross-elasticity-of-demand coefficient  $E_{xy}$  is computed as the percentage change in the quantity demanded of product X divided by the percentage change in the price of product Y. If the cross-elasticity coefficient is positive, the two products are substitutes; if negative, they are complements.
- ✓ The income-elasticity coefficient  $E_i$  is computed as the percentage change in quantity demanded divided by the percentage change in income. A positive coefficient indicates a normal or superior good. A negative coefficient implies an inferior good.

## LAST WORD

### **Elasticity and Pricing Power: Why different consumers pay different prices**

**firms and nonprofit institutions often recognize and exploit differences in price elasticity of demand.**

All the buyers of a product traded in a highly competitive market pay the same market price for the product, regardless of their individual price elasticities of demand. If the price rises, Jones may have an elastic demand and greatly reduce her purchases. Singh may have a unit-elastic demand and reduce his purchases less than Jones. Lopez may have an inelastic demand and hardly curtail her purchases at all. But all three consumers will pay the single higher price regardless of their respective demand elasticities.

In later chapters, we will find that not all sellers must passively accept a “one-for-all” price. Some firms have “market power” or “pricing power” that allows them to set their product prices in their best interests. For some goods and services, firms may find it advantageous to determine differences in price elasticity of demand and then charge different prices to different buyers.

It is extremely difficult to tailor prices for each customer on the basis of price elasticity of demand, but it is relatively easy to observe differences in group elasticities. Consider airline tickets. Business travelers generally have inelastic demand for air travel. Because their time is highly valuable, they do not see slower modes of transportation as realistic substitutes. Also, their employers pay for their tickets as part of their business expenses. In contrast, leisure travelers tend to have elastic demand. They have the option to drive rather than fly or to simply not travel at all. They also pay for their tickets out of their own pockets and thus are more sensitive to price.

Airlines recognize the difference between the groups in terms of price elasticity of demand and charge business travelers more than leisure travelers. To accomplish that, they have to dissuade business travelers from buying the less expensive round-trip tickets aimed at leisure travelers. One way to do this is by placing restrictions on the lower-priced tickets. For instance, airlines have at times made such tickets nonrefundable, required at least a two-week advance purchase, and required Saturday-night stays. These restrictions chase off most business travelers who engage in last-minute travel and want to be home for the weekend. As a result, a business traveler often pays hundreds of dollars more for a ticket than a leisure traveler on the same plane.

Discounts for children are another example of pricing based on group differences in price elasticity of demand. For many products, children have more elastic demands than adults because children have low budgets, often financed by their parents. Sellers recognize the elasticity difference and price accordingly. The barber spends as much time cutting a child’s hair



as an adult's but charges the child much less. A child takes up a full seat at the baseball game but pays a lower price than an adult. A child snowboarder occupies the same space on a chairlift as an adult snowboarder but qualifies for a discounted lift ticket.



Finally, consider pricing by colleges and universities. Price elasticity of demand for higher education is greater for prospective students from low-income families than similar students from high-income families. This makes sense because tuition is a much larger proportion of household income for a low-income student or family than for a high-income student or family. Desiring a diverse student body, colleges charge different net prices (tuition *minus* financial aid) to the two groups on the basis of price elasticity of demand. High-income students pay full tuition, unless they receive merit-based scholarships. Low-income students receive considerable financial aid in addition to merit-based scholarships and, in effect, pay a lower *net* price.

It is common for colleges to announce a large tuition increase and immediately cushion the news by emphasizing that they also are increasing financial aid. In effect, the college is increasing the tuition for students who have inelastic demand by the full amount and raising the net tuition of those with elastic demand by some lesser amount or not at all. Through this strategy, colleges boost revenue to cover rising costs while maintaining affordability for a wide range of students.

There are a number of other examples of dual or multiple pricing. All relate directly to price elasticity of demand. We will revisit this topic again in Chapter 11 when we analyze *price discrimination*—charging different prices to different customers for the same product.

**Discussion Question:** What is the purpose of charging different prices to different groups of customers? Supplement the two broad examples in the Last Word with two additional examples of your own. (Hint: Think of price discounts based on group characteristics or time of purchase.)

# Chapter 4 Review

## Summary

The demand schedule, or curve, represents buyers' willingness and ability to purchase a product at each of various prices in a specific period. The law of demand describes the relationship between price and quantity demanded. A *change in demand* shifts the market demand curve either left (a decrease in demand) or right (an increase in demand).

The supply schedule or curve shows the amounts of a product that producers are willing to offer in the market at each possible price during a specific period. The law of supply states that, other things equal, producers will offer more of a product at a high price than at a low price. A *change in supply* shifts the curve to left or right.

Price elasticity of demand measures consumer response to price changes. If total revenue changes in the opposite direction from prices, demand is elastic. If price and total revenue change in the same direction, demand is inelastic. Price elasticity of supply measures seller response to price changes. If sellers are sensitive to price changes, supply is elastic. If they are unresponsive, supply is inelastic.

Income elasticity of demand indicates the responsiveness of consumer purchases to a change in income. The coefficient is positive for normal goods and negative for inferior goods. The cross elasticity of demand measures the change in quantity demanded for one product in response to a price change of a related product.

## Key Terms and Concepts

|                            |                                 |                                 |
|----------------------------|---------------------------------|---------------------------------|
| demand 102                 | change in quantity demanded 110 | unit elasticity 121             |
| demand schedule 102        | supply 112                      | perfectly inelastic demand 122  |
| law of demand 104          | supply schedule 112             | perfectly elastic demand 122    |
| income effect 104          | law of supply 113               | total revenue (TR) 123          |
| substitution effect 104    | supply curve 113                | total-revenue test 123          |
| demand curve 105           | determinants of supply 115      | excise tax 130                  |
| determinants of demand 107 | change in supply 116            | price elasticity of supply 132  |
| normal good 108            | change in quantity supplied 117 | immediate market period 133     |
| inferior good 108          | price elasticity of demand 119  | short run 134                   |
| substitute good 109        | midpoint formula 120            | long run 134                    |
| complementary good 109     | elastic demand 121              | cross elasticity of demand 136  |
| change in demand 110       | inelastic demand 121            | income elasticity of demand 138 |

## Discussion Questions

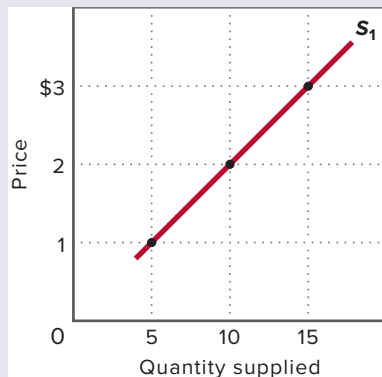
1. What are the determinants of demand? What happens to the demand curve when any of these determinants change? Distinguish between a change in demand and a movement along a fixed demand curve, noting the cause(s) of each.
2. What are the determinants of supply? What happens to the supply curve when any of these determinants change? Distinguish between a change in supply and a change in the quantity supplied, noting the cause(s) of each.
3. You were gifted a box of 50 water bottles with a unique logo that you do not need and you plan to sell them on eBay. You were initially thinking of asking for \$20 per bottle, but then you found out that demand is elastic at \$20. Should you lower your asking price? What if demand were inelastic at \$20?
4. The income elasticities of demand for movies, dental services, and clothing have been estimated to be +3.4, +1.0, and +0.5, respectively. Interpret these coefficients. What does a negative income-elasticity coefficient mean?

## Problems

1. Suppose there are three buyers of candy in a market: Tex, Dex, and Rex. The market demand and the individual demands of Tex, Dex, and Rex are shown in the below table.
  - a. Fill in the missing values.
  - b. Which buyer demands the least at a price of \$5? The most at a price of \$7?
  - c. Which buyer's quantity demanded increases the most when the price decreases from \$7 to \$6?
  - d. In which direction would the market demand curve shift if Tex withdrew from the market? What would happen to the market demand curve if Dex doubled his purchases at each possible price?
  - e. Suppose that at a price of \$6, the total quantity demanded increases from 19 to 38. Is this a "change in the quantity demanded" or a "change in demand"? Explain.

| Price Per Candy | Individual Quantities Demanded |     |     | Total Quantity Demanded |
|-----------------|--------------------------------|-----|-----|-------------------------|
|                 | Tex                            | Dex | Rex |                         |
| \$8             | 3 +                            | 1 + | 0 = | —                       |
| 7               | 8 +                            | 2 + | — = | 12                      |
| 6               | — +                            | 3 + | 4 = | 19                      |
| 5               | 17 +                           | — + | 6 = | 27                      |
| 4               | 23 +                           | 5 + | 8 = | —                       |

2. The figure below shows the supply curve for tennis balls,  $S_1$ , for Drop Volley Tennis, a producer of tennis equipment. Use the figure and the table below to give your answers to the following questions.



- a. Use the figure to fill in the quantity supplied on supply curve  $S_1$  for each price in the following table.

| Price | $S_1$<br>Quantity<br>Supplied | $S_2$<br>Quantity<br>Supplied | Change in<br>Quantity<br>Supplied |
|-------|-------------------------------|-------------------------------|-----------------------------------|
| \$3   | _____                         | 4                             | _____                             |
| 2     | _____                         | 2                             | _____                             |
| 1     | _____                         | 0                             | _____                             |

- b. If production costs were to increase, the quantities supplied at each price would be as shown by the third column of the table (" $S_2$  Quantity Supplied"). Use those data to draw supply curve  $S_2$  on the same graph as supply curve  $S_1$ .
- c. In the fourth column of the table, enter the amount by which the quantity supplied at each price changes due to the increase in product costs. (Use positive numbers for increases and negative numbers for decreases.)
- d. Did the increase in production costs cause a "decrease in supply" or a "decrease in quantity supplied"? Explain.

3. Graph the accompanying demand data, and then use the midpoint formula for  $E_d$  to determine price elasticity of demand for each of the four possible \$1 price changes. What can you conclude about the relationship between the slope of a curve and its elasticity? Explain why demand is elastic in the northwest segment of the demand curve and inelastic in the southeast segment.

| Product Price | Quantity Demanded |
|---------------|-------------------|
| \$5           | 1                 |
| 4             | 2                 |
| 3             | 3                 |
| 2             | 4                 |
| 1             | 5                 |

4. Calculate total-revenue data from the demand schedule in problem 3. Graph total revenue below your demand curve. Generalize about the relationship between price elasticity and total revenue.

## AP Exam Practice

### Multiple Choice

**Directions:** Each of the questions or incomplete statements below is followed by five answers or completions. Select the one that is best in each case.

- Forgs are a new consumer product. Which of the following would increase the demand for Forgs?
  - A decrease in income if Forgs are a normal good.
  - A decrease in the price of Forgs.
  - A decrease in the popularity of Forgs.
  - A decrease in the price of Borgs, a substitute for Forgs.
  - Consumers expect a higher price of Forgs in the near future.
- Consider the supply of coffee. Which of the following would decrease the supply of coffee?
  - Wages fall for workers that harvest coffee beans.
  - Climate change damages the coffee bean crops.
  - The price of coffee falls.
  - The price of tea falls.
  - Research produces coffee beans that grow more quickly to maturity.
- When the price of quesadillas is \$4, Joan buys 4 in a month. When the price of quesadillas is \$3, Joan buys 5 in a month. Using the midpoint formula, Joan's price elasticity of demand is equal to
  - 1
  - 0.78
  - 0.61
  - 1.65
  - 0
- Which of the following products most likely has a negative income elasticity of demand?
  - Art museum tickets
  - Wireless headphones
  - Day old doughnuts
  - Landscaping services
  - Hiking boots
- Hamzeh sells cups of tea and needs to increase total revenue by approximately 5%. If Hamzeh knows that the price elasticity of demand for his tea is equal to 2, he must
  - decrease price by approximately 10%.
  - decrease price by approximately 5%.
  - decrease price by approximately 2.5%.
  - decrease price by approximately 1.5%.
  - increase price by approximately 2%.

## Free Response

**Directions: Respond to all parts of the question. Use correctly-labeled diagrams, if useful or required, in explaining your answers. A correctly-labeled diagram must have all axes and curves clearly labeled and must show directional changes.**

The local market for Forgs has three suppliers: Hal, Ohura, and Ripley. The individual short-run supply schedules are provided in the table below.

- In a correctly labeled graph, based on values from the table, plot the market supply curve at prices of \$5 and \$7.
  - Calculate the price elasticity of supply between the prices of \$5 and \$7. Show your work.
  - Suppose that a fourth supplier, Kirk, begins to produce Forgs. Kirk's supply is perfectly inelastic at a quantity of 5 units. How will Kirk's presence in the market affect the market supply curve? Explain.
- Adjust your graph from part (a) to reflect the fourth supplier's presence in the market.
  - Is the price elasticity of supply in the long run likely to be greater than, smaller than, or the same as the value you calculated in part (b)? Explain.

| Price per Forg | Hal's quantity supplied | Ohura's quantity supplied | Ripley's quantity supplied |
|----------------|-------------------------|---------------------------|----------------------------|
| \$2            | 1                       | 0                         | 0                          |
| \$3            | 2                       | 1                         | 0                          |
| \$4            | 3                       | 2                         | 1                          |
| \$5            | 4                       | 3                         | 2                          |
| \$6            | 5                       | 4                         | 3                          |
| \$7            | 6                       | 5                         | 4                          |