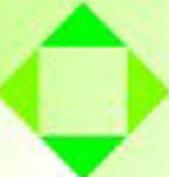


# MICROECONOMICS

CANADA IN THE GLOBAL ENVIRONMENT NINTH EDITION



PARKIN



BADE

# MICROECONOMICS

CANADA IN THE GLOBAL ENVIRONMENT **NINTH EDITION**

# MyEconLab® Provides the Power of Practice

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

## Study Plan

The Study Plan shows you the sections you should study next, gives easy access to practice problems, and provides you with an automatically generated quiz to prove mastery of the course material.

This screenshot shows the 'Study Plan' section of the MyEconLab platform. At the top, there's a navigation bar with 'Account', 'Help & Support', and 'Sign Out'. Below it, the 'MyEconLab' logo is visible. The main area is titled 'Study Plan' under 'Economics > STUDY PLAN'. It displays a message: 'You have earned 0 of 150 mastery points (MP). Practice these sections and then take a Quiz Me to prove mastery and earn more points.' There are two tabs: 'Sections to practice and master' and 'View all chapters'. Under 'Sections to practice and master', there are five items: '0.1 Tutorial Examples for Students', '1.1 Three Key Economic Ideas', '1.2 The Economic Problem That Every Society Must Solve', '1.3 Economic Models', and '1.4 Microeconomics and Macroeconomics'. Each item has a 'Practice' button and a 'Quiz Me' button. On the right side, there's a 'Legend' icon and a 'View progress' link. At the bottom, the 'MyEconLab' logo and 'with KNEWTON Adaptive Learning' are shown.

## Unlimited Practice

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

This screenshot shows a 'Homework: Assignment 3' interface. The assignment title is 'Chapter Problem 6' with '0 of 6 complete'. The problem statement is: 'OPEC deadlocked on oil production hike. Oil prices breached the \$100-a-barrel mark Wednesday after OPEC said it could not reach an agreement about raising crude production. Source: CNN Money, June 8, 2011'. The task is to 'Consider the market for oil when oil prices "breached the \$100-a-barrel mark". Draw a demand curve and a supply curve consistent with this information. Label both curves. Draw a point at the equilibrium price and equilibrium quantity. Label it 1.' A green box with a checkmark says 'Excellent!' with the message: 'Initially the price of a barrel of oil is greater than \$100. When OPEC members agree to increase production, the supply of oil increases and the supply curve shifts rightward. The equilibrium price of a barrel of oil falls and the equilibrium quantity increases.' Buttons for 'Done', 'Clear All', 'Check Answer', and 'Save' are at the bottom. To the left, there's a sidebar with 'All parts showing' and a 'Help' icon.

## Learning Resources

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

- **Help Me Solve This** learning aids help you break down a problem much the same way as an instructor would do during office hours. Help Me Solve This is available for select problems.
- **eText links** are specific to the problem at hand so that related concepts are easy to review just when they are needed.
- A **graphing tool** enables you to build and manipulate graphs to better understand how concepts, numbers, and graphs connect.

# MyEconLab®

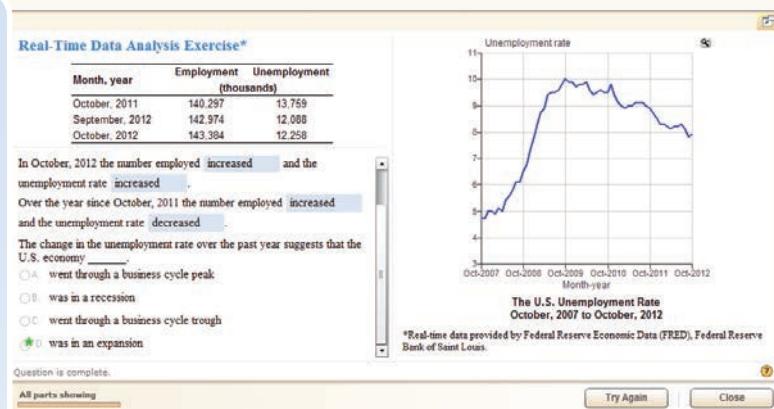
Find out more at [www.myeconlab.com](http://www.myeconlab.com)

## Real-Time Data Analysis Exercises

Up-to-date macro data is a great way to engage in and understand the usefulness of macro variables and their impact on the economy. Real-Time Data Analysis exercises communicate directly with the Federal Reserve Bank of St. Louis's FRED site, so every time FRED posts new data, students see new data.

End-of-chapter exercises accompanied by the Real-Time Data Analysis icon  include Real-Time Data versions in **MyEconLab**.

Select in-text figures labelled **MyEconLab** Real-Time Data update in the electronic version of the text using FRED data.



Real-Time Data Analysis Exercise\*

Month, year	Employment (thousands)	Unemployment
October, 2011	140,297	13,759
September, 2012	142,974	12,088
October, 2012	143,384	12,258

In October, 2012 the number employed increased \_\_\_\_\_ and the unemployment rate increased \_\_\_\_\_. Over the year since October, 2011 the number employed increased \_\_\_\_\_ and the unemployment rate decreased \_\_\_\_\_.

The change in the unemployment rate over the past year suggests that the U.S. economy \_\_\_\_\_.

- A went through a business cycle peak
- B was in a recession
- C went through a business cycle trough
- D was in an expansion

Question is complete.

All parts showing

The U.S. Unemployment Rate  
October, 2007 to October, 2012

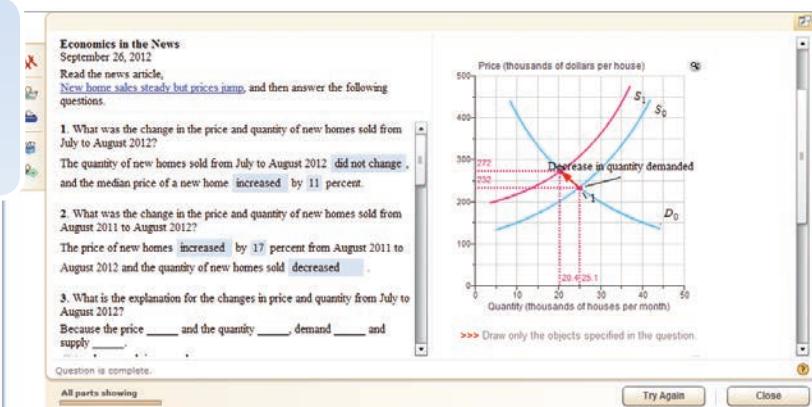
\*Real-time data provided by Federal Reserve Economic Data (FRED), Federal Reserve Bank of St. Louis.

Try Again

Close

## Current News Exercises

Posted weekly, we find the latest microeconomic and macroeconomic news stories, post them, and write auto-graded multi-part exercises that illustrate the economic way of thinking about the news.



Economics in the News  
September 26, 2012  
Read the news article, [New home sales steady but prices jump](#), and then answer the following questions.

1. What was the change in the price and quantity of new homes sold from July to August 2012?  
The quantity of new homes sold from July to August 2012 did not change, and the median price of a new home increased by 11 percent.

2. What was the change in the price and quantity of new homes sold from August 2011 to August 2012?  
The price of new homes increased by 17 percent from August 2011 to August 2012 and the quantity of new homes sold decreased.

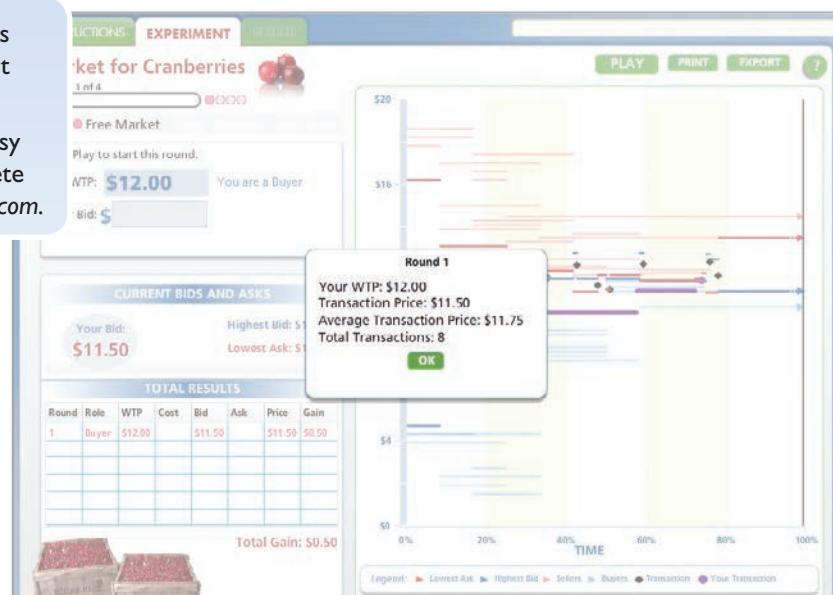
3. What is the explanation for the changes in price and quantity from July to August 2012?  
Because the price \_\_\_\_\_ and the quantity \_\_\_\_\_ demand \_\_\_\_\_ and supply \_\_\_\_\_.

Question is complete.  
All parts showing

## Interactive Homework Exercises

Participate in a fun and engaging activity that helps promote active learning and mastery of important economic concepts.

Pearson's experiments program is flexible and easy for instructors and students to use. For a complete list of available experiments, visit [www.myeconlab.com](http://www.myeconlab.com).



EXPERIMENT

Market for Cranberries  
1 of 4

Free Market

Play to start this round.

WTP: \$12.00 You are a Buyer

Bid: \$

CURRENT BIDS AND ASKS

Your Bid: \$11.50  
Highest Bid: \$11.50  
Lowest Ask: \$11.50

TOTAL RESULTS

Round	Role	WTP	Cost	Bid	Ask	Price	Gain
1	Buyer	\$12.00	\$11.50	\$11.50	\$11.50	\$11.50	\$0.50

Total Gain: \$0.50

Round 1  
Your WTP: \$12.00  
Transaction Price: \$11.50  
Average Transaction Price: \$11.75  
Total Transactions: 8

OK

Legend: Lowest Ask, Highest Bid, Sellers, Buyers, Transaction, Your Transaction

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# MICROECONOMICS

CANADA IN THE GLOBAL ENVIRONMENT **NINTH EDITION**



MICHAEL PARKIN  ROBIN BADE

PEARSON

Toronto

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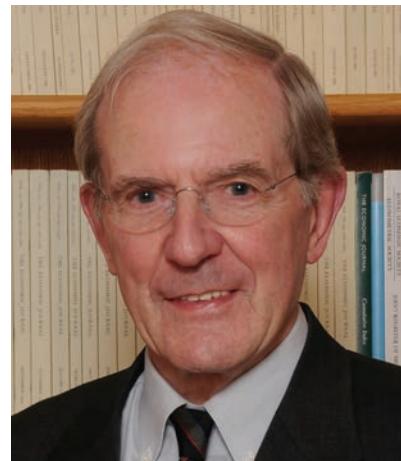
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TO OUR STUDENTS

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**Michael Parkin** received his training as an economist at the Universities of Leicester and Essex in England. He is Professor Emeritus in the Department of Economics at the University of Western Ontario, Canada. Professor Parkin has held faculty appointments at Brown University, the University of Manchester, the University of Essex, and Bond University. He is a past president of the Canadian Economics Association and has served on the editorial boards of the *American Economic Review* and the *Journal of Monetary Economics* and as managing editor of the *Canadian Journal of Economics*. Professor Parkin's research on macroeconomics, monetary economics, and international economics has resulted in over 160 publications in journals and edited volumes, including the *American Economic Review*, the *Journal of Political Economy*, the *Review of Economic Studies*, the *Journal of Monetary Economics*, and the *Journal of Money, Credit and Banking*. He became most visible to the public with his work on inflation that discredited the use of wage and price controls. Michael Parkin also spearheaded the movement towards European monetary union.



**Robin Bade** earned degrees in mathematics and economics at the University of Queensland and her Ph.D. at the Australian National University. She has held faculty appointments at the University of Edinburgh in Scotland, at Bond University in Australia, and at the Universities of Manitoba, Toronto, and Western Ontario in Canada. Her research on international capital flows appears in the *International Economic Review* and the *Economic Record*.

Professor Parkin and Dr. Bade are the joint authors of *Foundations of Economics* (Addison Wesley), *Modern Macroeconomics* (Pearson Education Canada), an intermediate text, and have collaborated on many research and textbook writing projects. They are both experienced and dedicated teachers of introductory economics.



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## PART ONE **INTRODUCTION** 1

- CHAPTER 1 What Is Economics? 1  
CHAPTER 2 The Economic Problem 31

## PART TWO **HOW MARKETS WORK** 55

- CHAPTER 3 Demand and Supply 55  
CHAPTER 4 Elasticity 83  
CHAPTER 5 Efficiency and Equity 105  
CHAPTER 6 Government Actions in Markets 127  
CHAPTER 7 Global Markets in Action 151

## PART THREE **HOUSEHOLDS' CHOICES** 177

- CHAPTER 8 Utility and Demand 177  
CHAPTER 9 Possibilities, Preferences, and Choices 201

## PART FOUR **FIRMS AND MARKETS** 223

- CHAPTER 10 Organizing Production 223  
CHAPTER 11 Output and Costs 247  
CHAPTER 12 Perfect Competition 271  
CHAPTER 13 Monopoly 297  
CHAPTER 14 Monopolistic Competition 323  
CHAPTER 15 Oligopoly 341

## PART FIVE **MARKET FAILURE AND GOVERNMENT** 369

- CHAPTER 16 Externalities 369  
CHAPTER 17 Public Goods and Common Resources 391

## PART SIX **FACTOR MARKETS AND INEQUALITY** 413

- CHAPTER 18 Markets for Factors of Production 413  
CHAPTER 19 Economic Inequality 439

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**The future is always uncertain.** But at some times, and now is one such time, the range of possible futures is enormous. The major sources of this uncertainty are economic policy and global macroeconomic forces. There is uncertainty about the way in which international trade policy will evolve as bilateral deals reshape the competitive landscape. There is uncertainty about exchange rate policy as currency fluctuations bring changes in international relative prices. There is extraordinary uncertainty about monetary policy with the Bank of Canada holding interest rates at historical lows in an attempt to stimulate a flagging economy. And there is uncertainty about fiscal policy as provincial budget deficits interacting with an aging population are ever harder to control. In the global economy, there is uncertainty about when, or even whether, a stagnating European economy will start to show life. And there is uncertainty about how fast China, India, and other developing economies will grow.

Since the global financial crisis of August 2007 moved economics from the business report to the front page, a fall in confidence has gripped producers, consumers, financial institutions, and governments.

Even the idea that the market is an efficient allocation mechanism has come into question. Many thoughtful people worry about increasing income inequality, and some political leaders called for the end of capitalism and the dawn of a new economic order in which tighter regulation reined in unfettered greed.

Rarely do teachers of economics have such a rich feast on which to draw. And rarely are the principles of economics more surely needed to provide the solid foundation on which to think about economic events and navigate the turbulence of economic life.

Although thinking like an economist can bring a clearer perspective to and deeper understanding of today's events, students don't find the economic way of thinking easy or natural. *Microeconomics* seeks to put clarity and understanding in the grasp of the student with a careful and vivid exploration of the tension between self-interest and the social interest, the role and power of incentives—of opportunity cost and marginal benefit—and demonstrating the possibility that markets supplemented by other mechanisms might allocate resources efficiently.

Parkin-Bade students begin to think about issues the way real economists do and learn how to explore policy problems and make better-informed decisions in their own economic lives.

## The Ninth Edition Revision

Thoroughly updated, intuitive rather than technical, grounded in data and empirical evidence, extensively illustrated with well-chosen examples and photographs, enlivened with applications that focus on issues at play in today's world, focused on learning by doing, and seamlessly integrated with MyEconLab: These are the hallmarks of this ninth edition of *Microeconomics: Canada in the Global Environment*.

This revision builds on the foundation of the previous edition and retains a thorough and careful presentation of the principles of economics, an emphasis on real-world examples and applications, the development of critical thinking skills, diagrams renowned for clarity, and path-breaking technology.

**Most chapters have been thoroughly reworked to achieve even greater clarity and to place greater emphasis on applications to current issues.** Some sections of chapters have been removed and other sections added to cover new issues, particularly those that involve current policy problems.

**Economics in the News**, a weekly feature on MyEconLab, appears in the revised text in two ways. First, the Parkin-Bade hallmark chapter-closing *Reading Between the Lines* is rebranded as *Economics in the News*. Second, additional *Economics in the News* boxes appear at appropriate points within chapters.

The aim of the end-of-chapter news feature is to encourage students to apply the tools they have learned in the chapter by analyzing an article from a newspaper or an online news source. The news article connects with the questions first raised in the chapter opener, and the analysis is reinforced with a related end-of-chapter problem.

Shorter, within-chapter *Economics in the News* boxes present brief news clips, relevant data, questions, and worked solutions. These boxes immediately apply a tool just explained and provide hand-held practice and help in approaching an economic analysis of the news.

A second new feature, **At Issue**, shows two sides of a controversial issue and helps students apply the economic way of thinking to clarify and debate the issues.

A third new feature is a full-page end-of-chapter **Worked Problem**. As part of the chapter review, the student has an opportunity to work a multi-part problem that covers the core content of the chapter and consists of questions, solutions, and key figures. This new feature increases the incentive for the student to learn by doing and actively, rather than passively, review the chapter.

## Highpoints of the Revision

In addition to the new features that we have just reviewed, we have built on the strengths of the previous edition by substantially revising the following two topics. They are:

- Price discrimination
- Carbon emissions and climate change externalities

**Price Discrimination** Chapter 13, Monopoly, has revised coverage of price discrimination, which emphasizes the key idea that price discrimination converts consumer surplus into producer surplus and economic profit. To strengthen this insight, we now begin with a brief explanation of the relationship between producer surplus and economic profit. We then use a carefully constructed model of two separated markets to show how discrimination between them can increase producer surplus. We build on this model to show how perfect price discrimination, if it were possible, would grab the entire consumer surplus and convert it to producer surplus. We illustrate the attempt to move toward perfect price discrimination with applications to Microsoft's pricing of Windows and Disney's pricing of tickets to its theme parks.

### Carbon Emissions and Climate Change

**Externalities** Chapter 16, Externalities, gets a thoroughly new treatment of carbon emission and climate change. We begin by contrasting the success story of local air quality in the major cities with the unrelenting rise in atmospheric carbon concentration. We then explain the three methods of coping with environmental externalities: property rights, mandating the use of clean technologies, and taxing or pricing emissions. We explore the ability of each method to achieve an efficient outcome. We also explore the special challenge that arises from the global rather than national scope of carbon emission. The climate change debate appears in an *At Issue*, which contrasts the views of Nicholas Stern and environmental skeptic Bjørn Lomborg.

Many other chapters have been thoroughly reworked to achieve even greater clarity and to place greater emphasis on applications to current issues. And every chapter now contains a new opening vignette linked directly to an *Economics in the News*, an end-of-chapter problem, and online practice.

All the end-of-chapter *Economics in the News* articles have been updated, and the analysis of the news and the linked problems and applications have been appropriately revised.



## Features to Enhance Teaching and Learning

The changes that we have described are adjustments to an already powerful teaching and learning package. Here, we briefly review the features retained from the previous edition.

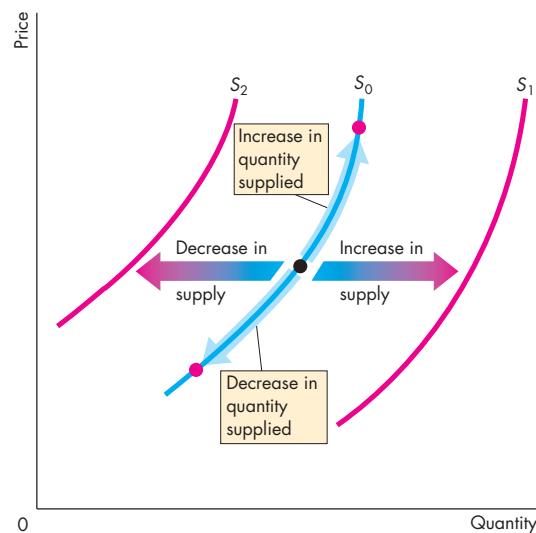
### Diagrams That Show the Action

Through the past eight editions, this book has set the standard of clarity in its diagrams; the ninth edition continues to uphold this tradition. Our goal is to show "where the economic action is." The diagrams in this book continue to generate an enormously positive response, which confirms our view that graphical analysis is the most powerful tool available for teaching and learning economics at the principles level.

Because many students find graphs hard to work with, we have developed the entire art program with the study and review needs of the student in mind.

The diagrams feature:

- Original curves consistently shown in blue
- Shifted curves, equilibrium points, and other important features highlighted in red
- Colour-blended arrows to suggest movement
- Graphs paired with data tables
- Diagrams labelled with boxed notes
- Extended captions that make each diagram and its caption a self-contained object for study and review



## Economics in Action Boxes

This feature uses boxes within the chapter to provide data and information that links models to real-world economic activity.

Some of the issues covered in these boxes include the best affordable choice of recorded music, movies, and DVDs; the cost of selling a pair of shoes; how Apple doesn't make the iPhone; taxing carbon emissions; how long a spell of poverty lasts; structural unemployment in Canada; how loanable funds fuel a home price bubble; the Canadian business cycle; and the size of the fiscal stimulus multipliers.

## Chapter Openers

Each chapter opens with a student-friendly vignette that raises questions to motivate the student and focus the chapter. This chapter-opening story is woven into the main body of the chapter and is explored in the *Economics in the News* feature that closes each chapter.

## In-Text Review Quizzes

A review quiz at the end of each major section enables students to determine whether a topic needs further study before moving on. This feature includes a reference to the appropriate MyEconLab study plan and a new **key terms quiz** to help students further test their understanding.

## End-of-Chapter Study Material

Each chapter closes with a concise summary organized by major topics, a list of key terms with page references, a worked problem, and problems and applications. These learning tools provide students with a summary for review and exam preparation.

## Interviews with Economists

Each part closes with an overview of the chapters and a teaser of an interview with a leading economist whose work correlates to what the student is learning. These interviews explore the education and research of these prominent economists and their advice for those who want to continue the study of economics. This edition has new interviews with Esther Duflo (MIT) and Raj Chetty (Harvard). The 65 past and present interviews we have conducted are available in full in MyEconLab.

## For the Instructor

This book enables you to focus on the economic way of thinking and choose your own course structure in your principles course.

## Focus on the Economic Way of Thinking

As an instructor, you know how hard it is to encourage a student to think like an economist. But that is your goal. Consistent with this goal, the text focuses on and repeatedly uses the central ideas of choice; tradeoff; opportunity cost; the margin; incentives; the gains from voluntary exchange; the forces of demand, supply, and equilibrium; the pursuit of economic rent; the tension between self-interest and the social interest; and the scope and limitations of government actions.

## Flexible Structure

You have preferences for how you want to teach your course, and we've organized this book to enable you to choose your teaching path. The charts on p. xxiii illustrate the book's flexibility. By following the arrows through the charts you can select the path that best fits your preference for course structure. Whether you want to teach a traditional course that blends theory and policy, or one that takes a fast-track through either theory or policy issues, *Microeconomics: Canada in the Global Environment* gives you the choice.

## Instructor's Supplemental Resources

The supplements for instructors are:

- Test Bank
- PowerPoint Resources
- Instructor's Manual
- Solutions Manual

**Test Bank** The ninth edition Test Bank (Test Item File), with more than 3,000 multiple-choice questions, has been prepared by Jeannie Gillmore of the University of Western Ontario. Jeannie has reviewed and edited all existing questions to ensure their clarity and consistency with the ninth edition and incorporated new questions. The new questions follow the style and format of the end-of-chapter text problems and provide the instructor with a whole

new set of testing opportunities and/or homework assignments. Test Item File questions are available in MyEconLab for instructors to use in a test, quiz, or as homework.

Pearson's **Computerized Test Bank** allows instructors to filter and select questions to create quizzes, tests, or homework. Instructors can revise questions or add their own, and may be able to choose print or online options. These questions are also available in Microsoft Word® format.

**PowerPoint Resources** Our full-colour Microsoft PowerPoint® Presentations for each chapter contain:

- Lecture notes with all the textbook figures animated, tables from the textbook, and speaking notes from the Instructor's Manual
- Large-scale versions of all the textbook figures and tables, animated for instructors to incorporate into their own slide shows
- A set of lecture notes for students, which include animated versions of the textbook figures

The presentations can be used electronically in the classroom or printed to create hard-copy transparency masters. A student version of the lecture notes is also available on MyEconlab.

**Instructor's Manual** Our Instructor's Manual integrates the teaching and learning resources and serves as a guide to all the supplements. Each chapter contains an overview, a list of what's new in the ninth edition, and ready-to-use lecture notes.

A new user can walk into a classroom armed to deliver a polished lecture. The lecture notes provide an outline of the chapter; concise statements of key material; alternative tables and figures; key terms and definitions; boxes that highlight key concepts, provide an interesting anecdote, or suggest how to handle a difficult idea; and additional discussion questions. The PowerPoint® lecture notes incorporate the chapter outlines and teaching suggestions.

**Solutions Manual** Our comprehensive Solutions Manual provides instructors with solutions to the Review Quizzes and the end-of-chapter Problems and Applications.

## Getting Your Instructor's Resources

Instructors can download supplements from a secure, instructor-only source via the Pearson Canada Higher Education Instructor Resource Centre Web page ([www.pearsoncanada.ca/highered](http://www.pearsoncanada.ca/highered)). Instructor resources are also available on a DVD.

**Instructor's Resource Centre DVD (IRDVD)** Fully compatible with Windows and Macintosh, this IRDVD contains Adobe PDF files of the Test Item File, the Solutions Manual, and the Instructor's Manual; PowerPoint resources; and the TestGen. Locate your local Pearson Canada sales representative at <http://catalogue.pearsoned.ca/educator> to request a copy of the IRDVD.

## Other Instructor Aids

**CourseSmart** CourseSmart goes beyond traditional expectations—providing instant, online access to the textbooks and course materials you need at a lower cost for students. And even as students save money, you can save time and hassle with a digital eTextbook that allows you to search for the most relevant content at the very moment you need it. Whether it's evaluating textbooks or creating lecture notes to help students with difficult concepts, CourseSmart can make life a little easier. See how when you visit [www.coursesmart.com/instructors](http://www.coursesmart.com/instructors).

**Learning Solutions Managers** Pearson's Learning Solutions Managers work with faculty and campus course designers to ensure that Pearson technology products, assessment tools, and online course materials are tailored to meet your specific needs.

This highly qualified team is dedicated to helping schools take full advantage of a wide range of educational resources by assisting in the integration of a variety of instructional materials and media formats. Your local Pearson Canada sales representative can provide you with more details on this service program.

**Pearson Custom Library** For enrollments of 25 students or more, you can create your own textbook by choosing the chapters of Parkin-Bade *Microeconomics* that best suit your own course needs. To begin building your custom text, visit [www.pearsoncustomlibrary.com](http://www.pearsoncustomlibrary.com).

 **MyEconLab**

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

- All of the Review Quiz questions and end-of-chapter Problems and Applications were recreated as assignable auto-graded exercises with targeted feedback and related “Help Me Solve This” tools by Robin Bade, Jeannie Gillmore of the University of Western Ontario, and Sharmistha Nag of Fairleigh Dickinson University, and were reviewed for accuracy by Trevor Collier of the University of Dayton.
- All of the Review Quiz questions and end-of-chapter Problems and Applications are assignable and automatically graded in MyEconLab.
- The Review Quiz questions and end-of-chapter Study Plan Problems and Applications are available for students to work in the adaptive Study Plan.
- The end-of-chapter Additional Problems and Applications are not available to students in MyEconLab unless assigned by the instructor.
- Many of the problems and applications are algorithmic, draw-graph, and numerical exercises.
- Problems and applications that use real-time data continuously update.
- The Custom Exercise Builder enables instructors to create their own problems for assignment.
- The Gradebook records each student’s performance and time spent on the Tests and Study Plan and generates reports by student or by chapter.
- Test Bank questions are also assignable for test, quiz, or homework and auto-graded in MyEconLab.

### Enhanced Pearson eText and New Interactive Features

New for the ninth edition is an enhanced Pearson eText that integrates directly with MyEconLab’s Study Plan, now powered by Knewton Adaptive Learning, and with MyEconLab’s Gradebook.

The enhanced Pearson eText is available within the online course materials and offline via an iPad

app. The eText also allows instructors and students to highlight, bookmark, and take notes. In addition, instructors can create notes and push them out to students.

The new eText includes videos, animations, and problem-solving tools designed to aid comprehension and bring those moments of discovery that stick in the memory.

The features of the enhanced eText include:

- Embedded MyEconLab Study Plan and assessment
- Figure animations
- Interactive graph-drawing exercises
- More *Economics in the News*
- Worked problems
- Key terms quizzes

#### Embedded MyEconLab Study Plan and Assessment

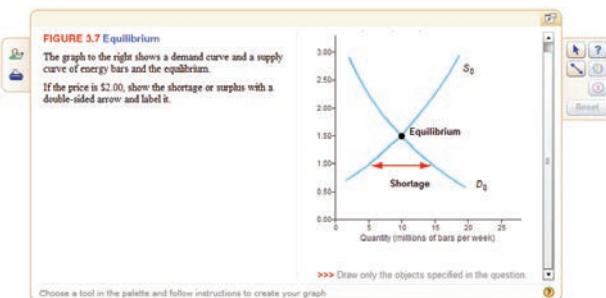
**Assessment** In the enhanced eText, every Review Quiz question and Study Plan Problem and Application exercise can be worked by the student directly from the eText page on which it occurs. These exercises are auto-graded and feed into MyEconLab’s Adaptive Study Plan, where students receive recommendations based upon their performance. Study Plan links provide opportunities for more practice with problems similar to those in the text and give targeted feedback to guide the student in answering the exercises.

**Figure Animations** Every textbook figure can be worked through using a step-by-step animation, with audio, to help students learn the intuition behind reading and interpreting graphs. These animations may be used for review or as an instructional aid in the classroom.

**More Economics in the News** Each in-text *Economics in the News* is reinforced through an extended application of the same analysis. These *Economics in the News* problems are auto-graded and feed into MyEconLab’s Adaptive Study Plan.

**Worked Problems** Each chapter concludes with a Worked Problem that consists of questions, solutions, and key figures. These problems can be worked in the enhanced eText directly from the Worked Problem page. As the student works through each problem, feedback and just-in-time learning aids help the student develop proficiency with the concept.

**Interactive Draw-Graph Exercises** For each major figure, a graph-drawing exercise accompanies the step-by-step animation. The student builds and interprets the key graphs and develops understanding by working a multiple-choice question about the graph. Each graph-drawing exercise is auto-graded and feeds into MyEconLab's Adaptive Study Plan.



**Key Terms Quizzes** Key Terms Quiz links provide opportunities for students to check their knowledge of the definitions and uses of the key terms.

## Other MyEconLab Features

MyEconLab also includes the following features:

**Adaptive Learning** MyEconLab's Study Plan is now powered by a sophisticated adaptive learning engine that tailors learning material to meet the unique needs of each student. MyEconLab's new **Adaptive Learning Study Plan** monitors students' performance on homework, quizzes, and tests and continuously makes recommendations based on that performance.

If a student is struggling with a concept such as supply and demand, or having trouble calculating a price elasticity of demand, the Study Plan provides customized remediation activities—a pathway based on personal proficiencies, the number of attempts, or the difficulty of the questions—to get the student back on track. Students will also receive recommendations for additional practice in the form of rich multimedia learning aids such as videos, an interactive eText, Help Me Solve This tutorials, and graphing tools.

The Study Plan can extrapolate a student's future trouble spots and provide learning material and practice to avoid pitfalls. In addition, students who are showing a high degree of success with the assessment

material are offered a chance to work on future topics based on the professor's course coverage preferences. This personalized and adaptive feedback and support ensures that your students are optimizing their current and future course work and mastering the concepts, rather than just memorizing and guessing answers.

You can learn more about adaptive learning at <http://www.myeconlab.com/product-info/adaptive>.

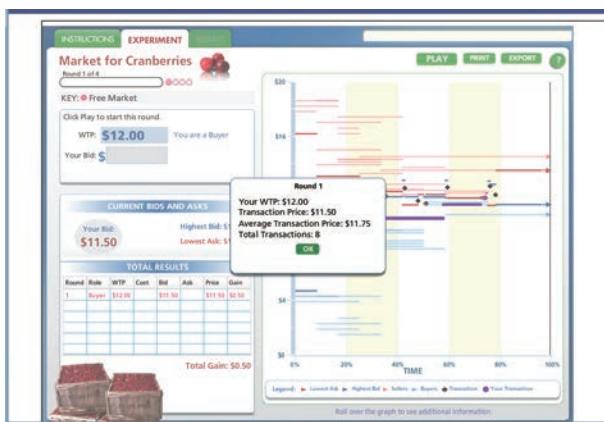
**Economics in the News** *Economics in the News* is a turnkey solution to bringing current news into the classroom. Updated weekly during the academic year, we upload two relevant articles (one micro, one macro) and provide questions that may be assigned for homework or for classroom discussion.

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

**Office Hours** Students and instructors can consult the authors using the "Office Hours" links in MyEconLab. The link for students is in Chapter Resources and for Instructors in Instructor Resources/Instructor Tools.

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

- Available experiments cover competitive market, price floors, price ceilings, taxes, price controls, and public goods.
- Single-player experiments, available to assign, allow your students to play against virtual players from anywhere at any time as long as they have an Internet connection.
- Multi-player experiments allow you to assign and manage a real-time experiment with your class.
- Experiments can be assigned in MyEconLab as homework integrated with pre-questions and post-questions.
- Experiments are auto-graded using algorithms that objectively evaluate a student's economic gain and performance during the experiment.



**Digital Interactives** A Digital Interactive is a simulation game that immerses the student in an activity that leads to the discovery of a fundamental economic idea or principle. Digital Interactives are designed for use in traditional, online, and hybrid courses, and many incorporate real-time data as well as data display and analysis tools. A Digital Interactive can be presented in class as a visually stimulating, engaging lecture tool, and can be assigned with assessment questions for grading analysis tools.

**Learning Catalytics** Learning Catalytics is a web-based system for managing the interactive classroom. It is a “bring your own device” platform that supports the peer-instruction teaching method and can also be used to provide the instructor with real-time feedback during class. Instructors can access 18 different question types among which are multiple choice, numerical, sketching, ranking, and highlighting. For more information, visit [learningcatalytics.com](http://learningcatalytics.com).

**Dynamic Study Modules** Dynamic Study Modules, which focus on key topic areas and are available from within MyEconLab, are an additional way for students to obtain tailored help. These modules work by continuously assessing student performance and activity on discrete topics and provide personalized content in real time to reinforce concepts that target each student’s particular strengths and weaknesses.

Each Dynamic Study Module, accessed by computer, smartphone, or tablet, promotes fast learning and long-term retention. Because MyEconLab and Dynamic Study Modules help students stay on track and achieve a higher level of subject-matter mastery, more class time is available for interaction,

discussion, collaboration, and exploring applications to current news and events.

Instructors can register, create, and access all of their MyEconLab courses at [www.myeconlab.com](http://www.myeconlab.com).

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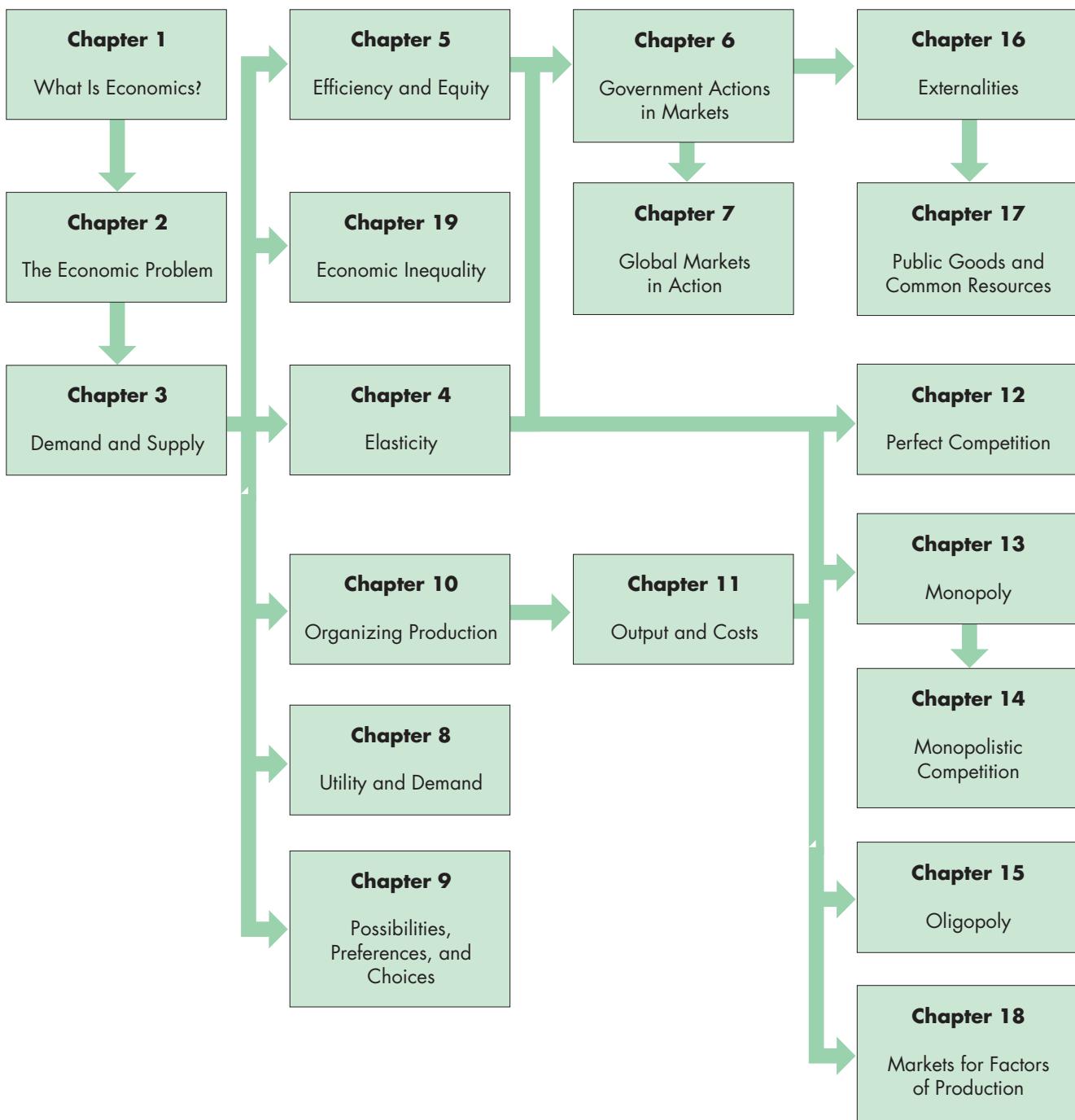
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# ALTERNATIVE PATHWAYS THROUGH THE CHAPTERS

## Flexibility



Start here ...

... then jump to  
any of these ...

... and jump to any of these after  
doing the prerequisites indicated

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**PART ONE**  
**INTRODUCTION 1**

<b>CHAPTER 1 ◆ WHAT IS ECONOMICS? 1</b>
Definition of Economics 2
Two Big Economic Questions 3
What, How, and For Whom? 3
Do Choices Made in the Pursuit of Self-Interest also Promote the Social Interest? 5
The Economic Way of Thinking 9
A Choice Is a Tradeoff 9
Making a Rational Choice 9
Benefit: What You Gain 9
Cost: What You <i>Must</i> Give Up 9
How Much? Choosing at the Margin 10
Choices Respond to Incentives 10
Economics as Social Science and Policy Tool 11
Economist as Social Scientist 11
Economist as Policy Adviser 11
■ <b>AT ISSUE 8</b>
■ <b>ECONOMICS IN THE NEWS 6, 12</b>

*Summary (Key Points and Key Terms), Worked Problem, Study Plan Problems and Applications, and Additional Problems and Applications appear at the end of each chapter.*

**APPENDIX Graphs in Economics 15**
**Graphing Data 15**

Scatter Diagrams 16

**Graphs Used in Economic Models 18**

Variables That Move in the Same Direction 18

Variables That Move in Opposite Directions 19

Variables That Have a Maximum or a Minimum 20

Variables That Are Unrelated 21

**The Slope of a Relationship 22**

The Slope of a Straight Line 22

The Slope of a Curved Line 23

**Graphing Relationships Among More Than Two Variables 24**

*Ceteris Paribus* 24

When Other Things Change 25

**MATHEMATICAL NOTE**

Equations of Straight Lines 26

**CHAPTER 2 ◆ THE ECONOMIC PROBLEM** 31

Production Possibilities and Opportunity Cost 32

- Production Possibilities Frontier 32
- Production Efficiency 33
- Tradeoff Along the *PPF* 33
- Opportunity Cost 33

Using Resources Efficiently 35

- The *PPF* and Marginal Cost 35
- Preferences and Marginal Benefit 36
- Allocative Efficiency 37

Economic Growth 38

- The Cost of Economic Growth 38
- A Nation's Economic Growth 39

Gains from Trade 40

- Comparative Advantage and Absolute Advantage 40
- Achieving the Gains from Trade 42

Economic Coordination 44

- Firms 44
- Markets 44
- Property Rights 44
- Money 44
- Circular Flows Through Markets 44
- Coordinating Decisions 45

■ ECONOMICS IN ACTION 39

■ ECONOMICS IN THE NEWS 34, 46

**PART ONE WRAP-UP ◆****Understanding the Scope of Economics**

Your Economic Revolution 53

**Talking with**

Esther Duflo 54

**PART TWO  
HOW MARKETS WORK** 55**CHAPTER 3 ◆ DEMAND AND SUPPLY** 55

Markets and Prices 56

Demand 57

- The Law of Demand 57
- Demand Curve and Demand Schedule 57
- A Change in Demand 58
- A Change in the Quantity Demanded Versus a Change in Demand 60

Supply 62

- The Law of Supply 62
- Supply Curve and Supply Schedule 62
- A Change in Supply 63
- A Change in the Quantity Supplied Versus a Change in Supply 64

Market Equilibrium 66

- Price as a Regulator 66
- Price Adjustments 67

Predicting Changes in Price and Quantity 68

- An Increase in Demand 68
- A Decrease in Demand 68
- An Increase in Supply 70
- A Decrease in Supply 70
- Changes in Both Demand and Supply 72

■ ECONOMICS IN THE NEWS 69, 71, 74

**MATHEMATICAL NOTE**

Demand, Supply, and Equilibrium 76

**CHAPTER 4 ◆ ELASTICITY 83****Price Elasticity of Demand 84**

- Calculating Price Elasticity of Demand 84
- Inelastic and Elastic Demand 85
- The Factors that Influence the Elasticity of Demand 86
- Elasticity Along a Linear Demand Curve 87
- Total Revenue and Elasticity 88
- Your Expenditure and Your Elasticity 90

**More Elasticities of Demand 91**

- Income Elasticity of Demand 91
- Cross Elasticity of Demand 92

**Elasticity of Supply 94**

- Calculating the Elasticity of Supply 94
- The Factors That Influence the Elasticity of Supply 95

**■ ECONOMICS IN ACTION 89, 91, 92****■ ECONOMICS IN THE NEWS 90, 93, 98****CHAPTER 5 ◆ EFFICIENCY AND EQUITY 105****Resource Allocation Methods 106**

- Market Price 106
- Command 106
- Majority Rule 106
- Contest 106
- First-Come, First-Served 106
- Lottery 107
- Personal Characteristics 107
- Force 107

**Benefit, Cost, and Surplus 108**

- Demand, Willingness to Pay, and Value 108
- Individual Demand and Market Demand 108
- Consumer Surplus 109
- Supply and Marginal Cost 109
- Supply, Cost, and Minimum Supply-Price 110
- Individual Supply and Market Supply 110
- Producer Surplus 111

**Is the Competitive Market Efficient? 112**

- Efficiency of Competitive Equilibrium 112
- Market Failure 114
- Sources of Market Failure 114
- Alternatives to the Market 115

**Is the Competitive Market Fair? 116**

- It's Not Fair if the *Result* Isn't Fair 116
- It's Not Fair if the *Rules* Aren't Fair 118
- Case Study: A Generator Shortage in a Natural Disaster 118

**■ ECONOMICS IN ACTION 113****■ AT ISSUE 119****■ ECONOMICS IN THE NEWS 120**

## CHAPTER 6 ◆ GOVERNMENT ACTIONS IN MARKETS 127

A Housing Market with a Rent Ceiling	128
A Housing Shortage	128
Increased Search Activity	128
A Black Market	128
Inefficiency of a Rent Ceiling	129
Are Rent Ceilings Fair?	130
A Labour Market with a Minimum Wage	131
Minimum Wage Brings Unemployment	131
Is the Minimum Wage Fair?	131
Inefficiency of a Minimum Wage	132
Taxes	133
Tax Incidence	133
A Tax on Sellers	133
A Tax on Buyers	134
Equivalence of Tax on Buyers and Sellers	134
Tax Incidence and Elasticity of Demand	135
Tax Incidence and Elasticity of Supply	136
Taxes and Efficiency	137
Taxes and Fairness	138
Production Quotas and Subsidies	139
Production Quotas	139
Subsidies	140
Markets for Illegal Goods	142
A Free Market for a Drug	142
A Market for an Illegal Drug	142
Legalizing and Taxing Drugs	143
■ ECONOMICS IN ACTION	130, 138, 141
■ AT ISSUE	132
■ ECONOMICS IN THE NEWS	144

## CHAPTER 7 ◆ GLOBAL MARKETS IN ACTION 151

How Global Markets Work	152
International Trade Today	152
What Drives International Trade?	152
Why Canada Imports T-Shirts	153
Why Canada Exports Regional Jets	154
Winners, Losers, and the Net Gain from Trade	155
Gains and Losses from Imports	155
Gains and Losses from Exports	156
Gains for All	156
International Trade Restrictions	157
Tariffs	157
Import Quotas	160
Other Import Barriers	163
Export Subsidies	163
The Case Against Protection	164
Helps an Infant Industry Grow	164
Counteracts Dumping	164
Saves Domestic Jobs	164
Allows Us to Compete with Cheap Foreign Labour	164
Penalizes Lax Environmental Standards	165
Prevents Rich Countries from Exploiting Developing Countries	165
Reduces Offshore Outsourcing that Sends Good Canadian Jobs to Other Countries	165
Avoiding Trade Wars	166
Why Is International Trade Restricted?	166
Compensating Losers	167
■ ECONOMICS IN ACTION	152, 158, 163
■ AT ISSUE	166
■ ECONOMICS IN THE NEWS	162, 168

## PART TWO WRAP-UP ◆

Understanding How Markets Work	
The Amazing Market	175
Talking with	
Susan Athey	176



## PART THREE HOUSEHOLDS' CHOICES 177

### CHAPTER 8 ◆ UTILITY AND DEMAND 177

#### Consumption Choices 178

Consumption Possibilities 178  
Preferences 179

#### Utility-Maximizing Choice 181

A Spreadsheet Solution 181  
Choosing at the Margin 182  
The Power of Marginal Analysis 184  
Revealing Preferences 184

#### Predictions of Marginal Utility Theory 185

A Fall in the Price of a Movie 185  
A Rise in the Price of Pop 187  
A Rise in Income 188  
The Paradox of Value 189  
Temperature: An Analogy 190

#### New Ways of Explaining Consumer Choices 192

Behavioural Economics 192  
Neuroeconomics 193  
Controversy 193

#### ■ ECONOMICS IN ACTION 190

#### ■ ECONOMICS IN THE NEWS 194

### CHAPTER 9 ◆ POSSIBILITIES, PREFERENCES, AND CHOICES 201

#### Consumption Possibilities 202

Budget Equation 203

#### Preferences and Indifference Curves 205

Marginal Rate of Substitution 206  
Degree of Substitutability 207

#### Predicting Consumer Choices 208

Best Affordable Choice 208  
A Change in Price 209  
A Change in Income 211  
Substitution Effect and Income Effect 212

#### ■ ECONOMICS IN ACTION 210

#### ■ ECONOMICS IN THE NEWS 214

### PART THREE WRAP-UP ◆

#### Understanding Households' Choices

Making the Most of Life 221

#### Talking with

Steven D. Levitt 222


**PART FOUR**  
**FIRMS AND MARKETS** 223

**CHAPTER 10 ◆ ORGANIZING PRODUCTION** 223

The Firm and Its Economic Problem 224

    The Firm's Goal 224

    Accounting Profit 224

    Economic Accounting 224

    A Firm's Opportunity Cost of Production 224

    Economic Accounting: A Summary 225

    Decisions 225

    The Firm's Constraints 226

Technological and Economic Efficiency 227

    Technological Efficiency 227

    Economic Efficiency 227

Information and Organization 229

    Command Systems 229

    Incentive Systems 229

    The Principal-Agent Problem 229

    Coping with the Principal-Agent Problem 229

    Types of Business Organization 230

    Pros and Cons of Different Types of Firms 231

Markets and the Competitive Environment 233

    Measures of Concentration 234

    Limitations of a Concentration Measure 236

Produce or Outsource? Firms and Markets 238

    Firm Coordination 238

    Market Coordination 238

    Why Firms? 238

■ ECONOMICS IN ACTION 232, 235, 237, 239

■ ECONOMICS IN THE NEWS 230, 240

**CHAPTER 11 ◆ OUTPUT AND COSTS** 247

Decision Time Frames 248

    The Short Run 248

    The Long Run 248

Short-Run Technology Constraint 249

    Product Schedules 249

    Product Curves 249

    Total Product Curve 250

    Marginal Product Curve 250

    Average Product Curve 252

Short-Run Cost 253

    Total Cost 253

    Marginal Cost 254

    Average Cost 254

    Marginal Cost and Average Cost 254

    Why the Average Total Cost Curve Is U-Shaped 254

    Cost Curves and Product Curves 256

    Shifts in the Cost Curves 258

Long-Run Cost 260

    The Production Function 260

    Short-Run Cost and Long-Run Cost 260

    The Long-Run Average Cost Curve 262

    Economies and Diseconomies of Scale 262

■ ECONOMICS IN ACTION 252, 263

■ ECONOMICS IN THE NEWS 256, 264

**CHAPTER 12 ◆ PERFECT COMPETITION** 271

What Is Perfect Competition? 272

How Perfect Competition Arises 272

Price Takers 272

Economic Profit and Revenue 272

The Firm's Decisions 273

The Firm's Output Decision 274

Marginal Analysis and the Supply Decision 275

Temporary Shutdown Decision 276

The Firm's Supply Curve 277

Output, Price, and Profit in the Short Run 278

Market Supply in the Short Run 278

Short-Run Equilibrium 279

A Change in Demand 279

Profits and Losses in the Short Run 279

Three Possible Short-Run Outcomes 280

Output, Price, and Profit in the Long Run 281

Entry and Exit 281

A Closer Look at Entry 282

A Closer Look at Exit 282

Long-Run Equilibrium 283

Changes in Demand and Supply as Technology Advances 284

An Increase in Demand 284

A Decrease in Demand 285

Technological Advances Change Supply 286

Competition and Efficiency 288

Efficient Use of Resources 288

Choices, Equilibrium, and Efficiency 288

**ECONOMICS IN ACTION** 281, 283**ECONOMICS IN THE NEWS** 285, 287, 290**CHAPTER 13 ◆ MONOPOLY** 297

Monopoly and How It Arises 298

How Monopoly Arises 298

Monopoly Price-Setting Strategies 299

A Single-Price Monopoly's Output and Price Decision 300

Price and Marginal Revenue 300

Marginal Revenue and Elasticity 301

Price and Output Decision 302

Single-Price Monopoly and Competition Compared 304

Comparing Price and Output 304

Efficiency Comparison 305

Redistribution of Surpluses 306

Rent Seeking 306

Rent-Seeking Equilibrium 306

Price Discrimination 307

Two Ways of Price Discriminating 307

Increasing Profit and Producer Surplus 308

A Price-Discriminating Airline 308

Efficiency and Rent Seeking with Price Discrimination 311

Monopoly Regulation 313

Efficient Regulation of a Natural Monopoly 313

Second-Best Regulation of a Natural

Monopoly 314

**ECONOMICS IN ACTION** 299, 311**ECONOMICS IN THE NEWS** 312, 316

## CHAPTER 14 ◆ MONOPOLISTIC COMPETITION 323

What Is Monopolistic Competition? 324	
Large Number of Firms 324	
Product Differentiation 324	
Competing on Quality, Price, and Marketing 324	
Entry and Exit 325	
Examples of Monopolistic Competition 325	
Price and Output in Monopolistic Competition 326	
The Firm's Short-Run Output and Price Decision 326	
Profit Maximizing Might Be Loss Minimizing 326	
Long Run: Zero Economic Profit 327	
Monopolistic Competition and Perfect Competition 328	
Is Monopolistic Competition Efficient? 329	
Product Development and Marketing 330	
Product Development 330	
Advertising 330	
Using Advertising to Signal Quality 332	
Brand Names 333	
Efficiency of Advertising and Brand Names 333	
<b>ECONOMICS IN ACTION 325, 331</b>	
<b>ECONOMICS IN THE NEWS 334</b>	

## CHAPTER 15 ◆ OLIGOPOLY 341

What Is Oligopoly? 342	
Barriers to Entry 342	
Small Number of Firms 343	
Examples of Oligopoly 343	
Oligopoly Games 344	
What Is a Game? 344	
The Prisoners' Dilemma 344	
An Oligopoly Price-Fixing Game 346	
A Game of Chicken 351	
Repeated Games and Sequential Games 352	
A Repeated Duopoly Game 352	
A Sequential Entry Game in a Contestable Market 354	
Anti-Combine Law 356	
Canada's Anti-Combine Law 356	
Some Major Anti-Combine Cases 356	
<b>ECONOMICS IN ACTION 343, 350, 357, 358, 359</b>	
<b>ECONOMICS IN THE NEWS 353, 360</b>	

## PART FOUR WRAP-UP ◆

<b>Understanding Firms and Markets</b>	
Managing Change and Limiting Market Power 367	
<b>Talking with</b>	
Thomas Hubbard 368	


**PART FIVE**  
 MARKET FAILURE AND GOVERNMENT 369

**CHAPTER 16 ◆ EXTERNALITIES** 369

## Externalities In Our Lives 370

- Negative Production Externalities 370
- Positive Production Externalities 370
- Negative Consumption Externalities 370
- Positive Consumption Externalities 370

## Negative Externality: Pollution 372

- Private, External, and Social Cost 372
- Establish Property Rights 373
- Mandate Clean Technology 374
- Tax or Cap and Price Pollution 375
- Coping with Global Externalities 378

## Positive Externality: Knowledge 379

- Private Benefits and Social Benefits 379
- Government Actions in the Face of External Benefits 380

■ ECONOMICS IN ACTION 371, 376, 378, 382

■ AT ISSUE 377

■ ECONOMICS IN THE NEWS 384

**CHAPTER 17 ◆ PUBLIC GOODS AND COMMON RESOURCES** 391

## Classifying Goods and Resources 392

- Excludable 392
- Rival 392
- A Fourfold Classification 392

## Public Goods 393

- The Free-Rider Problem 393
- Marginal Social Benefit from a Public Good 393
- Marginal Social Cost of a Public Good 394
- Efficient Quantity of a Public Good 394
- Inefficient Private Provision 394
- Efficient Public Provision 394
- Inefficient Public Overprovision 395
- Two Types of Political Equilibrium 397
- Why Government Is Large and Growing 397
- Voters Strike Back 397

## Common Resources 398

- Sustainable Use of a Renewable Resource 398
- The Overuse of a Common Resource 400
- Achieving an Efficient Outcome 401

■ ECONOMICS IN ACTION 396, 398, 399, 403

■ ECONOMICS IN THE NEWS 404

**PART FIVE WRAP-UP ◆**
**Understanding Market Failure and Government**

Making the Rules 411

**Talking with**

Caroline M. Hoxby 412


**PART SIX**  
**FACTOR MARKETS AND INEQUALITY** 413

**CHAPTER 18 ◆ MARKETS FOR FACTORS OF PRODUCTION** 413

The Anatomy of Factor Markets 414

Markets for Labour Services 414

Markets for Capital Services 414

Markets for Land Services and Natural Resources 414

Entrepreneurship 414

The Demand for a Factor of Production 415

Value of Marginal Product 415

A Firm's Demand for Labour 415

A Firm's Demand for Labour Curve 416

Changes in a Firm's Demand for Labour 417

Labour Markets 418

A Competitive Labour Market 418

Differences and Trends in Wage Rates 420

A Labour Market with a Union 422

Capital and Natural Resource Markets 426

Capital Rental Markets 426

Land Rental Markets 426

Nonrenewable Natural Resource Markets 427

■ ECONOMICS IN ACTION 420, 429

■ AT ISSUE 424

■ ECONOMICS IN THE NEWS 421, 430

**MATHEMATICAL NOTE**

Present Value and Discounting 432

**CHAPTER 19 ◆ ECONOMIC INEQUALITY** 439

Measuring Economic Inequality 440

The Distribution of Income 440

The Income Lorenz Curve 441

The Distribution of Wealth 442

Wealth or Income? 442

Annual or Lifetime Income and Wealth? 443

Trends in Inequality 444

Poverty 445

Inequality in the World Economy 446

Income Distributions in Selected Countries 446

Global Inequality and Its Trends 447

The Sources of Economic Inequality 448

Human Capital 448

Discrimination 450

Contests Among Superstars 451

Unequal Wealth 452

Income Redistribution 453

Income Taxes 453

Income Maintenance Programs 453

Subsidized Services 453

The Big Tradeoff 455

A Major Welfare Challenge 455

■ ECONOMICS IN ACTION 443, 444, 445, 454

■ ECONOMICS IN THE NEWS 456

**PART SIX WRAP-UP ◆**

**Understanding Factor Markets and Inequality**  
For Whom? 463

**Talking with**  
Raj Chetty 464

Glossary G-1

Index I-1

Credits C-1

# MICROECONOMICS

CANADA IN THE GLOBAL ENVIRONMENT **NINTH EDITION**

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## PART ONE INTRODUCTION



# 1

## WHAT IS ECONOMICS?

After studying this chapter,  
you will be able to:

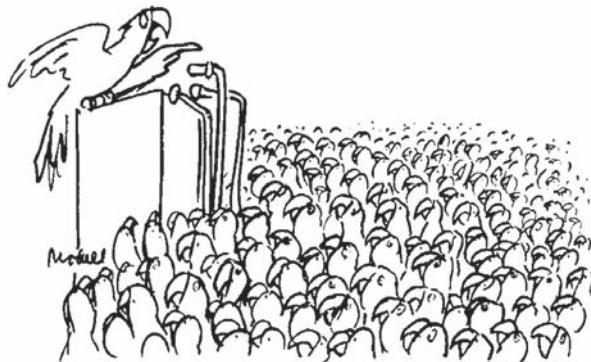
- ◆ Define economics and distinguish between microeconomics and macroeconomics
- ◆ Explain the two big questions of economics
- ◆ Explain the key ideas that define the economic way of thinking
- ◆ Explain how economists go about their work as social scientists and policy advisers

**Is economics about money: How people make it and spend it?** Is it about business, government, and jobs? Is it about why some people and some nations are rich and others poor? Economics is about all these things. But its core is the study of *choices* and their consequences.

Your life will be shaped by the choices that you make and the challenges that you face. To face those challenges and seize the opportunities they present, you must understand the powerful forces at play. The economics that you're about to learn will become your most reliable guide. This chapter gets you started by describing the questions that economists try to answer and looking at how economists think as they search for the answers.

## Definition of Economics

A fundamental fact dominates our lives: We want more than we can get. Our inability to get everything we want is called **scarcity**. Scarcity is universal. It confronts all living things. Even parrots face scarcity!



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

© The New Yorker Collection 1985  
Frank Modell from cartoonbank.com. All Rights Reserved.

Think about the things that *you* want and the scarcity that *you* face. You want to go to a good school, college, or university. You want to live in a well-equipped, spacious, and comfortable home. You want the latest smartphone and the fastest Internet connection for your laptop or iPad. You want some sports and recreational gear—perhaps some new running shoes, or a new bike. You want much more time than is available to go to class, do your homework, play sports and games, read novels, go to the movies, listen to music, travel, and hang out with your friends. And you want to live a long and healthy life.

What you can afford to buy is limited by your income and by the prices you must pay. And your time is limited by the fact that your day has 24 hours.

You want some other things that only governments provide. You want to live in a safe neighbourhood in a peaceful and secure world, and enjoy the benefits of clean air, lakes, rivers, and oceans.

What governments can afford is limited by the taxes they collect. Taxes lower people's incomes and compete with the other things they want to buy.

What *everyone* can get—what *society* can get—is limited by the productive resources available. These resources are the gifts of nature, human labour and ingenuity, and all the previously produced tools and equipment.

Because we can't get everything we want, we must make *choices*. You can't afford *both* a laptop *and* an iPhone, so you must *choose* which one to buy. You can't spend tonight *both* studying for your next test *and* going to the movies, so again, you must *choose* which one to do. Governments can't spend a tax dollar on *both* national defence *and* environmental protection, so they must *choose* how to spend that dollar.

Your choices must somehow be made consistent with the choices of *others*. If you choose to buy a laptop, someone else must choose to sell it. Incentives reconcile choices. An **incentive** is a reward that encourages an action or a penalty that discourages one. Prices act as incentives. If the price of a laptop is too high, more will be offered for sale than people want to buy. And if the price is too low, fewer will be offered for sale than people want to buy. But there is a price at which choices to buy and sell are consistent.

**Economics** is the social science that studies the *choices* that individuals, businesses, governments, and entire societies make as they cope with *scarcity* and the *incentives* that influence and reconcile those choices.

The subject has two parts:

- Microeconomics
- Macroeconomics

**Microeconomics** is the study of the choices that individuals and businesses make, the way these choices interact in markets, and the influence of governments. Some examples of microeconomic questions are: Why are people downloading more movies? How would a tax on e-commerce affect eBay?

**Macroeconomics** is the study of the performance of the national economy and the global economy. Some examples of macroeconomic questions are: Why does the Canadian unemployment rate fluctuate? Can the Bank of Canada make the unemployment rate fall by keeping interest rates low?

## REVIEW QUIZ

- 1 List some examples of the scarcity that you face.
- 2 Find examples of scarcity in today's headlines.
- 3 Find an example of the distinction between microeconomics and macroeconomics in today's headlines.

Work these questions in Study Plan 1.1 and get instant feedback. Do a Key Terms Quiz.

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## Two Big Economic Questions

Two big questions summarize the scope of economics:

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

### What, How, and For Whom?

**Goods and services** are the objects that people value and produce to satisfy wants. *Goods* are physical objects such as cellphones and automobiles. *Services* are tasks performed for people such as cellphone service and auto-repair service.

**What?** *What* we produce varies across countries and changes over time. In Canada today, agriculture accounts for 2 percent of total production, manufactured goods for 20 percent, and services (retail and wholesale trade, healthcare, and education are the biggest ones) for 78 percent. In contrast, in China today, agriculture accounts for 10 percent of total production, manufactured goods for 45 percent, and services for 45 percent.

Figure 1.1 shows these numbers and also the percentages for Brazil, which fall between those for Canada and China.

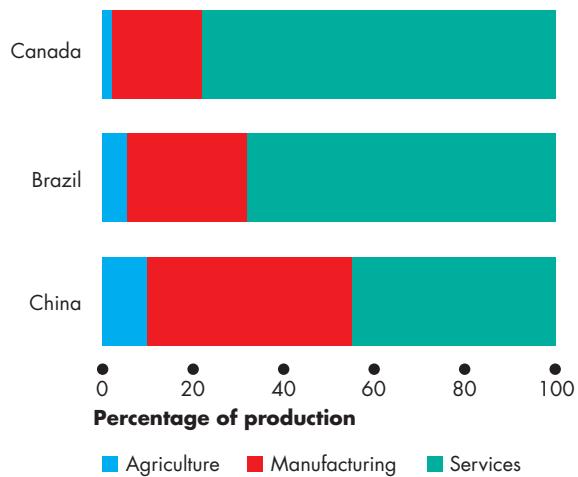
What determines these patterns of production? How do choices end up determining the quantities of cellphones, automobiles, cellphone service, auto-repair service, and the millions of other items that are produced in Canada and around the world?

**How?** *How* we produce is described by the technologies and resources that we use. The resources used to produce goods and services are called **factors of production**, which are grouped into four categories:

- Land
- Labour
- Capital
- Entrepreneurship

**Land** The “gifts of nature” that we use to produce goods and services are called **land**. In economics, *land* is what in everyday language we call *natural resources*. It includes land in the everyday sense

**FIGURE 1.1** What Three Countries Produce



Agriculture and manufacturing are small percentages of production in rich countries such as Canada and large percentages of production in poorer countries such as China. Most of what is produced in Canada is services.

Source of data: CIA Factbook 2014, Central Intelligence Agency.

**MyEconLab Animation**

together with minerals, oil, gas, coal, water, air, forests, and fish.

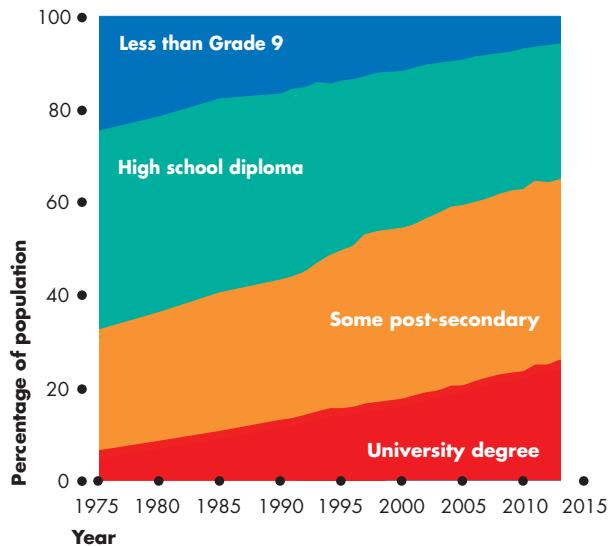
Our land surface and water resources are renewable, and some of our mineral resources can be recycled. But the resources that we use to create energy are nonrenewable—they can be used only once.

**Labour** The work time and work effort that people devote to producing goods and services is called **labour**. Labour includes the physical and mental efforts of all the people who work on farms and construction sites and in factories, shops, and offices.

The *quality* of labour depends on **human capital**, which is the knowledge and skill that people obtain from education, on-the-job training, and work experience. You are building your own human capital right now as you work on your economics course, and your human capital will continue to grow as you gain work experience.

Human capital expands over time. Today, 93 percent of the adult population of Canada have completed high school and 23 percent have a college or university degree. Figure 1.2 shows these measures of human capital in Canada and its growth over the past 38 years.

**FIGURE 1.2** A Measure of Human Capital



In 2013, 25.3 percent of the adult population had a university degree. A further 39 percent had some post-secondary education, and 93.6 percent had completed high school.

Source of data: Statistics Canada.

### MyEconLab Animation

**Capital** The tools, instruments, machines, buildings, and other constructions that businesses use to produce goods and services are called **capital**.

In everyday language, we talk about money, stocks, and bonds as being “capital.” These items are *financial capital*. Financial capital plays an important role in enabling businesses to borrow the funds that they use to buy physical capital. But financial capital is not used to produce goods and services and it is not a factor of production.

**Entrepreneurship** The human resource that organizes labour, land, and capital is called **entrepreneurship**. Entrepreneurs are the drivers of economic progress. They develop new ideas about what and how to produce, make business decisions, and bear the risks that arise from these decisions.

What determines how the factors of production are used to produce each good and service?

**For Whom?** *Who* consumes the goods and services that are produced depends on the incomes that people earn. People with large incomes can buy

a wide range of goods and services. People with small incomes have fewer options and can afford a smaller range of goods and services.

People earn their incomes by selling the services of the factors of production they own:

- Land earns **rent**.
- Labour earns **wages**.
- Capital earns **interest**.
- Entrepreneurship earns **profit**.

Which factor of production earns the most income? The answer is labour. Wages and fringe benefits are around 70 percent of total income and the incomes from land, capital, and entrepreneurship share the rest. These shares have been remarkably constant over time.

Knowing how income is shared among the factors of production doesn’t tell us how it is shared among individuals. And the distribution of income among individuals is extremely unequal. You know of some people who earn very large incomes: Dwayne “The Rock” Johnson (Hercules) earned \$46 million in 2013; and Canadian Shea Weber of the Nashville Predators earns \$14 million a year.

You know of even more people who earn very small incomes. Servers at Tim Hortons average \$9 an hour; checkout clerks, cleaners, and textile and leather workers all earn less than \$10 an hour.

You probably know about other persistent differences in incomes. Men, on average, earn more than women; whites earn more than minorities; university graduates earn more than high school graduates.

We can get a good sense of who consumes the goods and services produced by looking at the percentages of total income earned by different groups of people. The 20 percent of people with the lowest incomes earn about 5 percent of total income, while the richest 20 percent earn close to 50 percent of total income. So on average, people in the richest 20 percent earn more than 10 times the incomes of those in the poorest 20 percent. There is even huge inequality within the richest 20 percent, and the top 1 percent earns almost 15 percent of total income.

Why is the distribution of income so unequal?

Economics provides some answers to all these questions about *what*, *how*, and *for whom* goods and services are produced and much of the rest of this book will help you to understand those answers.

We’re now going to look at the second big question of economics: Do choices made in the pursuit of self-interest also promote the social interest?

## Do Choices Made in the Pursuit of Self-Interest also Promote the Social Interest?

Every day, you and 35.4 million other Canadians, along with 7.2 billion people in the rest of the world, make economic choices that result in *what*, *how*, and *for whom* goods and services are produced. These choices are made by people who are pursuing their self-interest.

**Self-Interest** You make a choice in your **self-interest** if you think that choice is the best one available for you. All the choices that people make about how to use their time and other resources are made in the pursuit of self-interest. When you allocate your time or your budget, you do what makes the most sense to you. You might think about how your choices affect other people and take into account how you feel about that, but it is how *you* feel that influences your choice. You order a home-delivery pizza because you're hungry, not because the delivery person needs a job. And when the pizza delivery person shows up at your door, he's not doing you a favour. He's pursuing *his* self-interest and hoping for a tip and another call next week.

The big question is: Is it possible that all the choices that each one of us makes in the pursuit of self-interest could end up achieving an outcome that is best for everyone?

**Social Interest** An outcome is in the **social interest** if it is best for society as a whole. It is easy to see how you decide what is in *your* self-interest. But how do we decide if something is in the social interest? To help you answer this question, imagine a scene like that in *Economics in the News* on the next page.

Ted, an entrepreneur, creates a new business. He hires a thousand workers and pays them \$20 an hour, \$1 an hour more than they earned in their old jobs. Ted's business is extremely profitable and his own earnings increase by \$1 million per week.

You can see that Ted's decision to create the business is in his self-interest—he gains \$1 million a week. You can also see that for Ted's employees, their decisions to work for Ted are in their self-interest—they gain \$1 an hour (say \$40 a week). And the decisions of Ted's customers must be in their self-interest, otherwise they wouldn't buy from him. But is this outcome in the social interest?

The economist's answer is "Yes." It is in the social interest because it makes everyone better off. There are no losers.

**Efficiency and the Social Interest** Economists use the everyday word "efficient" to describe a situation that can't be improved upon. Resource use is **efficient** if it is *not* possible to make someone better off without making someone else worse off. If it *is* possible to make someone better off without making anyone worse off, society can be made better off and the situation is not efficient.

In the Ted story everyone is better off, so it improves efficiency and the outcome is in the social interest. But notice that it would also have been efficient if the workers and customers had gained nothing and Ted had gained even more than \$1 million a week. But would that efficient outcome be in the social interest?

Many people have trouble seeing the outcome in which Ted is the only winner as being in the social interest. They say that the social interest requires Ted to share some of his gain either with his workers in higher wages or with his customers in lower prices, or with both groups.

**Fair Shares and the Social Interest** The idea that the social interest requires "fair shares" is a deeply held one. Think about what you regard as a fair share. To help you, imagine the following game.

I put \$100 on the table and tell someone you don't know and who doesn't know you to *propose* a share of the money between the two of you. If you *accept* the proposed share, you each get the agreed upon shares. If you don't accept the proposed share, you both get nothing.

It would be efficient—you would both be better off—if the proposer offered to take \$99 and leave you with \$1 and you accepted that offer.

But would you accept the \$1? If you are like most people, the idea that the other person gets 99 times as much as you is just too much to stomach. "No way," you say and the \$100 disappears. That outcome is inefficient. You have both given up something.

When the game I've just described is played in a classroom experiment, about half of the players reject offers of below \$30.

So fair shares matter. But what is *fair*? There isn't a crisp definition of fairness to match that of efficiency. Reasonable people have a variety of views about it. Almost everyone agrees that too much inequality is unfair. But how much is too much? And inequality of what: income, wealth, or the *opportunity* to work, earn an income, and accumulate wealth?

You will examine efficiency again in Chapter 2 and efficiency and fairness in Chapter 5.

Questions about the social interest are hard ones to answer and they generate discussion, debate, and disagreement. Four issues in today's world put some flesh on these questions. The issues are:

- Globalization
- Information-age monopolies
- Climate change
- Economic instability

**Globalization** The term *globalization* means the expansion of international trade, borrowing and lending, and investment.

When Nike produces sports shoes, people in Malaysia get work; and when China Airlines buys new regional jets, Canadians who work at Bombardier build them. While globalization brings expanded production and job opportunities for some workers, it destroys many Canadian jobs. Workers across the manufacturing industries must learn new skills or take service jobs, which are often lower-paid, or retire earlier than previously planned.

Globalization is in the self-interest of those consumers who buy low-cost goods and services produced

in other countries; and it is in the self-interest of the multinational firms that produce in low-cost regions and sell in high-price regions. But is globalization in the self-interest of the low-wage worker in Malaysia who sews your new running shoes and the displaced shoemaker in Toronto? Is it in the social interest?



## ECONOMICS IN THE NEWS

### The Invisible Hand

#### From Brewer to Bio-Tech Entrepreneur

Kiran Mazumdar-Shaw trained to become a master brewer and learned about enzymes, the stuff from which bio-pharmaceuticals are made. Discovering it was impossible for a woman in India to become a master brewer, the 25-year-old Kiran decided to create a bio-pharmaceutical business.

Kiran's firm, Biocom, employed uneducated workers who loved their jobs and the living conditions made possible by their high wages. But when a labour union entered the scene and unionized the workers, a furious Kiran fired the workers, automated their jobs, and hired a smaller number of educated workers. Biocom continued to grow and today, Kiran's wealth exceeds \$1 billion.

Kiran has become wealthy by developing and producing bio-pharmaceuticals that improve people's lives. But Kiran is sharing her wealth in creative ways. She has opened a cancer treatment centre to help thousands of patients who are too poor to pay and created a health insurance scheme.

Source: Ariel Levy, "Drug Test,"  
*The New Yorker*, January 2, 2012.

#### THE QUESTIONS

- Whose decisions in the story were taken in self-interest?
- Whose decisions turned out to be in the social interest?
- Did any of the decisions harm the social interest?

#### THE ANSWERS

- All the decisions—Kiran's, the workers', the union's, and the firm's customers'—are taken in the pursuit of self-interest.
- Kiran's decisions serve the social interest: She creates jobs that benefit her workers and products that benefit her customers. And her charitable work brings yet further social benefits.
- The labour union's decision might have harmed the social interest because it destroyed the jobs of uneducated workers.



KIRAN MAZUMDAR-SHAW,  
FOUNDER AND CEO OF  
BIOCOM

**Information-Age Monopolies** The technological change of the past forty years has been called the *Information Revolution*. Bill Gates, a co-founder of Microsoft, held a privileged position in this revolution. For many years, Windows was the only available operating system for the PC. The PC and Mac competed, but the PC had a huge market share.

An absence of competition gave Microsoft the power to sell Windows at prices far above the cost of production. With lower prices, many more people would have been able to afford and buy a computer.

The information revolution has clearly served your self-interest: It has provided your cellphone, laptop, loads of handy applications, and the Internet. It has also served the self-interest of Bill Gates who has seen his wealth soar.

But did the information revolution best serve the social interest? Did Microsoft produce the best possible Windows operating system and sell it at a price that was in the social interest? Or was the quality too low and the price too high?



**Climate Change** Burning fossil fuels to generate electricity and to power airplanes, automobiles, and trucks pours a staggering 28 billion tonnes—4 tonnes per person—of carbon dioxide into the atmosphere each year. These carbon emissions, two-thirds of which come from the United States, China, the European Union, Russia, and India, bring global warming and climate change.

Every day, when you make self-interested choices to use electricity and gasoline, you leave your carbon footprint. You can lessen this footprint by walking, riding a bike, taking a cold shower, or planting a tree.

But can each one of us be relied upon to make decisions that affect the Earth's carbon-dioxide concentration in the social interest? Must governments change the incentives we face so that our self-interested choices are also in the social interest? How can governments change incentives? How can we

encourage the use of wind and solar power to replace the burning of fossil fuels that brings climate change?



**Economic Instability** In 2008, U.S. banks were in trouble. They had made loans that borrowers couldn't repay and they were holding securities the values of which had crashed.

Banks' choices to take deposits and make loans are made in self-interest, but does this lending and borrowing serve the social interest? Do banks lend too much in the pursuit of profit?

When U.S. banks got into trouble in 2008, the U.S. Federal Reserve (the Fed) bailed them out with big loans backed by taxpayer dollars. Did the Fed's bailout of troubled banks serve the social interest? Or might the Fed's rescue action encourage banks to repeat their dangerous lending in the future?

We've looked at four topics and asked many questions that illustrate the potential conflict between the pursuit of self-interest and the social interest. We've asked questions but not answered them because we've not yet explained the economic principles needed to do so. We answer these questions in future chapters.

## REVIEW QUIZ

- 1 Describe the broad facts about *what, how, and for whom* goods and services are produced.
- 2 Use headlines from the recent news to illustrate the potential for conflict between self-interest and the social interest.

Work these questions in Study Plan 1.2 and get instant feedback. Do a Key Terms Quiz.

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## AT ISSUE

### The Protest Against Market Capitalism

**Market capitalism** is an economic system in which individuals own land and capital and are free to buy and sell land, capital, and goods and services in markets. Markets for goods and services, along with markets for land and capital, coordinate billions of self-interested choices, which determine what, how, and for whom goods and services are produced. A few people earn enormous incomes, many times the average income. There is no supreme planner guiding the use of scarce resources and the outcome is unintended and unforeseeable.

**Centrally planned socialism** is an economic system in which the government owns all the land and capital, directs workers to jobs, and decides what, how, and for whom to produce. The Soviet Union, several Eastern European countries, and China have used this system in the past but have now abandoned it. Only Cuba and North Korea use this system today. A few bureaucrats in positions of great power receive huge incomes, many times that of an average person.

Our economy today is a **mixed economy**, which is market capitalism with government regulation.

#### The Protest

The protest against market capitalism takes many forms. Historically, **Karl Marx** and other communist and socialist thinkers wanted to replace it with *socialism* and *central planning*. Today, thousands of people who feel let down by the economic system want less market capitalism and more government regulation. The **Occupy Wall Street** movement, with its focus on the large incomes of the top 1 percent, is a visible example of today's protest. Protesters say:

- Big corporations (especially big banks) have too much power and influence on governments.
- Democratically elected governments can do a better job of allocating resources and distributing income than uncoordinated markets.
- More regulation in the social interest is needed—to serve “human need, not corporate greed.”
- In a market, for every winner, there is a loser.
- Big corporations are the winners. Workers and unemployed people are the losers.



An Occupy Wall Street protester

#### The Economist's Response

Economists agree that market capitalism isn't perfect. But they argue that it is the best system available and while some government intervention and regulation can help, government attempts to serve the social interest often end up harming it.

**Adam Smith** (see p. 53), who gave the first systematic account of how market capitalism works, says:

- The self-interest of big corporations is *maximum profit*.
- But an *invisible hand* leads production decisions made in pursuit of self-interest to *unintentionally* promote the social interest.
- Politicians are ill-equipped to regulate corporations or to intervene in markets, and those who think they can improve on the market outcome are most likely wrong.
- In a market, buyers get what they want for less than they would be willing to pay and sellers earn a profit. Both buyers and sellers gain. A market transaction is a “win-win” event.

“It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own interest.”

*The Wealth of Nations,*  
1776



Adam Smith



## The Economic Way of Thinking

The questions that economics tries to answer tell us about the *scope of economics*, but they don't tell us how economists *think* and go about seeking answers to these questions. You're now going to see how economists go about their work.

We're going to look at six key ideas that define the *economic way of thinking*. These ideas are:

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

### A Choice Is a Tradeoff

Because we face scarcity, we must make choices. And when we make a choice, we select from the available alternatives. For example, you can spend Saturday night studying for your next test or having fun with your friends, but you can't do both of these activities at the same time. You must choose how much time to devote to each. Whatever choice you make, you could have chosen something else.

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

### Making a Rational Choice

Economists view the choices that people make as rational. A **rational choice** is one that compares costs and benefits and achieves the greatest benefit over cost for the person making the choice.

Only the wants of the person making a choice are relevant to determine its rationality. For example, you might like your coffee black and strong but your friend prefers his milky and sweet. So it is rational for you to choose espresso and for your friend to choose cappuccino.

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

But how do people choose rationally? Why do more people choose an iPhone rather than a BlackBerry? Why don't CN and CPR build high-speed tracks so that VIA Rail can run Bombardier super-fast trains like those used in Europe? The answers turn on comparing benefits and costs.

### Benefit: What You Gain

The **benefit** of something is the gain or pleasure that it brings and is determined by **preferences**—by what a person likes and dislikes and the intensity of those feelings. If you get a huge kick out of “Leagues of Legends,” that video game brings you a large benefit. And if you have little interest in listening to Yo-Yo Ma playing a Vivaldi cello concerto, that activity brings you a small benefit.

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

Economists measure benefit as the most that a person is *willing to give up* to get something. You are willing to give up a lot to be in school. But you would give up only an iTunes download for a slice of pizza.

### Cost: What You Must Give Up

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

To make the idea of opportunity cost concrete, think about *your* opportunity cost of being in school. It has two components: the things you can't afford to buy and the things you can't do with your time.

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

You've also given up the opportunity to get a job and earn an income. Suppose that the best job you could get if you weren't in school is working at CIBC as a teller earning \$25,000 a year. Another part of your opportunity cost of being in school is all the things that you could buy with the extra \$25,000 you would have.

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

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

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

### How Much? Choosing at the Margin

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

The benefit that arises from an increase in an activity is called **marginal benefit**. For example, your marginal benefit from one more night of study before a test is the boost it gives to your grade. Your marginal benefit doesn't include the grade you're already achieving without that extra night of work.

The *opportunity cost* of an *increase* in an activity is called **marginal cost**. For you, the marginal cost of studying one more night is the cost of not spending that night on your favourite leisure activity.

To make your decisions, you compare marginal benefit and marginal cost. If the marginal benefit from an extra night of study exceeds its marginal cost, you study the extra night. If the marginal cost exceeds the marginal benefit, you don't study the extra night.

### Choices Respond to Incentives

Economists take human nature as given and view people as acting in their self-interest. All people—you, other consumers, producers, politicians, and public servants—pursue their self-interest.

Self-interested actions are not necessarily *selfish* actions. You might decide to use your resources in ways that bring pleasure to others as well as to yourself. But a self-interested act gets the most benefit for *you* based on *your* view about benefit.

The central idea of economics is that we can predict the self-interested choices that people make by looking at the *incentives* they face. People undertake those activities for which marginal benefit exceeds marginal cost; and they reject options for which marginal cost exceeds marginal benefit.

For example, your economics instructor gives you a problem set and tells you these problems will be on the next test. Your marginal benefit from working these problems is large, so you diligently work them. In contrast, your math instructor gives you a problem set on a topic that she says will never be on a test. You get little marginal benefit from working these problems, so you decide to skip most of them.

Economists see incentives as the key to reconciling self-interest and social interest. When our choices are *not* in the social interest, it is because of the incentives we face. One of the challenges for economists is to figure out the incentives that result in self-interested choices being in the social interest.

Economists emphasize the crucial role that institutions play in influencing the incentives that people face as they pursue their self-interest. Laws that protect private property and markets that enable voluntary exchange are the fundamental institutions. You will learn as you progress with your study of economics that where these institutions exist, self-interest can indeed promote the social interest.

### REVIEW QUIZ

- 1 Explain the idea of a tradeoff and think of three tradeoffs that you have made today.
- 2 Explain what economists mean by rational choice and think of three choices that you've made today that are rational.
- 3 Explain why opportunity cost is the best forgone alternative and provide examples of some opportunity costs that you have faced today.
- 4 Explain what it means to choose at the margin and illustrate with three choices at the margin that you have made today.
- 5 Explain why choices respond to incentives and think of three incentives to which you have responded today.

Work these questions in Study Plan 1.3 and get instant feedback. Do a Key Terms Quiz.

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## Economics as Social Science and Policy Tool

Economics is both a social science and a toolkit for advising on policy decisions.

### Economist as Social Scientist

As social scientists, economists seek to discover how the economic world works. In pursuit of this goal, like all scientists, economists distinguish between positive and normative statements.

**Positive Statements** A *positive* statement is about what *is*. It says what is currently believed about the way the world operates. A positive statement might be right or wrong, but we can test it by checking it against the facts. “Our planet is warming because of the amount of coal that we’re burning” is a positive statement. We can test whether it is right or wrong.

A central task of economists is to test positive statements about how the economic world works and to weed out those that are wrong. Economics first got off the ground in the late 1700s, so it is a young science compared with, for example, physics, and much remains to be discovered.

**Normative Statements** A *normative* statement is about what *ought to be*. It depends on values and cannot be tested. Policy goals are normative statements. For example, “We ought to cut our use of coal by 50 percent” is a normative policy statement. You may agree or disagree with it, but you can’t test it. It doesn’t assert a fact that can be checked.

**Unscrambling Cause and Effect** Economists are particularly interested in positive statements about cause and effect. Are computers getting cheaper because people are buying them in greater quantities? Or are people buying computers in greater quantities because they are getting cheaper? Or is some third factor causing both the price of a computer to fall and the quantity of computers bought to increase?

To answer such questions, economists create and test economic models. An **economic model** is a description of some aspect of the economic world that includes only those features that are needed for the purpose at hand. For example, an economic model of a cellphone network might include features such as the prices of calls, the number of cellphone users, and the volume of calls. But the model would ignore cellphone colours and ringtones.

A model is tested by comparing its predictions with the facts. But testing an economic model is difficult because we observe the outcomes of the simultaneous change of many factors. To cope with this problem, economists look for natural experiments (situations in the ordinary course of economic life in which the one factor of interest is different and other things are equal or similar); conduct statistical investigations to find correlations; and perform economic experiments by putting people in decision-making situations and varying the influence of one factor at a time to discover how they respond.

### Economist as Policy Adviser

Economics is useful. It is a toolkit for advising governments and businesses and for making personal decisions. Some of the most famous economists work partly as policy advisers.

Many leading Canadian economists have advised governments and other organizations on a wide range of economic policy issues. Among them are David Laidler of the University of Western Ontario, Christopher Ragan of McGill University, and Angela Reddish of the University of British Columbia, all of whom have spent time advising the Bank of Canada and the Department of Finance.

All the policy questions on which economists provide advice involve a blend of the positive and the normative. Economics can’t help with the normative part—the policy goal. But it can help to clarify the goal. And for a given goal, economics provides the tools for evaluating alternative solutions—comparing marginal benefits and marginal costs and finding the solution that makes the best use of the available resources.

### REVIEW QUIZ

- 1 Distinguish between a positive statement and a normative statement and provide examples.
- 2 What is a model? Can you think of a model that you might use in your everyday life?
- 3 How do economists try to disentangle cause and effect?
- 4 How is economics used as a policy tool?

Work these questions in Study Plan 1.4 and get instant feedback. Do a Key Terms Quiz.

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## ECONOMICS IN THE NEWS

### The Internet for Everyone

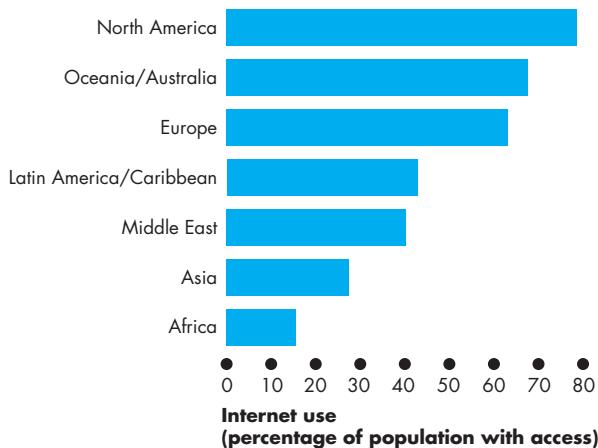
#### Mark Zuckerberg's Big Idea: The "Next 5 Billion"

Facebook founder Mark Zuckerberg wants to make it so that anyone, anywhere, can get online. To achieve this goal, he has created internet.org, "a global partnership between technology leaders, nonprofits, local communities, and experts who are working together to bring the Internet to the two-thirds of the world's population that don't have it."

Sources: CNN Money, August 21, 2013, and internet.org

#### THE DATA

- The figure shows that almost 80 percent of Americans and Canadians have Internet access compared to only 16 percent of Africans and 28 percent of Asians.



- Of the 5 billion people who Mark Zuckerberg wants to have Internet access, 1 billion live in Africa and 2.8 billion live in Asia.
- To figure out what it would take for everyone to have Internet access, we must make an assumption about how many people share resources.
- If four people shared, it would cost about \$285 billion for computers and \$115 billion a year for Internet access for everyone to get online.
- Satisfying Mark Zuckerberg's want would cost the equivalent of 400 years of Facebook's 2012 profit, or 1,600 Boeing 787 Dreamliners, or 90 aircraft carriers, or 87 billion Big Macs.

#### THE QUESTIONS

- What is the fundamental economic problem and how does this news clip illustrate it?
- What are some of the things that might be forgone for more people to get online?
- Why don't more people make the tradeoffs needed to get online?
- Why might it be in Mark Zuckerberg's self-interest to get everyone online?
- Why might it not be in the social interest for everyone to get online?



In Africa, 4 in 5 people lack Internet access.

#### THE ANSWERS

- The fundamental economic problem is scarcity—the fact that wants exceed the resources available to satisfy them. The news clip illustrates scarcity because Mark Zuckerberg's want for everyone to get online *exceeds* the resources available to satisfy it.
- Some of the scarce resources that are used to produce airplanes, war ships, and Big Macs could be reallocated and used to produce more computers and Internet service.
- People don't make the tradeoffs needed to get online because for them the marginal cost of doing so would exceed the marginal benefit.
- It might be in Mark Zuckerberg's self-interest to get everyone online because that would increase the number of Facebook users and increase the firm's advertising revenues.
- It would not be in the social interest to get everyone online if the marginal cost of an Internet connection exceeded its marginal benefit.

## SUMMARY

### Key Points

#### Definition of Economics (p. 2)

- All economic questions arise from scarcity—from the fact that wants exceed the resources available to satisfy them.
- Economics is the social science that studies the choices that people make as they cope with scarcity.
- The subject divides into microeconomics and macroeconomics.

Working Problem 1 will give you a better understanding of the definition of economics.

#### Two Big Economic Questions (pp. 3–8)

- Two big questions summarize the scope of economics:
  1. How do choices end up determining *what, how, and for whom* goods and services are produced?
  2. When do choices made in the pursuit of *self-interest* also promote the *social interest*?

Working Problems 2 and 3 will give you a better understanding of the two big questions of economics.

#### The Economic Way of Thinking (pp. 9–10)

- Every choice is a tradeoff—exchanging more of something for less of something else.
- People make rational choices by comparing benefit and cost.
- Cost—*opportunity cost*—is what you must give up to get something.
- Most choices are “how much” choices made at the *margin* by comparing marginal benefit and marginal cost.
- Choices respond to incentives.

Working Problems 4 and 5 will give you a better understanding of the economic way of thinking.

#### Economics as Social Science and Policy Tool (p. 11)

- Economists distinguish between positive statements—what is—and normative statements—what ought to be.
- To explain the economic world, economists create and test economic models.
- Economics is a toolkit used to provide advice on government, business, and personal economic decisions.

Working Problem 6 will give you a better understanding of economics as social science and policy tool.

### Key Terms

Benefit, 9  
 Capital, 4  
 Economic model, 11  
 Economics, 2  
 Efficient, 5  
 Entrepreneurship, 4  
 Factors of production, 3  
 Goods and services, 3  
 Human capital, 3  
 Incentive, 2

Interest, 4  
 Labour, 3  
 Land, 3  
 Macroeconomics, 2  
 Margin, 10  
 Marginal benefit, 10  
 Marginal cost, 10  
 Microeconomics, 2  
 Opportunity cost, 9  
 Preferences, 9

Profit, 4  
 Rational choice, 9  
 Rent, 4  
 Scarcity, 2  
 Self-interest, 5  
 Social interest, 5  
 Tradeoff, 9  
 Wages, 4

## ◆ STUDY PLAN PROBLEMS AND APPLICATIONS

**MyEconLab** You can work Problems 1 to 6 in MyEconLab Chapter 1 Study Plan and get instant feedback.

### Definition of Economics (Study Plan 1.1)

1. Apple Inc. decides to make iTunes freely available in unlimited quantities.
  - a. Does Apple's decision change the incentives that people face?
  - b. Is Apple's decision an example of a microeconomic or a macroeconomic issue?

### Two Big Economic Questions (Study Plan 1.2)

2. Which of the following pairs does not match?
  - a. Labour and wages
  - b. Land and rent
  - c. Entrepreneurship and profit
  - d. Capital and profit
3. Explain how the following news headlines concern self-interest and the social interest.
  - a. Starbucks Expands in China
  - b. McDonald's Moves into Gourmet Coffee
  - c. Food Must Be Labelled with Nutrition Data

### The Economic Way of Thinking (Study Plan 1.3)

4. The night before an economics test, you decide to go to the movies instead of staying home and working your MyEconLab Study Plan. You get

50 percent on your test compared with the 70 percent that you normally score.

- a. Did you face a tradeoff?
- b. What was the opportunity cost of your evening at the movies?

### 5. Cost of Sochi Winter Olympics

The Russian government spent \$6.7 billion on Olympic facilities and \$16.7 billion upgrading Sochi area infrastructure. Sponsors spent \$27.6 billion on hotels and facilities hoping to turn Sochi into a year-round tourist magnet.

Source: *The Washington Post*, February 11, 2014

Was the opportunity cost of the Sochi Olympics \$6.7, \$23.4, or \$51 billion? Explain your answer.

### Economics as Social Science and Policy Tool

(Study Plan 1.4)

6. Which of the following statements is positive, which is normative, and which can be tested?
  - a. Canada should cut its imports.
  - b. China is Canada's largest trading partner.
  - c. The federal government should increase the production of biofuels.

## ◆ ADDITIONAL PROBLEMS AND APPLICATIONS

**MyEconLab** You can work these problems in MyEconLab if assigned by your instructor.

### Definition of Economics

#### 7. Rapper Offers Free Tickets for Concert

Eminem will hit the road with Rihanna offering an awesome deal—buy one and get one free!

Source: *Mstars News*, February 24, 2014

When Eminem gave away tickets, what was free and what was scarce? Explain your answer.

as drivers lined up to get the discount of 10 cents a litre.

- a. What is the opportunity cost of a litre of gas? Explain.
- b. To control the crowd, Costco hires traffic police. What is the tradeoff that Costco faces?
11. What might be an incentive for you to take a class in summer school? List some of the benefits and costs involved in your decision. Would your choice be rational?

### Economics as Social Science and Policy Tool

12. Look at today's *National Post*. What is the leading economic news story? With which of the big economic questions does it deal and what trade-offs does it discuss or imply?
13. Provide two microeconomic statements and two macroeconomic statements. Classify your statements as positive or normative. Explain why.

### Two Big Economic Questions

8. How does the creation of a successful movie influence *what, how, and for whom* goods and services are produced?
9. How does a successful movie illustrate self-interested choices that are also in the social interest?

### The Economic Way of Thinking

10. When Costco opened a gas bar just off Highway 401, the neighbourhood was swamped with cars

## APPENDIX

### Graphs in Economics

**After studying this appendix,  
you will be able to:**

- ◆ Make and interpret a scatter diagram
- ◆ Identify linear and nonlinear relationships and relationships that have a maximum and a minimum
- ◆ Define and calculate the slope of a line
- ◆ Graph relationships among more than two variables

### Graphing Data

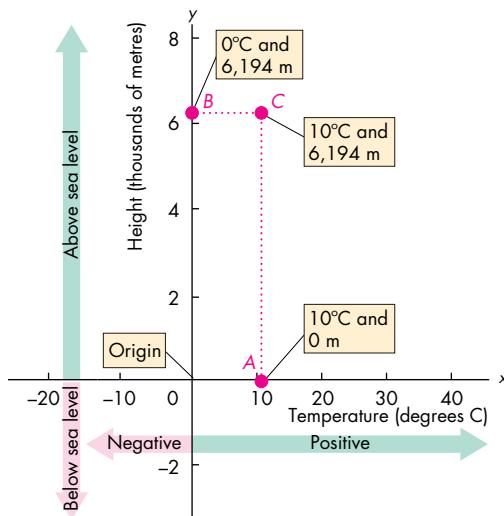
A graph represents a quantity as a distance on a line. In Fig. A1.1, a distance on the horizontal line represents temperature, measured in degrees Celsius. A movement from left to right shows an increase in temperature. The point 0 represents zero degrees Celsius. To the right of 0, the temperature is positive. To the left of 0, the temperature is negative (as indicated by the minus sign). A distance on the vertical line represents height, measured in thousands of metres. The point 0 represents sea level. Points above 0 represent metres above sea level. Points below 0 represent metres below sea level (indicated by a minus sign).

In Fig. A1.1, the two scale lines are perpendicular to each other and are called *axes*. The vertical line is the *y-axis*, and the horizontal line is the *x-axis*. Each axis has a zero point, which is shared by the two axes and called the *origin*.

To make a two-variable graph, we need two pieces of information: the value of the variable *x* and the value of the variable *y*. For example, off the coast of British Columbia, the temperature is 10 degrees—the value of *x*. A fishing boat is located at 0 metres above sea level—the value of *y*. These two bits of information appear as point *A* in Fig. A1.1. A climber at the top of Mount McKinley on a cold day is 6,194 metres above sea level in a zero-degree gale. These two pieces of information appear as point *B*. On a warmer day, a climber might be at the peak of Mt. McKinley when the temperature is 10 degrees, at point *C*.

We can draw two lines, called *coordinates*, from point *C*. One, called the *x*-coordinate, runs from *C* to

**FIGURE A1.1** Making a Graph



Graphs have axes that measure quantities as distances. Here, the horizontal axis (*x*-axis) measures temperature, and the vertical axis (*y*-axis) measures height. Point *A* represents a fishing boat at sea level (0 on the *y*-axis) on a day when the temperature is 10°C. Point *B* represents a climber at the top of Mt. McKinley, 6,194 metres above sea level at a temperature of 0°F. Point *C* represents a climber at the top of Mt. McKinley, 6,194 metres above sea level at a temperature of 10°C.

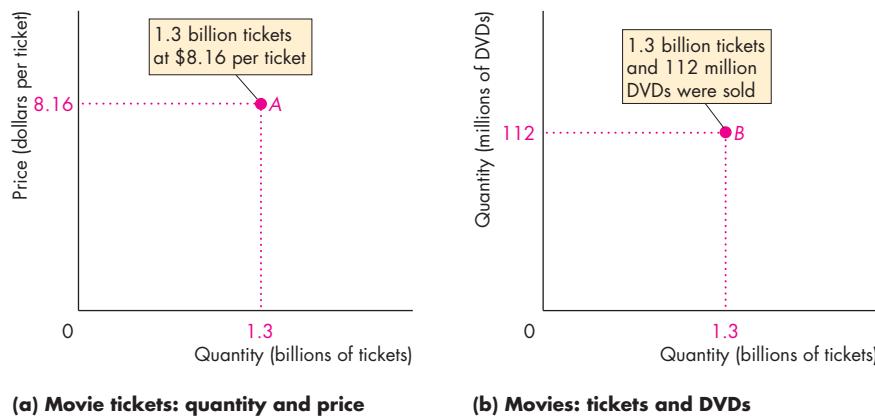
**MyEconLab Animation**

the vertical axis. This line is called “the *x*-coordinate” because its length is the same as the value marked off on the *x*-axis. The other, called the *y*-coordinate, runs from *C* to the horizontal axis. This line is called “the *y*-coordinate” because its length is the same as the value marked off on the *y*-axis.

We describe a point on a graph by the values of its *x*-coordinate and its *y*-coordinate. For example, at point *C*, *x* is 10 degrees and *y* is 6,194 metres.

A graph like that in Fig. A1.1 can be made using any quantitative data on two variables. The graph can show just a few points, like Fig. A1.1, or many points. Before we look at graphs with many points, let’s reinforce what you’ve just learned by looking at two graphs made with economic data.

Economists measure variables that describe *what*, *how*, and *for whom* goods and services are produced. These variables are quantities produced and prices. Figure A1.2 shows two examples of economic graphs.

**FIGURE A1.2** Two Graphs of Economic Data

The graph in part (a) tells us that in 2013, 1.3 billion movie tickets were sold at an average price of \$8.16 per ticket.

The graph in part (b) tells us that in 2013, 1.3 billion movie tickets and 112 million DVDs were sold.

**MyEconLab Animation**

Figure A1.2(a) is a graph about movie tickets in 2013. The  $x$ -axis measures the quantity of movie tickets sold and the  $y$ -axis measures the average price of a ticket. Point *A* tells us what the quantity and price were. You can “read” this graph as telling you that in 2013, 1.3 billion movie tickets were sold at an average ticket price of \$8.16.

Figure A1.2(b) is a graph about movie-going and DVD buying. The  $x$ -axis measures the quantity of movie tickets sold in 2013 and the  $y$ -axis measures the quantity of DVDs sold in the same year. Point *B* tells us what these quantities were. You can “read” this graph as telling you that in 2013, 1.3 billion movie tickets and 112 million DVDs were sold.

The three graphs that you’ve just seen tell you how to make a graph and how to read a data point on a graph, but they don’t improve on the raw data. Graphs become interesting and revealing when they contain a number of data points because then you can visualize the data.

Economists create graphs based on the principles in Figs. A1.1 and A1.2 to reveal, describe, and visualize the relationships among variables. We’re now going to look at some examples. These graphs are called scatter diagrams.

### Scatter Diagrams

A **scatter diagram** is a graph that plots the value of one variable against the value of another variable for a number of different values of each variable. Such a graph reveals whether a relationship exists between two variables and describes their relationship.

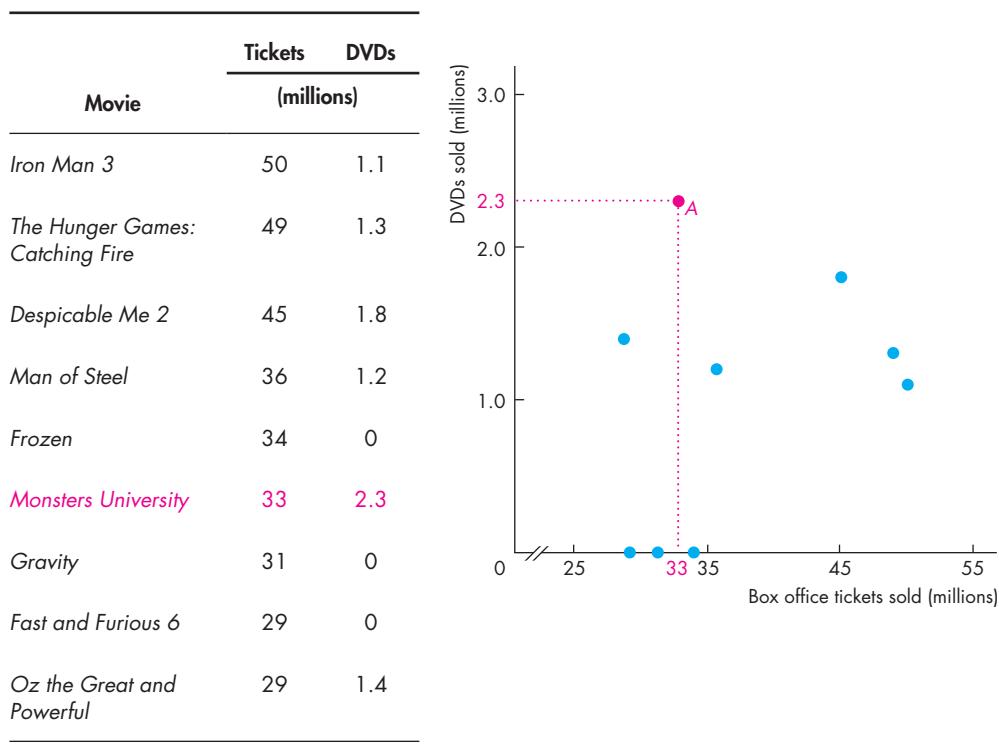
The table in Fig. A1.3 shows some data on two variables: the number of tickets sold at the box office and the number of DVDs sold for nine of the most popular movies in 2013.

What is the relationship between these two variables? Does a big box office success generate a large volume of DVD sales? Or does a box office success mean that fewer DVDs are sold?

We can answer these questions by making a scatter diagram. We do so by graphing the data in the table. In the graph in Fig. A1.3, each point shows the number of box office tickets sold (the  $x$  variable) and the number of DVDs sold (the  $y$  variable) of one of the movies. There are nine movies, so there are nine points “scattered” within the graph.

The point labelled *A* tells us that *Monsters University* sold 33 million tickets at the box office and 2.3 million DVDs. The points in the graph don’t form a distinct pattern. They suggest that large box office sales do not directly bring large DVD sales. If you want to predict a movie’s DVD sales in a given year with any confidence, you need to know more than the number of tickets sold at the box office in that year.

Figure A1.4 shows two scatter diagrams of economic variables. Part (a) shows the relationship between income and expenditure, on average, from 2003 to 2013. Each point represents income and expenditure in a given year. For example, point *A* shows that in 2006, income was \$35,000 and expenditure was \$25,000. This graph shows that as income increases, so does expenditure, and the relationship is a close one.

**FIGURE A1.3** A Scatter Diagram

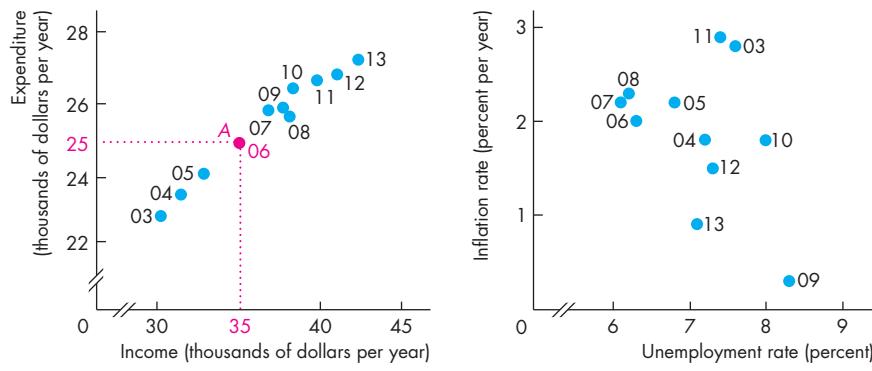
The table lists the number of tickets sold at the box office and the number of DVDs sold for nine popular movies.

The pattern formed by the points shows no tendency for large box office sales to bring greater DVD sales. You cannot predict how many DVDs of a movie will sell in a given year just by knowing its box office sales in that year.

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Figure A1.4(b) shows a scatter diagram of inflation and unemployment in Canada from 2003 to 2013. Here, the points show no relationship between the two variables. For example, when unemployment was high, the inflation rate was high in 2003 and low in 2013.

You can see that a scatter diagram conveys a wealth of information, and it does so in much less space than we have used to describe only some of its features. But you do have to “read” the graph to obtain all this information.

**FIGURE A1.4** Two Economic Scatter Diagrams

The scatter diagram in part (a) shows the relationship between income and expenditure from 2003 to 2013. Point A shows that in 2006, income was \$35,000 on the x-axis and expenditure was \$25,000 on the y-axis. This graph shows that as income rises, so does expenditure, and the relationship is a close one.

The scatter diagram in part (b) shows a weak relationship between unemployment and inflation in Canada during most of the years.

**MyEconLab Animation**

**Breaks in the Axes** The graph in Fig. A1.4(a) has breaks in its axes, as shown by the small gaps. The breaks indicate that there are jumps from the origin, 0, to the first values recorded.

The breaks are used because the lowest value of income is \$30,000 and the lowest value of expenditure exceeds \$22,000. If we made this graph with no breaks in its axes, there would be a lot of empty space, the points would be crowded into the top right corner, and it would be difficult to see whether a relationship exists between these two variables. By breaking the axes, we are able to bring the relationship into view.

Putting a break in one or both axes is like using a zoom lens to bring the relationship into the centre of the graph and magnify it so that the relationship fills the graph.

**Misleading Graphs** Breaks can be used to highlight a relationship, but they can also be used to mislead—to make a graph that lies. The most common way of making a graph lie is to put a break in the axis and either to stretch or compress the scale. For example, suppose that in Fig. A1.4(a), the  $y$ -axis that measures expenditure ran from zero to \$28,000 while the  $x$ -axis was the same as the one shown. The graph would now create the impression that despite a huge increase in income, expenditure had barely changed.

To avoid being misled, it is a good idea to get into the habit of always looking closely at the values and the labels on the axes of a graph before you start to interpret it.

**Correlation and Causation** A scatter diagram that shows a clear relationship between two variables, such as Fig. A1.4(a), tells us that the two variables have a high correlation. When a high correlation is present, we can predict the value of one variable from the value of the other variable. But correlation does not imply causation.

Sometimes a high correlation does arise from a causal relationship. It is likely that rising income causes rising expenditure (Fig. A1.4a). But a high correlation can mean that two variables have a common cause. For example, ice cream sales and pool drownings are correlated not because one causes the other, but because both are caused by hot weather.

You've now seen how we can use graphs in economics to show economic data and to reveal relationships. Next, we'll learn how economists use graphs to construct and display economic models.

## Graphs Used in Economic Models

The graphs used in economics are not always designed to show real-world data. Often they are used to show general relationships among the variables in an economic model.

An *economic model* is a stripped-down, simplified description of an economy or of a component of an economy such as a business or a household. It consists of statements about economic behaviour that can be expressed as equations or as curves in a graph. Economists use models to explore the effects of different policies or other influences on the economy in ways that are similar to the use of model airplanes in wind tunnels and models of the climate.

You will encounter many different kinds of graphs in economic models, but there are some repeating patterns. Once you've learned to recognize these patterns, you will instantly understand the meaning of a graph. Here, we'll look at the different types of curves that are used in economic models, and we'll see some everyday examples of each type of curve. The patterns to look for in graphs are the four cases in which:

- Variables move in the same direction.
- Variables move in opposite directions.
- Variables have a maximum or a minimum.
- Variables are unrelated.

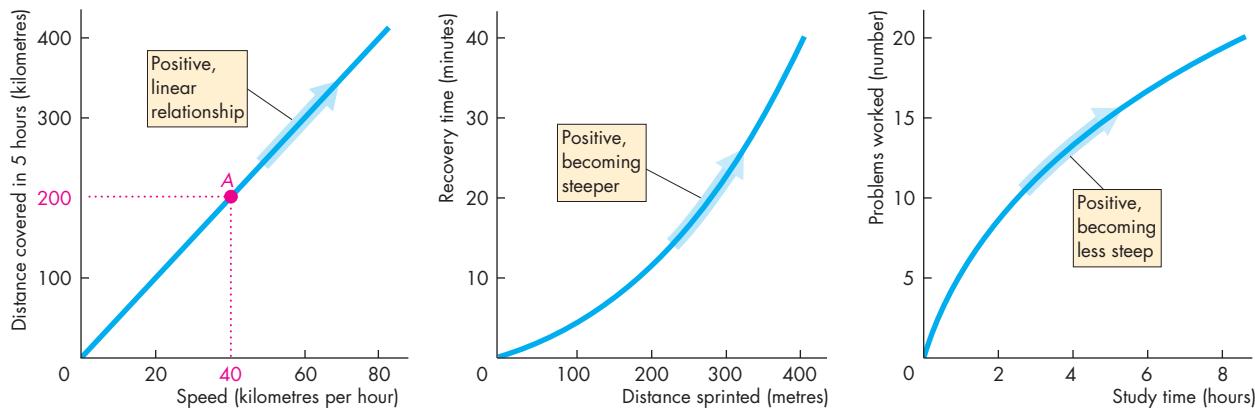
Let's look at these four cases.

### Variables That Move in the Same Direction

Figure A1.5 shows graphs of the relationships between two variables that move up and down together. A relationship between two variables that move in the same direction is called a **positive relationship** or a **direct relationship**. A line that slopes upward shows such a relationship.

Figure A1.5 shows three types of relationships: one that has a straight line and two that have curved lines. All the lines in these three graphs are called curves. Any line on a graph—no matter whether it is straight or curved—is called a *curve*.

A relationship shown by a straight line is called a **linear relationship**. Figure A1.5(a) shows a linear relationship between the number of kilometres travelled

**FIGURE A1.5** Positive (Direct) Relationships

(a) Positive, linear relationship

(b) Positive, becoming steeper

(c) Positive, becoming less steep

Each part shows a positive (direct) relationship between two variables. That is, as the value of the variable measured on the x-axis increases, so does the value of the variable measured on the y-axis. Part (a) shows a linear positive relationship—as the two variables increase together, we move along a straight line.

Part (b) shows a positive relationship such that as the two variables increase together, we move along a curve that becomes steeper.

Part (c) shows a positive relationship such that as the two variables increase together, we move along a curve that becomes flatter.

[MyEconLab Animation](#)

in 5 hours and speed. For example, point A shows that you will travel 200 kilometres in 5 hours if your speed is 40 kilometres an hour. If you double your speed to 80 kilometres an hour, you will travel 400 kilometres in 5 hours.

Figure A1.5(b) shows the relationship between distance sprinted and recovery time (the time it takes the heart rate to return to its normal resting rate). This relationship is an upward-sloping one that starts out quite flat but then becomes steeper as we move along the curve away from the origin. The reason this curve becomes steeper is that the additional recovery time needed from sprinting an additional 100 metres increases. It takes less than 5 minutes to recover from sprinting 100 metres but more than 10 minutes to recover from 200 metres.

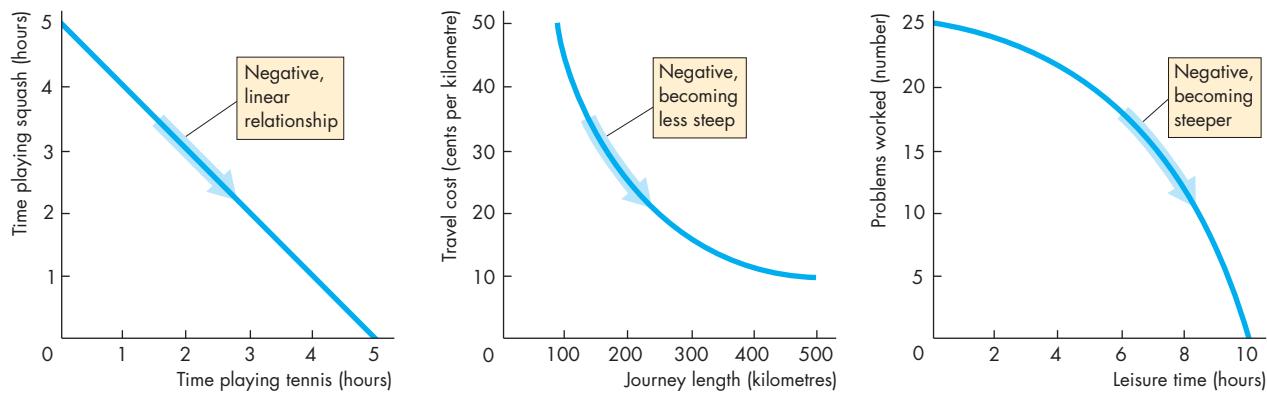
Figure A1.5(c) shows the relationship between the number of problems worked by a student and the amount of study time. This relationship is an upward-sloping one that starts out quite steep and becomes flatter as we move along the curve away from the origin. Study time becomes less productive as the student spends more hours studying and becomes more tired.

## Variables That Move in Opposite Directions

Figure A1.6 shows relationships between things that move in opposite directions. A relationship between variables that move in opposite directions is called a **negative relationship** or an **inverse relationship**.

Figure A1.6(a) shows the relationship between the hours spent playing squash and the hours spent playing tennis when the total time available is 5 hours. One extra hour spent playing tennis means one hour less spent playing squash and vice versa. This relationship is negative and linear.

Figure A1.6(b) shows the relationship between the cost per kilometre travelled and the length of a journey. The longer the journey, the lower is the cost per kilometre. But as the journey length increases, even though the cost per kilometre decreases, the fall in the cost per kilometre is smaller, the longer the journey. This feature of the relationship is shown by the fact that the curve slopes downward, starting out steep at a short journey length and then becoming flatter as the journey length increases. This relationship arises because some of the costs are fixed, such as auto insurance, and the fixed costs are spread over a longer journey.

**FIGURE A1.6** Negative (Inverse) Relationships**(a) Negative, linear relationship****(b) Negative, becoming less steep****(c) Negative, becoming steeper**

Each part shows a negative (inverse) relationship between two variables. Part (a) shows a linear negative relationship. The total time spent playing tennis and squash is 5 hours. As the time spent playing tennis increases, the time spent playing squash decreases, and we move along a straight line.

Part (b) shows a negative relationship such that as the journey length increases, the travel cost decreases as we move along a curve that becomes less steep.

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

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Figure A1.6(c) shows the relationship between the amount of leisure time and the number of problems worked by a student. Increasing leisure time produces an increasingly large reduction in the number of problems worked. This relationship is a negative one that starts out with a gentle slope at a small number of leisure hours and becomes steeper as the number of leisure hours increases. This relationship is a different view of the idea shown in Fig. A1.5(c).

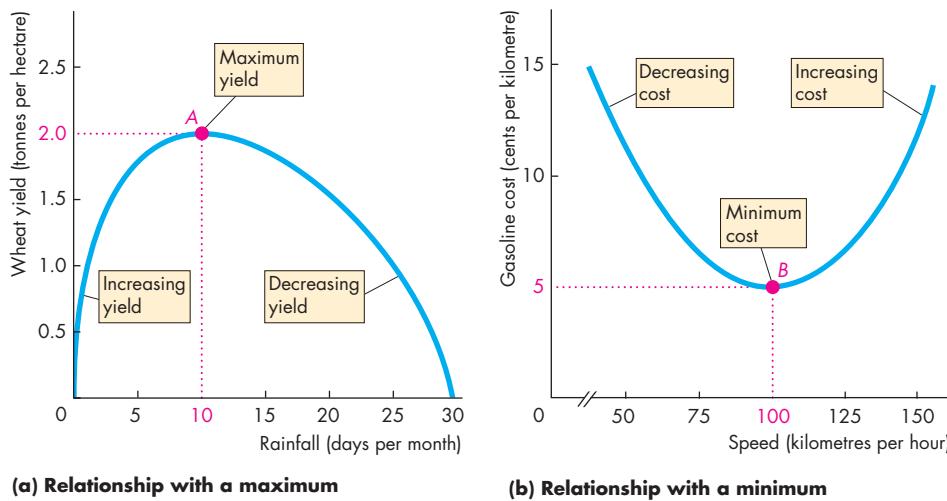
### Variables That Have a Maximum or a Minimum

Many relationships in economic models have a maximum or a minimum. For example, firms try to make the maximum possible profit and to produce at the lowest possible cost. Figure A1.7 shows relationships that have a maximum or a minimum.

Figure A1.7(a) shows the relationship between rainfall and wheat yield. When there is no rainfall, wheat will not grow, so the yield is zero. As the rainfall increases up to 10 days a month, the wheat yield increases. With 10 rainy days each month, the wheat

yield reaches its maximum at 2 tonnes per hectare (point A). Rain in excess of 10 days a month starts to lower the yield of wheat. If every day is rainy, the wheat suffers from a lack of sunshine and the yield decreases to zero. This relationship is one that starts out sloping upward, reaches a maximum, and then slopes downward.

Figure A1.7(b) shows the reverse case—a relationship that begins sloping downward, falls to a minimum, and then slopes upward. Most economic costs are like this relationship. An example is the relationship between the cost per kilometre and the speed of the car. At low speeds, the car is creeping in a traffic snarl-up. The number of kilometres per litre is low, so the gasoline cost per kilometre is high. At high speeds, the car is travelling faster than its efficient speed, using a large quantity of gasoline, and again the number of kilometres per litre is low and the gasoline cost per kilometre is high. At a speed of 100 kilometres an hour, the gasoline cost per kilometre is at its minimum (point B). This relationship is one that starts out sloping downward, reaches a minimum, and then slopes upward.

**FIGURE A1.7** Maximum and Minimum Points

Part (a) shows a relationship that has a maximum point, A. The curve slopes upward as it rises to its maximum point, is flat at its maximum, and then slopes downward.

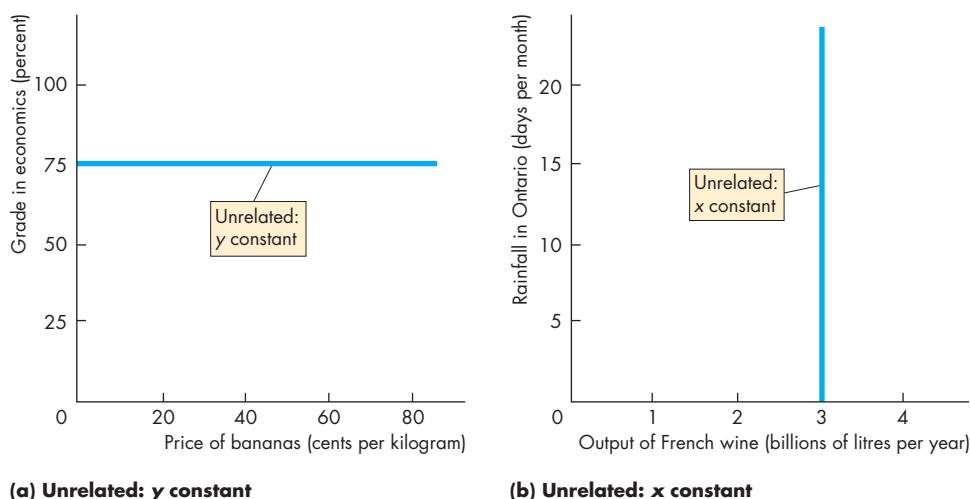
Part (b) shows a relationship with a minimum point, B. The curve slopes downward as it falls to its minimum, is flat at its minimum, and then slopes upward.

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### Variables That Are Unrelated

There are many situations in which no matter what happens to the value of one variable, the other variable remains constant. Sometimes we want to show the independence between two variables in a graph, and Fig. A1.8 shows two ways of achieving this.

In describing the graphs in Fig. A1.5 through Fig. A1.7, we have talked about curves that slope upward or slope downward and curves that become less steep or steeper. Let's spend a little time discussing exactly what we mean by *slope* and how we measure the slope of a curve.

**FIGURE A1.8** Variables That Are Unrelated

This figure shows how we can graph two variables that are unrelated. In part (a), a student's grade in economics is plotted at 75 percent on the y-axis regardless of the price of bananas on the x-axis. The curve is horizontal.

In part (b), the output of the vineyards of France on the x-axis does not vary with the rainfall in Ontario on the y-axis. The curve is vertical.

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## The Slope of a Relationship

We can measure the influence of one variable on another by the slope of the relationship. The **slope** of a relationship is the change in the value of the variable measured on the  $y$ -axis divided by the change in the value of the variable measured on the  $x$ -axis. We use the Greek letter  $\Delta$  (*delta*) to represent “change in.” Thus  $\Delta y$  means the change in the value of the variable measured on the  $y$ -axis, and  $\Delta x$  means the change in the value of the variable measured on the  $x$ -axis. Therefore the slope of the relationship is

$$\text{Slope} = \frac{\Delta y}{\Delta x}.$$

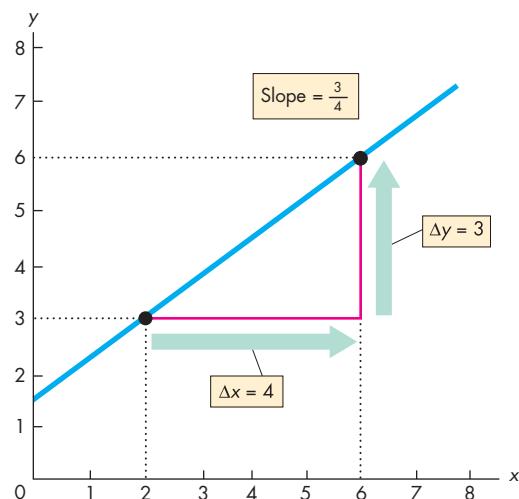
If a large change in the variable measured on the  $y$ -axis ( $\Delta y$ ) is associated with a small change in the variable measured on the  $x$ -axis ( $\Delta x$ ), the slope is large and the curve is steep. If a small change in the variable measured on the  $y$ -axis ( $\Delta y$ ) is associated with a large change in the variable measured on the  $x$ -axis ( $\Delta x$ ), the slope is small and the curve is flat.

We can make the idea of slope clearer by doing some calculations.

### The Slope of a Straight Line

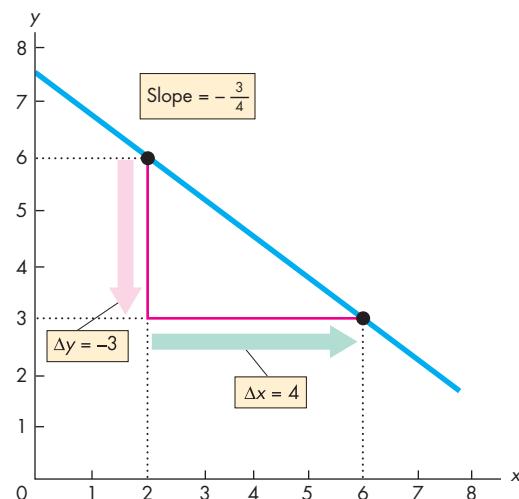
The slope of a straight line is the same regardless of where on the line you calculate it. The slope of a straight line is constant. Let’s calculate the slope of the positive relationship in Fig. A1.9. In part (a),

**FIGURE A1.9** The Slope of a Straight Line



To calculate the slope of a straight line, we divide the change in the value of the variable measured on the  $y$ -axis ( $\Delta y$ ) by the change in the value of the variable measured on the  $x$ -axis ( $\Delta x$ ) as we move along the line.

Part (a) shows the calculation of a positive slope. When  $x$  increases from 2 to 6,  $\Delta x$  equals 4. That change in



$x$  brings about an increase in  $y$  from 3 to 6, so  $\Delta y$  equals 3. The slope ( $\Delta y/\Delta x$ ) equals  $3/4$ .

Part (b) shows the calculation of a negative slope. When  $x$  increases from 2 to 6,  $\Delta x$  equals 4. That increase in  $x$  brings about a decrease in  $y$  from 6 to 3, so  $\Delta y$  equals  $-3$ . The slope ( $\Delta y/\Delta x$ ) equals  $-3/4$ .

when  $x$  increases from 2 to 6,  $y$  increases from 3 to 6. The change in  $x$  is +4—that is,  $\Delta x$  is 4. The change in  $y$  is +3—that is,  $\Delta y$  is 3. The slope of that line is

$$\frac{\Delta y}{\Delta x} = \frac{3}{4}.$$

In part (b), when  $x$  increases from 2 to 6,  $y$  decreases from 6 to 3. The change in  $y$  is *minus* 3—that is,  $\Delta y$  is -3. The change in  $x$  is *plus* 4—that is,  $\Delta x$  is 4. The slope of the curve is

$$\frac{\Delta y}{\Delta x} = \frac{-3}{4}.$$

Notice that the two slopes have the same magnitude ( $3/4$ ), but the slope of the line in part (a) is positive ( $+3/4 = 3/4$ ) while that in part (b) is negative ( $-3/4 = -3/4$ ). The slope of a positive relationship is positive; the slope of a negative relationship is negative.

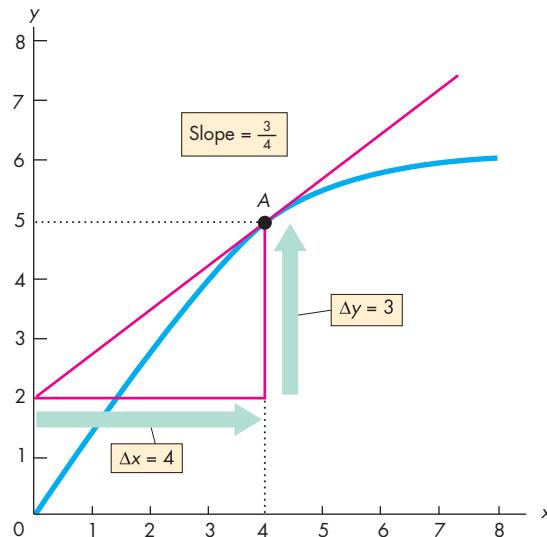
### The Slope of a Curved Line

The slope of a curved line is trickier. The slope of a curved line is not constant, so the slope depends on where on the curved line we calculate it. There are two ways to calculate the slope of a curved line: You can calculate the slope at a point, or you can calculate the slope across an arc of the curve. Let's look at the two alternatives.

**Slope at a Point** To calculate the slope at a point on a curve, you need to construct a straight line that has the same slope as the curve at the point in question. Figure A1.10 shows how this is done. Suppose you want to calculate the slope of the curve at point  $A$ . Place a ruler on the graph so that the ruler touches point  $A$  and no other point on the curve, then draw a straight line along the edge of the ruler. The straight red line is this line, and it is the tangent to the curve at point  $A$ . If the ruler touches the curve only at point  $A$ , then the slope of the curve at point  $A$  must be the same as the slope of the edge of the ruler. If the curve and the ruler do not have the same slope, the line along the edge of the ruler will cut the curve instead of just touching it.

Now that you have found a straight line with the same slope as the curve at point  $A$ , you can calculate the slope of the curve at point  $A$  by calculating the slope of the straight line. Along the straight

**FIGURE A1.10** Slope at a Point



To calculate the slope of the curve at point  $A$ , draw the red line that just touches the curve at  $A$ —the tangent. The slope of this straight line is calculated by dividing the change in  $y$  by the change in  $x$  along the red line. When  $x$  increases from 0 to 4,  $\Delta x$  equals 4. That change in  $x$  is associated with an increase in  $y$  from 2 to 5, so  $\Delta y$  equals 3. The slope of the red line is  $3/4$ , so the slope of the curve at point  $A$  is  $3/4$ .

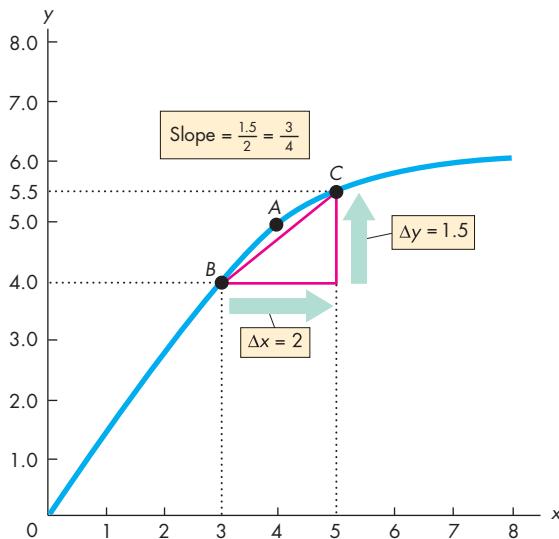
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line, as  $x$  increases from 0 to 4 ( $\Delta x$  is 4)  $y$  increases from 2 to 5 ( $\Delta y$  is 3). Therefore the slope of the straight line is

$$\frac{\Delta y}{\Delta x} = \frac{3}{4}.$$

So the slope of the curve at point  $A$  is  $3/4$ .

**Slope Across an Arc** An arc of a curve is a piece of a curve. Figure A1.11 shows the same curve as in Fig. A1.10, but instead of calculating the slope at point  $A$ , we are now going to calculate the slope across the arc from point  $B$  to point  $C$ . You can see that the slope of the curve at point  $B$  is greater than at point  $C$ . When we calculate the slope across an arc, we are calculating the average slope between two points. As we move along the arc from  $B$  to  $C$ ,  $x$  increases from 3 to 5 and  $y$  increases from 4.0 to 5.5. The change in  $x$  is 2 ( $\Delta x$  is 2), and the change in  $y$  is 1.5 ( $\Delta y$  is 1.5).

**FIGURE A1.11** Slope Across an Arc

To calculate the average slope of the curve along the arc  $BC$ , draw a straight line from point  $B$  to point  $C$ . The slope of the line  $BC$  is calculated by dividing the change in  $y$  by the change in  $x$ . In moving from  $B$  to  $C$ , the increase in  $x$  is 2 ( $\Delta x$  equals 2) and the change in  $y$  is 1.5 ( $\Delta y$  equals 1.5). The slope of the line  $BC$  is 1.5 divided by 2, or  $3/4$ . So the slope of the curve across the arc  $BC$  is  $3/4$ .

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Therefore the slope is

$$\frac{\Delta y}{\Delta x} = \frac{1.5}{2} = \frac{3}{4}.$$

So the slope of the curve across the arc  $BC$  is  $3/4$ .

This calculation gives us the slope of the curve between points  $B$  and  $C$ . The actual slope calculated is the slope of the straight line from  $B$  to  $C$ . This slope approximates the average slope of the curve along the arc  $BC$ . In this particular example, the slope across the arc  $BC$  is identical to the slope of the curve at point  $A$ , but the calculation of the slope of a curve does not always work out so neatly. You might have fun constructing some more examples and a few counter examples.

You now know how to make and interpret a graph. So far, we've limited our attention to graphs of two variables. We're now going to learn how to graph more than two variables.

## Graphing Relationships Among More Than Two Variables

We have seen that we can graph the relationship between two variables as a point formed by the  $x$ - and  $y$ -coordinates in a two-dimensional graph. You might be thinking that although a two-dimensional graph is informative, most of the things in which you are likely to be interested involve relationships among many variables, not just two. For example, the amount of ice cream consumed depends on the price of ice cream and the temperature. If ice cream is expensive and the temperature is low, people eat much less ice cream than when ice cream is inexpensive and the temperature is high. For any given price of ice cream, the quantity consumed varies with the temperature; and for any given temperature, the quantity of ice cream consumed varies with its price.

Figure A1.12 shows a relationship among three variables. The table shows the number of litres of ice cream consumed each day at two different temperatures and at a number of different prices of ice cream. How can we graph these numbers?

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

### Ceteris Paribus

**Ceteris paribus** (often shortened to *cet par*) means “if all other relevant things remain the same.” To isolate the relationship of interest in a laboratory experiment, a scientist holds everything constant except for the variable whose effect is being studied. Economists use the same method to graph a relationship that has more than two variables.

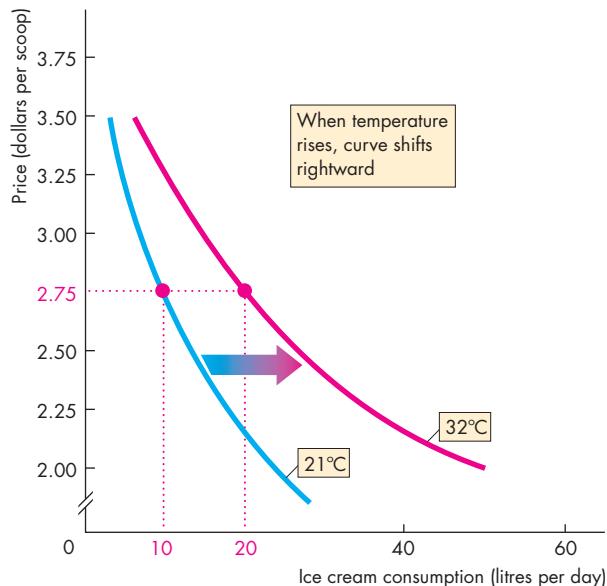
Figure A1.12 shows an example. There, you can see what happens to the quantity of ice cream consumed when the price of ice cream varies but the temperature is held constant.

The curve labelled  $21^{\circ}\text{C}$  shows the relationship between ice cream consumption and the price of ice cream if the temperature remains at  $21^{\circ}\text{C}$ . The numbers used to plot that curve are those in the first two columns of the table. For example, if the temperature is  $21^{\circ}\text{C}$ , 10 litres of ice cream are consumed when the price is \$2.75 a scoop and 18 litres are consumed when the price is \$2.25 a scoop.

The curve labelled  $32^{\circ}\text{C}$  shows the relationship between ice cream consumption and the price of ice cream if the temperature remains at  $32^{\circ}\text{C}$ . The numbers used to plot that curve are those in the first

**FIGURE A1.12** Graphing a Relationship Among Three Variables

Price (dollars per scoop)	Ice cream consumption (litres per day)	
	21°C	32°C
2.00	25	50
2.25	18	36
2.50	13	26
<b>2.75</b>	<b>10</b>	<b>20</b>
3.00	7	14
3.25	5	10
3.50	3	6



Ice cream consumption depends on its price and the temperature. The table tells us how many litres of ice cream are consumed each day at different prices and two different temperatures. For example, if the price is \$2.75 a scoop and the temperature is 21°C, 10 litres of ice cream are consumed. But if the temperature is 32°C, 20 litres are consumed.

To graph a relationship among three variables, the value of one variable is held constant. The graph shows the relationship between price and consumption when

the temperature is held constant. One curve holds the temperature at 21°C and the other holds it at 32°C.

A change in the price of ice cream brings a movement along one of the curves—along the blue curve at 21°C and along the red curve at 32°C.

When the temperature rises from 21°C to 32°C, the curve that shows the relationship between consumption and the price shifts rightward from the blue curve to the red curve.

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and third columns of the table. For example, if the temperature is 32°C, 20 litres are consumed when the price is \$2.75 a scoop and 36 litres are consumed when the price is \$2.25 a scoop.

When the price of ice cream changes but the temperature is constant, you can think of what happens in the graph as a movement along one of the curves. At 21°C there is a movement along the blue curve, and at 32°C there is a movement along the red curve.

### When Other Things Change

The temperature is held constant along each of the curves in Fig. A1.12, but in reality the temperature changes. When that event occurs, you can think of

what happens in the graph as a shift of the curve. When the temperature rises from 21°C to 32°C, the curve that shows the relationship between ice cream consumption and the price of ice cream shifts rightward from the blue curve to the red curve.

You will encounter these ideas of movements along and shifts of curves at many points in your study of economics. Think carefully about what you've just learned and make up some examples (with assumed numbers) about other relationships.

With what you have learned about graphs, you can move forward with your study of economics. There are no graphs in this book that are more complicated than those that have been explained in this appendix.

## MATHEMATICAL NOTE

### Equations of Straight Lines

If a straight line in a graph describes the relationship between two variables, we call it a linear relationship. Figure 1 shows the *linear relationship* between a person's expenditure and income. This person spends \$100 a week (by borrowing or spending previous savings) when income is zero. Out of each dollar earned, this person spends 50 cents (and saves 50 cents).

All linear relationships are described by the same general equation. We call the quantity that is measured on the horizontal axis (or  $x$ -axis)  $x$ , and we call the quantity that is measured on the vertical axis (or  $y$ -axis)  $y$ . In the case of Fig. 1,  $x$  is income and  $y$  is expenditure.

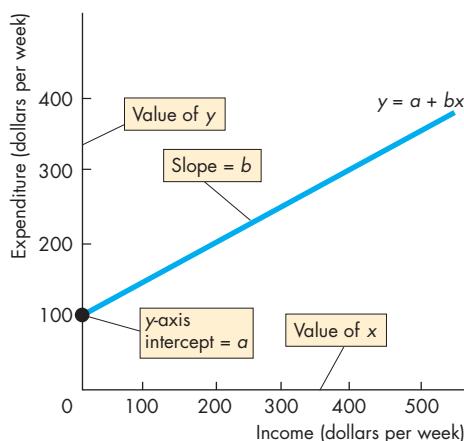
### A Linear Equation

The equation that describes a straight-line relationship between  $x$  and  $y$  is

$$y = a + bx.$$

In this equation,  $a$  and  $b$  are fixed numbers and they are called *constants*. The values of  $x$  and  $y$  vary, so these numbers are called *variables*. Because the equation describes a straight line, the equation is called a *linear equation*.

The equation tells us that when the value of  $x$  is zero, the value of  $y$  is  $a$ . We call the constant  $a$  the  $y$ -axis intercept. The reason is that on the graph



**Figure 1** Linear Relationship

the straight line hits the  $y$ -axis at a value equal to  $a$ . Figure 1 illustrates the  $y$ -axis intercept.

For positive values of  $x$ , the value of  $y$  exceeds  $a$ . The constant  $b$  tells us by how much  $y$  increases above  $a$  as  $x$  increases. The constant  $b$  is the slope of the line.

### Slope of the Line

As we explain in the chapter, the *slope* of a relationship is the change in the value of  $y$  divided by the change in the value of  $x$ . We use the Greek letter  $\Delta$  (delta) to represent "change in." So  $\Delta y$  means the change in the value of the variable measured on the  $y$ -axis, and  $\Delta x$  means the change in the value of the variable measured on the  $x$ -axis. Therefore the slope of the relationship is

$$\text{Slope} = \frac{\Delta y}{\Delta x}.$$

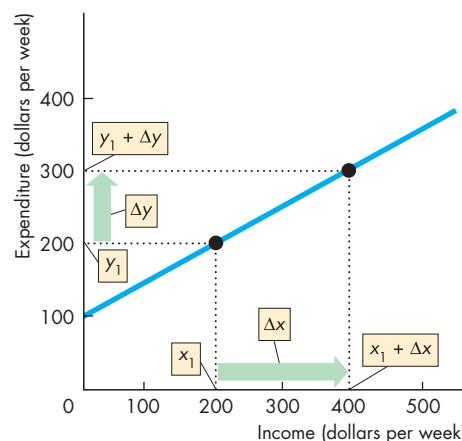
To see why the slope is  $b$ , suppose that initially the value of  $x$  is  $x_1$ , or \$200 in Fig. 2. The corresponding value of  $y$  is  $y_1$ , also \$200 in Fig. 2. The equation of the line tells us that

$$y_1 = a + bx_1. \quad (1)$$

Now the value of  $x$  increases by  $\Delta x$  to  $x_1 + \Delta x$  (or \$400 in Fig. 2). And the value of  $y$  increases by  $\Delta y$  to  $y_1 + \Delta y$  (or \$300 in Fig. 2).

The equation of the line now tells us that

$$y_1 + \Delta y = a + b(x_1 + \Delta x). \quad (2)$$



**Figure 2** Calculating Slope

To calculate the slope of the line, subtract equation (1) from equation (2) to obtain

$$\Delta y = b\Delta x \quad (3)$$

and now divide equation (3) by  $\Delta x$  to obtain

$$\Delta y/\Delta x = b.$$

So the slope of the line is  $b$ .

### Position of the Line

The  $y$ -axis intercept determines the position of the line on the graph. Figure 3 illustrates the relationship between the  $y$ -axis intercept and the position of the line. In this graph, the  $y$ -axis measures saving and the  $x$ -axis measures income. In this graph, the  $y$ -axis measures saving and the  $x$ -axis measures income.

When the  $y$ -axis intercept,  $a$ , is positive, the line hits the  $y$ -axis at a positive value of  $y$ —as the blue line does. Its  $y$ -axis intercept is 100. When the  $y$ -axis intercept,  $a$ , is zero, the line hits the  $y$ -axis at the origin—as the purple line does. Its  $y$ -axis intercept is 0. When the  $y$ -axis intercept,  $a$ , is negative, the line hits the  $y$ -axis at a negative value of  $y$ —as the red line does. Its  $y$ -axis intercept is  $-100$ .

As the equations of the three lines show, the value of the  $y$ -axis intercept does not influence the slope of the line. All three lines have a slope equal to 0.5.

### Positive Relationships

Figure 1 shows a positive relationship—the two variables  $x$  and  $y$  move in the same direction. All positive relationships have a slope that is positive. In the

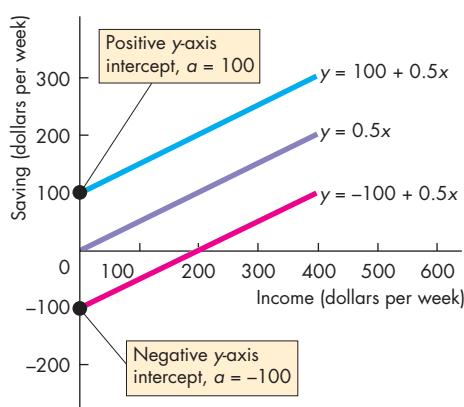


Figure 3 The  $y$ -Axis Intercept

equation of the line, the constant  $b$  is positive. In this example, the  $y$ -axis intercept,  $a$ , is 100. The slope  $b$  equals  $\Delta y/\Delta x$ , which in Fig. 2 is 100/200 or 0.5. The equation of the line is

$$y = 100 + 0.5x.$$

### Negative Relationships

Figure 4 shows a negative relationship—the two variables  $x$  and  $y$  move in the opposite direction. All negative relationships have a slope that is negative. In the equation of the line, the constant  $b$  is negative. In the example in Fig. 4, the  $y$ -axis intercept,  $a$ , is 30. The slope,  $b$ , equals  $\Delta y/\Delta x$ , which is  $-20/2$  or  $-10$ . The equation of the line is

$$y = 30 + (-10)x$$

or

$$y = 30 - 10x.$$

### Example

A straight line has a  $y$ -axis intercept of 50 and a slope of 2. What is the equation of this line?

The equation of a straight line is

$$y = a + bx$$

where  $a$  is the  $y$ -axis intercept and  $b$  is the slope. So the equation is

$$y = 50 + 2x.$$

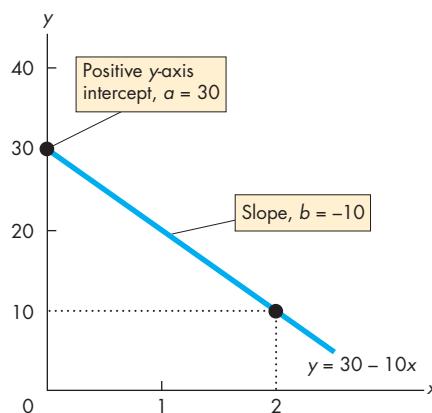


Figure 4 Negative Relationship

## REVIEW QUIZ

- 1 Explain how we “read” the three graphs in Figs. A1.1 and A1.2.
- 2 Explain what scatter diagrams show and why we use them.
- 3 Explain how we “read” the three scatter diagrams in Figs. A1.3 and A1.4.
- 4 Draw a graph to show the relationship between two variables that move in the same direction.
- 5 Draw a graph to show the relationship between two variables that move in opposite directions.
- 6 Draw a graph of two variables whose relationship shows (i) a maximum and (ii) a minimum.
- 7 Which of the relationships in Questions 4 and 5 is a positive relationship and which is a negative relationship?
- 8 What are the two ways of calculating the slope of a curved line?
- 9 How do we graph a relationship among more than two variables?
- 10 Explain what change will bring a *movement along* a curve.
- 11 Explain what change will bring a *shift* of a curve.

Work these questions in Study Plan 1.A and get instant feedback. Do a Key Terms Quiz. **MyEconLab**

## SUMMARY

### Key Points

#### Graphing Data (pp. 15–18)

- A graph is made by plotting the values of two variables  $x$  and  $y$  at a point that corresponds to their values measured along the  $x$ -axis and the  $y$ -axis.
- A scatter diagram is a graph that plots the values of two variables for a number of different values of each.
- A scatter diagram shows the relationship between the two variables. It shows whether they are positively related, negatively related, or unrelated.

#### Graphs Used in Economic Models (pp. 18–21)

- Graphs are used to show relationships among variables in economic models.
- Relationships can be positive (an upward-sloping curve), negative (a downward-sloping curve), positive and then negative (have a maximum point), negative and then positive (have a minimum point), or unrelated (a horizontal or vertical curve).

#### The Slope of a Relationship (pp. 22–24)

- The slope of a relationship is calculated as the change in the value of the variable measured on the  $y$ -axis divided by the change in the value of the variable measured on the  $x$ -axis—that is,  $\Delta y/\Delta x$ .
- A straight line has a constant slope.
- A curved line has a varying slope. To calculate the slope of a curved line, we calculate the slope at a point or across an arc.

#### Graphing Relationships Among More Than Two Variables (pp. 24–25)

- To graph a relationship among more than two variables, we hold constant the values of all the variables except two.
- We then plot the value of one of the variables against the value of another.
- A *cet par* change in the value of a variable on an axis of a graph brings a movement along the curve.
- A change in the value of a variable held constant along the curve brings a shift of the curve.

### Key Terms

*Ceteris paribus*, 24

Direct relationship, 18

Inverse relationship, 19

Linear relationship, 18

Negative relationship, 19

Positive relationship, 18

#### MyEconLab Key Terms Quiz

Scatter diagram, 16

Slope, 22



## STUDY PLAN PROBLEMS AND APPLICATIONS

**MyEconLab** You can work Problems 1 to 11 in Chapter 1A Study Plan and get instant feedback.

Use the following spreadsheet to work Problems 1 to 3. The spreadsheet provides the economic data: Column A is the year, column B is the inflation rate, column C is the interest rate, column D is the growth rate, and column E is the unemployment rate.

	A	B	C	D	E
1	2003	1.6	1.0	2.8	6.0
2	2004	2.3	1.4	3.8	5.5
3	2005	2.7	3.2	3.4	5.1
4	2006	3.4	4.9	2.7	4.6
5	2007	3.2	4.5	1.8	4.6
6	2008	2.9	1.4	-0.3	5.8
7	2009	3.8	0.2	-2.8	9.3
8	2010	-0.3	0.1	2.5	9.6
9	2011	1.6	0.1	1.8	8.9
10	2012	3.1	0.1	2.8	8.1
11	2013	2.1	0.1	1.9	7.4

1. Draw a scatter diagram of the inflation rate and the interest rate. Describe the relationship.
2. Draw a scatter diagram of the growth rate and the unemployment rate. Describe the relationship.
3. Draw a scatter diagram of the interest rate and the unemployment rate. Describe the relationship.

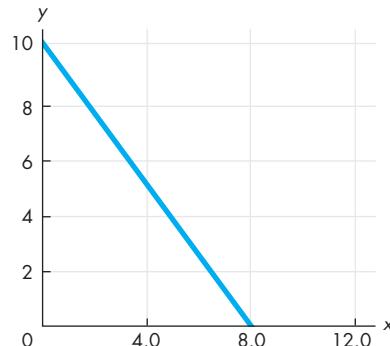
Use the following news clip to work Problems 4 to 6.  
**LEGO Tops the Box Office**

Movie	Theatres (number)	Revenue (dollars per theatre)
<i>The LEGO Movie</i>	3,775	\$16,551
<i>About Last Night</i>	2,253	\$12,356
<i>RoboCop</i>	3,372	\$7,432
<i>The Monuments Men</i>	3,083	\$5,811

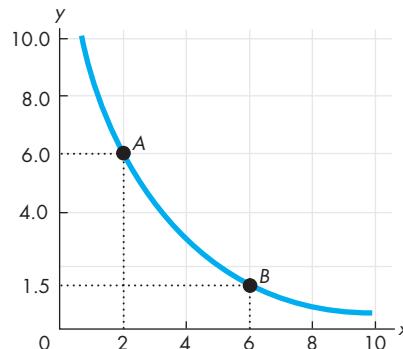
Source: [boxofficemojo.com](http://boxofficemojo.com),  
Data for weekend of February 14–17, 2014

4. Draw a graph of the relationship between the revenue per theatre on the  $y$ -axis and the number of theatres on the  $x$ -axis. Describe the relationship.
5. Calculate the slope of the relationship in Problem 4 between 3,775 and 2,253 theatres.
6. Calculate the slope of the relationship in Problem 4 between 2,253 and 3,372 theatres.

7. Calculate the slope of the following relationship.



Use the following relationship to work Problems 8 and 9.



8. Calculate the slope of the relationship at point  $A$  and at point  $B$ .
9. Calculate the slope across the arc  $AB$ .

Use the following table to work Problems 10 and 11. The table gives the price of a balloon ride, the temperature, and the number of rides a day.

Price (dollars per ride)	Balloon rides (number per day)		
	10°C	20°C	30°C
5	32	40	50
10	27	32	40
15	18	27	32

10. Draw a graph to show the relationship between the price and the number of rides when the temperature is 20°C. Describe this relationship.
11. What happens in the graph in Problem 10 if the temperature rises to 30°C?

## ADDITIONAL PROBLEMS AND APPLICATIONS

**MyEconLab** You can work these problems in MyEconLab if assigned by your instructor.

Use the following spreadsheet to work Problems 12 to 14. The spreadsheet provides data on oil and gasoline: Column A is the year, column B is the price of oil (dollars per barrel), column C is the price of gasoline (cents per litre), column D is oil production, and column E is the quantity of gasoline refined (both in millions of barrels per day).

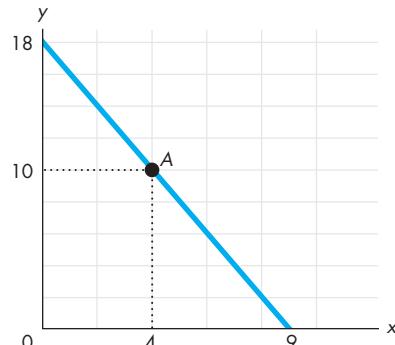
	A	B	C	D	E
1	2003	31	42	5.7	8.9
2	2004	42	50	5.4	9.1
3	2005	57	61	5.2	9.2
4	2006	66	69	5.1	9.3
5	2007	72	75	5.1	9.3
6	2008	100	87	5.0	9.0
7	2009	62	64	5.4	9.0
8	2010	79	75	5.5	9.0
9	2011	95	94	5.7	9.1
10	2012	94	96	6.5	9.0
11	2013	98	93	7.5	9.1

12. Draw a scatter diagram of the price of oil and the quantity of oil produced. Describe the relationship.
13. Draw a scatter diagram of the price of gasoline and the quantity of gasoline refined. Describe the relationship.
14. Draw a scatter diagram of the quantity of oil produced and the quantity of gasoline refined. Describe the relationship.

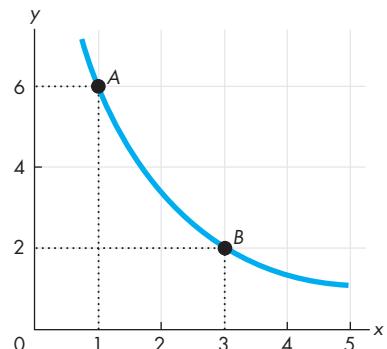
Use the following data to work Problems 15 to 17. Draw a graph that shows the relationship between the two variables  $x$  and  $y$ :

$x$	0	1	2	3	4	5
$y$	25	24	22	18	12	0

15. a. Is the relationship positive or negative?  
b. Does the slope of the relationship become steeper or flatter as the value of  $x$  increases?  
c. Think of some economic relationships that might be similar to this one.
16. Calculate the slope of the relationship between  $x$  and  $y$  when  $x$  equals 3.
17. Calculate the slope of the relationship across the arc as  $x$  increases from 4 to 5.
18. Calculate the slope of the curve in the figure in the next column at point  $A$ .



Use the following relationship to work Problems 19 and 20.



19. Calculate the slope at point  $A$  and at point  $B$ .
20. Calculate the slope across the arc  $AB$ .

Use the following table to work Problems 21 to 23. The table gives data about umbrellas: price, the number purchased, and rainfall in millimetres (mm).

Price (dollars per umbrella)	Umbrellas (number purchased per day)		
	0 mm	200 mm	400 mm
20	4	7	8
30	2	4	7
40	1	2	4

21. Draw a graph to show the relationship between the price and the number of umbrellas purchased, holding the amount of rainfall constant at 200 mm. Describe this relationship.
22. What happens in the graph in Problem 21 if the price rises and rainfall is constant?
23. What happens in the graph in Problem 21 if the rainfall increases from 200 mm to 400 mm?



# 2

## THE ECONOMIC PROBLEM

After studying this chapter, you will be able to:

- ◆ Define the production possibilities frontier and use it to calculate opportunity cost
- ◆ Distinguish between production possibilities and preferences and describe an efficient allocation of resources
- ◆ Explain how current production choices expand future production possibilities
- ◆ Explain how specialization and trade expand production possibilities
- ◆ Describe the economic institutions that coordinate decisions

**Canada has vast oil and natural gas resources and** we produce much more energy than we consume. We are an energy-exporting nation. Should we produce and export even more oil and gas? How do we know when we are using our energy and other resources efficiently?

In this chapter, you study an economic model that answers questions about the efficiency of production and trade.

At the end of the chapter, in *Economics in the News*, we'll apply what you learn to explain why it is smart to export some of our oil and gas, but why it might not be smart to increase our energy production.

## Production Possibilities and Opportunity Cost

Every working day, in mines, factories, shops, and offices and on farms and construction sites across Canada, 18 million people produce a vast variety of goods and services valued at \$60 billion. But the quantities of goods and services that we can produce are limited by our available resources and by technology. And if we want to increase our production of one good, we must decrease our production of something else—we face a tradeoff. You are now going to study the limits to production.

The **production possibilities frontier (PPF)** is the boundary between those combinations of goods and services that can be produced and those that cannot. To illustrate the *PPF*, we look at a *model economy* in which the quantities produced of only two goods change, while the quantities produced of all the other goods and services remain the same.

Let's look at the production possibilities frontier for cola and pizza, which represent *any* pair of goods or services.

### Production Possibilities Frontier

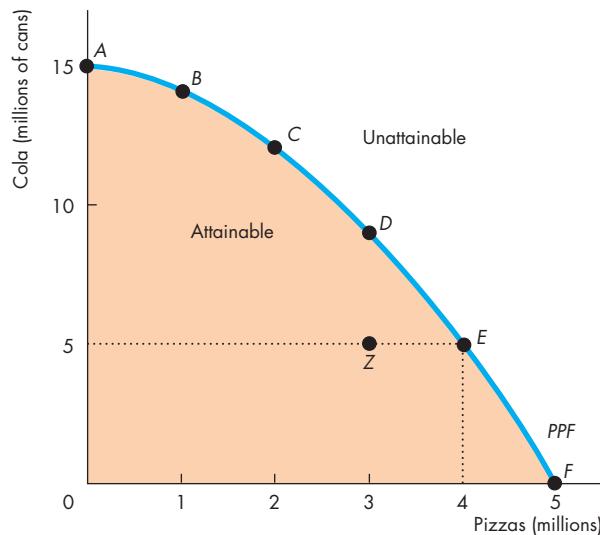
The *production possibilities frontier* for cola and pizza shows the limits to the production of these two goods, given the total resources and technology available to produce them. Figure 2.1 shows this production possibilities frontier. The table lists combinations of the quantities of pizza and cola that can be produced in a month and the figure graphs these combinations. The *x*-axis shows the quantity of pizzas produced, and the *y*-axis shows the quantity of cola produced.

The *PPF* illustrates *scarcity* because the points outside the frontier are *unattainable*. These points describe wants that can't be satisfied.

We can produce at any point *inside* the *PPF* or *on* the *PPF*. These points are *attainable*. For example, we can produce 4 million pizzas and 5 million cans of cola. Figure 2.1 shows this combination as point *E* in the graph and as possibility *E* in the table.

Moving along the *PPF* from point *E* to point *D* (possibility *D* in the table) we produce more cola and less pizza: 9 million cans of cola and 3 million pizzas. Or moving in the opposite direction from point *E* to point *F* (possibility *F* in the table), we produce more pizza and less cola: 5 million pizzas and no cola.

**FIGURE 2.1** Production Possibilities Frontier



Possibility	Pizzas (millions)	Cola (millions of cans)
A	0	15
B	1	14
C	2	12
D	3	9
E	4	5
F	5	0

The table lists six production possibilities for cola and pizzas. Row *A* tells us that if we produce no pizzas, the maximum quantity of cola we can produce is 15 million cans. Points *A*, *B*, *C*, *D*, *E*, and *F* in the figure represent the rows of the table. The curve passing through these points is the production possibilities frontier (*PPF*).

The *PPF* separates the attainable from the unattainable. Production is possible at any point *inside* the orange area or *on* the frontier. Points outside the frontier are unattainable. Points inside the frontier, such as point *Z*, are inefficient because resources are wasted or misallocated. At such points, it is possible to use the available resources to produce more of either or both goods.

**MyEconLab Animation and Draw Graph**

## Production Efficiency

We achieve **production efficiency** if we produce goods and services at the lowest possible cost. This outcome occurs at all the points *on* the PPF. At points *inside* the PPF, production is inefficient because we are giving up more than necessary of one good to produce a given quantity of the other good.

For example, at point *Z* in Fig. 2.1, we produce 3 million pizzas and 5 million cans of cola, but we have enough resources to produce 3 million pizzas and 9 million cans of cola. Our pizzas cost more cola than necessary. We can get them for a lower cost. Only when we produce *on* the PPF do we incur the lowest possible cost of production.

Production inside the PPF is *inefficient* because resources are either *unused* or *misallocated* or both.

Resources are *unused* when they are idle but could be working. For example, we might leave some of the factories idle or some workers unemployed.

Resources are *misallocated* when they are assigned to tasks for which they are not the best match. For example, we might assign skilled pizza chefs to work in a cola factory and skilled cola workers to cook pizza in a pizzeria. We could get more pizzas *and* more cola if we reassigned these workers to the tasks that more closely match their skills.

## Tradeoff Along the PPF

A choice *along* the PPF involves a *tradeoff*. Tradeoffs like that between cola and pizza arise in every imaginable real-world situation in which a choice must be made. At any given time, we have a fixed amount of labour, land, capital, and entrepreneurship and a given state of technology. We can employ these resources and technology to produce goods and services, but we are limited in what we can produce.

When doctors want to spend more on AIDS and cancer research, they face a tradeoff: more medical research for less of some other things. When Parliament wants to spend more on education and healthcare, it faces a tradeoff: more education and healthcare for less national defence. When an environmental group argues for less logging, it is suggesting a tradeoff: greater conservation of endangered wildlife for less paper. When you want a higher grade on your next test, you face a tradeoff: spend more time studying and less leisure or sleep time.

All the tradeoffs you've just considered involve a cost—an opportunity cost.

## Opportunity Cost

The **opportunity cost** of an action is the highest-valued alternative forgone. The PPF makes this idea precise and enables us to calculate opportunity cost. Along the PPF, there are only two goods, so there is only one alternative forgone: some quantity of the other good. To produce more pizzas we must produce less cola. The opportunity cost of producing an additional pizza is the cola we *must* forgo. Similarly, the opportunity cost of producing an additional can of cola is the quantity of pizza we must forgo.

In Fig. 2.1, if we move from point *C* to point *D*, we produce an additional 1 million pizzas but 3 million fewer cans of cola. The additional 1 million pizzas *cost* 3 million cans of cola. Or 1 pizza costs 3 cans of cola. Similarly, if we move from *D* to *C*, we produce an additional 3 million cans of cola but 1 million fewer pizzas. The additional 3 million cans of cola *cost* 1 million pizzas. Or 1 can of cola costs 1/3 of a pizza.

**Opportunity Cost Is a Ratio** Opportunity cost is a ratio. It is the decrease in the quantity produced of one good divided by the increase in the quantity produced of another good as we move along the production possibilities frontier.

Because opportunity cost is a ratio, the opportunity cost of producing an additional can of cola is equal to the *inverse* of the opportunity cost of producing an additional pizza. Check this proposition by returning to the calculations we've just done. In the move from *C* to *D*, the opportunity cost of a pizza is 3 cans of cola. And in the move from *D* to *C*, the opportunity cost of a can of cola is 1/3 of a pizza. So the opportunity cost of pizza is the inverse of the opportunity cost of cola.

**Increasing Opportunity Cost** The opportunity cost of a pizza increases as the quantity of pizzas produced increases. The outward-bowed shape of the PPF reflects increasing opportunity cost. When we produce a large quantity of cola and a small quantity of pizza—between points *A* and *B* in Fig. 2.1—the frontier has a gentle slope. An increase in the quantity of pizzas costs a small decrease in the quantity of cola—the opportunity cost of a pizza is a small quantity of cola.

When we produce a large quantity of pizzas and a small quantity of cola—between points *E* and *F* in Fig. 2.1—the frontier is steep. A given increase in the quantity of pizzas *costs* a large decrease in the quantity of cola, so the opportunity cost of a pizza is a large quantity of cola.



## ECONOMICS IN THE NEWS

### Opportunity Cost of Cocoa

#### World's Sweet Tooth Heats Up Cocoa

Chocolate consumption is soaring as people in developing countries are getting wealthier. Cocoa farmers are ramping up production to keep the chocolate flowing, but the price of cocoa keeps rising.

Source: *The Wall Street Journal*, February 13, 2014

### THE QUESTIONS

- How does the *PPF* illustrate (1) the limits to cocoa production; (2) the tradeoff we must make to increase cocoa production; and (3) the effect of increased chocolate consumption on the cost of producing cocoa?

### THE ANSWERS

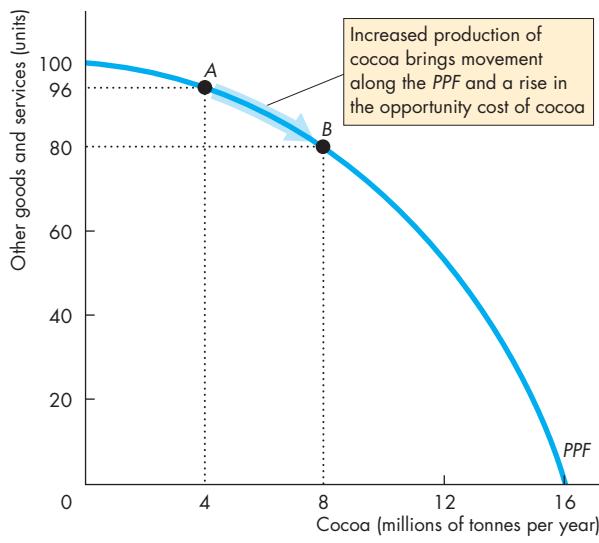
- The figure shows the global *PPF* for cocoa and other goods and services. Point *A* on the *PPF* tells us that if 4 million tonnes of cocoa are produced, a maximum of 96 units of other goods and services can be produced.
- The movement along the *PPF* from *A* to *B* shows the tradeoff we must make to increase cocoa production.
- The slope of the *PPF* measures the opportunity cost of cocoa. If cocoa production increases from zero to 4 million tonnes, the production of other goods and services decreases from 100 units to 96 units. The opportunity cost of 1 tonne of cocoa is 1 unit of other goods and services.

The *PPF* is bowed outward because resources are not all equally productive in all activities. People with many years of experience working for PepsiCo are good at producing cola but not very good at making pizzas. So if we move some of these people from PepsiCo to Domino's, we get a small increase in the quantity of pizzas but a large decrease in the quantity of cola.

Similarly, people who have spent years working at Domino's are good at producing pizzas, but they have no idea how to produce cola. So if we move some people from Domino's to PepsiCo, we get a small increase in the quantity of cola but a large decrease in the quantity of pizzas. The more we produce of either good, the less productive are the additional resources we use and the larger is the opportunity cost of a unit of that good.

How do we choose among the points on the *PPF*? How do we know which point is the best?

- But if cocoa production increases from 4 million tonnes to 8 million tonnes, the production of other goods and services decreases from 96 units to 80 units. The opportunity cost of 1 tonne of cocoa is now 4 units of other goods and services.
- As resources are moved into producing cocoa, labour, land, and capital less suited to the task of cocoa production are used and the cost of the additional cocoa produced increases.



**PPF for Cocoa and Other Goods and Services**

### MyEconLab More Economics in the News

### REVIEW QUIZ

- How does the production possibilities frontier illustrate scarcity?
- How does the production possibilities frontier illustrate production efficiency?
- How does the production possibilities frontier show that every choice involves a tradeoff?
- How does the production possibilities frontier illustrate opportunity cost?
- Why is opportunity cost a ratio?
- Why does the *PPF* bow outward and what does that imply about the relationship between opportunity cost and the quantity produced?

Work these questions in Study Plan 2.1 and get instant feedback. Do a Key Terms Quiz.

**MyEconLab**

## Using Resources Efficiently

We achieve *production efficiency* at every point on the *PPF*, but which of these points is best? The answer is the point on the *PPF* at which goods and services are produced in the quantities that provide the greatest possible benefit. When goods and services are produced at the lowest possible cost and in the quantities that provide the greatest possible benefit, we have achieved **allocative efficiency**.

The questions that we raised when we reviewed the four big issues in Chapter 1 are questions about allocative efficiency. To answer such questions, we must measure and compare costs and benefits.

### The PPF and Marginal Cost

The **marginal cost** of a good is the opportunity cost of producing one more unit of it. We calculate marginal cost from the slope of the *PPF*. As the quantity of pizzas produced increases, the *PPF* gets steeper and the marginal cost of a pizza increases. Figure 2.2 illustrates the calculation of the marginal cost of a pizza.

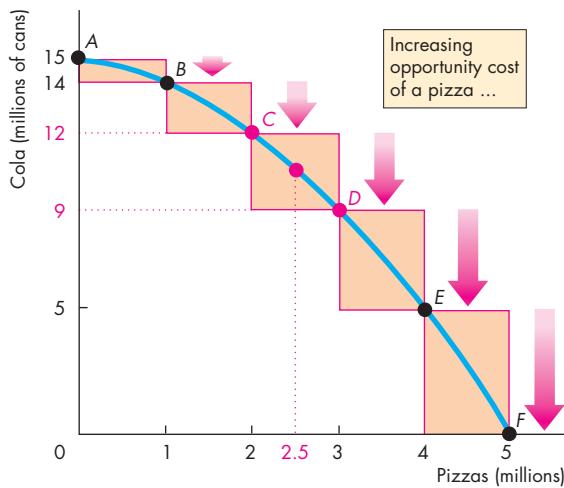
Begin by finding the opportunity cost of pizza in blocks of 1 million pizzas. The cost of the first million pizzas is 1 million cans of cola; the cost of the second million pizzas is 2 million cans of cola; the cost of the third million pizzas is 3 million cans of cola, and so on. The bars in part (a) illustrate these calculations.

The bars in part (b) show the cost of an average pizza in each of the 1 million pizza blocks. Focus on the third million pizzas—the move from *C* to *D* in part (a). Over this range, because 1 million pizzas cost 3 million cans of cola, one of these pizzas, on average, costs 3 cans of cola—the height of the bar in part (b).

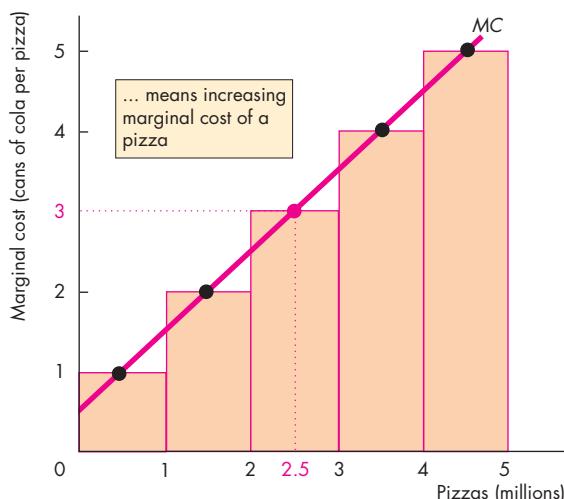
Next, find the opportunity cost of each additional pizza—the marginal cost of a pizza. The marginal cost of a pizza increases as the quantity of pizzas produced increases. The marginal cost at point *C* is less than it is at point *D*. On average over the range from *C* to *D*, the marginal cost of a pizza is 3 cans of cola. But it exactly equals 3 cans of cola only in the middle of the range between *C* and *D*.

The red dot in part (b) indicates that the marginal cost of a pizza is 3 cans of cola when 2.5 million pizzas are produced. Each black dot in part (b) is interpreted in the same way. The red curve that passes through these dots, labelled *MC*, is the marginal cost curve. It shows the marginal cost of a pizza at each quantity of pizzas as we move along the *PPF*.

**FIGURE 2.2** The *PPF* and Marginal Cost



(a) *PPF and opportunity cost*



(b) *Marginal cost*

Marginal cost is calculated from the slope of the *PPF*. As the quantity of pizzas produced increases, the *PPF* gets steeper and the marginal cost of a pizza increases. The bars in part (a) show the opportunity cost of pizza in blocks of 1 million pizzas. The bars in part (b) show the cost of an average pizza in each of these 1 million blocks. The red curve, *MC*, shows the marginal cost of a pizza at each point along the *PPF*. This curve passes through the centre of each of the bars in part (b).

**MyEconLab Animation**

## Preferences and Marginal Benefit

The **marginal benefit** from a good or service is the benefit received from consuming one more unit of it. This benefit is subjective. It depends on people's **preferences**—people's likes and dislikes and the intensity of those feelings.

*Marginal benefit and preferences stand in sharp contrast to marginal cost and production possibilities.* Preferences describe what people like and want and the production possibilities describe the limits or constraints on what is feasible.

We need a concrete way of illustrating preferences that parallels the way we illustrate the limits to production using the *PPF*.

The device that we use to illustrate preferences is the **marginal benefit curve**, which is a curve that shows the relationship between the marginal benefit from a good and the quantity consumed of that good. Note that the *marginal benefit curve is unrelated to the PPF* and cannot be derived from it.

We measure the marginal benefit from a good or service by the most that people are *willing to pay* for an additional unit of it. The idea is that you are willing to pay less for a good than it is worth to you but you are not willing to pay more: The most you are willing to pay for something is its marginal benefit.

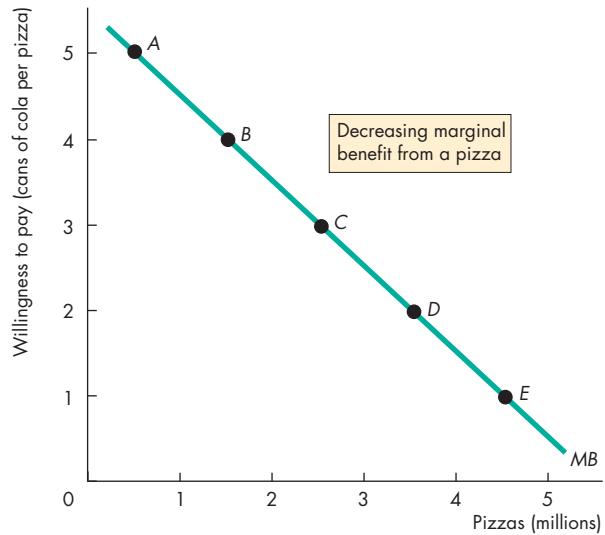
It is a general principle that the more we have of any good or service, the smaller is its marginal benefit and the less we are willing to pay for an additional unit of it. This tendency is so widespread and strong that we call it a principle—the *principle of decreasing marginal benefit*.

The basic reason why marginal benefit decreases is that we like variety. The more we consume of any one good or service, the more we tire of it and would prefer to switch to something else.

Think about your willingness to pay for a pizza. If pizza is hard to come by and you can buy only a few slices a year, you might be willing to pay a high price to get an additional slice. But if pizza is all you've eaten for the past few days, you are willing to pay almost nothing for another slice.

You've learned to think about cost as opportunity cost, not as a dollar cost. You can think about marginal benefit and willingness to pay in the same way. The marginal benefit, measured by what you are willing to pay for something, is the quantity of other goods and services that you are willing to forgo. Let's continue with the example of cola and pizza and illustrate preferences this way.

**FIGURE 2.3** Preferences and the Marginal Benefit Curve



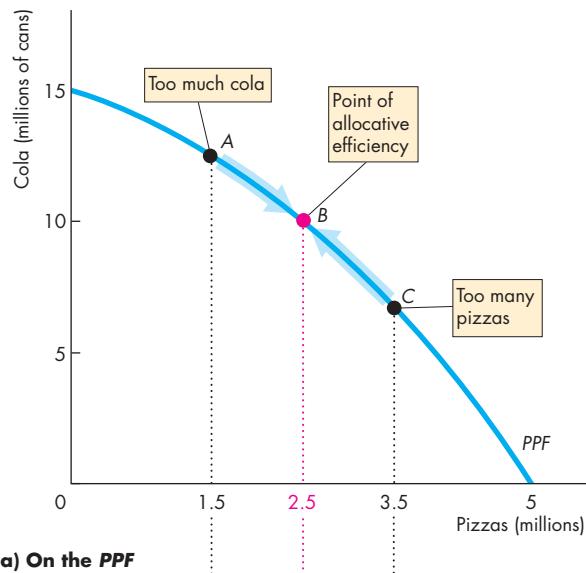
Possibility	Pizzas (millions)	Willingness to pay (cans of cola per pizza)
A	0.5	5
B	1.5	4
C	2.5	3
D	3.5	2
E	4.5	1

The smaller the quantity of pizzas available, the more cola people are willing to give up for an additional pizza. With 0.5 million pizzas available, people are willing to pay 5 cans of cola per pizza. But with 4.5 million pizzas, people are willing to pay only 1 can of cola per pizza. Willingness to pay measures marginal benefit. A universal feature of people's preferences is that marginal benefit decreases.

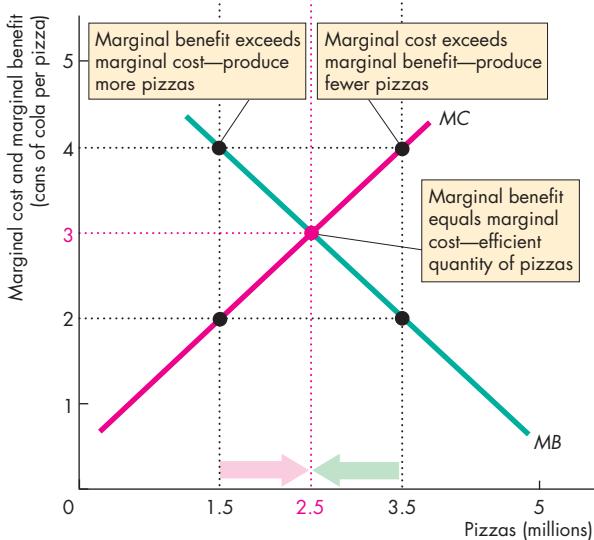
### MyEconLab Animation

Figure 2.3 illustrates preferences as the willingness to pay for pizza in terms of cola. In row A, with 0.5 million pizzas available, people are willing to pay 5 cans of cola per pizza. As the quantity of pizzas increases, the amount that people are willing to pay for a pizza falls. With 4.5 million pizzas available, people are willing to pay only 1 can of cola per pizza.

Let's now use the concepts of marginal cost and marginal benefit to describe allocative efficiency.

**FIGURE 2.4** Efficient Use of Resources

(a) On the PPF



(b) Marginal benefit equals marginal cost

The greater the quantity of pizzas produced, the smaller is the marginal benefit ( $MB$ ) from pizza—the less cola people are willing to give up to get an additional pizza. But the greater the quantity of pizzas produced, the greater is the marginal cost ( $MC$ ) of a pizza—the more cola people must give up to get an additional pizza. When marginal benefit equals marginal cost, resources are being used efficiently.

[MyEconLab Animation](#)

## Allocative Efficiency

At *any* point on the  $PPF$ , we cannot produce more of one good without giving up some other good. At the *best* point on the  $PPF$ , we cannot produce more of one good without giving up some other good that provides greater benefit. We are producing at the point of allocative efficiency—the point on the  $PPF$  that we prefer above all other points.

Suppose in Fig. 2.4 we produce 1.5 million pizzas. In part (b), the marginal cost of a pizza is 2 cans of cola and the marginal benefit from a pizza is 4 cans of cola. Because someone values an additional pizza more highly than it costs to produce, we can get more value from our resources by moving some of them out of producing cola and into producing pizza.

Now suppose we produce 3.5 million pizzas. The marginal cost of a pizza is now 4 cans of cola, but the marginal benefit from a pizza is only 2 cans of cola. Because the additional pizza costs more to produce than anyone thinks it is worth, we can get more value from our resources by moving some of them away from producing pizza and into producing cola.

Suppose we produce 2.5 million pizzas. Marginal cost and marginal benefit are now equal at 3 cans of cola. This allocation of resources between pizzas and cola is efficient. If more pizzas are produced, the forgone cola is worth more than the additional pizzas. If fewer pizzas are produced, the forgone pizzas are worth more than the additional cola.

## REVIEW QUIZ

- 1 What is marginal cost? How is it measured?
- 2 What is marginal benefit? How is it measured?
- 3 How does the marginal benefit from a good change as the quantity produced of that good increases?
- 4 What is allocative efficiency and how does it relate to the production possibilities frontier?
- 5 What conditions must be satisfied if resources are used efficiently?

Work these questions in Study Plan 2.2 and get instant feedback. Do a Key Terms Quiz. [MyEconLab](#)

You now understand the limits to production and the conditions under which resources are used efficiently. Your next task is to study the expansion of production possibilities.

## Economic Growth

During the past 30 years, production per person in Canada has doubled. The expansion of production possibilities is called **economic growth**. Economic growth increases our *standard of living*, but it doesn't overcome scarcity and avoid opportunity cost. To make our economy grow, we face a tradeoff—the faster we make production grow, the greater is the opportunity cost of economic growth.

### The Cost of Economic Growth

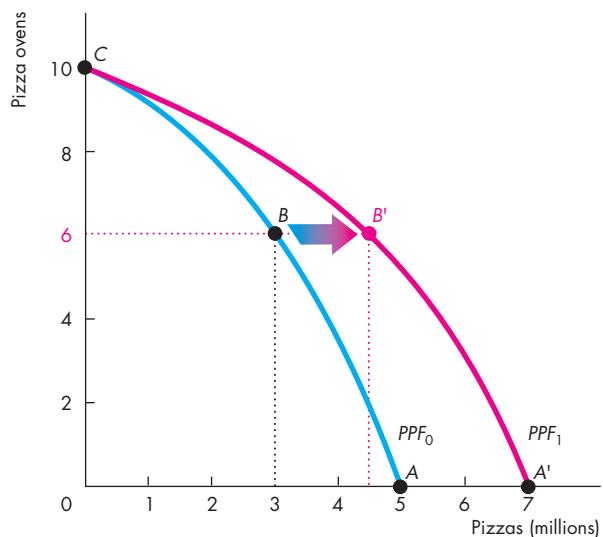
Economic growth comes from technological change and capital accumulation. **Technological change** is the development of new goods and of better ways of producing goods and services. **Capital accumulation** is the growth of capital resources, including *human capital*.

Technological change and capital accumulation have vastly expanded our production possibilities. We can produce automobiles that provide us with more transportation than was available when we had only horses and carriages. We can produce satellites that provide global communications on a much larger scale than that available with the earlier cable technology. But if we use our resources to develop new technologies and produce capital, we must decrease our production of consumption goods and services. New technologies and new capital have an opportunity cost. Let's look at this opportunity cost.

Instead of studying the *PPF* of pizzas and cola, we'll hold the quantity of cola produced constant and examine the *PPF* for pizzas and pizza ovens. Figure 2.5 shows this *PPF* as the blue curve  $PPF_0$ . If we devote no resources to producing pizza ovens, we produce at point  $A$ . If we produce 3 million pizzas, we can produce 6 pizza ovens at point  $B$ . If we produce no pizza, we can produce 10 ovens at point  $C$ .

The amount by which our production possibilities expand depends on the resources we devote to technological change and capital accumulation. If we devote no resources to this activity (point  $A$ ), our *PPF* remains the blue curve  $PPF_0$  in Fig. 2.5. If we cut the current pizza production and produce 6 ovens (point  $B$ ), then in the future, we'll have more capital and our *PPF* will rotate outward to the position shown by the red curve  $PPF_1$ . The fewer resources we use for producing pizza and the more resources we use for producing ovens, the greater is the expansion of our future production possibilities.

**FIGURE 2.5** Economic Growth



$PPF_0$  shows the limits to the production of pizzas and pizza ovens, with the production of all other goods and services remaining the same. If we devote no resources to producing pizza ovens and produce 5 million pizzas, our production possibilities will remain the same at  $PPF_0$ . But if we decrease pizza production to 3 million and produce 6 ovens, at point  $B$ , our production possibilities expand. After one period, the *PPF* rotates outward to  $PPF_1$  and we can produce at point  $B'$ , a point outside the original  $PPF_0$ . We can rotate the *PPF* outward, but we cannot avoid opportunity cost. The opportunity cost of producing more pizzas in the future is fewer pizzas today.

#### **MyEconLab Animation and Draw Graph**

Economic growth brings enormous benefits in the form of increased consumption in the future, but economic growth is not free and it doesn't abolish scarcity.

In Fig. 2.5, to make economic growth happen we must use some resources to produce new ovens, which leaves fewer resources to produce pizzas. To move to  $B'$  in the future, we must move from  $A$  to  $B$  today. The opportunity cost of more pizzas in the future is fewer pizzas today. Also, on the new *PPF*, we still face a tradeoff and opportunity cost.

The ideas about economic growth that we have explored in the setting of the pizza industry also apply to nations. Hong Kong and Canada provide a striking case study.

## Economics in Action

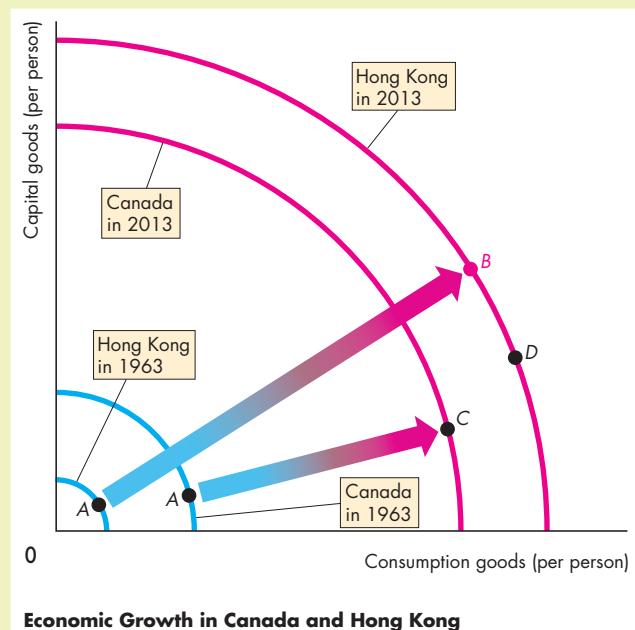
### Hong Kong Overtakes Canada

In 1963, the production possibilities per person in Canada were more than three times those in Hong Kong (see the figure). Canada devotes one-fifth of its resources to accumulating capital, and in 1963, Canada was at point *A* on its PPF. Hong Kong devotes one-third of its resources to accumulating capital, and in 1963, Hong Kong was at point *A* on its PPF.

Since 1963, both economies have experienced economic growth, but because Hong Kong devotes a bigger fraction of its resources to accumulating capital, its production possibilities have expanded more quickly.

By 2013, production possibilities per person in Hong Kong had *overtaken* those in Canada. If Hong Kong continues to devote more resources to accumulating capital (at point *B* on its 2013 PPF) than Canada does, Hong Kong will continue to grow more rapidly than Canada. But if Hong Kong decreases its capital accumulation (moving to point *D* on its 2013 PPF), then its rate of economic growth will slow.

Hong Kong is typical of the fast-growing Asian economies, which include Taiwan, Thailand, South Korea, China, and India. Production possibilities



expand in these countries by between 5 percent and almost 10 percent a year.

If such high economic growth rates are maintained, these other Asian countries will continue to catch up with and eventually overtake Canada, as Hong Kong has done.

## A Nation's Economic Growth

The experiences of Canada and Hong Kong make a striking example of the effects of our choices about consumption and capital accumulation on the rate of economic growth.

If an economy devotes all its factors of production to producing consumption goods and services and none to advancing technology and accumulating capital, its production possibilities in the future will be the same as they are today.

To expand production possibilities in the future, a nation or an economy must devote fewer resources to producing current consumption goods and services and some resources to accumulating capital and developing new technologies. As production possibilities expand, consumption in the future can increase. The decrease in today's consumption is the opportunity cost of tomorrow's increase in consumption.

## REVIEW QUIZ

- 1 What generates economic growth?
- 2 How does economic growth influence the production possibilities frontier?
- 3 What is the opportunity cost of economic growth?
- 4 Explain why Hong Kong has experienced faster economic growth than Canada.
- 5 Does economic growth overcome scarcity?

Work these questions in Study Plan 2.3 and get instant feedback. Do a Key Terms Quiz. **MyEconLab**

Next, we're going to study another way in which we expand our production possibilities—the amazing fact that *both* buyers and sellers gain from specialization and trade.



## Gains from Trade

People can produce for themselves all the goods and services that they consume, or they can produce one good or a few goods and trade with others. Producing only one good or a few goods is called *specialization*. We are going to learn how people gain by specializing in the production of the good in which they have a *comparative advantage* and trading with others.

### Comparative Advantage and Absolute Advantage

A person has a **comparative advantage** in an activity if that person can perform the activity at a lower opportunity cost than anyone else. Differences in opportunity costs arise from differences in individual abilities and from differences in the characteristics of other resources.

No one excels at everything. One person is an outstanding pitcher but a poor catcher; another person is a brilliant lawyer but a poor teacher. In almost all human endeavours, what one person does easily, someone else finds difficult. The same applies to land and capital. One plot of land is fertile but has no mineral deposits; another plot of land has outstanding views but is infertile. One machine has great precision but is difficult to operate; another is fast but often breaks down.

Although no one excels at everything, some people excel and can outperform others in a large number of activities—perhaps even in all activities. A person who is more productive than others has an **absolute advantage**.

Absolute advantage involves comparing productivities—production per hour—whereas comparative advantage involves comparing opportunity costs.

A person who has an absolute advantage does not have a *comparative* advantage in every activity. John Grisham is a better lawyer and a better author of fast-paced thrillers than most people. He has an absolute advantage in these two activities. But compared to others, he is a better writer than lawyer, so his *comparative* advantage is in writing.

Because ability and resources vary from one person to another, people have different opportunity costs of producing various goods. These differences in opportunity cost are the source of comparative advantage.

Let's explore the idea of comparative advantage by looking at two smoothie bars: one operated by Liz and the other operated by Joe.

**Joe's Smoothie Bar** Joe produces smoothies and salads in a small, low-tech bar. He has only one blender, and it's a slow, old machine that keeps stopping. Even if Joe uses all his resources to produce smoothies, he can produce only 6 an hour—see Table 2.1. But Joe is good at making salads, and if he uses all his resources in this activity, he can produce 30 salads an hour.

Joe's ability to make smoothies and salads is the same regardless of how he splits an hour between the two tasks. He can make a salad in 2 minutes or a smoothie in 10 minutes. For each additional smoothie Joe produces, he must decrease his production of salads by 5. And for each additional salad he produces, he must decrease his production of smoothies by 1/5 of a smoothie. So

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

and

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

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

Figure 2.6(a) illustrates the production possibilities at Joe's smoothie bar—Joe's *PPF*.

Joe's *PPF* is linear (not outward bowed) because his ability to produce salads and smoothies is the same no matter how he divides his time between the two activities. Joe's opportunity cost of a smoothie is constant—it is the same at all quantities of smoothies produced.

**TABLE 2.1** Joe's Production Possibilities

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

**Liz's Smoothie Bar** Liz also produces smoothies and salads but in a high-tech bar that is much more productive than Joe's. Liz can turn out either a smoothie or a salad every 2 minutes—see Table 2.2.

If Liz spends all her time making smoothies, she can produce 30 an hour. And if she spends all her time making salads, she can also produce 30 an hour.

Liz's ability to make smoothies and salads, like Joe's, is the same regardless of how she divides her time between the two tasks. She can make a salad in 2 minutes or a smoothie in 2 minutes. For each additional smoothie Liz produces, she must decrease her production of salads by 1. And for each additional salad she produces, she must decrease her production of smoothies by 1. So

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

and

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

**TABLE 2.2** Liz's Production Possibilities

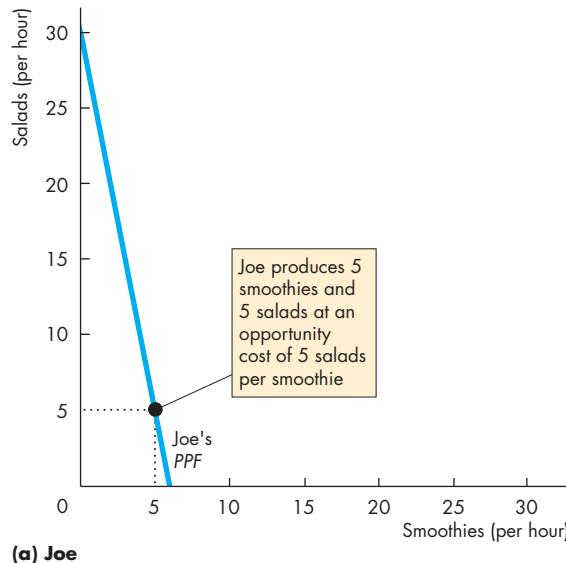
Item	Minutes to produce 1	Quantity per hour
Smoothies	2	30
Salads	2	30

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

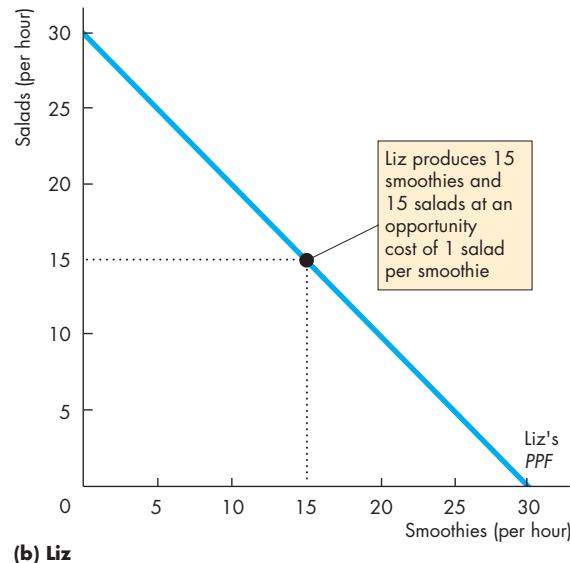
Figure 2.6(b) illustrates the production possibilities at Liz's smoothie bar—Liz's *PPF*.

Like Joe's, Liz's *PPF* is linear because her ability to produce salads and smoothies is the same no matter how she divides her time between the two activities. Liz's opportunity cost of a smoothie is 1 salad at all quantities of smoothies produced.

**FIGURE 2.6** The Production Possibilities Frontiers



Joe can produce 30 salads per hour, 1 every two minutes, if he produces no smoothies. Or, he can produce 6 smoothies per hour, 1 every 10 minutes, if he produces no salads. Joe's customers buy equal quantities of salads and smoothies, so Joe produces 5 of each. His opportunity cost of a smoothie is 5 salads.



Liz can produce 30 salads or 30 smoothies per hour, 1 of either item every two minutes. Liz's customers buy equal quantities of salads and smoothies, so she produces 15 of each. Liz's opportunity cost of a smoothie is 1 salad.

**Joe's Comparative Advantage** In which of the two activities does Joe have a comparative advantage? To answer this question, first recall the definition of comparative advantage. A person has a comparative advantage when that person's opportunity cost of producing a good is lower than another person's opportunity cost of producing that same good.

Joe's opportunity cost of producing a salad is only 1/5 of a smoothie, while Liz's opportunity cost of producing a salad is 1 smoothie. So Joe has a comparative advantage in producing salads.

**Liz's Comparative Advantage** If Joe has a comparative advantage in producing salads, Liz must have a comparative advantage in producing smoothies. Check the numbers. For Joe, a smoothie costs 5 salads, and for Liz, a smoothie costs only 1 salad. So Liz has a comparative advantage in making smoothies.

### Achieving the Gains from Trade

Liz and Joe run into each other one evening in a singles bar. After a few minutes of getting acquainted, Liz tells Joe about her amazing smoothie business. Her only problem, she tells Joe, is that she would like to produce more because potential customers leave when her lines get too long.

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

**Liz's Proposal** Here's the deal that Liz sketches on a paper napkin. Joe stops making smoothies and allocates all his time to producing salads; Liz stops making salads and allocates all her time to producing smoothies. That is, they both specialize in producing the good in which they have a comparative advantage. Together they produce 30 smoothies and 30 salads—see Table 2.3(b).

They then trade. Liz suggests trading at a price of 2 salads per smoothie. For her, that is a good deal because she can produce a smoothie at a cost of 1 salad and sell it to Joe for 2 salads. It is also a good deal for Joe because he can produce a salad at a cost of 1/5th of a smoothie and sell it to Liz for 1/2 a smoothie.

Liz explains that any price above 1 salad per smoothie is good for her and any price below 5 salads per smoothie is good for Joe, so a price of 2 salads per smoothie lets them both gain, as she now describes.

**TABLE 2.3** Liz and Joe Gain from Trade

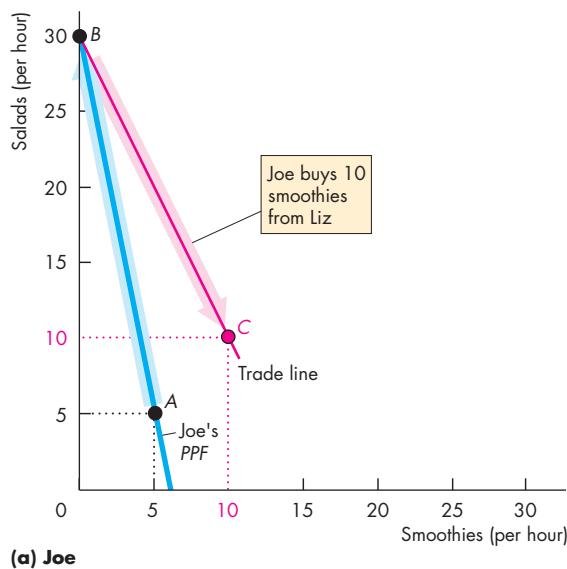
(a) Before trade	Liz	Joe
Smoothies	15	5
Salads	15	5
(b) Specialization	Liz	Joe
Smoothies	30	0
Salads	0	30
(c) Trade	Liz	Joe
Smoothies	sell 10	buy 10
Salads	buy 20	sell 20
(d) After trade	Liz	Joe
Smoothies	20	10
Salads	20	10
(e) Gains from trade	Liz	Joe
Smoothies	+5	+5
Salads	+5	+5

At the proposed price, Liz offers to sell Joe 10 smoothies in exchange for 20 salads. Equivalently, Joe sells Liz 20 salads in exchange for 10 smoothies—see Table 2.3(c).

After this trade, Joe has 10 salads—the 30 he produces minus the 20 he sells to Liz. He also has the 10 smoothies that he buys from Liz. So Joe now has increased the quantities of smoothies and salads that he can sell to his customers—see Table 2.3(d).

Liz has 20 smoothies—the 30 she produces minus the 10 she sells to Joe. She also has the 20 salads that she buys from Joe. Liz has increased the quantities of smoothies and salads that she can sell to her customers—see Table 2.3(d). Both Liz and Joe gain 5 smoothies and 5 salads an hour—see Table 2.3(e).

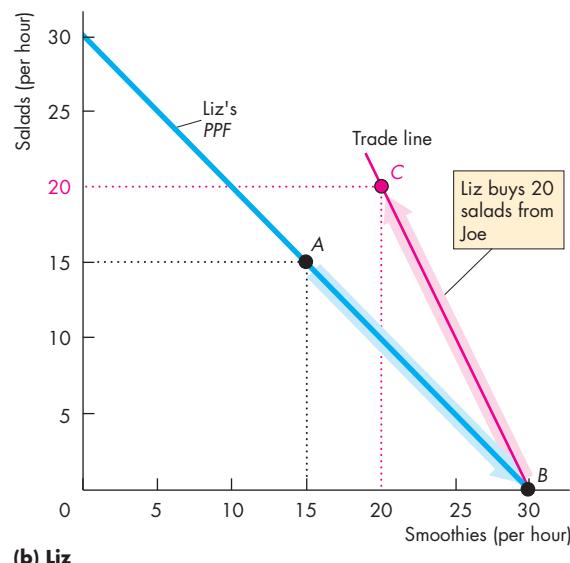
**Illustrating Liz's Idea** To illustrate her idea, Liz grabs a fresh napkin and draws the graphs in Fig. 2.7. First, she sketches Joe's PPF in part (a) and shows the point at which he is producing before they meet.

**FIGURE 2.7** The Gains from Trade

(a) Joe

Initially, Joe produces at point A on his *PPF* in part (a), and Liz produces at point A on her *PPF* in part (b). Joe's opportunity cost of producing a salad is less than Liz's, so Joe has a comparative advantage in producing salads. Liz's opportunity cost of producing a smoothie is less than Joe's, so Liz has a comparative advantage in producing smoothies.

If Joe specializes in making salads, he produces 30 salads and no smoothies at point B on his *PPF*. If Liz specializes



(b) Liz

in making smoothies, she produces 30 smoothies and no salads at point B on her *PPF*. They exchange salads for smoothies along the red "Trade line." Liz buys salads from Joe for less than her opportunity cost of producing them. Joe buys smoothies from Liz for less than his opportunity cost of producing them. Each goes to point C—a point outside his or her *PPF*. With specialization and trade, Joe and Liz gain 5 smoothies and 5 salads each with no extra resources.

### MyEconLab Animation and Draw Graph

Recall that he is producing 5 smoothies and 5 salads an hour at point A.

She then sketches her own *PPF* in part (b), and marks the point A at which she is producing 15 smoothies and 15 salads an hour.

She then shows what happens when they each specialize in producing the good in which they have a comparative advantage. Joe specializes in producing salads and produces 30 salads and no smoothies at point B on his *PPF*. Liz specializes in producing smoothies and produces 30 smoothies and no salads at point B on her *PPF*.

They then trade smoothies and salads at a price of 2 salads per smoothie or 1/2 a smoothie per salad. The red "Trade line" that Liz draws on each part of the figure illustrates the tradeoff that each faces at the proposed price.

Liz now shows Joe the amazing outcome of her idea. After specializing and trading, Joe gets 10 smoothies and 10 salads at point C—a gain of 5 smoothies and 5 salads. He moves to a point outside

his *PPF*. And Liz gets 20 smoothies and 20 salads at point C—also a gain of 5 smoothies and 5 salads—and moves to a point *outside* her *PPF*.

Despite Liz being more productive than Joe, both gain from specializing at producing the good in which they have a comparative advantage and trading.

### REVIEW QUIZ

- 1 What gives a person a comparative advantage?
- 2 Distinguish between comparative advantage and absolute advantage.
- 3 Why do people specialize and trade?
- 4 What are the gains from specialization and trade?
- 5 What is the source of the gains from trade?

Work these questions in Study Plan 2.4 and get instant feedback. Do a Key Terms Quiz.

**MyEconLab**

## Economic Coordination

For 7 billion people to specialize and produce millions of different goods and services, individual choices must somehow be coordinated. Two competing coordination systems have been used: central economic planning and markets (see *At Issue*, p. 8).

Central economic planning works badly because economic planners don't know people's production possibilities and preferences, so production ends up *inside* the PPF and the wrong things are produced.

Decentralized coordination works best, but to do so it needs four complementary social institutions. They are:

- Firms
- Markets
- Property rights
- Money

### Firms

A **firm** is an economic unit that hires factors of production and organizes them to produce and sell goods and services.

Firms coordinate a huge amount of economic activity. For example, Loblaws buys or rents large buildings, equips them with storage shelves and checkout lanes, and hires labour. Loblaws directs the labour and decides what goods to buy and sell.

But Galen Weston would not have become one of the wealthiest people in Canada if Loblaws produced everything that it sells. He became rich by specializing in providing retail services and buying from other firms that specialize in producing goods (just as Liz and Joe did). This trade needs markets.

### Markets

In ordinary speech, the word *market* means a place where people buy and sell goods such as fish, meat, fruits, and vegetables.

In economics, a **market** is any arrangement that enables buyers and sellers to get information and to do business with each other. An example is the world oil market, which is not a place but a network of producers, consumers, wholesalers, and brokers who buy and sell oil. In the world oil market, decision makers make deals by using the Internet. Enterprising individuals and firms, each pursuing their own self-interest, have profited by making markets—by

standing ready to buy or sell items in which they specialize. But markets can work only when property rights exist.

### Property Rights

The social arrangements that govern the ownership, use, and disposal of anything that people value are called **property rights**. *Real property* includes land and buildings—the things we call property in ordinary speech—and durable goods such as plant and equipment. *Financial property* includes stocks and bonds and money in the bank. *Intellectual property* is the intangible product of creative effort. This type of property includes books, music, computer programs, and inventions of all kinds and is protected by copyrights and patents.

Where property rights are enforced, people have the incentive to specialize and produce the goods and services in which they have a comparative advantage. Where people can steal the production of others, resources are devoted not to production but to protecting possessions.

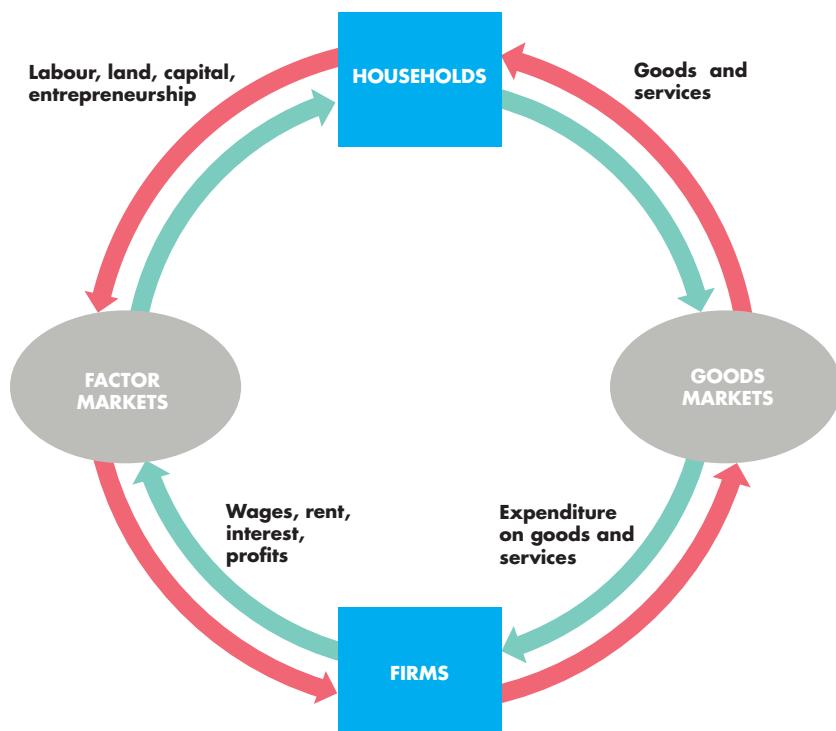
### Money

**Money** is any commodity or token that is generally acceptable as a means of payment. Liz and Joe don't need money. They can exchange salads and smoothies. In principle, trade in markets can exchange any item for any other item. But you can perhaps imagine how complicated life would be if we exchanged goods for other goods. The “invention” of money makes trading in markets much more efficient.

### Circular Flows Through Markets

Trading in markets for goods and services and factors of production creates a circular flow of expenditures and incomes. Figure 2.8 shows the circular flows. Households specialize and choose the quantities of labour, land, capital, and entrepreneurial services to sell or rent to firms. Firms choose the quantities of factors of production to hire. These (red) flows go through the *factor markets*. Households choose the quantities of goods and services to buy, and firms choose the quantities to produce. These (red) flows go through the *goods markets*. Households receive incomes and make expenditures on goods and services (the green flows).

How do markets coordinate all these decisions?

**FIGURE 2.8** Circular Flows in the Market Economy

Households and firms make economic choices and markets coordinate these choices.

Households choose the quantities of labour, land, capital, and entrepreneurial services to sell or rent to firms in exchange for wages, rent, interest, and profits.

Households also choose how to spend their incomes on the various types of goods and services available.

Firms choose the quantities of factors of production to hire and the quantities of goods and services to produce.

Goods markets and factor markets coordinate these choices of households and firms.

The counterclockwise red flows are real flows—the flow of factors of production from households to firms and the flow of goods and services from firms to households.

The clockwise green flows are the payments for the red flows. They are the flow of incomes from firms to households and the flow of expenditure on goods and services from households to firms.

[MyEconLab Animation](#)

## Coordinating Decisions

Markets coordinate decisions through price adjustments. Suppose that some people who want to buy hamburgers are not able to do so. To make buying and selling plans the same, either more hamburgers must be offered for sale or buyers must scale down their appetites (or both). A rise in the price of a hamburger produces this outcome. It encourages producers to offer more hamburgers for sale and encourages some people to change their lunch plans. When the price is right, buying plans and selling plans match.

Alternatively, suppose that more hamburgers are available than people want to buy. In this case, more hamburgers must be bought or fewer hamburgers must be offered for sale (or both). A fall in the price of a hamburger achieves this outcome. It encourages people to buy more hamburgers and it encourages firms to produce a smaller quantity of hamburgers.

## REVIEW QUIZ

- 1 Why are social institutions such as firms, markets, property rights, and money necessary?
- 2 What are the main functions of markets?
- 3 What are the flows in the market economy that go from firms to households and the flows from households to firms?

Work these questions in Study Plan 2.5 and get instant feedback. Do a Key Terms Quiz.

[MyEconLab](#)

◆ You have now begun to see how economists approach economic questions. You can see all around you the lessons you've learned in this chapter. *Economics in the News* on pp. 46–47 provides an opportunity to apply the PPF model to deepen your understanding of why Canada produces more energy than it consumes and exports the rest.

# Expanding Production Possibilities

## Husky Energy Inc Eyes Atlantic Canada LNG Project to Export to Europe, Indonesia

*Financial Post*

April 3, 2014

Husky Energy Inc. is mulling a liquefied natural gas (LNG) project in Canada's Atlantic Coast amid interest from European countries looking to diversify their natural gas supplies away from Russia.

"We are constantly looking at ways to monetize some of our gas discoveries," Malcolm Maclean, Husky's senior vice-president for the Atlantic region, said in an interview on the sidelines of a conference in Toronto. "We are looking at a world-class LNG project exporting to Europe or even Indonesia. We are in very early [stages]. We are looking at preliminary studies and need to further appraise some of the discoveries to date. In the Atlantic region, the focus has been very much on oil, not really gas." ...

Natural gas production from the Atlantic may present a new growth avenue for Husky, which has seen its oil production decline from Atlantic fields, despite significant new discoveries. Husky's production from the Atlantic fell to 40,800 barrels per day in the fourth quarter, from 45,700 [barrels a day] during the same period in 2012, partly due to the maturing White Rose fields.

Last year, the company made major discoveries at Bay du Nord and Harpoon in the Atlantic region along with its Norwegian partner Statoil SA.

The companies are accelerating appraisal of the two discoveries, along with the Mizzen field discovery, which is expected to contain as much as 200 million barrels of oil. The Bay du Nord alone may contain 400 million barrels of crude oil, according to a company presentation. ...

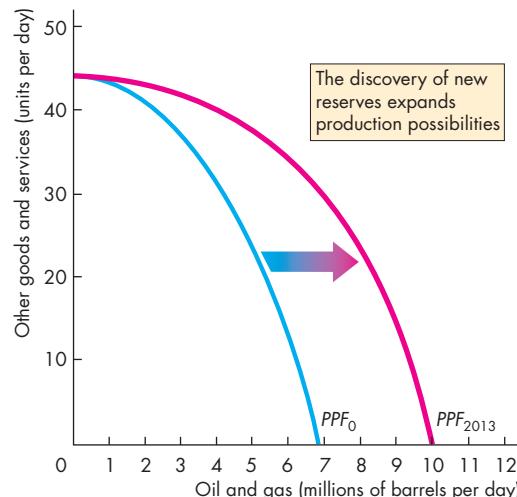
Written by Yadullah Hussain. Material reprinted with the express permission of National Post, a division of Postmedia Network Inc.

### ESSENCE OF THE STORY

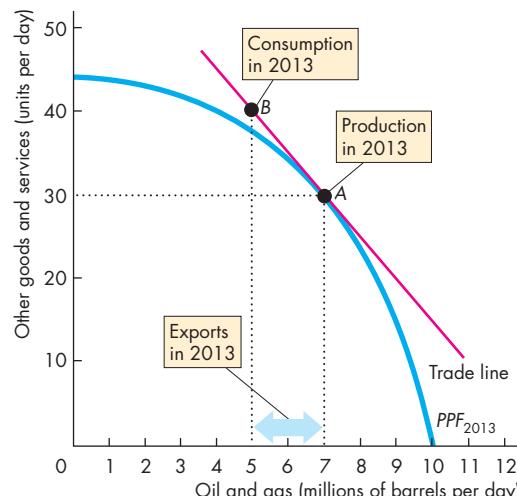
- Husky Energy Inc. is thinking about producing liquefied natural gas (LNG) on the Atlantic Coast for export to Europe and Indonesia.
- The firm's production of oil from its existing Atlantic field is shrinking, but it expects both natural gas and oil production to expand.
- Husky and a partner say they have discovered new Atlantic reserves they believe contain up to 600 million barrels of crude oil.

## ECONOMIC ANALYSIS

- Husky Energy Inc. is Canada's third-largest producer of oil and gas.
- Canada has hundreds of oil and gas producers, and in 2013 the industry's output was the equivalent of 7 million barrels per day.
- Canada consumed 5 million barrels per day and exported 2 million barrels.
- We can explain Canada's oil and gas production, consumption, and exports using the ideas you have learned in this chapter.
- Figure 1 shows how the discovery of new oil and gas reserves changes Canada's production possibilities.
- The blue curve  $PPF_0$  shows what our production possibilities would be without the discovery of new reserves.
- The discovery of new reserves expands production possibilities and the  $PPF$  becomes the red  $PPF_{2013}$ . At each quantity of other goods and services (measured on the y-axis), Canada can produce more oil and gas (measured on the x-axis).
- Figure 2 shows the point on  $PPF_{2013}$  at which Canada produced in 2013. It produced 7 million barrels (equivalent) of oil and gas and 30 units of other goods and services a day at point A.
- The slope of the  $PPF$  at point A measures the opportunity cost of oil and gas—the units of other goods and services that must be forgone to get another million barrels per day.
- Canada can sell oil and gas to other countries and the terms on which that trade occurs is shown by the red "Trade line." This line is like that for trade between Joe and Liz in Fig. 2.7.
- In 2013, Canada consumed 5 million barrels of oil and gas a day at point B, a point outside its  $PPF$ , and exported 2 million barrels a day, as shown by the blue arrow.



**Figure 1 Oil and Gas Production Possibilities Expand**



**Figure 2 Production, Exports, and Consumption of Oil and Gas in 2013**



## SUMMARY

### Key Points

#### Production Possibilities and Opportunity Cost

(pp. 32–34)

- The production possibilities frontier is the boundary between production levels that are attainable and those that are not attainable when all the available resources are used to their limits.
- Production efficiency occurs at points on the production possibilities frontier.
- Along the production possibilities frontier, the opportunity cost of producing more of one good is the amount of the other good that must be given up.
- The opportunity cost of all goods increases as the production of the good increases.

Working Problems 1 to 3 will give you a better understanding of production possibilities and opportunity cost.

#### Using Resources Efficiently

- (pp. 35–37)
- Allocative efficiency occurs when goods and services are produced at the least possible cost and in the quantities that bring the greatest possible benefit.
  - The marginal cost of a good is the opportunity cost of producing one more unit of it.
  - The marginal benefit from a good is the benefit received from consuming one more unit of it and is measured by the willingness to pay for it.
  - The marginal benefit of a good decreases as the amount of the good available increases.
  - Resources are used efficiently when the marginal cost of each good is equal to its marginal benefit.

Working Problems 4 to 6 will give you a better understanding of the efficient use of resources.

### Key Terms

- Absolute advantage, 40
- Allocative efficiency, 35
- Capital accumulation, 38
- Comparative advantage, 40
- Economic growth, 38
- Firm, 44

- Marginal benefit, 36
- Marginal benefit curve, 36
- Marginal cost, 35
- Market, 44
- Money, 44
- Opportunity cost, 33

### MyEconLab Key Terms Quiz

- Preferences, 36
- Production efficiency, 33
- Production possibilities frontier, 32
- Property rights, 44
- Technological change, 38

#### Economic Growth

(pp. 38–39)

- Economic growth, which is the expansion of production possibilities, results from capital accumulation and technological change.
- The opportunity cost of economic growth is forgone current consumption.
- The benefit of economic growth is increased future consumption.

Working Problem 7 will give you a better understanding of economic growth.

#### Gains from Trade

(pp. 40–43)

- A person has a comparative advantage in producing a good if that person can produce the good at a lower opportunity cost than everyone else.
- People gain by specializing in the activity in which they have a comparative advantage and trading with others.

Working Problems 8 and 9 will give you a better understanding of the gains from trade.

#### Economic Coordination

(pp. 44–45)

- Firms coordinate a large amount of economic activity, but there is a limit to the efficient size of a firm.
- Markets coordinate the economic choices of people and firms.
- Markets can work efficiently only when property rights exist.
- Money makes trading in markets more efficient.

Working Problem 10 will give you a better understanding of economic coordination.

## WORKED PROBLEM

**MyEconLab** You can work this problem in Chapter 2 Study Plan.

Leisure Island has 50 hours of labour a day that it can use to produce entertainment and good food. The table shows the maximum quantity of each good that it can produce with different quantities of labour.

Labour (hours)	Entertainment (shows per week)	Good food (meals per week)
0	0	0
10	2	5
20	4	9
30	6	12
40	8	14
50	10	15

### Questions

1. Can Leisure Island produce 4 shows and 14 meals a week?
2. If Leisure Island produces 4 shows and 9 meals a week, is production efficient?
3. If Leisure Island produces 8 shows and 5 meals a week, do the people of Leisure Island face a tradeoff?
4. Suppose that Leisure Island produces 4 shows and 12 meals a week. Calculate the opportunity cost of producing 2 additional shows a week.

### Solutions

1. To produce 4 shows it would use 20 hours and to produce 14 meals it would use 40 hours, so to produce 4 shows and 14 meals a week, Leisure Island would use 60 hours of labour. Leisure Island has only 50 hours of labour available, so it cannot produce 4 shows and 14 meals a week.

**Key Point:** Production is *unattainable* if it uses more resources than are available.

2. When Leisure Island produces 4 shows it uses 20 hours of labour and when it produces 9 meals it uses 20 hours. In total, it uses 40 hours, which is *less than* the 50 hours of labour available. So Leisure Island's production is not efficient.

**Key Point:** Production is *efficient* only if the economy uses all its resources.

3. When Leisure Island produces 8 shows and 5 meals, it uses 50 hours of labour. Leisure Island is using all its resources, so to produce more of either good, it would face a tradeoff.

**Key Point:** An economy faces a *tradeoff* only when it uses all the available resources.

4. When Leisure Island produces 4 shows and 12 meals a week, it uses 50 hours of labour. To

produce 2 additional shows a week, Leisure Island faces a tradeoff and incurs an opportunity cost.

To produce 2 additional shows a week, Leisure Island moves 10 hours of labour from good food production, which decreases the quantity of meals from 12 to 9 a week—a decrease of 3 meals. That is, to get 2 additional shows a week Leisure Island *must give up* 3 meals a week. The opportunity cost of the 2 additional shows is 3 meals a week.

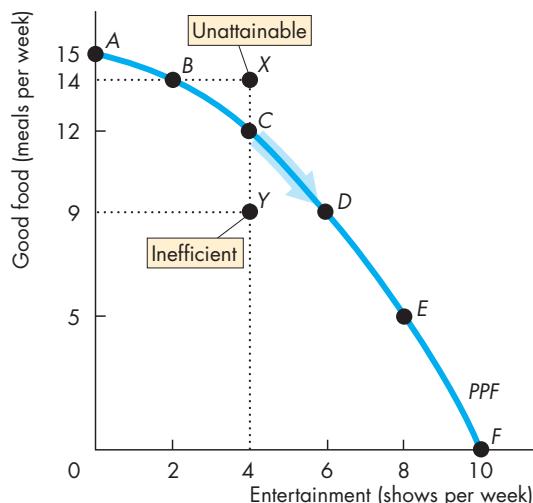
**Key Point:** When an economy is using all its resources and it decides to increase production of one good, it incurs an opportunity cost equal to the quantity of the good that it *must forgo*.

### Key Figure

Each row of the following table sets out the combination of shows and meals that Leisure Island can produce in a week when it uses 50 hours of labour.

	Entertainment (shows per week)	Good food (meals per week)
A	0	15
B	2	14
C	4	12
D	6	9
E	8	5
F	10	0

Points A through F plot these combinations of shows and meals. The blue curve through these points is Leisure Island's *PPF*. Point X (4 shows and 14 meals in Question 1) is unattainable; Point Y (4 shows and 9 meals in Question 2) is inefficient. Point E (8 shows and 5 meals in Question 3) is on the *PPF* and the arrow illustrates the tradeoff and the calculation of opportunity cost of 2 additional shows a week.



**MyEconLab Interactive Animation**

## ◆ STUDY PLAN PROBLEMS AND APPLICATIONS

**MyEconLab** You can work Problems 1 to 10 in Chapter 2 Study Plan and get instant feedback.

### Production Possibilities and Opportunity Cost (Study Plan 2.1)

Use the following information to work Problems 1 to 3. Brazil produces ethanol from sugar, and the land used to grow sugar can be used to grow food crops. The table sets out Brazil's production possibilities for ethanol and food crops:

Ethanol (barrels per day)		Food crops (tonnes per day)
70	and	0
64	and	1
54	and	2
40	and	3
22	and	4
0	and	5

1. a. Draw a graph of Brazil's *PPF* and explain how your graph illustrates scarcity.  
b. If Brazil produces 40 barrels of ethanol a day, how much food must it produce to achieve production efficiency?  
c. Why does Brazil face a tradeoff on its *PPF*?
2. a. If Brazil increases ethanol production from 40 barrels per day to 54 barrels a day, what is the opportunity cost of the additional ethanol?  
b. If Brazil increases food production from 2 tonnes per day to 3 tonnes per day, what is the opportunity cost of the additional food?  
c. What is the relationship between your answers to parts (a) and (b)?
3. Does Brazil face an increasing opportunity cost of ethanol? What feature of Brazil's *PPF* illustrates increasing opportunity cost?

### Using Resources Efficiently (Study Plan 2.2)

Use the table above to work Problems 4 and 5.

4. Define marginal cost and calculate Brazil's marginal cost of producing a tonne of food when the quantity produced is 2.5 tonnes per day.
5. Define marginal benefit. Explain how it is measured and why the data in the table does not enable you to calculate Brazil's marginal benefit from food.
6. Distinguish between *production efficiency* and *allocative efficiency*. Explain why many production possibilities achieve production efficiency but only one achieves allocative efficiency.

### Economic Growth (Study Plan 2.3)

7. A farm grows wheat and produces pork. The marginal cost of producing each of these products increases as more of it is produced.
  - a. Make a graph that illustrates the farm's *PPF*.
  - b. The farm adopts a new technology that allows it to use fewer resources to fatten pigs. On your graph sketch the impact of the new technology on the farm's *PPF*.
  - c. With the farm using the new technology described in part (b), has the opportunity cost of producing a tonne of wheat increased, decreased, or remained the same? Explain and illustrate your answer.
  - d. Is the farm more efficient with the new technology than it was with the old one? Why?

### Gains from Trade (Study Plan 2.4)

8. In an hour, Sue can produce 40 caps or 4 jackets and Tessa can produce 80 caps or 4 jackets.
  - a. Calculate Sue's opportunity cost of producing a cap.
  - b. Calculate Tessa's opportunity cost of producing a cap.
  - c. Who has a comparative advantage in producing caps?
  - d. If Sue and Tessa specialize in producing the good in which they have a comparative advantage and then trade 1 jacket for 15 caps, who gains from the specialization and trade?
9. Suppose that Tessa buys a new machine that enables her to make 20 jackets an hour. (She can still make only 80 caps per hour.)
  - a. Who now has a comparative advantage in producing jackets?
  - b. Can Sue and Tessa still gain from trade?
  - c. Would Sue and Tessa still be willing to trade 1 jacket for 15 caps? Explain your answer.

### Economic Coordination (Study Plan 2.5)

10. For 50 years, Cuba has had a centrally planned economy in which the government makes the big decisions on how resources will be allocated.
  - a. Why would you expect Cuba's production possibilities (per person) to be smaller than those of Canada?
  - b. What are the social institutions that Cuba might lack that help Canada to achieve allocative efficiency?



## ADDITIONAL PROBLEMS AND APPLICATIONS

**MyEconLab** You can work these problems in MyEconLab if assigned by your instructor.

### Production Possibilities and Opportunity Cost

Use the following table to work Problems 11 and 12.

Suppose that Yucatan's production possibilities are:

Food (kilograms per month)		Sunscreen (litres per month)
300	and	0
200	and	50
100	and	100
0	and	150

11. a. Draw a graph of Yucatan's PPF and explain how your graph illustrates a tradeoff.  
b. If Yucatan produces 150 kilograms of food per month, how much sunscreen must it produce if it achieves production efficiency?  
c. What is Yucatan's opportunity cost of producing (i) 1 kilogram of food and (ii) 1 litre of sunscreen?  
d. What is the relationship between your answers to part (c)?
12. What feature of a PPF illustrates increasing opportunity cost? Explain why Yucatan's opportunity cost does or does not increase.

### Using Resources Efficiently

13. In Problem 11, what is the marginal cost of 1 kilogram of food in Yucatan when the quantity produced is 150 kilograms per day? What is special about the marginal cost of food in Yucatan?
14. The table describes the preferences in Yucatan.

Sunscreen (litres per month)	Willingness to pay (kilograms of food per litre)
25	3
75	2
125	1

- a. What is the marginal benefit from sunscreen and how is it measured?  
b. Use the table in Problem 11. What does Yucatan produce to achieve allocative efficiency?

### Downtown Music Stores Squeezed out of Business

Music retailing is changing: Sony Music and Amazon are selling online, discount stores are selling at low prices, and downtown music retailers are all struggling.

Source: *The Economist*, January 20, 2007

- a. Draw the PPF curves for downtown music retailers and online music retailers before and after the Internet became available.

- b. Draw the marginal cost and marginal benefit curves for downtown music retailers and online music retailers before and after the Internet became available.
- c. Explain how changes in production possibilities, preferences, or both have changed the way in which recorded music is retailed.

Use the following news clip to work Problems 16 and 17.

### Malaria Eradication Back on the Table

In response to the Gates Malaria Forum in October 2007, countries are debating the pros and cons of eradication. Dr. Arata Kochi of the World Health Organization believes that with enough money malaria cases could be cut by 90 percent, but it would be very expensive to eliminate the remaining 10 percent of cases, so countries should not strive to eradicate malaria.

Source: *The New York Times*, March 4, 2008

16. Is Dr. Kochi talking about *production efficiency* or *allocative efficiency* or both?
17. Make a graph with the percentage of malaria cases eliminated on the *x*-axis and the marginal cost and marginal benefit of driving down malaria cases on the *y*-axis. On your graph:
  - (i) Draw a marginal cost curve and marginal benefit curve that are consistent with Dr. Kochi's opinion.
  - (ii) Identify the quantity of malaria eradicated that achieves allocative efficiency.

### Economic Growth

18. Capital accumulation and technological change bring economic growth: Production that was unattainable yesterday becomes attainable today; production that is unattainable today will become attainable tomorrow. Why doesn't economic growth bring an end to scarcity one day?
19. **Toyota Plans to Build a Better Company**  
Toyota will continue to produce 3 million cars per year and will use the balance of its resources to upgrade its workers' skills and create new technology. In three years' time, Toyota plans to produce better cars and be more productive.

- Source: *Financial Post*, April 7, 2014
- a. What is the opportunity cost of Toyota upgrading its workers' skills and creating new technology?

- b. Sketch Toyota's *PPF* and mark its production point in 2014. Now show on your graph Toyota's *PPF* in 2018.

### Gains from Trade

Use the following data to work Problems 20 and 21. Kim can produce 40 pies or 400 cakes an hour. Liam can produce 100 pies or 200 cakes an hour.

20. a. Calculate Kim's opportunity cost of a pie and Liam's opportunity cost of a pie.
- b. If each spends 30 minutes of each hour producing pies and 30 minutes producing cakes, how many pies and cakes does each produce?
- c. Who has a comparative advantage in producing (i) pies and (ii) cakes?
21. a. Draw a graph of Kim's *PPF* and Liam's *PPF* and show the point at which each produces when they spend 30 minutes of each hour producing pies and 30 minutes producing cakes.
- b. On your graph, show what Kim produces and what Liam produces when they specialize.
- c. When they specialize and trade, what are the total gains from trade?
- d. If Kim and Liam share the total gains equally, what trade takes place between them?
22. Tony and Patty produce skis and snowboards. The tables show their production possibilities. Tony produces 5 snowboards and 40 skis a week; Patty produces 10 snowboards and 5 skis a week.

Tony's Production Possibilities		
Snowboards (units per week)		Skis (units per week)
25	and	0
20	and	10
15	and	20
10	and	30
5	and	40
0	and	50

Patty's Production Possibilities		
Snowboards (units per week)		Skis (units per week)
20	and	0
10	and	5
0	and	10

- a. Who has a comparative advantage in producing (i) snowboards and (ii) skis?
- b. If Tony and Patty specialize and trade 1 snowboard for 1 ski, what are the gains from trade?

### Economic Coordination

23. On a graph of the circular flows in the market economy indicate the real and money flows in which the following items belong:
  - a. You buy an iPad from the Apple Store.
  - b. Apple Inc. pays the designers of the iPad.
  - c. Apple Inc. decides to expand and rents an adjacent building.
  - d. You buy a new e-book from Amazon.
  - e. Apple Inc. hires a student as an intern during the summer.

### Economics in the News

24. After you have studied *Economics in the News* on pp. 46–47, answer the following questions.
  - a. How does the discovery of new oil and gas reserves change Canada's *PPF*?
  - b. How do technological advances in the production of other goods and services change Canada's *PPF*?
  - c. How are Husky's discoveries changing Canada's opportunity cost of producing oil and gas?
  - d. When technological advances in the production of other goods and services occur, how does the opportunity cost of producing oil and gas change? Does it increase or decrease?

### Lots of Little Screens

Inexpensive broadband access has created a generation of television producers for whom the Internet is their native medium. As they redirect the focus from TV to computers, cellphones, and iPods, the video market is developing into an open digital network.

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

- a. How has inexpensive broadband changed the production possibilities of video entertainment and other goods and services?
- b. Sketch a *PPF* for video entertainment and other goods and services before broadband.
- c. Show how the arrival of inexpensive broadband has changed the *PPF*.
- d. Sketch a marginal benefit curve for video entertainment.
- e. Show how the new generation of TV producers for whom the Internet is their native medium might have changed the marginal benefit from video entertainment.
- f. Explain how the efficient quantity of video entertainment has changed.

# Your Economic Revolution

Three periods in human history stand out as ones of economic revolution. The first, the *Agricultural Revolution*, occurred 10,000 years ago. In what is today Iraq, people learned to domesticate animals and plant crops. People stopped roaming in search of food and settled in villages, towns, and cities where they specialized in the activities in which they had a comparative advantage and developed markets in which to exchange their products. Wealth increased enormously.

Economics was born during the *Industrial Revolution*, which began in England during the 1760s. For the first time, people began to apply science and create new technologies for the manufacture of textiles and iron, to create steam engines, and to boost the output of farms.

You are studying economics at a time that future historians will call the *Information Revolution*. Over the entire world, people are embracing new information technologies and prospering on an unprecedented scale.

During all three economic revolutions, many have prospered but others have been left behind. It is the range of human progress that poses the greatest question for economics and the one that Adam Smith addressed in the first work of economic science: What causes the differences in wealth among nations?

*Many people had written about economics before Adam Smith, but he made economics a science. Born in 1723 in Kirkcaldy, a small fishing town near Edinburgh, Scotland, Smith was the only child of the town's customs officer. Lured from his professorship (he was a full professor at 28) by a wealthy Scottish duke who gave him a pension of £300 a year—10 times the average income at that time—Smith devoted 10 years to writing his masterpiece: An Inquiry into the Nature and Causes of the Wealth of Nations, published in 1776.*

*Why, Adam Smith asked, are some nations wealthy while others are poor? He was pondering these questions at the height of the Industrial Revolution, and he answered by emphasizing the power of the division of labour and free markets in raising labour productivity.*

*To illustrate his argument, Adam Smith described two pin factories. In the first, one person, using the hand tools available in the 1770s, could make 20 pins a day. In the other, by using those same hand tools but breaking the process into a number of individually small operations in which people specialize—by the division of labour—10 people could make a staggering 48,000 pins a day. One draws out*

## PART ONE

### UNDERSTANDING THE SCOPE OF ECONOMICS

*Every individual who intends only his own gain is led by an invisible hand to promote an end (the public good) which was no part of his intention.*

**ADAM SMITH**  
*The Wealth of Nations*



*the wire, another straightens it, a third cuts it, a fourth points it, a fifth grinds it. Three specialists make the head, and a fourth attaches it. Finally, the pin is polished and packaged.*

*But a large market is needed to support the division of labour: One factory employing 10 workers would need to sell more than 15 million pins a year to stay in business!*



TALKING WITH

**Esther Duflo\***



ESTHER DUFLO is the Abdul Latif Jameel Professor of Poverty Alleviation and Development Economics at the Massachusetts Institute of Technology. Among her many honours are the 2010 John Bates Clark Medal for the best economist under 40 and the Financial Times and Goldman Sachs Business Book of the Year Award in 2011 for her book (with Abhijit Banerjee) *Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty*. Professor Duflo's research seeks to advance our understanding of the economic choices of the extremely poor by conducting massive real-world experiments.

Professor Duflo was an undergraduate student of history and economics at École Normale Supérieure and completed a master's degree at DELTA in Paris before moving to the United States. She earned her Ph.D. in economics at MIT in 1999.

Michael Parkin and Robin Bade talked with her about her work, which advances our understanding of the economic choices and condition of the very poor.

*Professor Duflo, what's the story about how you became an economist and in particular the architect of experiments designed to understand the economic choices of the very poor?*

When I was a kid, I was exposed to many stories and images of poor children: through my mothers' engagement as a doctor in a small NGO dealing with child victims of war and through books and stories about children living all around the world.

I remember asking myself how I could justify my luck of being born where I was. I had a very exaggerated idea of what it was to be poor, but this idea caused sufficient discomfort that I knew

I had to do something about it, if I could. Quite by accident, I discovered that economics was the way in which I could actually be useful: While spending a year in Russia teaching French and studying history, I realized that academic economists have the ability to intervene in the world while keeping enough sanity to analyze it. I thought this would be ideal for me and I have never regretted it. I have the best job in the world.

**... imagine living on under a dollar  
a day after your rent is paid in  
Seattle or Denver. Not easy!**

*The very poor who you study are people who live on \$1 a day or \$2 a day. ... Is \$1 a day a true measure that includes everything these poor people consume?*

For defining the poverty line, we don't include the cost of housing. The poor also get free goods, sometimes of bad quality (education, healthcare) and the value of those is also not included. Other than that, yes, it is everything.

Moreover, you have to realize this is everything, taking into account the fact that life is much cheaper in many poor countries because salaries are lower, so anything that is made and consumed locally (e.g., a haircut) is cheaper.

For example, in India, the purchasing power of a dollar (in terms of the real goods you can buy) is about 3 times what it is in the United States. So the poverty line we use for India is 33 cents per day, not a dollar.

All told, you really have to imagine living on under a dollar a day after your rent is paid in Seattle or Denver. Not easy!

\*Read the full interview with Esther Duflo in [MyEconLab](#).



# 3

## DEMAND AND SUPPLY

After studying this chapter, you will be able to:

- ◆ Describe a competitive market and think about a price as an opportunity cost
- ◆ Explain the influences on demand
- ◆ Explain the influences on supply
- ◆ Explain how demand and supply determine prices and quantities bought and sold
- ◆ Use the demand and supply model to make predictions about changes in prices and quantities

A disease that kills banana trees is jumping continents and left unchecked will bring a big drop in banana production. What will happen to the price of bananas if the disease isn't contained? The demand and supply model answers this question.

This model that you're about to study is the main tool of economics. It explains how prices are determined and how they guide the use of resources to influence *What, How, and For Whom* goods and services are produced.

*Economics in the News* at the end of the chapter answers the question about the price of bananas.

## Markets and Prices

When you need a new pair of running shoes, want a bagel and a latte, plan to upgrade your cellphone, or need to fly home for Thanksgiving, you must find a place where people sell those items or offer those services. The place in which you find them is a *market*. You learned in Chapter 2 (p. 44) that a market is any arrangement that enables buyers and sellers to get information and to do business with each other.

A market has two sides: buyers and sellers. There are markets for *goods* such as apples and hiking boots, for *services* such as haircuts and tennis lessons, for *factors of production* such as computer programmers and earthmovers, and for other manufactured *inputs* such as memory chips and auto parts. There are also markets for money such as Japanese yen and for financial securities such as Yahoo! stock. Only our imagination limits what can be traded in markets.

Some markets are physical places where buyers and sellers meet and where an auctioneer or a broker helps to determine the prices. Examples of this type of market are live car and house auctions and the wholesale fish, meat, and produce markets.

Some markets are groups of people spread around the world who never meet and know little about each other but are connected through the Internet or by telephone and fax. Examples are the e-commerce markets and the currency markets.

But most markets are unorganized collections of buyers and sellers. You do most of your trading in this type of market. An example is the market for basketball shoes. The buyers in this \$3 billion-a-year market are the 45 million Canadians and Americans who play basketball (or who want to make a fashion statement). The sellers are the tens of thousands of retail sports equipment and footwear stores. Each buyer can visit several different stores, and each seller knows that the buyer has a choice of stores.

Markets vary in the intensity of competition that buyers and sellers face. In this chapter, we're going to study a **competitive market**—a market that has many buyers and many sellers, so no single buyer or seller can influence the price.

Producers offer items for sale only if the price is high enough to cover their opportunity cost. And consumers respond to changing opportunity cost by seeking cheaper alternatives to expensive items.

We are going to study how people respond to prices and the forces that determine prices. But

to pursue these tasks, we need to understand the relationship between a price and an opportunity cost.

In everyday life, the *price* of an object is the number of dollars that must be given up in exchange for it. Economists refer to this price as the **money price**.

The *opportunity cost* of an action is the highest-valued alternative forgone. If, when you buy a cup of coffee, the highest-valued thing you forgo is some gum, then the opportunity cost of the coffee is the *quantity* of gum forgone. We can calculate the quantity of gum forgone from the money prices of the coffee and the gum.

If the money price of coffee is \$1 a cup and the money price of gum is 50¢ a pack, then the opportunity cost of one cup of coffee is two packs of gum. To calculate this opportunity cost, we divide the price of a cup of coffee by the price of a pack of gum and find the *ratio* of one price to the other. The ratio of one price to another is called a **relative price**, and a *relative price is an opportunity cost*.

We can express the relative price of coffee in terms of gum or any other good. The normal way of expressing a relative price is in terms of a “basket” of all goods and services. To calculate this relative price, we divide the money price of a good by the money price of a “basket” of all goods (called a *price index*). The resulting relative price tells us the opportunity cost of the good in terms of how much of the “basket” we must give up to buy it.

The demand and supply model that we are about to study determines *relative prices*, and the word “price” means *relative* price. When we predict that a price will fall, we do not mean that its *money* price will fall—although it might. We mean that its *relative* price will fall. That is, its price will fall *relative* to the average price of other goods and services.

### REVIEW QUIZ

- 1 What is the distinction between a money price and a relative price?
- 2 Explain why a relative price is an opportunity cost.
- 3 Think of examples of goods whose relative price has risen or fallen by a large amount.

Work these questions in Study Plan 3.1 and get instant feedback. Do a Key Terms Quiz. 

Let's begin our study of demand and supply, starting with demand.



## Demand

If you demand something, then you:

1. Want it.
2. Can afford it.
3. Plan to buy it.

*Wants* are the unlimited desires or wishes that people have for goods and services. How many times have you thought that you would like something “if only you could afford it” or “if it weren’t so expensive”? Scarcity guarantees that many—perhaps most—of our wants will never be satisfied. Demand reflects a decision about which wants to satisfy.

The **quantity demanded** of a good or service is the amount that consumers plan to buy during a given time period at a particular price. The quantity demanded is not necessarily the same as the quantity actually bought. Sometimes the quantity demanded exceeds the amount of goods available, so the quantity bought is less than the quantity demanded.

The quantity demanded is measured as an amount per unit of time. For example, suppose that you buy one cup of coffee a day. The quantity of coffee that you demand can be expressed as 1 cup per day, 7 cups per week, or 365 cups per year.

Many factors influence buying plans, and one of them is the price. We look first at the relationship between the quantity demanded of a good and its price. To study this relationship, we keep all other influences on buying plans the same and we ask: How, other things remaining the same, does the quantity demanded of a good change as its price changes?

The law of demand provides the answer.

### The Law of Demand

The **law of demand** states:

Other things remaining the same, the higher the price of a good, the smaller is the quantity demanded; and the lower the price of a good, the greater is the quantity demanded.

Why does a higher price reduce the quantity demanded? For two reasons:

- Substitution effect
- Income effect

**Substitution Effect** When the price of a good rises, other things remaining the same, its *relative* price—its opportunity cost—rises. Although each good is unique, it has *substitutes*—other goods that can be used in its place. As the opportunity cost of a good rises, the incentive to economize on its use and switch to a substitute becomes stronger.

**Income Effect** When a price rises, other things remaining the same, the price rises *relative* to income. Faced with a higher price and an unchanged income, people cannot afford to buy all the things they previously bought. They must decrease the quantities demanded of at least some goods and services. Normally, the good whose price has increased will be one of the goods that people buy less of.

To see the substitution effect and the income effect at work, think about the effects of a change in the price of an energy bar. Several different goods are substitutes for an energy bar. For example, an energy drink could be consumed instead of an energy bar.

Suppose that an energy bar initially sells for \$3 and then its price falls to \$1.50. People now substitute energy bars for energy drinks—the substitution effect. And with a budget that now has some slack from the lower price of an energy bar, people buy even more energy bars—the income effect. The quantity of energy bars demanded increases for these two reasons.

Now suppose that an energy bar initially sells for \$3 and then the price doubles to \$6. People now buy fewer energy bars and more energy drinks—the substitution effect. And faced with a tighter budget, people buy even fewer energy bars—the income effect. The quantity of energy bars demanded decreases for these two reasons.

### Demand Curve and Demand Schedule

You are now about to study one of the two most used curves in economics: the demand curve. You are also going to encounter one of the most critical distinctions: the distinction between *demand* and *quantity demanded*.

The term **demand** refers to the entire relationship between the price of a good and the quantity demanded of that good. Demand is illustrated by the demand curve and the demand schedule. The term *quantity demanded* refers to a point on a demand curve—the quantity demanded at a particular price.

Figure 3.1 shows the demand curve for energy bars. A **demand curve** shows the relationship between the quantity demanded of a good and its price when all other influences on consumers' planned purchases remain the same.

The table in Fig. 3.1 is the demand schedule for energy bars. A *demand schedule* lists the quantities demanded at each price when all the other influences on consumers' planned purchases remain the same. For example, if the price of a bar is 50¢, the quantity demanded is 22 million a week. If the price is \$2.50, the quantity demanded is 5 million a week. The other rows of the table show the quantities demanded at prices of \$1.00, \$1.50, and \$2.00.

We graph the demand schedule as a demand curve with the quantity demanded on the  $x$ -axis and the price on the  $y$ -axis. The points on the demand curve labelled  $A$  through  $E$  correspond to the rows of the demand schedule. For example, point  $A$  on the graph shows a quantity demanded of 22 million energy bars a week at a price of 50¢ a bar.

**Willingness and Ability to Pay** Another way of looking at the demand curve is as a willingness-and-ability-to-pay curve. The willingness and ability to pay is a measure of *marginal benefit*.

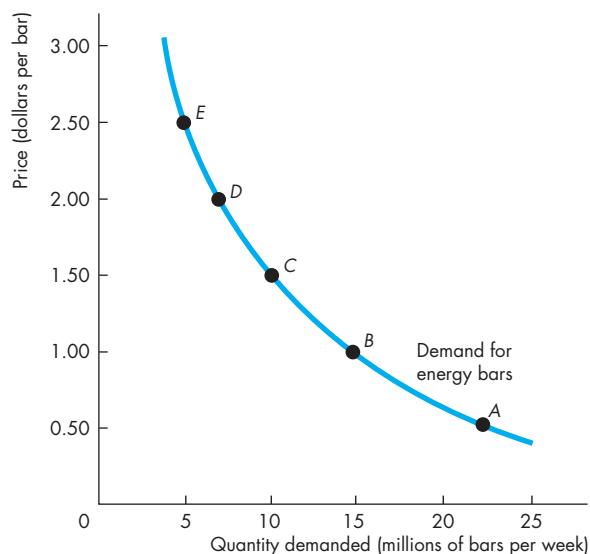
If a small quantity is available, the highest price that someone is willing and able to pay for one more unit is high. But as the quantity available increases, the marginal benefit of each additional unit falls and the highest price that someone is willing and able to pay also falls along the demand curve.

In Fig. 3.1, if only 5 million energy bars are available each week, the highest price that someone is willing to pay for the 5 millionth bar is \$2.50. But if 22 million energy bars are available each week, someone is willing to pay 50¢ for the last bar bought.

## A Change in Demand

When any factor that influences buying plans changes, other than the price of the good, there is a **change in demand**. Figure 3.2 illustrates an increase in demand. When demand increases, the demand curve shifts rightward and the quantity demanded at each price is greater. For example, at \$2.50 a bar, the quantity demanded on the original (blue) demand curve is 5 million energy bars a week. On the new (red) demand curve, at \$2.50 a bar, the quantity demanded is 15 million bars a week. Look closely at the numbers in the table and check that the quantity demanded at each price is greater.

**FIGURE 3.1** The Demand Curve

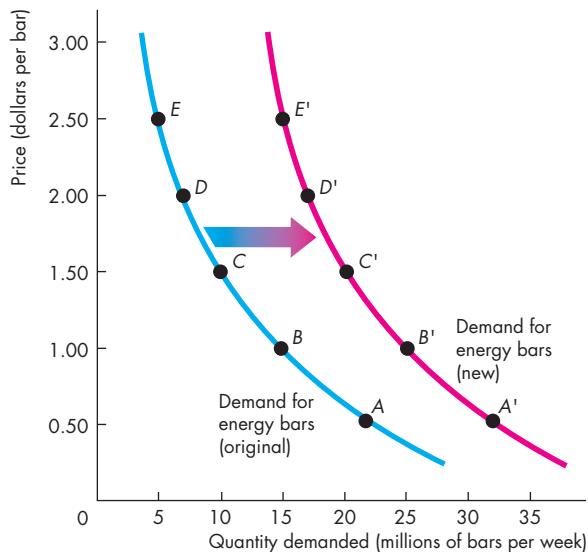


	Price (dollars per bar)	Quantity demanded (millions of bars per week)
A	0.50	22
B	1.00	15
C	1.50	10
D	2.00	7
E	2.50	5

The table shows a demand schedule for energy bars. At a price of 50¢ a bar, 22 million bars a week are demanded; at a price of \$1.50 a bar, 10 million bars a week are demanded. The demand curve shows the relationship between quantity demanded and price, other things remaining the same. The demand curve slopes downward: As the price falls, the quantity demanded increases.

The demand curve can be read in two ways. For a given price, the demand curve tells us the quantity that people plan to buy. For example, at a price of \$1.50 a bar, people plan to buy 10 million bars a week. For a given quantity, the demand curve tells us the maximum price that consumers are willing and able to pay for the last bar available. For example, the maximum price that consumers will pay for the 15 millionth bar is \$1.00.

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**FIGURE 3.2** An Increase in Demand

Original demand schedule Original income		New demand schedule New higher income	
	Quantity demanded (millions of bars per week)		Quantity demanded (millions of bars per week)
Price (dollars per bar)		Price (dollars per bar)	
A	22	A'	32
B	15	B'	25
C	10	C'	20
D	7	D'	17
E	5	E'	15

A change in any influence on buying plans other than the price of the good itself results in a new demand schedule and a shift of the demand curve. A change in income changes the demand for energy bars. At a price of \$1.50 a bar, 10 million bars a week are demanded at the original income (row C of the table) and 20 million bars a week are demanded at the new higher income (row C'). A rise in income increases the demand for energy bars. The demand curve shifts *rightward*, as shown by the shift arrow and the resulting red curve.

MyEconLab Animation

Six main factors bring changes in demand. They are changes in:

- The prices of related goods
- Expected future prices
- Income
- Expected future income and credit
- Population
- Preferences

**Prices of Related Goods** The quantity of energy bars that consumers plan to buy depends in part on the prices of substitutes for energy bars. A **substitute** is a good that can be used in place of another good. For example, a bus ride is a substitute for a train ride; a hamburger is a substitute for a hot dog; and an energy drink is a substitute for an energy bar. If the price of a substitute for an energy bar rises, people buy less of the substitute and more energy bars. For example, if the price of an energy drink rises, people buy fewer energy drinks and more energy bars. The demand for energy bars increases.

The quantity of energy bars that people plan to buy also depends on the prices of complements with energy bars. A **complement** is a good that is used in conjunction with another good. Hamburgers and fries are complements, and so are energy bars and exercise. If the price of an hour at the gym falls, people buy more gym time *and more* energy bars.

**Expected Future Prices** If the expected future price of a good rises and if the good can be stored, the opportunity cost of obtaining the good for future use is lower today than it will be in the future when people expect the price to be higher. So people retime their purchases—they substitute over time. They buy more of the good now before its price is expected to rise (and less afterward), so the demand for the good today increases.

For example, suppose that a Florida frost damages the season's orange crop. You expect the price of orange juice to rise, so you fill your freezer with enough frozen juice to get you through the next six months. Your current demand for frozen orange juice has increased, and your future demand has decreased.

Similarly, if the expected future price of a good falls, the opportunity cost of buying the good today is high relative to what it is expected to be in the future. So again, people retime their purchases. They buy less of the good now before its price is expected

to fall, so the demand for the good decreases today and increases in the future.

Computer prices are constantly falling, and this fact poses a dilemma. Will you buy a new computer now, in time for the start of the school year, or will you wait until the price has fallen some more? Because people expect computer prices to keep falling, the current demand for computers is less (and the future demand is greater) than it otherwise would be.

**Income** Consumers' income influences demand. When income increases, consumers buy more of most goods; and when income decreases, consumers buy less of most goods. Although an increase in income leads to an increase in the demand for *most* goods, it does not lead to an increase in the demand for *all* goods. A **normal good** is one for which demand increases as income increases. An **inferior good** is one for which demand decreases as income increases. As incomes increase, the demand for air travel (a normal good) increases and the demand for long-distance bus trips (an inferior good) decreases.

**Expected Future Income and Credit** When expected future income increases or credit becomes easier to get, demand for a good might increase now. For example, a salesperson gets the news that she will receive a big bonus at the end of the year, so she goes into debt and buys a new car right now, rather than waiting until she receives the bonus.

**Population** Demand also depends on the size and the age structure of the population. The larger the population, the greater is the demand for all goods and services; the smaller the population, the smaller is the demand for all goods and services.

For example, the demand for parking spaces, running shoes, movies, or just about anything that you can imagine is much greater in the Greater Toronto Area (population 6 million) than it is in Thunder Bay, Ontario (population 146,000).

Also, the larger the proportion of the population in an age group, the greater is the demand for the goods and services used by that group. For example, in 2010, there were 2.3 million 20-to-24-year-olds in Canada compared with 2.1 million in 2000. As a result, the demand for university places in 2010 was greater than in 2000. During this period, the number of Canadians aged 90 years or more than doubled and the demand for nursing home services increased.

**TABLE 3.1** The Demand for Energy Bars

### The Law of Demand

*The quantity of energy bars demanded*

<i>Decreases if:</i>	<i>Increases if:</i>
■ The price of an energy bar rises	■ The price of an energy bar falls

### Changes in Demand

*The demand for energy bars*

<i>Decreases if:</i>	<i>Increases if:</i>
<ul style="list-style-type: none"> <li>■ The price of a substitute falls</li> <li>■ The price of a complement rises</li> <li>■ The expected future price of an energy bar falls</li> <li>■ Income falls*</li> <li>■ Expected future income falls or credit becomes harder to get*</li> <li>■ The population decreases</li> </ul>	<ul style="list-style-type: none"> <li>■ The price of a substitute rises</li> <li>■ The price of a complement falls</li> <li>■ The expected future price of an energy bar rises</li> <li>■ Income rises*</li> <li>■ Expected future income rises or credit becomes easier to get*</li> <li>■ The population increases</li> </ul>

\*An energy bar is a normal good.

### Preferences

Demand depends on preferences. *Preferences* determine the value that people place on each good and service. Preferences depend on such things as the weather, information, and fashion. For example, greater health and fitness awareness has shifted preferences in favour of energy bars, so the demand for energy bars has increased.

Table 3.1 summarizes the influences on demand and the direction of those influences.

### A Change in the Quantity Demanded Versus a Change in Demand

Changes in the influences on buying plans bring either a change in the quantity demanded or a change in demand. Equivalently, they bring either a movement along the demand curve or a shift of the demand curve. The distinction between a change in

the quantity demanded and a change in demand is the same as that between a movement along the demand curve and a shift of the demand curve.

A point on the demand curve shows the quantity demanded at a given price, so a movement along the demand curve shows a **change in the quantity demanded**. The entire demand curve shows demand, so a shift of the demand curve shows a *change in demand*. Figure 3.3 illustrates these distinctions.

**Movement Along the Demand Curve** If the price of the good changes but no other influence on buying plans changes, we illustrate the effect as a movement along the demand curve.

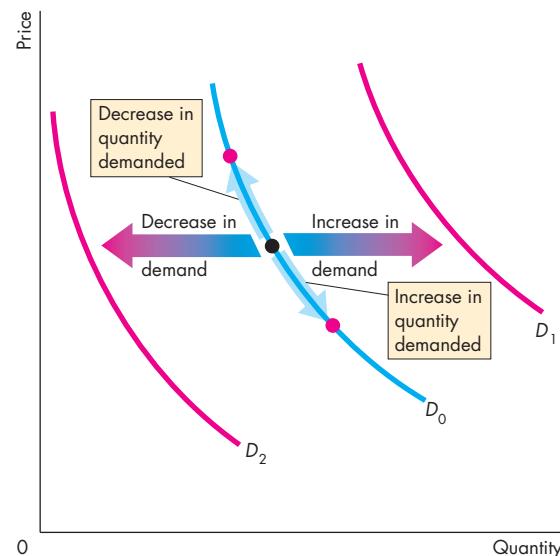
A fall in the price of a good increases the quantity demanded of it. In Fig. 3.3, we illustrate the effect of a fall in price as a movement down along the demand curve  $D_0$ .

A rise in the price of a good decreases the quantity demanded of it. In Fig. 3.3, we illustrate the effect of a rise in price as a movement up along the demand curve  $D_0$ .

**A Shift of the Demand Curve** If the price of a good remains constant but some other influence on buying plans changes, there is a change in demand for that good. We illustrate a change in demand as a shift of the demand curve. For example, if more people work out at the gym, consumers buy more energy bars regardless of the price of a bar. That is what a rightward shift of the demand curve shows—more energy bars are demanded at each price.

In Fig. 3.3, there is a *change in demand* and the demand curve shifts when any influence on buying plans changes, other than the price of the good. Demand *increases* and the demand curve *shifts rightward* (to the red demand curve  $D_1$ ) if the price of a substitute rises, the price of a complement falls, the expected future price of the good rises, income increases (for a normal good), expected future income or credit increases, or the population increases. Demand *decreases* and the demand curve *shifts leftward* (to the red demand curve  $D_2$ ) if the price of a substitute falls, the price of a complement rises, the expected future price of the good falls, income decreases (for a normal good), expected future income or credit decreases, or the population decreases. (For an inferior good, the effects of changes in income are in the opposite direction to those described above.)

**FIGURE 3.3** A Change in the Quantity Demanded Versus a Change in Demand



When the price of the good changes, there is a movement along the demand curve and a *change in the quantity demanded*, shown by the blue arrows on demand curve  $D_0$ . When any other influence on buying plans changes, there is a shift of the demand curve and a *change in demand*. An increase in demand shifts the demand curve rightward (from  $D_0$  to  $D_1$ ). A decrease in demand shifts the demand curve leftward (from  $D_0$  to  $D_2$ ).

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#### REVIEW QUIZ

- 1 Define the quantity demanded of a good or service.
- 2 What is the law of demand and how do we illustrate it?
- 3 What does the demand curve tell us about the price that consumers are willing to pay?
- 4 List all the influences on buying plans that change demand, and for each influence, say whether it increases or decreases demand.
- 5 Why does demand not change when the price of a good changes with no change in the other influences on buying plans?

Work these questions in Study Plan 3.2 and get instant feedback. Do a Key Terms Quiz. **MyEconLab**



## Supply

If a firm supplies a good or service, the firm:

1. Has the resources and technology to produce it.
2. Can profit from producing it.
3. Plans to produce it and sell it.

A supply is more than just having the *resources* and the *technology* to produce something. *Resources and technology* are the constraints that limit what is possible.

Many useful things can be produced, but they are not produced unless it is profitable to do so. Supply reflects a decision about which technologically feasible items to produce.

The **quantity supplied** of a good or service is the amount that producers plan to sell during a given time period at a particular price. The quantity supplied is not necessarily the same amount as the quantity actually sold. Sometimes the quantity supplied is greater than the quantity demanded, so the quantity sold is less than the quantity supplied.

Like the quantity demanded, the quantity supplied is measured as an amount per unit of time. For example, suppose that GM produces 1,000 cars a day. The quantity of cars supplied by GM can be expressed as 1,000 a day, 7,000 a week, or 365,000 a year. Without the time dimension, we cannot tell whether a particular quantity is large or small.

Many factors influence selling plans, and again one of them is the price of the good. We look first at the relationship between the quantity supplied of a good and its price. Just as we did when we studied demand, to isolate the relationship between the quantity supplied of a good and its price, we keep all other influences on selling plans the same and ask: How does the quantity supplied of a good change as its price changes when other things remain the same?

The law of supply provides the answer.

### The Law of Supply

The **law of supply** states:

Other things remaining the same, the higher the price of a good, the greater is the quantity supplied; and the lower the price of a good, the smaller is the quantity supplied.

Why does a higher price increase the quantity supplied? It is because *marginal cost increases*. As the quantity produced of any good increases, the marginal cost of producing the good increases. (See Chapter 2, p. 35 to review marginal cost.)

It is never worth producing a good if the price received for the good does not at least cover the marginal cost of producing it. When the price of a good rises, other things remaining the same, producers are willing to incur a higher marginal cost, so they increase production. The higher price brings forth an increase in the quantity supplied.

Let's now illustrate the law of supply with a supply curve and a supply schedule.

### Supply Curve and Supply Schedule

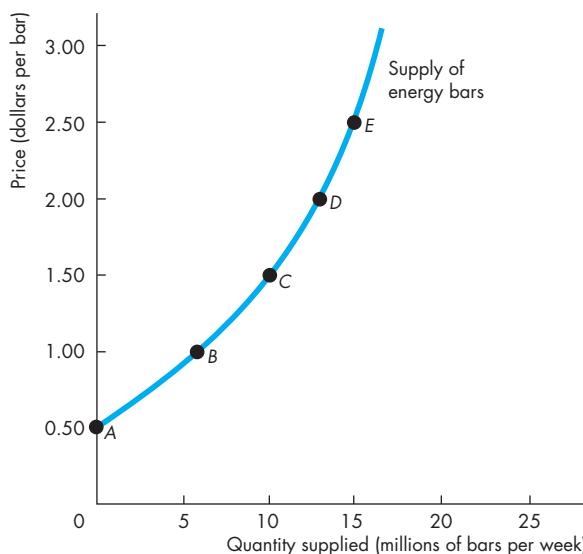
You are now going to study the second of the two most used curves in economics: the supply curve. You're also going to learn about the critical distinction between *supply* and *quantity supplied*.

The term **supply** refers to the entire relationship between the price of a good and the quantity supplied of it. Supply is illustrated by the supply curve and the supply schedule. The term *quantity supplied* refers to a point on a supply curve—the quantity supplied at a particular price.

Figure 3.4 shows the supply curve of energy bars. A **supply curve** shows the relationship between the quantity supplied of a good and its price when all other influences on producers' planned sales remain the same. The supply curve is a graph of a supply schedule.

The table in Fig. 3.4 sets out the supply schedule for energy bars. A *supply schedule* lists the quantities supplied at each price when all the other influences on producers' planned sales remain the same. For example, if the price of an energy bar is 50¢, the quantity supplied is zero—in row A of the table. If the price of an energy bar is \$1.00, the quantity supplied is 6 million energy bars a week—in row B. The other rows of the table show the quantities supplied at prices of \$1.50, \$2.00, and \$2.50.

To make a supply curve, we graph the quantity supplied on the *x*-axis and the price on the *y*-axis. The points on the supply curve labelled A through E correspond to the rows of the supply schedule. For example, point A on the graph shows a quantity supplied of zero at a price of 50¢ an energy bar. Point E shows a quantity supplied of 15 million bars at \$2.50 an energy bar.

**FIGURE 3.4** The Supply Curve

	Price (dollars per bar)	Quantity supplied (millions of bars per week)
A	0.50	0
B	1.00	6
C	1.50	10
D	2.00	13
E	2.50	15

The table shows the supply schedule of energy bars. For example, at a price of \$1.00, 6 million bars a week are supplied; at a price of \$2.50, 15 million bars a week are supplied. The supply curve shows the relationship between the quantity supplied and the price, other things remaining the same. The supply curve slopes upward: As the price of a good increases, the quantity supplied increases.

A supply curve can be read in two ways. For a given price, the supply curve tells us the quantity that producers plan to sell at that price. For example, at a price of \$1.50 a bar, producers are planning to sell 10 million bars a week. For a given quantity, the supply curve tells us the minimum price at which producers are willing to sell one more bar. For example, if 15 million bars are produced each week, the lowest price at which a producer is willing to sell the 15 millionth bar is \$2.50.

**Minimum Supply Price** The supply curve can be interpreted as a minimum-supply-price curve—a curve that shows the lowest price at which someone is willing to sell. This lowest price is the *marginal cost*.

If a small quantity is produced, the lowest price at which someone is willing to sell one more unit is low. But as the quantity produced increases, the marginal cost of each additional unit rises, so the lowest price at which someone is willing to sell an additional unit rises along the supply curve.

In Fig. 3.4, if 15 million bars are produced each week, the lowest price at which someone is willing to sell the 15 millionth bar is \$2.50. But if 10 million bars are produced each week, someone is willing to accept \$1.50 for the last bar produced.

### A Change in Supply

When any factor that influences selling plans other than the price of the good changes, there is a **change in supply**. Six main factors bring changes in supply. They are changes in:

- The prices of factors of production
- The prices of related goods produced
- Expected future prices
- The number of suppliers
- Technology
- The state of nature

**Prices of Factors of Production** The prices of the factors of production used to produce a good influence its supply. To see this influence, think about the supply curve as a minimum-supply-price curve. If the price of a factor of production rises, the lowest price that a producer is willing to accept for that good rises, so supply decreases. For example, during 2008, as the price of jet fuel increased, the supply of air travel decreased. Similarly, a rise in the minimum wage decreases the supply of hamburgers.

**Prices of Related Goods Produced** The prices of related goods that firms produce influence supply. For example, if the price of an energy drink rises, firms switch production from bars to drinks. The supply of energy bars decreases. Energy bars and energy drinks are *substitutes in production*—goods that can be produced by using the same resources. If the price of beef rises, the supply of cowhide increases. Beef and cowhide are *complements in production*—goods that must be produced together.

**Expected Future Prices** If the expected future price of a good rises, the return from selling the good in the future increases and is higher than it is today. So supply decreases today and increases in the future.

**The Number of Suppliers** The larger the number of firms that produce a good, the greater is the supply of the good. As new firms enter an industry, the supply in that industry increases. As firms leave an industry, the supply in that industry decreases.

**Technology** The term “technology” is used broadly to mean the way that factors of production are used to produce a good. A technology change occurs when a new method is discovered that lowers the cost of producing a good. For example, new methods used in the factories that produce computer chips have lowered the cost and increased the supply of chips.

**The State of Nature** The state of nature includes all the natural forces that influence production. It includes the state of the weather and, more broadly, the natural environment. Good weather can increase the supply of many agricultural products and bad weather can decrease their supply. Extreme natural events such as earthquakes, tornadoes, and hurricanes can also influence supply.

Figure 3.5 illustrates an increase in supply. When supply increases, the supply curve shifts rightward and the quantity supplied at each price is larger. For example, at \$1.00 per bar, on the original (blue) supply curve, the quantity supplied is 6 million bars a week. On the new (red) supply curve, the quantity supplied is 15 million bars a week. Look closely at the numbers in the table in Fig. 3.5 and check that the quantity supplied is larger at each price.

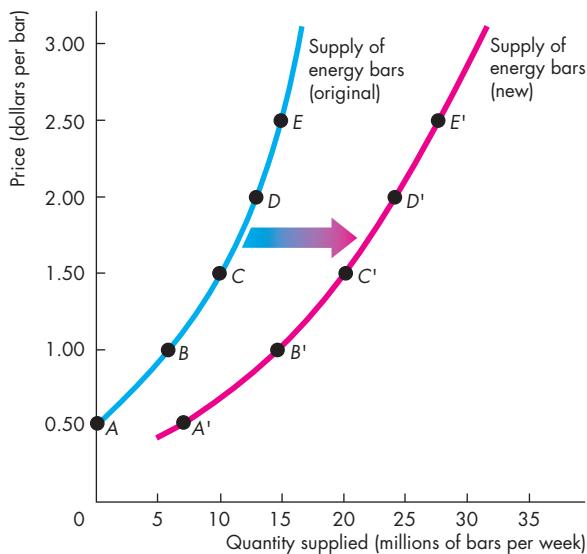
Table 3.2 summarizes the influences on supply and the directions of those influences.

## A Change in the Quantity Supplied Versus a Change in Supply

Changes in the influences on selling plans bring either a change in the quantity supplied or a change in supply. Equivalently, they bring either a movement along the supply curve or a shift of the supply curve.

A point on the supply curve shows the quantity supplied at a given price. A movement along the supply curve shows a **change in the quantity supplied**. The entire supply curve shows supply. A shift of the supply curve shows a *change in supply*.

**FIGURE 3.5** An Increase in Supply



Original supply schedule Old technology		New supply schedule New technology			
Price (dollars per bar)	Quantity supplied (millions of bars per week)		Price (dollars per bar)	Quantity supplied (millions of bars per week)	
A	0.50	0	A'	0.50	7
B	1.00	6	B'	1.00	15
C	1.50	10	C'	1.50	20
D	2.00	13	D'	2.00	25
E	2.50	15	E'	2.50	27

A change in any influence on selling plans other than the price of the good itself results in a new supply schedule and a shift of the supply curve. For example, a new, cost-saving technology for producing energy bars changes the supply of energy bars. At a price of \$1.50 a bar, 10 million bars a week are supplied when producers use the old technology (row C of the table) and 20 million energy bars a week are supplied when producers use the new technology (row C'). An advance in technology *increases* the supply of energy bars. The supply curve shifts *rightward*, as shown by the shift arrow and the resulting red curve.

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Figure 3.6 illustrates and summarizes these distinctions. If the price of the good changes and other things remain the same, there is a *change in the quantity supplied* of that good. If the price of the good falls, the quantity supplied decreases and there is a movement down along the supply curve  $S_0$ . If the price of the good rises, the quantity supplied increases and there is a movement up along the supply curve  $S_0$ . When any other influence on selling plans changes, the supply curve shifts and there is a *change in supply*. If supply increases, the supply curve shifts rightward to  $S_1$ . If supply decreases, the supply curve shifts leftward to  $S_2$ .

**TABLE 3.2** The Supply of Energy Bars

### The Law of Supply

*The quantity of energy bars supplied*

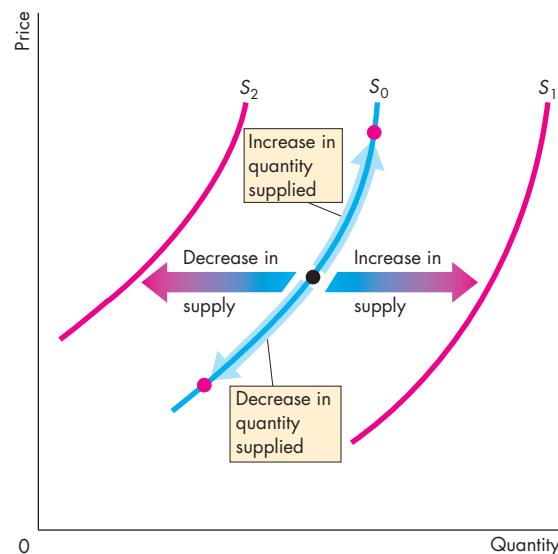
Decreases if:	Increases if:
■ The price of an energy bar falls	■ The price of an energy bar rises

### Changes in Supply

*The supply of energy bars*

Decreases if:	Increases if:
<ul style="list-style-type: none"> <li>■ The price of a factor of production used to produce energy bars rises</li> <li>■ The price of a substitute in production rises</li> <li>■ The price of a complement in production falls</li> <li>■ The expected future price of an energy bar rises</li> <li>■ The number of suppliers of bars decreases</li> <li>■ A technology change decreases energy bar production</li> <li>■ A natural event decreases energy bar production</li> </ul>	<ul style="list-style-type: none"> <li>■ The price of a factor of production used to produce energy bars falls</li> <li>■ The price of a substitute in production falls</li> <li>■ The price of a complement in production rises</li> <li>■ The expected future price of an energy bar falls</li> <li>■ The number of suppliers of bars increases</li> <li>■ A technology change increases energy bar production</li> <li>■ A natural event increases energy bar production</li> </ul>

**FIGURE 3.6** A Change in the Quantity Supplied Versus a Change in Supply



When the price of the good changes, there is a movement along the supply curve and a *change in the quantity supplied*, shown by the blue arrows on supply curve  $S_0$ . When any other influence on selling plans changes, there is a shift of the supply curve and a *change in supply*. An increase in supply shifts the supply curve rightward (from  $S_0$  to  $S_1$ ), and a decrease in supply shifts the supply curve leftward (from  $S_0$  to  $S_2$ ).

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### REVIEW QUIZ

- 1 Define the quantity supplied of a good or service.
- 2 What is the law of supply and how do we illustrate it?
- 3 What does the supply curve tell us about the producer's minimum supply price?
- 4 List all the influences on selling plans, and for each influence, say whether it changes supply.
- 5 What happens to the quantity of cellphones supplied and the supply of cellphones if the price of a cellphone falls?

Work these questions in Study Plan 3.3 and get instant feedback. Do a Key Terms Quiz.

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Now we're going to combine demand and supply and see how prices and quantities are determined.

## Market Equilibrium

We have seen that when the price of a good rises, the quantity demanded *decreases* and the quantity supplied *increases*. We are now going to see how the price adjusts to coordinate buying plans and selling plans and achieve an equilibrium in the market.

An *equilibrium* is a situation in which opposing forces balance each other. Equilibrium in a market occurs when the price balances buying plans and selling plans. The **equilibrium price** is the price at which the quantity demanded equals the quantity supplied. The **equilibrium quantity** is the quantity bought and sold at the equilibrium price. A market moves toward its equilibrium because

- Price regulates buying and selling plans.
- Price adjusts when plans don't match.

### Price as a Regulator

The price of a good regulates the quantities demanded and supplied. If the price is too high, the quantity supplied exceeds the quantity demanded. If the price is too low, the quantity demanded exceeds the quantity supplied. There is one price at which the quantity demanded equals the quantity supplied. Let's work out what that price is.

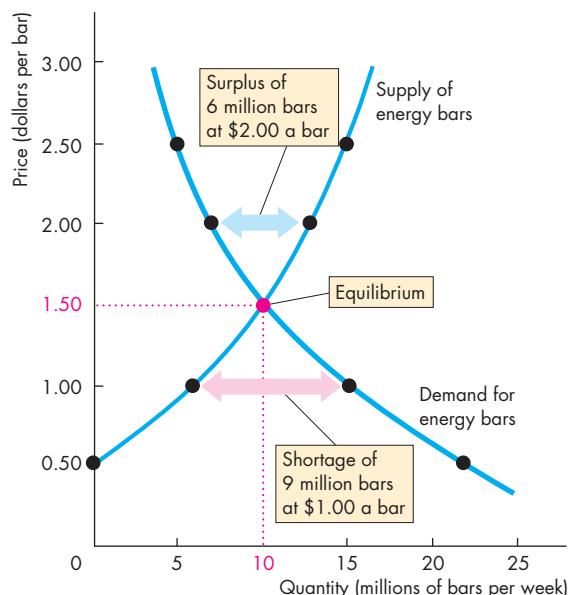
Figure 3.7 shows the market for energy bars. The table shows the demand schedule (from Fig. 3.1) and the supply schedule (from Fig. 3.4). If the price is 50¢ a bar, the quantity demanded is 22 million bars a week but no bars are supplied. There is a shortage of 22 million bars a week. The final column of the table shows this shortage. At a price of \$1.00 a bar, there is still a shortage but only of 9 million bars a week.

If the price is \$2.50 a bar, the quantity supplied is 15 million bars a week but the quantity demanded is only 5 million. There is a surplus of 10 million bars a week.

The one price at which there is neither a shortage nor a surplus is \$1.50 a bar. At that price, the quantity demanded equals the quantity supplied: 10 million bars a week. The equilibrium price is \$1.50 a bar, and the equilibrium quantity is 10 million bars a week.

Figure 3.7 shows that the demand curve and the supply curve intersect at the equilibrium price of \$1.50 a bar. At each price *above* \$1.50 a bar, there is a surplus of bars. For example, at \$2.00 a bar, the surplus is

**FIGURE 3.7** Equilibrium



Price (dollars per bar)	Quantity demanded	Quantity supplied	Shortage (-) or surplus (+)
	(millions of bars per week)		
0.50	22	0	-22
1.00	15	6	-9
<b>1.50</b>	<b>10</b>	<b>10</b>	<b>0</b>
2.00	7	13	+6
2.50	5	15	+10

The table lists the quantity demanded and the quantity supplied as well as the shortage or surplus of bars at each price. If the price is \$1.00 a bar, 15 million bars a week are demanded and 6 million bars are supplied. There is a shortage of 9 million bars a week, and the price rises.

If the price is \$2.00 a bar, 7 million bars a week are demanded and 13 million bars are supplied. There is a surplus of 6 million bars a week, and the price falls.

If the price is \$1.50 a bar, 10 million bars a week are demanded and 10 million bars are supplied. There is neither a shortage nor a surplus, and the price does not change. The price at which the quantity demanded equals the quantity supplied is the equilibrium price, and 10 million bars a week is the equilibrium quantity.

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6 million bars a week, as shown by the blue arrow. At each price *below* \$1.50 a bar, there is a shortage of bars. For example, at \$1.00 a bar, the shortage is 9 million bars a week, as shown by the red arrow.

## Price Adjustments

You've seen that if the price is below equilibrium there is a shortage, and that if the price is above equilibrium there is a surplus. But can we count on the price to change and eliminate a shortage or a surplus? We can, because such price changes are beneficial to both buyers and sellers. Let's see why the price changes when there is a shortage or a surplus.

**A Shortage Forces the Price Up** Suppose the price of an energy bar is \$1. Consumers plan to buy 15 million bars a week, and producers plan to sell 6 million bars a week. Consumers can't force producers to sell more than they plan, so the quantity that is actually offered for sale is 6 million bars a week. In this situation, powerful forces operate to increase the price and move it toward the equilibrium price. Some producers, noticing lines of unsatisfied consumers, raise the price. Some producers increase their output. As producers push the price up, the price rises toward its equilibrium. The rising price reduces the shortage because it decreases the quantity demanded and increases the quantity supplied. When the price has increased to the point at which there is no longer a shortage, the forces moving the price stop operating and the price comes to rest at its equilibrium.

**A Surplus Forces the Price Down** Suppose the price of a bar is \$2. Producers plan to sell 13 million bars a week, and consumers plan to buy 7 million bars a week. Producers cannot force consumers to buy more than they plan, so the quantity that is actually bought is 7 million bars a week. In this situation, powerful forces operate to lower the price and move it toward the equilibrium price. Some producers, unable to sell the quantities of energy bars they planned to sell, cut their prices. In addition, some producers scale back production. As producers cut the price, the price falls toward its equilibrium. The falling price decreases the surplus because it increases the quantity demanded and decreases the quantity supplied. When the price has fallen to the point at which there is no longer a surplus, the forces moving the price stop operating and the price comes to rest at its equilibrium.

## The Best Deal Available for Buyers and Sellers

When the price is below equilibrium, it is forced upward. Why don't buyers resist the increase and refuse to buy at the higher price? The answer is because they value the good more highly than its current price and they can't satisfy their demand at the current price. In some markets—for example, the markets that operate on eBay—the buyers might even be the ones who force the price up by offering to pay a higher price.

When the price is above equilibrium, it is bid downward. Why don't sellers resist this decrease and refuse to sell at the lower price? The answer is because their minimum supply price is below the current price and they cannot sell all they would like to at the current price. Sellers willingly lower the price to gain market share.

At the price at which the quantity demanded and the quantity supplied are equal, neither buyers nor sellers can do business at a better price. Buyers pay the highest price they are willing to pay for the last unit bought, and sellers receive the lowest price at which they are willing to supply the last unit sold.

When people freely make offers to buy and sell and when demanders try to buy at the lowest possible price and suppliers try to sell at the highest possible price, the price at which trade takes place is the equilibrium price—the price at which the quantity demanded equals the quantity supplied. The price coordinates the plans of buyers and sellers, and no one has an incentive to change it.

## REVIEW QUIZ

- 1 What is the equilibrium price of a good or service?
- 2 Over what range of prices does a shortage arise? What happens to the price when there is a shortage?
- 3 Over what range of prices does a surplus arise? What happens to the price when there is a surplus?
- 4 Why is the price at which the quantity demanded equals the quantity supplied the equilibrium price?
- 5 Why is the equilibrium price the best deal available for both buyers and sellers?

Work these questions in Study Plan 3.4 and get instant feedback. Do a Key Terms Quiz.

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## Predicting Changes in Price and Quantity

The demand and supply model that we have just studied provides us with a powerful way of analyzing influences on prices and the quantities bought and sold. According to the model, a change in price stems from a change in demand, a change in supply, or a change in both demand and supply. Let's look first at the effects of a change in demand.

### An Increase in Demand

If more people join health clubs, the demand for energy bars increases. The table in Fig. 3.8 shows the original and new demand schedules for energy bars as well as the supply schedule of energy bars.

The increase in demand creates a shortage at the original price, and to eliminate the shortage the price must rise.

Figure 3.8 shows what happens. The figure shows the original demand for and supply of energy bars. The original equilibrium price is \$1.50 an energy bar, and the equilibrium quantity is 10 million energy bars a week. When demand increases, the demand curve shifts rightward. The equilibrium price rises to \$2.50 an energy bar, and the quantity supplied increases to 15 million energy bars a week, as highlighted in the figure. There is an *increase in the quantity supplied* but *no change in supply*—a movement along, but no shift of, the supply curve.

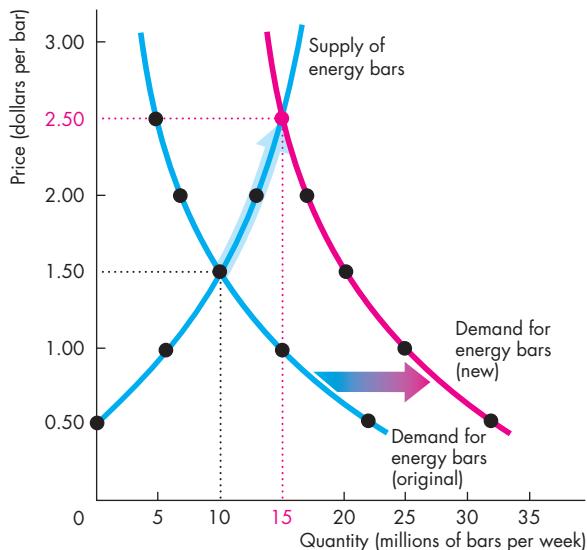
### A Decrease in Demand

We can reverse this change in demand. Start at a price of \$2.50 a bar with 15 million energy bars a week being bought and sold, and then work out what happens if demand decreases to its original level. Such a decrease in demand might arise if people switch to energy drinks (a substitute for energy bars). The decrease in demand shifts the demand curve leftward. The equilibrium price falls to \$1.50 a bar, the quantity supplied decreases, and the equilibrium quantity decreases to 10 million bars a week.

We can now make our first two predictions:

- When demand increases, the price rises and the quantity increases.
- When demand decreases, the price falls and the quantity decreases.

**FIGURE 3.8** The Effects of a Change in Demand



Price (dollars per bar)	Quantity demanded (millions of bars per week)		Quantity supplied (millions of bars per week)
	Original	New	
0.50	22	32	0
1.00	15	25	6
<b>1.50</b>	<b>10</b>	<b>20</b>	<b>10</b>
2.00	7	17	13
<b>2.50</b>	<b>5</b>	<b>15</b>	<b>15</b>

Initially, the demand for energy bars is the blue demand curve. The equilibrium price is \$1.50 a bar, and the equilibrium quantity is 10 million bars a week. When more health-conscious people do more exercise, the demand for energy bars increases and the demand curve shifts rightward to become the red curve.

At \$1.50 a bar, there is now a shortage of 10 million bars a week. The price of a bar rises to a new equilibrium of \$2.50. As the price rises to \$2.50, the quantity supplied increases—shown by the blue arrow on the supply curve—to the new equilibrium quantity of 15 million bars a week. Following an increase in demand, the quantity supplied increases but supply does not change—the supply curve does not shift.

**MyEconLab Animation and Draw Graph**



## ECONOMICS IN THE NEWS

### The Markets for Chocolate and Cocoa

#### World's Sweet Tooth Heats Up Cocoa

With rising incomes in China and other fast-growing economies, the consumption of chocolate and the cocoa from which it is made is soaring. And the price of cocoa is soaring too.

Source: *The Wall Street Journal*, February 3, 2014

#### THE DATA

Year	Quantity of Cocoa (millions of tonnes per year)	Price (dollars per tonne)
2010	4	1,500
2014	5	3,000

#### THE QUESTIONS

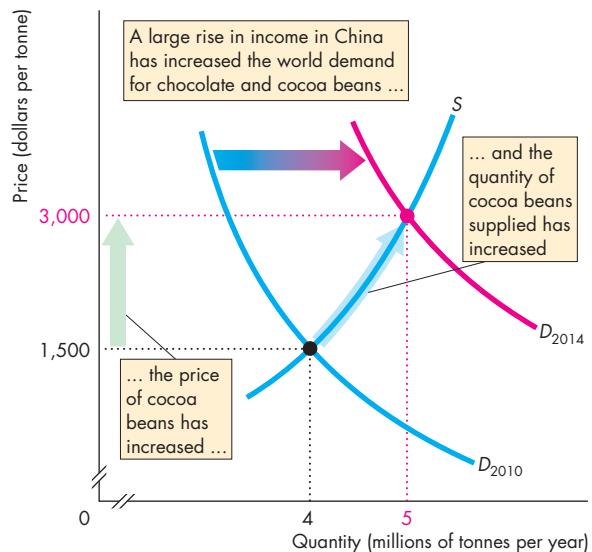
- What does the data table tell us?
- Why did the price of cocoa increase? Is it because demand changed or supply changed, and in which direction?

#### THE ANSWERS

- The data table tells us that from 2010 to 2014, both the quantity of cocoa produced and the price of cocoa increased.
- An increase in demand brings an increase in the quantity and a rise in the price.
- An increase in supply brings an increase in the quantity and a fall in the price.
- Because both the quantity of cocoa and the price of cocoa increased, there must have been an increase in the demand for cocoa.
- The demand for cocoa increases if cocoa is a normal good and incomes increase.
- Cocoa is a normal good and the news clip says that incomes are rising fast in China and some other countries. These increases in income have brought an increase in the demand for cocoa.
- The figure illustrates the market for cocoa in 2010 and 2014. The supply curve  $S$  shows the supply of cocoa.
- In 2010, the demand curve was  $D_{2010}$ , the price was \$1,500 per tonne, and the quantity of cocoa traded was 4 million tonnes.



- By 2014, the higher incomes in China and other countries had increased the demand for cocoa to  $D_{2014}$ . The price rose to \$3,000 per tonne and the quantity traded increased to 5 million tonnes.
- The higher price brought an increase in the quantity of cocoa supplied, which is shown by the movement upward along the supply curve.



The Market for Cocoa Beans

## An Increase in Supply

When Nestlé (the producer of PowerBar) and other energy bar producers switch to a new cost-saving technology, the supply of energy bars increases. Figure 3.9 shows the new supply schedule (the same one that was shown in Fig. 3.5). What are the new equilibrium price and quantity? The price falls to \$1.00 a bar, and the quantity increases to 15 million bars a week. You can see why by looking at the quantities demanded and supplied at the old price of \$1.50 a bar. The new quantity supplied at that price is 20 million bars a week, and there is a surplus. The price falls. Only when the price is \$1.00 a bar does the quantity supplied equal the quantity demanded.

Figure 3.9 illustrates the effect of an increase in supply. It shows the demand curve for energy bars and the original and new supply curves. The initial equilibrium price is \$1.50 a bar, and the equilibrium quantity is 10 million bars a week. When supply increases, the supply curve shifts rightward. The equilibrium price falls to \$1.00 a bar, and the quantity demanded increases to 15 million bars a week, highlighted in the figure. There is an *increase in the quantity demanded but no change in demand*—a movement along, but no shift of, the demand curve.

## A Decrease in Supply

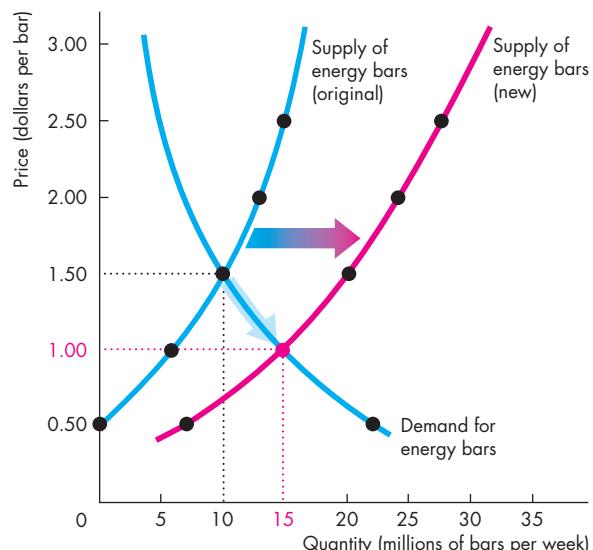
Start out at a price of \$1.00 a bar with 15 million bars a week being bought and sold. Then suppose that the cost of labour or raw materials rises and the supply of energy bars decreases. The decrease in supply shifts the supply curve leftward. The equilibrium price rises to \$1.50 a bar, the quantity demanded decreases, and the equilibrium quantity decreases to 10 million bars a week.

We can now make two more predictions:

1. When supply increases, the price falls and the quantity increases.
2. When supply decreases, the price rises and the quantity decreases.

You've now seen what happens to the price and the quantity when either demand or supply changes while the other one remains unchanged. In real markets, both demand and supply can change together. When this happens, to predict the changes in price and quantity, we must combine the effects that you've just seen. That is your final task in this chapter.

**FIGURE 3.9** The Effects of a Change in Supply



Price (dollars per bar)	Quantity demanded (millions of bars per week)	Quantity supplied (millions of bars per week)	
		Original	New
0.50	22	0	7
1.00	15	6	15
1.50	10	10	20
2.00	7	13	25
2.50	5	15	27

Initially, the supply of energy bars is shown by the blue supply curve. The equilibrium price is \$1.50 a bar, and the equilibrium quantity is 10 million bars a week. When the new cost-saving technology is adopted, the supply of energy bars increases and the supply curve shifts rightward to become the red curve.

At \$1.50 a bar, there is now a surplus of 10 million bars a week. The price of an energy bar falls to a new equilibrium of \$1.00 a bar. As the price falls to \$1.00, the quantity demanded increases—shown by the blue arrow on the demand curve—to the new equilibrium quantity of 15 million bars a week. Following an increase in supply, the quantity demanded increases but demand does not change—the demand curve does not shift.

**MyEconLab Animation and Draw Graph**



## ECONOMICS IN THE NEWS

### The Market for Coffee

#### Coffee Price Slides

With plentiful crops in Brazil and a recovery in Colombian production, the price of arabica beans has fallen.

Source: *The Financial Times*, October 24, 2013

#### THE DATA

Year	Quantity (millions of tonnes per year)	Price (dollars per kilogram)
2013	134	12.00
2014	145	10.00

#### THE QUESTIONS

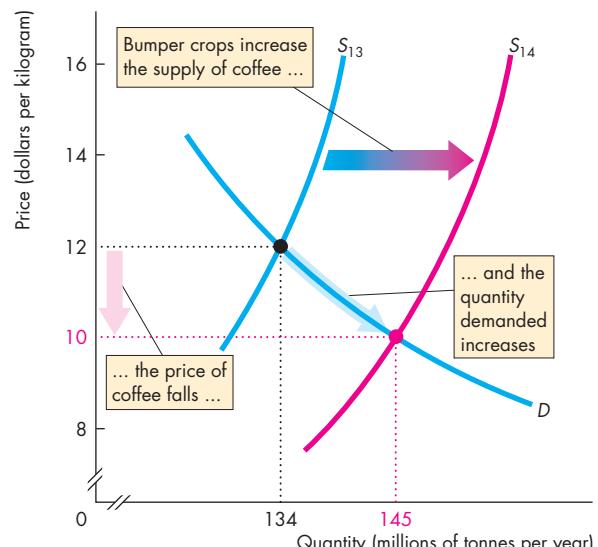
- What does the data table tell us?
- Why did the price of coffee decrease? Is it because demand changed or supply changed, and in which direction?

#### THE ANSWERS

- The data table tells us that during 2014, the quantity of coffee produced increased and the average price of coffee fell.
- An increase in demand brings an increase in the quantity and a rise in the price.
- An increase in supply brings an increase in the quantity and a fall in the price.
- Because the quantity of coffee increased and the price fell, there must have been an increase in the supply of coffee.
- The supply of coffee increases if the crop yields increase or if producers increase their plantings.
- The news clip says Brazilian crop was plentiful and Colombian production recovered. These increases in production brought an increase in the supply of coffee.
- The figure illustrates the market for coffee in 2013 and 2014. The demand curve  $D$  shows the demand for coffee.
- In 2013, the supply curve was  $S_{13}$ , the average price was \$12.00 per kilogram, and the quantity of coffee traded was 134 million tonnes.
- In 2014, the increased coffee production in Brazil and Colombia increased the supply of coffee to  $S_{14}$ .



- The average price fell to \$10.00 per kilogram and the quantity traded increased to 145 million tonnes.
- The lower price brought an increase in the quantity of coffee demanded, which is shown by the movement along the demand curve.



The Market for Coffee in 2013–2014

## Changes in Both Demand and Supply

You now know how a change in demand or a change in supply changes the equilibrium price and quantity. But sometimes, events occur that change both demand and supply. When both demand and supply change, we find the resulting change in the equilibrium price and equilibrium quantity by combining the separate cases you've just studied.

Four cases need to be considered. Both demand and supply might increase or decrease, and demand or supply might increase and the other decrease.

### Both Demand and Supply Change in the Same Direction

**When demand and supply change in the same direction,** the equilibrium quantity changes in that same direction, but to predict whether the price rises or falls, we need to know the magnitudes of the changes in demand and supply.

If demand increases by more than supply increases, the price rises. But if supply increases by more than demand increases, the price falls.

Figure 3.10(a) shows the case when both demand and supply increase and by the same amount. The

equilibrium quantity increases. But because the increase in demand equals the increase in supply, neither a shortage nor a surplus arises so the price doesn't change. A bigger increase in demand would have created a shortage and a rise in the price; a bigger increase in supply would have created a surplus and a fall in the price.

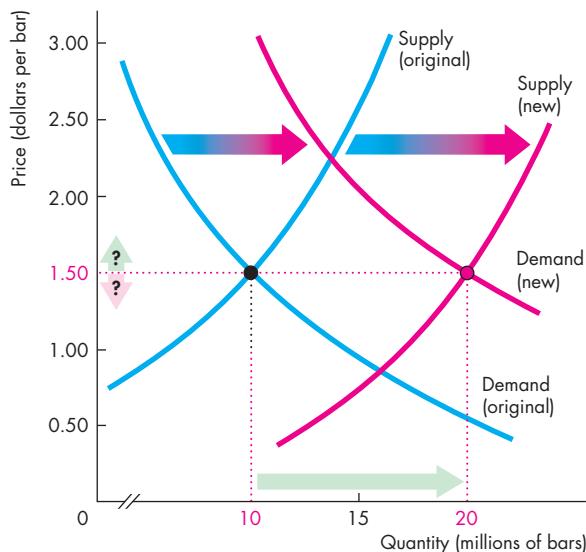
Figure 3.10(b) shows the case when both demand and supply decrease by the same amount. Here the equilibrium quantity decreases and again the price might either rise or fall.

### Both Demand and Supply Change in Opposite Directions

**When demand and supply change in opposite directions,** we can predict how the price changes, but we need to know the magnitudes of the changes in demand and supply to say whether the equilibrium quantity increases or decreases.

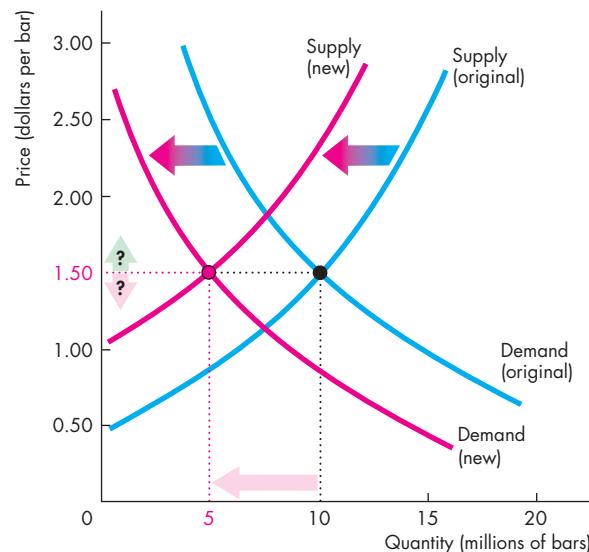
If demand changes by more than supply, the equilibrium quantity changes in the same direction as the change in demand. But if supply changes by more than demand, the equilibrium quantity changes in the same direction as the change in supply.

**FIGURE 3.10** The Effects of Changes in Both Demand and Supply in the Same Direction



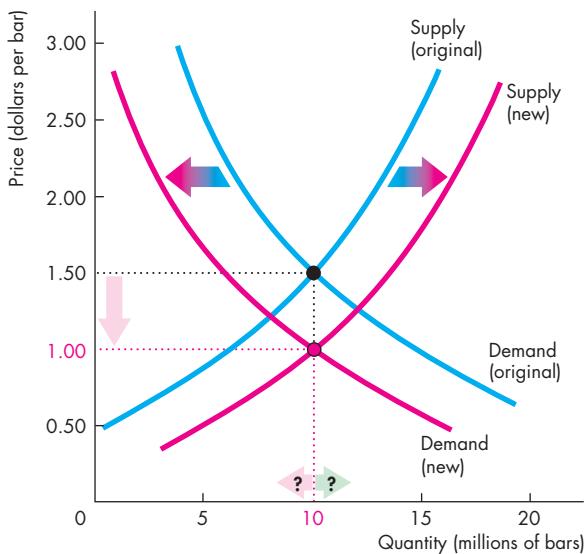
**(a) Increase in both demand and supply**

An increase in demand shifts the demand curve rightward to become the red new demand curve and an increase in supply shifts the supply curve rightward to become the red new supply curve. The price might rise or fall, but the quantity increases.

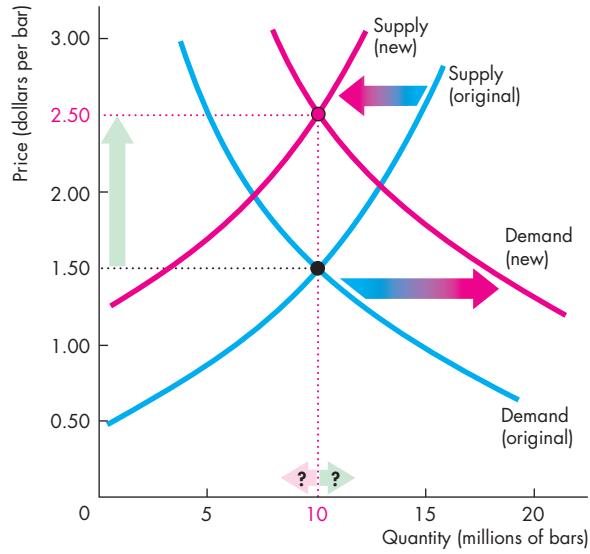


**(b) Decrease in both demand and supply**

A decrease in demand shifts the demand curve leftward to become the red new demand curve and a decrease in supply shifts the supply curve leftward to become the red new supply curve. The price might rise or fall, but the quantity decreases.

**FIGURE 3.11** The Effects of Changes in Both Demand and Supply in Opposite Directions**(a) Decrease in demand; increase in supply**

A decrease in demand shifts the demand curve leftward to become the red new demand curve and an increase in supply shifts the supply curve rightward to become the red new supply curve. The price falls, but the quantity might increase or decrease.

**(b) Increase in demand; decrease in supply**

An increase in demand shifts the demand curve rightward to become the red new demand curve and a decrease in supply shifts the supply curve leftward to become the red new supply curve. The price rises, but the quantity might increase or decrease.

[MyEconLab Animation](#)

Figure 3.11(a) illustrates what happens when demand decreases and supply increases by the *same* amount. At the initial price, there is a surplus, so the price falls. A decrease in demand decreases the quantity and an increase in supply increases the quantity, so when these changes occur together, we can't say what happens to the quantity unless we know the magnitudes of the changes.

Figure 3.11(b) illustrates what happens when demand increases and supply decreases by the same amount. In this case, at the initial price, there is a shortage, so the price rises. An increase in demand increases the quantity and a decrease in supply decreases the quantity, so again, when these changes occur together, we can't say what happens to the quantity unless we know the magnitudes of the changes in demand and supply.

For all the cases in Figures 3.10 and 3.11 where you "can't say" what happens to price or quantity, draw some examples that go in each direction.

## REVIEW QUIZ

What is the effect on the price and quantity of MP3 players (such as the iPod) if:

- 1 The price of a PC falls or the price of an MP3 download rises? (Draw the diagrams!)
- 2 More firms produce MP3 players or electronics workers' wages rise? (Draw the diagrams!)
- 3 Any two of the events in questions 1 and 2 occur together? (Draw the diagrams!)

Work these questions in Study Plan 3.5 and get instant feedback.

[MyEconLab](#)

◆ To complete your study of demand and supply, take a look at *Economics in the News* on pp. 74–75, which explains what would happen to the price of bananas if a disease that kills plants were to jump continents to Central America. Try to get into the habit of using the demand and supply model to understand the changes in prices in your everyday life.

# Demand and Supply: The Market for Bananas

## Banana Supply Seen at Risk as Disease Spreads

Bloomberg News

April 9, 2014

A disease damaging banana crops in Southeast Asia has spread to the Middle East and Africa, posing risks to world supply and trade totaling \$8.9 billion, according to the United Nations' Food and Agriculture Organization.

The TR4 strain of Panama disease, a soil-born fungus that attacks plant roots, is deadly for the Cavendish banana that makes up about 95 percent of supplies to importers, including North America and Europe, Fazil Dusunceli, an agriculture officer at the FAO, said. ...

While the disease hasn't reached top Latin America exporters such as Ecuador, Costa Rica or Colombia, TR4 was discovered in Jordan and Mozambique, indicating it moved beyond Asia, he said.

"The export market is dominated by the Cavendish, and it is unfortunately susceptible to this particular race of the disease," Dusunceli said. "This is serious for the medium term, but at the same time we should avoid panicking too."

Global exports reached a record value in 2011 and totaled 18.7 million tonnes, making bananas the world's most widely-traded fruit, according to the most recent FAO data. The U.S. is the top importer, followed by Belgium, the data show. Belgium's Port of Antwerp is the world's largest banana port, it says.

Consumer prices for bananas were 131.8 cents a kilogram in February, 2.2 percent higher than an almost three-year low reached in October at 128.9 cents a kilogram, according to data from the Bureau of Labor Statistics. The export price of bananas from Ecuador, the world's biggest shipper, and Central America for North American destinations was \$966.85 a tonne in March, the highest in 18 months, according to the International Monetary Fund. ...

Written by Whitney McFerron. Copyright © 2014. Used by permission of Bloomberg News. All rights reserved.

### ESSENCE OF THE STORY

- The consumer price of bananas was 131.8 cents per kilogram in February 2014.
- About 95 percent of bananas traded are a variety called Cavendish.
- Cavendish banana plants can be destroyed by the TR4 strain of Panama disease.
- TR4 hasn't reached Latin America, but it has jumped from Asia to the Middle East and Africa.
- Fazil Dusunceli of the United Nations' Food and Agriculture Organization says "This is serious for the medium term, but at the same time we should avoid panicking too."

## ECONOMIC ANALYSIS

- In the market for bananas, a decrease in world production would decrease supply.
- A decrease in the supply of bananas would raise their price, decrease the equilibrium quantity, and decrease the quantity of bananas demanded.
- We can see the likely price increase by looking at previous events in the banana market.
- Figure 1 shows the price of bananas since 2004. You can see that there was a big temporary jump in the price in 2008.
- That jump in price was *not* caused by a decrease in banana production because as Fig. 2 shows, banana production has increased every year since 2004 except for 2012.
- What happened in 2008? The answer is a spike in the price of oil.
- Transporting bananas from plantations in Central and South America to your neighbourhood grocery store uses a lot of fuel. So when the cost of fuel increased in 2008, the cost of delivering bananas increased, and the consumer price of bananas increased.
- A decrease in supply caused by the TR4 disease would have a similar effect on the banana market to what happened in 2008.
- Figure 3 illustrates this effect. The supply of bananas decreases from  $S_N$  (normal) to  $S_D$  (disease), the price rises, the equilibrium quantity decreases, and the quantity of bananas demanded decreases.

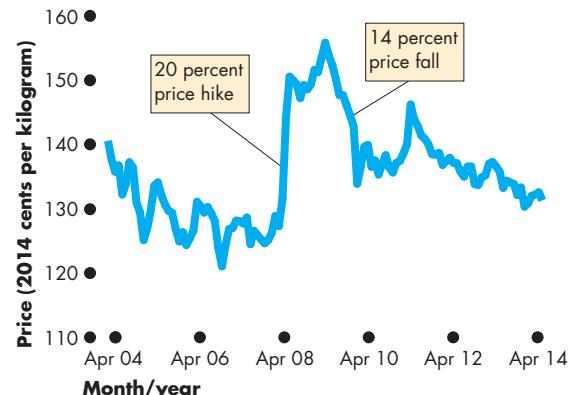


Figure 1 The Price of Bananas: 2004–2014

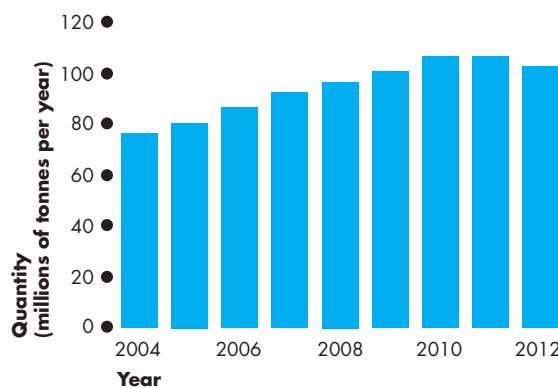


Figure 2 Banana Production: 2004–2012

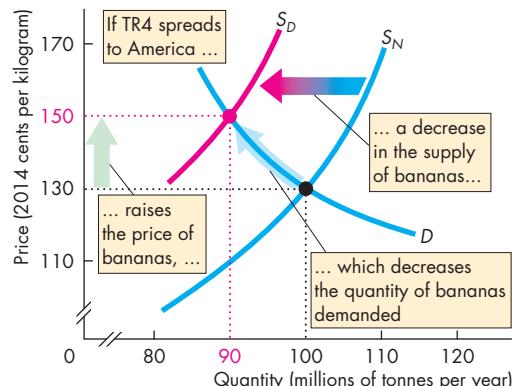


Figure 3 The Market for Bananas

## MATHEMATICAL NOTE

### Demand, Supply, and Equilibrium

#### Demand Curve

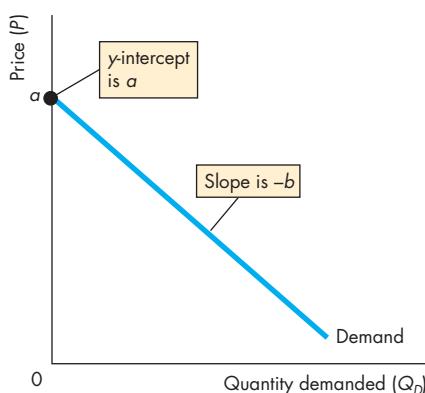
The law of demand says that as the price of a good or service falls, the quantity demanded of that good or service increases. We can illustrate the law of demand by drawing a graph of the demand curve or writing down an equation. When the demand curve is a straight line, the following equation describes it:

$$P = a - bQ_D,$$

where  $P$  is the price and  $Q_D$  is the quantity demanded. The  $a$  and  $b$  are positive constants.

The demand equation tells us three things:

1. The price at which no one is willing to buy the good ( $Q_D$  is zero). That is, if the price is  $a$ , then the quantity demanded is zero. You can see the price  $a$  in Fig. 1. It is the price at which the demand curve hits the  $y$ -axis—what we call the demand curve's "y-intercept."
2. As the price falls, the quantity demanded increases. If  $Q_D$  is a positive number, then the price  $P$  must be less than  $a$ . As  $Q_D$  gets larger, the price  $P$  becomes smaller. That is, as the quantity increases, the maximum price that buyers are willing to pay for the last unit of the good falls.
3. The constant  $b$  tells us how fast the maximum price that someone is willing to pay for the good falls as the quantity increases. That is, the constant  $b$  tells us about the steepness of the demand curve. The equation tells us that the slope of the demand curve is  $-b$ .



**Figure 1 Demand Curve**

#### Supply Curve

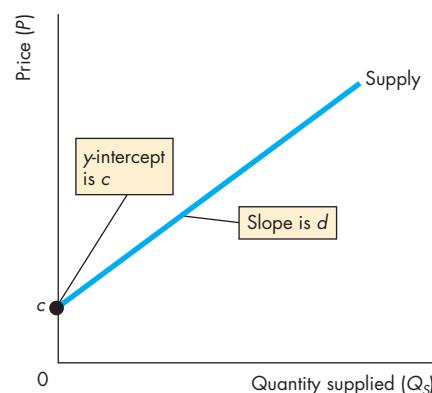
The law of supply says that as the price of a good or service rises, the quantity supplied of that good or service increases. We can illustrate the law of supply by drawing a graph of the supply curve or writing down an equation. When the supply curve is a straight line, the following equation describes it:

$$P = c + dQ_S,$$

where  $P$  is the price and  $Q_S$  is the quantity supplied. The  $c$  and  $d$  are positive constants.

The supply equation tells us three things:

1. The price at which sellers are not willing to supply the good ( $Q_S$  is zero). That is, if the price is  $c$ , then no one is willing to sell the good. You can see the price  $c$  in Fig. 2. It is the price at which the supply curve hits the  $y$ -axis—what we call the supply curve's "y-intercept."
2. As the price rises, the quantity supplied increases. If  $Q_S$  is a positive number, then the price  $P$  must be greater than  $c$ . As  $Q_S$  increases, the price  $P$  becomes larger. That is, as the quantity increases, the minimum price that sellers are willing to accept for the last unit rises.
3. The constant  $d$  tells us how fast the minimum price at which someone is willing to sell the good rises as the quantity increases. That is, the constant  $d$  tells us about the steepness of the supply curve. The equation tells us that the slope of the supply curve is  $d$ .



**Figure 2 Supply Curve**

## Market Equilibrium

Demand and supply determine market equilibrium. Figure 3 shows the equilibrium price ( $P^*$ ) and equilibrium quantity ( $Q^*$ ) at the intersection of the demand curve and the supply curve.

We can use the equations to find the equilibrium price and equilibrium quantity. The price of a good adjusts until the quantity demanded  $Q_D$  equals the quantity supplied  $Q_S$ . So at the equilibrium price ( $P^*$ ) and equilibrium quantity ( $Q^*$ ),

$$Q_D = Q_S = Q^*.$$

To find the equilibrium price and equilibrium quantity, substitute  $Q^*$  for  $Q_D$  in the demand equation and  $Q^*$  for  $Q_S$  in the supply equation. Then the price is the equilibrium price ( $P^*$ ), which gives

$$P^* = a - bQ^*$$

$$P^* = c + dQ^*.$$

Notice that

$$a - bQ^* = c + dQ^*.$$

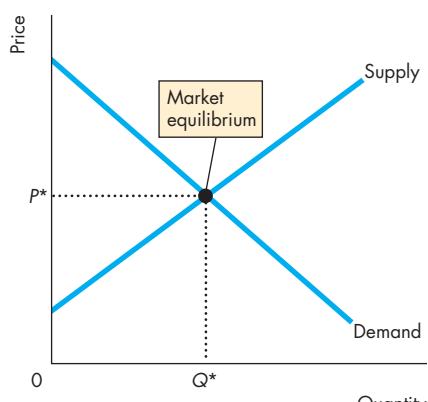
Now solve for  $Q^*$ :

$$a - c = bQ^* + dQ^*$$

$$a - c = (b + d)Q^*$$

$$Q^* = \frac{a - c}{b + d}.$$

To find the equilibrium price  $P^*$ , substitute for  $Q^*$  in either the demand equation or the supply equation.



**Figure 3 Market Equilibrium**

Using the demand equation, we have

$$P^* = a - b\left(\frac{a - c}{b + d}\right)$$

$$P^* = \frac{a(b + d) - b(a - c)}{b + d}$$

$$P^* = \frac{ad + bc}{b + d}.$$

Alternatively, using the supply equation, we have

$$P^* = c + d\left(\frac{a - c}{b + d}\right)$$

$$P^* = \frac{c(b + d) + d(a - c)}{b + d}$$

$$P^* = \frac{ad + bc}{b + d}.$$

## An Example

The demand for ice-cream cones is

$$P = 800 - 2Q_D.$$

The supply of ice-cream cones is

$$P = 200 + 1Q_S.$$

The price of a cone is expressed in cents, and the quantities are expressed in cones per day.

To find the equilibrium price ( $P^*$ ) and equilibrium quantity ( $Q^*$ ), substitute  $Q^*$  for  $Q_D$  and  $Q_S$  and  $P^*$  for  $P$ . That is,

$$P^* = 800 - 2Q^*$$

$$P^* = 200 + 1Q^*.$$

Now solve for  $Q^*$ :

$$800 - 2Q^* = 200 + 1Q^*$$

$$600 = 3Q^*$$

$$Q^* = 200.$$

And

$$P^* = 800 - 2(200)$$

$$= 400.$$

The equilibrium price is \$4 a cone, and the equilibrium quantity is 200 cones per day.



## SUMMARY

### Key Points

#### Markets and Prices (p. 56)

- A competitive market is one that has so many buyers and sellers that no single buyer or seller can influence the price.
- Opportunity cost is a relative price.
- Demand and supply determine relative prices.

Working Problem 1 will give you a better understanding of markets and prices.

#### Demand (pp. 57–61)

- Demand is the relationship between the quantity demanded of a good and its price when all other influences on buying plans remain the same.
- The higher the price of a good, other things remaining the same, the smaller is the quantity demanded—the law of demand.
- Demand depends on the prices of related goods (substitutes and complements), expected future prices, income, expected future income and credit, the population, and preferences.

Working Problems 2 to 4 will give you a better understanding of demand.

#### Supply (pp. 62–65)

- Supply is the relationship between the quantity supplied of a good and its price when all other influences on selling plans remain the same.
- The higher the price of a good, other things remaining the same, the greater is the quantity supplied—the law of supply.

- Supply depends on the prices of factors of production used to produce a good, the prices of related goods produced, expected future prices, the number of suppliers, technology, and the state of nature.

Working Problems 5 and 6 will give you a better understanding of supply.

#### Market Equilibrium (pp. 66–67)

- At the equilibrium price, the quantity demanded equals the quantity supplied.
- At any price above the equilibrium price, there is a surplus and the price falls.
- At any price below the equilibrium price, there is a shortage and the price rises.

Working Problem 7 will give you a better understanding of market equilibrium.

#### Predicting Changes in Price and Quantity (pp. 68–73)

- An increase in demand brings a rise in the price and an increase in the quantity supplied. A decrease in demand brings a fall in the price and a decrease in the quantity supplied.
- An increase in supply brings a fall in the price and an increase in the quantity demanded. A decrease in supply brings a rise in the price and a decrease in the quantity demanded.
- An increase in demand and an increase in supply bring an increased quantity but an uncertain price change. An increase in demand and a decrease in supply bring a higher price but an uncertain change in quantity.

Working Problems 8 to 10 will give you a better understanding of predicting changes in price and quantity.

### Key Terms

- Change in demand, 58
- Change in supply, 63
- Change in the quantity demanded, 61
- Change in the quantity supplied, 64
- Competitive market, 56
- Complement, 59
- Demand, 57

- Demand curve, 58
- Equilibrium price, 66
- Equilibrium quantity, 66
- Inferior good, 60
- Law of demand, 57
- Law of supply, 62
- Money price, 56
- Normal good, 60

### MyEconLab Key Terms Quiz

- Quantity demanded, 57
- Quantity supplied, 62
- Relative price, 56
- Substitute, 59
- Supply, 62
- Supply curve, 62

## WORKED PROBLEM

**MyEconLab** You can work this problem in Chapter 3 Study Plan.

The table sets out the demand and supply schedules for roses on a normal weekend.

Price (dollars per rose)	Quantity demanded	Quantity supplied
	(roses per week)	
6.00	150	60
7.00	100	100
8.00	70	130
9.00	50	150

### Questions

- If the price of a rose is \$6, describe the situation in the rose market. Explain how the price adjusts.
- If the price of a rose is \$9, describe the situation in the rose market. Explain how the price adjusts.
- What is the market equilibrium?
- Rose sellers know that Mother's Day is next weekend and they expect the price to be higher, so they withhold 60 roses from the market this weekend. What is the price this weekend?
- On Mother's Day, demand increases by 160 roses. What is the price of a rose on Mother's Day?

### Solutions

- At \$6 a rose, the quantity demanded is 150 and the quantity supplied is 60. The quantity demanded exceeds the quantity supplied and there is a *shortage* of 90 roses. With people lining up and a shortage, the price rises above \$6 a rose.

**Key Point:** When a shortage exists, the price rises.

- At \$9 a rose, the quantity demanded is 50 and the quantity supplied is 180. The quantity supplied exceeds the quantity demanded and there is a *surplus* of 130 roses. With slow sales of roses and a surplus, the price falls to below \$9 a rose.

**Key Point:** When a surplus exists, the price falls.

- Market equilibrium occurs at the price at which the quantity demanded *equals* the quantity supplied. That price is \$7 a rose. The equilibrium quantity of roses is 100 a week. Point A on the figure.

**Key Point:** At market equilibrium, there is no shortage or surplus.

- Sellers expect a higher price next weekend, so they decrease the supply this weekend by 60 roses at each price. Create the new table:

Price (dollars per rose)	Quantity demanded	Quantity supplied
	(roses per week)	
6.00	150	0
7.00	100	40
8.00	70	70
9.00	50	90

At \$7 a rose, there was a shortage of 60 roses, so the price rises to \$8 a rose at which the quantity demanded equals the quantity supplied (Point B).

**Key Point:** When supply decreases, the price rises.

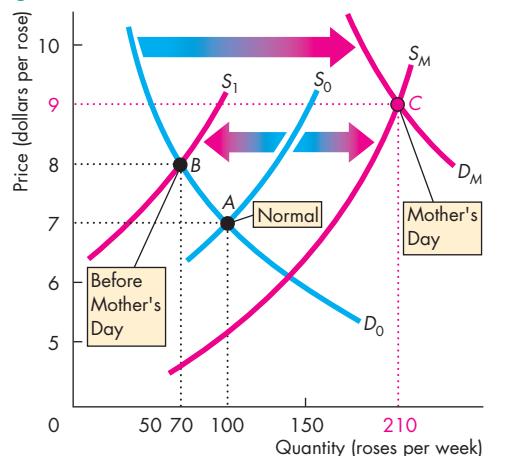
- Demand increases by 160 roses. Sellers plan to increase the normal supply by the 60 roses withheld last weekend. Create the new table:

Price (dollars per rose)	Quantity demanded	Quantity supplied
	(roses per week)	
6.00	310	120
7.00	260	160
8.00	230	190
9.00	210	210

At \$7 a rose, there is a shortage of 100 roses, so the price rises. It rises until at \$9 a rose, the quantity demanded equals the quantity supplied. The price on Mother's Day is \$9 a rose. (Point C)

**Key Point:** When demand increases by more than supply, the price rises.

### Key Figure



**MyEconLab** Interactive Animation



## STUDY PLAN PROBLEMS AND APPLICATIONS

**MyEconLab** You can work Problems 1 to 10 in Chapter 3 Study Plan and get instant feedback.

### Markets and Prices (Study Plan 3.1)

- In April 2014, the money price of a litre of milk was \$2.01 and the money price of a litre of gasoline was \$1.30. Calculate the real price of a litre of gasoline in terms of milk.

### Demand (Study Plan 3.2)

- The price of food increased during the past year.
  - Explain why the law of demand applies to food just as it does to other goods and services.
  - Explain how the substitution effect influences food purchases when the price of food rises and other things remain the same.
  - Explain how the income effect influences food purchases and provide some examples of the income effect.
- Which of the following goods are likely substitutes and which are likely complements? (You may use an item more than once.)
  - coal, oil, natural gas, wheat, corn, pasta, pizza, sausage, skateboard, roller blades, video game, laptop, iPad, cellphone, text message, email
- As the average income in China continues to increase, explain how the following would change:
  - The demand for beef
  - The demand for rice

### Supply (Study Plan 3.3)

- In 2013, the price of corn fell and some corn farmers switched from growing corn in 2014 to growing soybeans.
  - Does this fact illustrate the law of demand or the law of supply? Explain your answer.
  - Why would a corn farmer grow soybeans?
- Dairies make low-fat milk from full-cream milk, and in the process they produce cream, which is made into ice cream. The following events occur one at a time:
  - The wage rate of dairy workers rises.
  - The price of cream rises.
  - The price of low-fat milk rises.
  - With a drought forecasted, dairies raise their expected price of low-fat milk next year.
  - New technology lowers the cost of producing ice cream.

Explain the effect of each event on the supply of low-fat milk.

### Market Equilibrium (Study Plan 3.4)

- The demand and supply schedules for gum are:

Price (cents per pack)	Quantity demanded (millions of packs a week)	Quantity supplied (millions of packs a week)
20	180	60
40	140	100
60	100	140
80	60	180

- Suppose that the price of gum is 70¢ a pack. Describe the situation in the gum market and explain how the price adjusts.
- Suppose that the price of gum is 30¢ a pack. Describe the situation in the gum market and explain how the price adjusts.

### Predicting Changes in Price and Quantity

#### (Study Plan 3.5)

- The following events occur one at a time:
  - The price of crude oil rises.
  - The price of a car rises.
  - All speed limits on highways are abolished.
  - Robots cut car production costs.

Explain the effect of each of these events on the market for gasoline.

- In Problem 7, a fire destroys some factories that produce gum and the quantity of gum supplied decreases by 40 million packs a week at each price.
  - Explain what happens in the market for gum and draw a graph to illustrate the changes.
  - If, at the same time as the fire, the teenage population increases and the quantity of gum demanded increases by 40 million packs a week at each price. What is the new market equilibrium? Illustrate these changes on your graph.
- Tim Hortons' Risks**

Tim Hortons has exploded to become a dominant player among quick-serve restaurants. In 2001, it took the risk by switching to centralized production of baked goods, which lowered its labour costs and increased its sales volume.

Source: *Financial Post*, August 12, 2010

Draw a graph to show the effect of lower labour costs on the price of Tim's baked goods and the quantity sold.



## ADDITIONAL PROBLEMS AND APPLICATIONS

**MyEconLab** You can work these problems in MyEconLab if assigned by your instructor.

### Markets and Prices

11. What features of the world market for crude oil make it a competitive market?
12. The money price of a textbook is \$90 and the money price of the Wii game *Super Mario Galaxy* is \$45.
  - a. What is the opportunity cost of a textbook in terms of the Wii game?
  - b. What is the relative price of the Wii game in terms of textbooks?

### Demand

13. The price of gasoline has increased during the past year.
  - a. Explain why the law of demand applies to gasoline just as it does to all other goods and services.
  - b. Explain how the substitution effect influences gasoline purchases and provide some examples of substitutions that people might make when the price of gasoline rises and other things remain the same.
  - c. Explain how the income effect influences gasoline purchases and provide some examples of the income effects that might occur when the price of gasoline rises and other things remain the same.
14. Think about the demand for the three game consoles: Xbox One, PlayStation 4, and Wii U. Explain the effect of each of the following events on the demand for Xbox One games and the quantity of Xbox One games demanded, other things remaining the same. The events are:
  - a. The price of an Xbox One falls.
  - b. The prices of a PlayStation 4 and a Wii U fall.
  - c. The number of people writing and producing Xbox One games increases.
  - d. Consumers' incomes increase.
  - e. Programmers who write code for Xbox One games become more costly to hire.
  - f. The expected future price of an Xbox One game falls.
  - g. A new game console that is a close substitute for Xbox One comes onto the market.

### Supply

15. Classify the following pairs of goods and services as substitutes in production, complements in production, or neither.
  - a. Bottled water and health club memberships
  - b. French fries and baked potatoes
  - c. Leather boots and leather shoes
  - d. Hybrids and SUVs
  - e. Diet coke and regular coke
16. When a timber mill makes logs from trees it also produces sawdust, which is used to make plywood.
  - a. Explain how a rise in the price of sawdust influences the supply of logs.
  - b. Explain how a rise in the price of sawdust influences the supply of plywood.

### 17. New Maple Syrup Sap Method

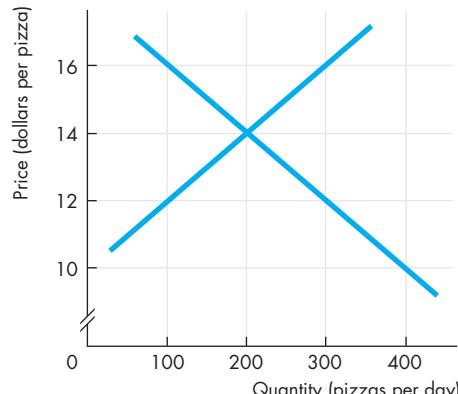
With the new way to tap maple trees, farmers could produce 10 times as much maple syrup per acre.

Source: cbc.ca, February 5, 2014

Will the new method change the supply of maple syrup or the quantity supplied of maple syrup, other things remaining the same? Explain.

### Market Equilibrium

Use the following figure to work Problems 18 and 19.



18. a. Label the curves. Which curve shows the willingness to pay for a pizza?
  - b. If the price of a pizza is \$16, is there a shortage or a surplus and does the price rise or fall?

- c. Sellers want to receive the highest possible price, so why would they be willing to accept less than \$16 a pizza?
19. a. If the price of a pizza is \$12, is there a shortage or a surplus and does the price rise or fall?
- b. Buyers want to pay the lowest possible price, so why would they be willing to pay more than \$12 for a pizza?
20. The demand and supply schedules for potato chips are:

Price (cents per bag)	Quantity demanded	Quantity supplied
	(millions of bags per week)	
50	160	130
60	150	140
70	140	150
80	130	160
90	120	170
100	110	180

- a. Draw a graph of the potato chip market and mark in the equilibrium price and quantity.
- b. If the price is 60¢ a bag, is there a shortage or a surplus, and how does the price adjust?

### Predicting Changes in Price and Quantity

21. In Problem 20, a new dip increases the quantity of potato chips that people want to buy by 30 million bags per week at each price.
- a. Does the demand for chips change? Does the supply of chips change? Describe the change.
- b. How do the equilibrium price and equilibrium quantity of chips change?
22. In Problem 20, if a virus destroys potato crops and the quantity of potato chips produced decreases by 40 million bags a week at each price, how does the supply of chips change?
23. If the virus in Problem 22 hits just as the new dip in Problem 21 comes onto the market, how do the equilibrium price and equilibrium quantity of chips change?
24. **Strawberry Prices Drop as Late Harvest Hits Market**

Shoppers bought strawberries in March for \$1.25 a pound rather than the \$3.49 a pound they paid last year. With the price so low, some growers removed their strawberry plants to make way for spring melons; others froze their harvests and sold them to juice and jam makers.

Source: *USA Today*, April 5, 2010

- a. Explain how the market for strawberries would have changed if growers had not removed their plants but offered locals “you pick for free.”
- b. Describe the changes in demand and supply in the market for strawberry jam.

**25. “Popcorn Movie” Experience Gets Pricier**

Cinemas are raising the price of popcorn. Demand for field corn, which is used for animal feed, corn syrup, and ethanol, has increased and its price has exploded. That’s caused some farmers to shift from growing popcorn to easier-to-grow field corn.

Source: *USA Today*, May 24, 2008

Explain and illustrate graphically the events described in the news clip in the market for

- a. Popcorn  
b. Movie tickets

**26. Watch Out for Rising Dry-Cleaning Bills**

In the past year, the price of dry-cleaning solvent doubled. More than 4,000 dry cleaners across the United States disappeared as budget-conscious consumers cut back. This year the price of hangers used by dry cleaners is expected to double.

Source: *CNN Money*, June 4, 2012

- a. Explain the effect of rising solvent prices on the market for dry cleaning.
- b. Explain the effect of consumers becoming more budget conscious along with the rising price of solvent on the price of dry cleaning.
- c. If the price of hangers does rise this year, do you expect additional dry cleaners to disappear? Explain why or why not.

### Economics in the News

27. After you have studied *Economics in the News* on pp. 74–75, answer the following questions.
- a. What would happen to the price of bananas if TR4 spread to Central America?
- b. What are some of the substitutes for bananas and what would happen to demand, supply, price, and quantity in the markets for these items if TR4 spread to Central America?
- c. What are some of the complements of bananas and what would happen to demand, supply, price, and quantity in the markets for these items if TR4 spread to Central America?
- d. When the price of bananas increased in 2008, did it rise by as much as the rise in the price of oil? Why or why not?
- e. Why would the expectation of the future arrival of TR4 in Central Americas have little or no effect on today’s price of bananas?



# 4

## ELASTICITY

After studying this chapter,  
you will be able to:

- ◆ Define, calculate, and explain the factors that influence the price elasticity of demand
- ◆ Define, calculate, and explain the factors that influence the income elasticity of demand and the cross elasticity of demand
- ◆ Define, calculate, and explain the factors that influence the elasticity of supply

In 2013, coffee production soared and the price tumbled. Despite the increased production, coffee producers saw their revenue fall. How does the quantity of coffee produced influence the price of coffee and the revenue of coffee producers?

To answer this and similar questions, we use the neat tool that you study in this chapter: elasticity.

At the end of the chapter, in *Economics in the News*, we use the concept of elasticity to answer the question about the market for coffee. But we begin by explaining elasticity in another familiar setting: the market for pizza.

## Price Elasticity of Demand

You know that when supply decreases, the equilibrium price rises and the equilibrium quantity decreases. But does the price rise by a large amount and the quantity decrease by a little? Or does the price barely rise and the quantity decrease by a large amount?

The answer depends on the responsiveness of the quantity demanded of a good to a change in its price. If the quantity demanded is not very responsive to a change in the price, the price rises a lot and the equilibrium quantity doesn't change much. If the quantity demanded is very responsive to a change in the price, the price barely rises and the equilibrium quantity changes a lot.

You might think about the responsiveness of the quantity demanded of a good to a change in its price in terms of the slope of the demand curve. If the demand curve is steep, the quantity demanded of the good isn't very responsive to a change in the price. If the demand curve is almost flat, the quantity demanded is very responsive to a change in the price.

But the slope of a demand curve depends on the units in which we measure the price and the quantity—we can make the curve steep or almost flat just by changing the units in which we measure the price and the quantity. Also we often want to compare the demand for different goods and services and quantities of these goods are measured in unrelated units. For example, a pizza producer might want to compare the demand for pizza with the demand for soft drinks. Which quantity demanded is more responsive to a price change? This question can't be answered by comparing the slopes of two demand curves. The units of measurement of pizza and soft drinks are unrelated. But the question *can* be answered with a measure of responsiveness that is *independent* of units of measurement. Elasticity is such a measure.

The **price elasticity of demand** is a units-free measure of the responsiveness of the quantity demanded of a good to a change in its price when all other influences on buying plans remain the same.

### Calculating Price Elasticity of Demand

We calculate the *price elasticity of demand* by using the formula:

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

To calculate the price elasticity of demand for pizza, we need to know the quantity demanded of pizza at two different prices, when all other influences on buying plans remain the same.

Figure 4.1 zooms in on a section of the demand curve for pizza and shows how the quantity demanded responds to a small change in price. Initially, the price is \$20.50 a pizza and 9 pizzas an hour are demanded—the original point. The price then falls to \$19.50 a pizza, and the quantity demanded increases to 11 pizzas an hour—the new point. When the price falls by \$1 a pizza, the quantity demanded increases by 2 pizzas an hour.

To calculate the price elasticity of demand, we express the change in price as a percentage of the *average price* and the change in the quantity demanded as a percentage of the *average quantity*. By using the average price and average quantity, we calculate the elasticity at a point on the demand curve midway between the original point and the new point.

The original price is \$20.50 and the new price is \$19.50, so the price change is \$1 and the average price is \$20 a pizza. Call the percentage change in the price  $\% \Delta P$ , then

$$\% \Delta P = \Delta P / P_{ave} \times 100 = (\$1/\$20) \times 100 = 5\%.$$

The original quantity demanded is 9 pizzas and the new quantity demanded is 11 pizzas, so the quantity change is 2 pizzas and the average quantity demanded is 10 pizzas. Call the percentage change in the quantity demanded  $\% \Delta Q$ , then

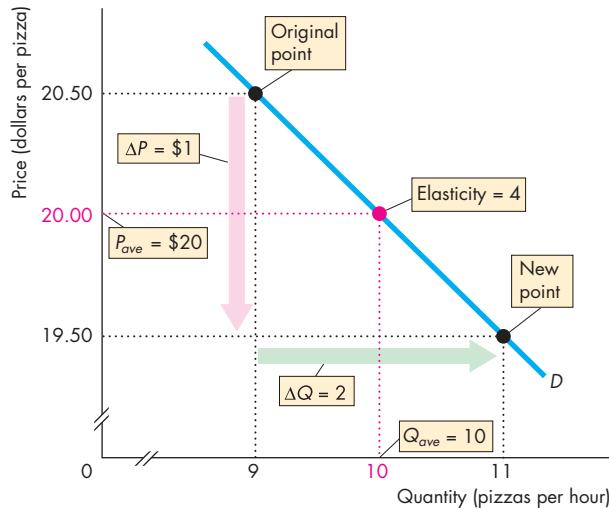
$$\% \Delta Q = \Delta Q / Q_{ave} \times 100 = (2/10) \times 100 = 20\%.$$

The price elasticity of demand equals the percentage change in the quantity demanded (20 percent) divided by the percentage change in price (5 percent) and is 4. That is,

$$\begin{aligned}\text{Price elasticity of demand} &= \frac{\% \Delta Q}{\% \Delta P} \\ &= \frac{20\%}{5\%} = 4.\end{aligned}$$

**Average Price and Quantity** Notice that we use the *average* price and *average* quantity. We do this because it gives the most precise measurement of elasticity—at the *midpoint* between the original price and the new price. If the price falls from \$20.50 to \$19.50, the \$1 price change is 4.9 percent of \$20.50. The 2 pizza change in quantity is 22.2 percent of 9 pizzas, the original quantity. So if we use

**FIGURE 4.1** Calculating the Elasticity of Demand



The elasticity of demand is calculated by using the formula:<sup>\*</sup>

$$\begin{aligned} \text{Price elasticity of demand} &= \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price}} \\ &= \frac{\% \Delta Q}{\% \Delta P} \\ &= \frac{\% \Delta Q / Q_{\text{ave}}}{\% \Delta P / P_{\text{ave}}} \\ &= \frac{2/10}{1/20} = 4. \end{aligned}$$

This calculation measures the elasticity at an average price of \$20 a pizza and an average quantity of 10 pizzas an hour.

\* In the formula, the Greek letter delta ( $\Delta$ ) stands for "change in" and  $\%$  stands for "percentage change in."

### MyEconLab Animation and Draw Graph

these numbers, the price elasticity of demand is 22.2 divided by 4.9, which equals 4.5. But if the price rises from \$19.50 to \$20.50, the \$1 price change is 5.1 percent of \$19.50. The 2 pizza change in quantity is 18.2 percent of 11 pizzas, the original quantity. So if we use these numbers, the price elasticity of demand is 18.2 divided by 5.1, which equals 3.6.

By using percentages of the *average* price and *average* quantity, we get the *same value* for the elasticity regardless of whether the price falls from \$20.50 to \$19.50 or rises from \$19.50 to \$20.50.

**Percentages and Proportions** Elasticity is the ratio of two percentage changes, so when we divide one percentage change by another, the 100s cancel. A percentage change is a *proportionate* change multiplied by 100. The proportionate change in price is  $\Delta P/P_{\text{ave}}$ , and the proportionate change in quantity demanded is  $\Delta Q/Q_{\text{ave}}$ . So if we divide  $\Delta Q/Q_{\text{ave}}$  by  $\Delta P/P_{\text{ave}}$  we get the same answer as we get by using percentage changes.

**A Units-Free Measure** Now that you've calculated a price elasticity of demand, you can see why it is a *units-free measure*. Elasticity is a units-free measure because the percentage change in each variable is independent of the units in which the variable is measured. The ratio of the two percentages is a number without units.

**Minus Sign and Elasticity** When the price of a good rises, the quantity demanded *decreases*. Because a *positive* change in price brings a *negative* change in the quantity demanded, the price elasticity of demand is a negative number. But it is the magnitude, or *absolute value*, of the price elasticity of demand that tells us how responsive the quantity demanded is. So to compare price elasticities of demand, we use the *magnitude* of the elasticity and ignore the minus sign.

### Inelastic and Elastic Demand

If the quantity demanded remains constant when the price changes, then the price elasticity of demand is zero and the good is said to have a **perfectly inelastic demand**. One good that has a very low price elasticity of demand (perhaps zero over some price range) is insulin. Insulin is of such importance to some diabetics that if the price rises or falls, they do not change the quantity they buy.

If the percentage change in the quantity demanded equals the percentage change in the price, then the price elasticity equals 1 and the good is said to have a **unit elastic demand**.

Between perfectly inelastic demand and unit elastic demand is a general case in which *the percentage change in the quantity demanded is less than the percentage change in the price*. In this case, the price elasticity of demand is between zero and 1 and the good is said to have an **inelastic demand**. Food and shelter are examples of goods with inelastic demand.

If the quantity demanded changes by an infinitely large percentage in response to a tiny price change, then the price elasticity of demand is infinity and the good is said to have a **perfectly elastic demand**. An example of a good that has a very high elasticity of

demand (almost infinite) is a soft drink from two campus machines located side by side. If the two machines offer the same soft drinks for the same price, some people buy from one machine and some from the other. But if one machine's price is higher than the other's, by even a small amount, no one buys from the machine with the higher price. Drinks from the two machines are perfect substitutes. The demand for a good that has a perfect substitute is perfectly elastic.

Between unit elastic demand and perfectly elastic demand is another general case in which *the percentage change in the quantity demanded exceeds the percentage change in price*. In this case, the price elasticity of demand is greater than 1 and the good is said to have an **elastic demand**. Automobiles and furniture are examples of goods that have elastic demand.

Figure 4.2 shows three demand curves that cover the entire range of possible elasticities of demand that you've just reviewed. In Fig. 4.2(a), the quantity demanded is constant regardless of the price, so this demand is perfectly inelastic. In Fig. 4.2(b), the percentage change in the quantity demanded equals the percentage change in price, so this demand is unit elastic. In Fig. 4.2(c), the price is constant regardless of the quantity demanded, so this figure illustrates a perfectly elastic demand.

You now know the distinction between elastic and inelastic demand. But what determines whether the demand for a good is elastic or inelastic?

## The Factors that Influence the Elasticity of Demand

The elasticity of demand for a good depends on:

- The closeness of substitutes
- The proportion of income spent on the good
- The time elapsed since the price change

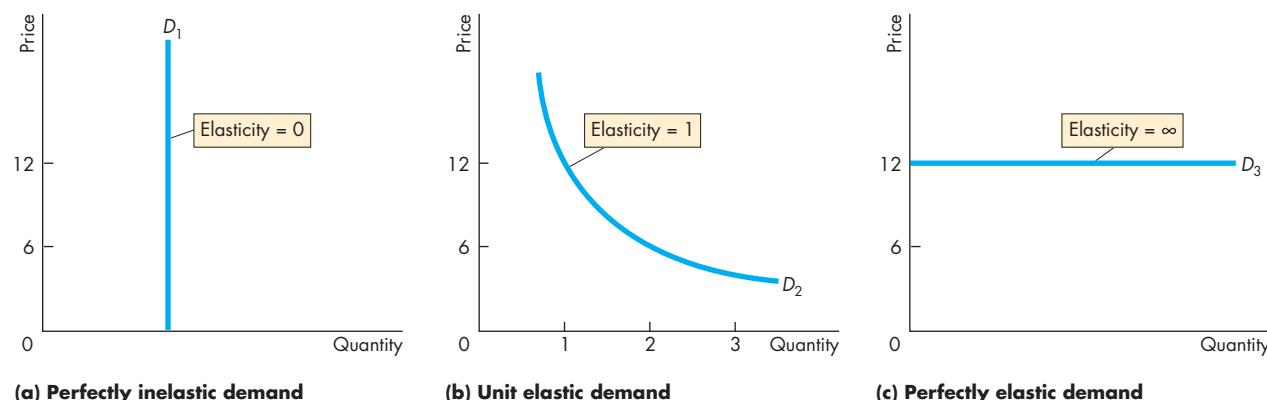
**Closeness of Substitutes** The closer the substitutes for a good, the more elastic is the demand for it. Oil as fuel or raw material for chemicals has no close substitutes so the demand for oil is inelastic. Plastics are close substitutes for metals, so the demand for metals is elastic.

The degree of substitutability depends on how narrowly (or broadly) we define a good. For example, a smartphone has no close substitutes, but an Apple iPhone is a close substitute for a Samsung Galaxy. So the elasticity of demand for smartphones is lower than the elasticity of demand for an iPhone or a Galaxy.

In everyday language we call goods such as food and shelter *necessities* and goods such as exotic vacations *luxuries*. A necessity has poor substitutes, so it generally has an inelastic demand. A luxury usually has many substitutes, one of which is not buying it. So a luxury generally has an elastic demand.

**Proportion of Income Spent on the Good** Other things remaining the same, the greater the proportion of income spent on a good, the more elastic (or less inelastic) is the demand for it.

**FIGURE 4.2** Inelastic and Elastic Demand



Each demand illustrated here has a constant elasticity. The demand curve in part (a) illustrates the demand for a good that has a zero elasticity of demand. The demand curve in

part (b) illustrates the demand for a good with a unit elasticity of demand. And the demand curve in part (c) illustrates the demand for a good with an infinite elasticity of demand.

Think about your own elasticity of demand for chewing gum and housing. If the price of gum rises, you consume almost as much as before. Your demand for gum is inelastic. If apartment rents rise, you look for someone to share with. Your demand for housing is not as inelastic as your demand for gum. Why the difference? Housing takes a big chunk of your budget, and gum takes little. You barely notice the higher price of gum, while the higher rent puts your budget under severe strain.

**Time Elapsed Since Price Change** The longer the time that has elapsed since a price change, the more elastic is demand. When the price of oil increased by 400 percent during the 1970s, people barely changed the quantity of oil and gasoline they bought. But gradually, as more efficient auto and airplane engines were developed, the quantity bought decreased. The demand for oil became more elastic as more time elapsed following the huge price hike.

### Elasticity Along a Linear Demand Curve

Elasticity of demand is not the same as slope. And a good way to see this fact is by studying a demand curve that has a constant slope but a varying elasticity.

The demand curve in Fig. 4.3 is linear, which means that it has a constant slope. Along this demand curve, a \$5 rise in the price brings a decrease of 10 pizzas an hour.

But the price elasticity of demand is not constant along this demand curve. To see why, let's calculate some elasticities.

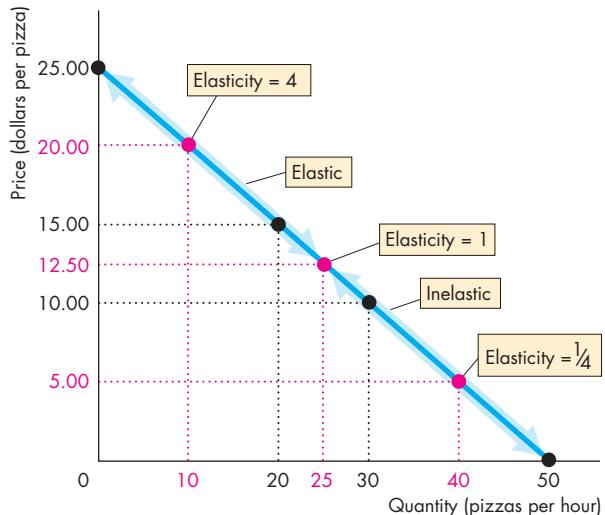
At the midpoint of the demand curve, the price is \$12.50 and the quantity is 25 pizzas per hour. If the price rises from \$10 to \$15 a pizza the quantity demanded decreases from 30 to 20 pizzas an hour and the average price and average quantity are at the midpoint of the demand curve. So

$$\begin{aligned}\text{Price elasticity of demand} &= \frac{10/25}{5/12.50} \\ &= 1.\end{aligned}$$

That is, at the midpoint of a linear demand curve, the price elasticity of demand is 1.

At prices *above* the midpoint, the price elasticity of demand is greater than 1: Demand is elastic. To see that demand is elastic, let's calculate the elasticity when the price rises from \$15 to \$25 a pizza. You can see that quantity demanded decreases from 20 to zero pizzas an hour. The average price is \$20 a pizza, and

**FIGURE 4.3** Elasticity Along a Linear Demand Curve



On a linear demand curve, demand is unit elastic at the midpoint (elasticity is 1), elastic above the midpoint, and inelastic below the midpoint.

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the average quantity is 10 pizzas. Putting these numbers into the elasticity formula:

$$\begin{aligned}\text{Price elasticity of demand} &= \frac{\Delta Q/Q_{ave}}{\Delta P/P_{ave}} \\ &= \frac{20/10}{10/20} \\ &= 4.\end{aligned}$$

That is, the price elasticity of demand at an average price of \$20 a pizza is 4.

At prices *below* the midpoint, the price elasticity of demand is less than 1: Demand is inelastic. For example, if the price rises from zero to \$10 a pizza, the quantity demanded decreases from 50 to 30 pizzas an hour. The average price is now \$5 and the average quantity is 40 pizzas an hour. So

$$\begin{aligned}\text{Price elasticity of demand} &= \frac{20/40}{10/5} \\ &= 1/4.\end{aligned}$$

That is, the price elasticity of demand at an average price of \$5 a pizza is 1/4.

## Total Revenue and Elasticity

The **total revenue** from the sale of a good equals the price of the good multiplied by the quantity sold. When a price changes, total revenue also changes. But a cut in the price does not always decrease total revenue. The change in total revenue depends on the elasticity of demand in the following way:

- If demand is elastic, a 1 percent price cut increases the quantity sold by more than 1 percent and total revenue increases.
- If demand is inelastic, a 1 percent price cut increases the quantity sold by less than 1 percent and total revenue decreases.
- If demand is unit elastic, a 1 percent price cut increases the quantity sold by 1 percent and total revenue does not change.

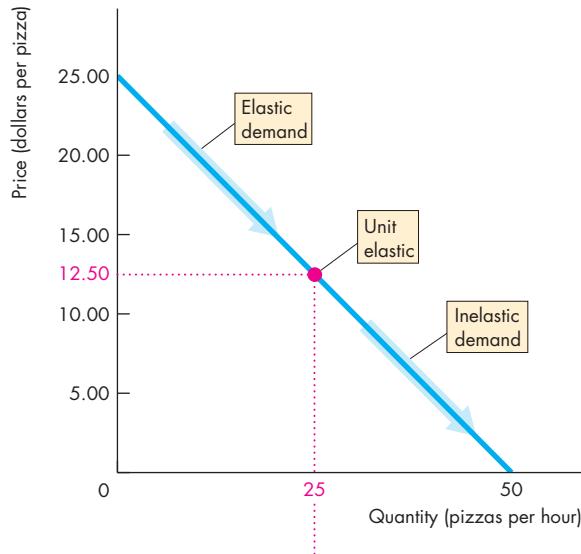
In Fig. 4.4(a), over the price range \$25 to \$12.50 a pizza, demand is elastic. At a price of \$12.50 a pizza, demand is unit elastic. Over the price range from \$12.50 a pizza to zero, demand is inelastic.

Figure 4.4(b) shows total revenue. At a price of \$25, the quantity sold is zero, so total revenue is zero. At a price of zero, the quantity demanded is 50 pizzas an hour and total revenue is again zero. A price cut in the elastic range brings an increase in total revenue—the percentage increase in the quantity demanded is greater than the percentage decrease in price. A price cut in the inelastic range brings a decrease in total revenue—the percentage increase in the quantity demanded is less than the percentage decrease in price. At unit elasticity, total revenue is at a maximum.

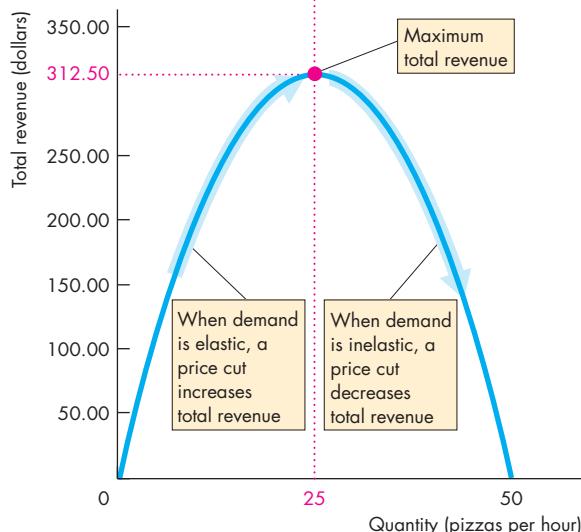
Figure 4.4 shows how we can use this relationship between elasticity and total revenue to estimate elasticity using the total revenue test. The **total revenue test** is a method of estimating the price elasticity of demand by observing the change in total revenue that results from a change in the price, when all other influences on the quantity sold remain the same.

- If a price cut increases total revenue, demand is elastic.
- If a price cut decreases total revenue, demand is inelastic.
- If a price cut leaves total revenue unchanged, demand is unit elastic.

**FIGURE 4.4** Elasticity and Total Revenue



(a) Demand



(b) Total revenue

When demand is elastic, in the price range from \$25 to \$12.50, a decrease in price (part a) brings an increase in total revenue (part b). When demand is inelastic, in the price range from \$12.50 to zero, a decrease in price (part a) brings a decrease in total revenue (part b). When demand is unit elastic, at a price of \$12.50 (part a), total revenue is at a maximum (part b).

**MyEconLab Animation**

## Economics in Action

### Elastic and Inelastic Demand

The real-world price elasticities of demand in the table range from 1.52 for metals, the item with the most elastic demand in the table, to 0.05 for oil, the item with the most inelastic demand in the table. The demand for food is also inelastic.

Oil and food, which have poor substitutes and inelastic demand, might be classified as necessities. Furniture and motor vehicles, which have good substitutes and elastic demand, might be classified as luxuries.

### Price Elasticities of Demand

Good or Service	Elasticity
<b>Elastic Demand</b>	
Metals	1.52
Electrical engineering products	1.39
Mechanical engineering products	1.30
Furniture	1.26
Motor vehicles	1.14
Instrument engineering products	1.10
Transportation services	1.03
<b>Inelastic Demand</b>	
Gas, electricity, and water	0.92
Chemicals	0.89
Clothing	0.64
Banking and insurance services	0.56
Housing services	0.55
Agricultural and fish products	0.42
Books, magazines, and newspapers	0.34
Food	0.12
Cigarettes	0.11
Soft drinks	0.05
Oil	0.05

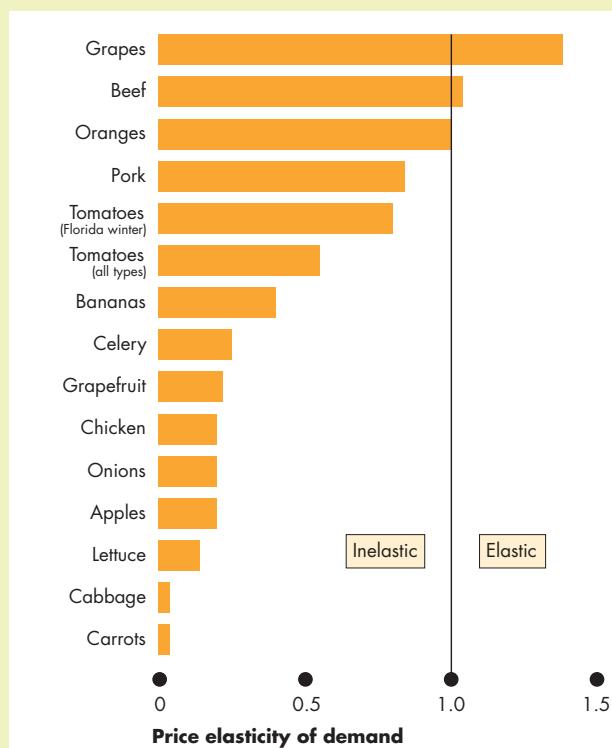
Sources of data: Ahsan Mansur and John Whalley, "Numerical Specification of Applied General Equilibrium Models: Estimation, Calibration, and Data," in *Applied General Equilibrium Analysis*, eds. Herbert E. Scarf and John B. Shoven (New York: Cambridge University Press, 1984), 109; Henri Theil, ChingFan Chung, and James L. Seale, Jr., *Advances in Econometrics, Supplement I*, 1989, *International Evidence on Consumption Patterns* (Greenwich, Conn.: JAI Press Inc., 1989); Emilia Papoulia and Robert Sorensen, "What Determines the Elasticity of Industry Demand," *International Journal of Industrial Organization*, 1986; and Geoffrey Heal, Columbia University, Web site.

### Price Elasticities of Demand for Food

The price elasticity of demand for food in the United States is estimated to be 0.12. This elasticity is an average over all types of food. The demand for most food items is inelastic, but there is a wide range of elasticities as the figure below shows for a range of fruits, vegetables, and meats.

The demand for grapes and the demand for beef are elastic. The demand for oranges is unit elastic. These food items, especially grapes and beef, have many good substitutes. Florida winter tomatoes have closer substitutes than tomatoes in general, so the demand for the Florida winter variety is more elastic (less inelastic) than the demand for tomatoes.

Carrots and cabbage, on which we spend a very small proportion of income, have an almost zero elastic demand.



### Price Elasticities of Demand for Food

Sources of data: Kuo S. Huang, *U.S. demand for food: A complete system of price and income effects*, U.S. Dept. of Agriculture, Economic Research Service, Washington, DC, 1985; J. Scott Shonkwiler and Robert D. Emerson, "Imports and the Supply of Winter Tomatoes: An Application of Rational Expectations," *American Journal of Agricultural Economics*, Vol. 64, No. 4 (Nov., 1982), pp. 634–641; and Kuo S. Huang, "A Further Look at Flexibilities and Elasticities," *American Journal of Agricultural Economics*, Vol. 76, No. 2 (May, 1994), pp. 313–317.



## ECONOMICS IN THE NEWS

### The Elasticity of Demand for Peanut Butter

#### Peanut Butter Prices to Rise 30 to 40 Percent

Scott Karns, president and CEO of Karns Foods, said “People are still going to need it for their family. It’s still an extremely economical item.” Patty Nolan, who is on a fixed income, said “I love peanut butter so I’m using a little less so I don’t go through it.”

Source: *The Patriot-News*, November 2, 2011

#### THE DATA

Year	Quantity (millions of tonnes per year)	Price (dollars per kilogram)
2011	350	4.00
2012	300	5.60

#### THE QUESTIONS

- Does the news clip imply that the demand for peanut butter is elastic or inelastic?
- If the data are two points on the demand curve for peanut butter, what is the price elasticity of demand?

#### THE ANSWERS

- The two remarks in the news clip suggest that the quantity of peanut butter demanded will decrease when the price rises, but not by much. The demand for peanut butter is inelastic.

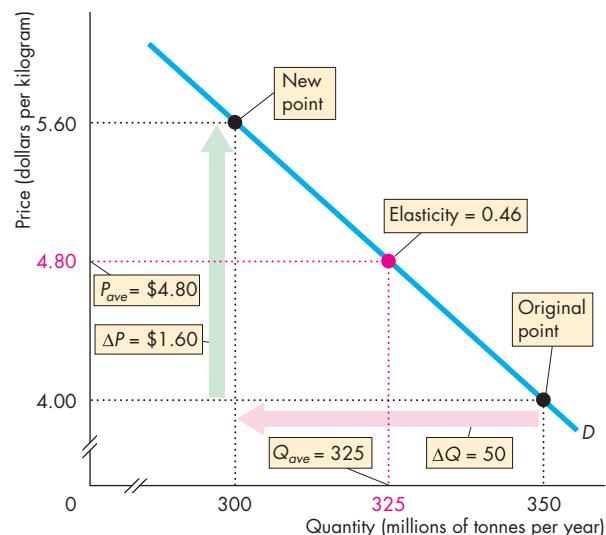
### Your Expenditure and Your Elasticity

When the price of a good changes, the change in your expenditure on the good depends on *your elasticity of demand*.

- If your demand for the good is elastic, a 1 percent price cut increases the quantity you buy by more than 1 percent and your expenditure on the item increases.
- If your demand for the good is inelastic, a 1 percent price cut increases the quantity you buy by less than 1 percent and your expenditure on the item decreases.
- If your demand for the good is unit elastic, a 1 percent price cut increases the quantity you buy by 1 percent and your expenditure on the item does not change.

So if you spend more on an item when its price falls, your demand for that item is elastic; if you spend the same amount, your demand is unit elastic; and if you spend less, your demand is inelastic.

- The data table says the price of peanut butter increased by \$1.60 with an average price of \$4.80, so the price increased by 33.3 percent. The quantity demanded decreased by 50 million tonnes with an average quantity of 325 million tonnes, so the quantity demanded decreased by 15.4 percent. The price elasticity of demand is 15.4 percent divided by 33.3 percent, which equals 0.46.



#### Calculating the Price Elasticity of Demand for Peanut Butter

**MyEconLab More Economics in the News**

### REVIEW QUIZ

- Why do we need a units-free measure of the responsiveness of the quantity demanded of a good or service to a change in its price?
- Define the price elasticity of demand and show how it is calculated.
- What makes the demand for some goods elastic and the demand for other goods inelastic?
- Why is the demand for a luxury generally more elastic (or less inelastic) than the demand for a necessity?
- What is the total revenue test?

Work these questions in Study Plan 4.1 and get instant feedback. Do a Key Terms Quiz.

**MyEconLab**

You've now completed your study of the *price elasticity of demand*. Two other elasticity concepts tell us about the effects of other influences on demand. Let's look at these other elasticities of demand.

## More Elasticities of Demand

Suppose the economy is expanding and people are enjoying rising incomes. You know that a change in income changes demand. So this increased prosperity brings an increase in the demand for most types of goods and services. By how much will a rise in income increase the demand for pizza? This question is answered by the income elasticity of demand.

### Income Elasticity of Demand

The **income elasticity of demand** is a measure of the responsiveness of the demand for a good or service to a change in income, other things remaining the same. It tells us by how much a demand curve shifts at a given price.

The income elasticity of demand is calculated by using the formula:

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

Income elasticities of demand can be positive or negative and they fall into three interesting ranges:

- Positive and greater than 1 (*normal* good, income elastic)
- Positive and less than 1 (*normal* good, income inelastic)
- Negative (*inferior* good)

**Income Elastic Demand** Suppose that the price of pizza is constant and 9 pizzas an hour are bought. Then incomes rise from \$975 to \$1,025 a week. No other influence on buying plans changes and the quantity of pizzas sold increases to 11 an hour.

The change in the quantity demanded is +2 pizzas. The average quantity is 10 pizzas, so the quantity demanded increases by 20 percent. The change in income is +\$50 and the average income is \$1,000, so incomes increase by 5 percent. The income elasticity of demand for pizza is

$$\frac{20\%}{5\%} = 4.$$

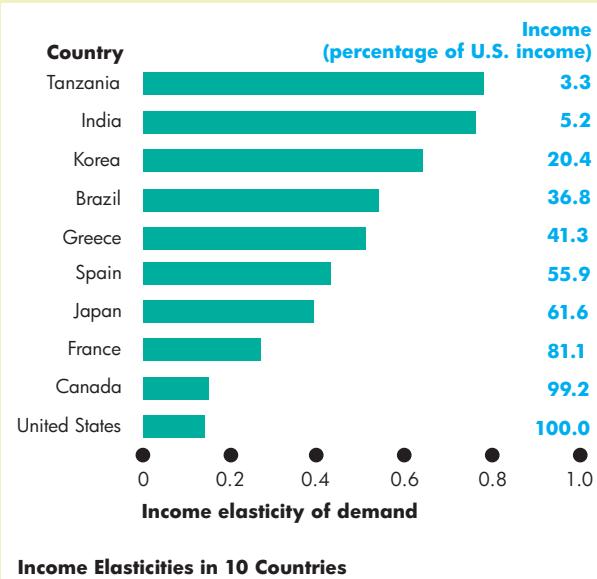
The demand for pizza is income elastic. The percentage increase in the quantity of pizza demanded exceeds the percentage increase in income.

### Economics in Action

#### Necessities and Luxuries

The demand for a necessity such as food or clothing is income inelastic, while the demand for a luxury such as airline and foreign travel is income elastic. But what is a necessity and what is a luxury depends on the level of income. For people with a low income, food and clothing can be luxuries. So the level of income has a big effect on income elasticities of demand.

The figure shows this effect on the income elasticity of demand for food in 10 countries. In countries with low incomes, such as Tanzania and India, the income elasticity of demand for food is high. In countries with high incomes, such as Canada, the income elasticity of demand for food is low. That is, as income increases, the income elasticity of demand for food decreases. Low-income consumers spend a larger percentage of any increase in income on food than do high-income consumers.



**Income Inelastic Demand** If the income elasticity of demand is positive but less than 1, demand is income inelastic. The percentage increase in the quantity demanded is positive but less than the percentage increase in income.

Whether demand is income elastic or income inelastic has an important implication for the percentage of income spent on a good. If the demand for a good is *income elastic*, the percentage

## Economics in Action

### Income Elastic and Inelastic Demand

The table shows some real-world income elasticities of demand and confirms that a necessity such as food or clothing is income inelastic, while the demand for a luxury such as airline travel is income elastic.

#### Some Real-World Income Elasticities of Demand

##### Income Elastic Demand

Airline travel	5.82
Movies	3.41
Foreign travel	3.08
Electricity	1.94
Restaurant meals	1.61
Local buses and trains	1.38
Haircuts	1.36
Automobiles	1.07

##### Income Inelastic Demand

Tobacco	0.86
Alcoholic drinks	0.62
Furniture	0.53
Clothing	0.51
Newspapers and magazines	0.38
Telephone	0.32
Food	0.14

Sources of data: H.S. Houthakker and Lester D. Taylor, *Consumer Demand in the United States* (Cambridge, Mass.: Harvard University Press, 1970); and Henri Theil, Ching-Fan Chung, and James L. Seale, Jr., *Advances in Econometrics, Supplement 1, 1989, International Evidence on Consumption Patterns* (Greenwich, Conn.: JAI Press, Inc., 1989).

of income spent on that good *increases* as income increases. And if the demand for a good is *income inelastic*, the percentage of income spent on that good *decreases* as income increases.

**Inferior Goods** If the income elasticity of demand is negative, the good is an *inferior* good. The quantity demanded of an inferior good and the amount spent on it *decrease* when income increases. Goods in this category include small motorcycles, potatoes, and rice. Low-income consumers buy these goods and spend a large percentage of their incomes on them.

### Cross Elasticity of Demand

The burger shop next to your pizzeria has just raised the price of its burger. You know that pizzas and burgers are substitute. You also know that when the price of a substitute for pizza *rises*, the demand for pizza *increases*. But how big is the influence of the price of burgers on the demand for pizza?

You know, too, that pizza and soft drinks are complements. And you know that if the price of a complement of pizza *rises*, the demand for pizza *decreases*. So you wonder, by how much will a rise in the price of a soft drink decrease the demand for your pizza?

To answer this question, you need to know about the cross elasticity of demand for pizza. Let's examine this elasticity measure.

We measure the influence of a change in the price of a substitute or complement by using the concept of the cross elasticity of demand. The **cross elasticity of demand** is a measure of the responsiveness of the demand for a good to a change in the price of a substitute or complement, other things remaining the same.

We calculate the *cross elasticity of demand* by using the formula:

$$\text{Cross elasticity of demand} = \frac{\text{Percentage change in quantity demanded}}{\text{Percentage change in price of a substitute or complement}}.$$

The cross elasticity of demand can be positive or negative. If the cross elasticity of demand is *positive*, demand and the price of the other good change in the *same* direction, so the two goods are *substitutes*. If the cross elasticity of demand is *negative*, demand and the price of the other good change in *opposite* directions, so the two goods are *complements*.

**Substitutes** Suppose that the price of pizza is constant and people buy 9 pizzas an hour. Then the price of a burger rises from \$1.50 to \$2.50. No other influence on buying plans changes and the quantity of pizzas bought increases to 11 an hour.

The change in the quantity demanded at the current price is +2 pizzas—the new quantity, 11 pizzas, minus the original quantity, 9 pizzas. The average quantity is 10 pizzas. So the quantity of pizzas demanded increases by 20 percent. That is,

$$\Delta Q/Q_{ave} \times 100 = (+2/10) \times 100 = +20\%.$$

The change in the price of a burger, a substitute for pizza, is +\$1—the new price, \$2.50, minus the original price, \$1.50. The average price is \$2 a burger. So the price of a burger rises by 50 percent. That is,

$$\Delta P/P_{ave} \times 100 = (+\$1/\$2) \times 100 = +50\%.$$

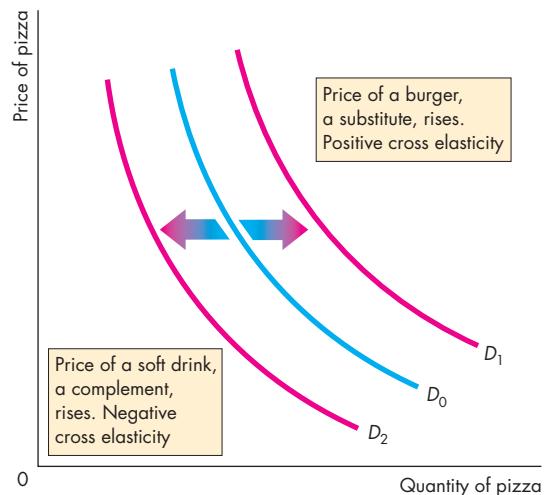
So the cross elasticity of demand for pizza with respect to the price of a burger is:

$$\frac{+20\%}{+50\%} = 0.4.$$

Figure 4.5 illustrates the cross elasticity of demand. Because pizza and burgers are substitutes, when the price of a burger rises, the demand for pizza increases. The demand curve for pizza shifts rightward from  $D_0$  to  $D_1$ . Because a *rise* in the price of a burger brings an *increase* in the demand for pizza, the cross elasticity of demand for pizza with respect to the price of a burger is *positive*. Both the price and the quantity change in the same direction.

**Complements** Now suppose that the price of pizza is constant and 11 pizzas an hour are bought. Then the price of a soft drink rises from \$1.50 to \$2.50. No other influence on buying plans changes and the quantity of pizzas bought falls to 9 an hour.

**FIGURE 4.5** Cross Elasticity of Demand



A burger is a *substitute* for pizza. When the price of a burger rises, the demand for pizza increases and the demand curve for pizza shifts rightward from  $D_0$  to  $D_1$ . The cross elasticity of demand is *positive*.

A soft drink is a *complement* of pizza. When the price of a soft drink rises, the demand for pizza decreases and the demand curve for pizza shifts leftward from  $D_0$  to  $D_2$ . The cross elasticity of demand is *negative*.

[MyEconLab Animation and Draw Graph](#)



## ECONOMICS IN THE NEWS

### More Peanut Butter Demand Elasticities

#### Peanut Butter Related Markets

Professor Timothy Mathews teaches economics at Kennesaw State University, Georgia, the nation's number one peanut producing state. The data table below shows his guesses about some demand elasticities for peanut butter.

Source: Timothy Mathews

#### THE DATA

Income elasticity	- 0.31
Cross elasticity peanut butter and grape jelly	- 0.27
Cross elasticity peanut butter and cheese	+ 0.18

#### THE QUESTIONS

- What do the data provided tell us about the demand for peanut butter? Is it a normal good?

- Is grape jelly a substitute for or a complement of peanut butter? Is cheese a substitute for or a complement of peanut butter?

#### THE ANSWERS

- The income elasticity of demand for peanut butter is *negative*, which means that peanut butter is an *inferior good*. People buy less peanut butter as income rises.
- The cross elasticity of demand of peanut butter with respect to the price of grape jelly is *negative*, which means that peanut butter and grape jelly are *complements*.
- The cross elasticity of demand of peanut butter with respect to the price of cheese is *positive*, which means that peanut butter and cheese are *substitutes*.

[MyEconLab More Economics in the News](#)

The change in the quantity demanded is the opposite of what we've just calculated: The quantity of pizzas demanded decreases by 20 percent ( $-20\%$ ).

The change in the price of a soft drink, a rise of \$1 from \$1.50 to \$2.50, is the same as the change in the price of a burger that we've just calculated. That is, the price rises by 50 percent ( $+50\%$ ).

So the cross elasticity of demand for pizza with respect to the price of a soft drink is

$$\frac{-20\%}{+50\%} = -0.4.$$

Because pizza and soft drinks are complements, when the price of a soft drink rises, the demand for pizza decreases.

In Fig. 4.5, when the price of soft drinks rises the demand curve for pizza shifts leftward from  $D_0$  to  $D_2$ . Because a *rise* in the price of a soft drink brings a *decrease* in the demand for pizza, the cross elasticity of demand for pizza with respect to the price of a soft drink is *negative*. The price and quantity change in *opposite* directions.

The magnitude of the cross elasticity of demand determines how far the demand curve shifts. The larger the cross elasticity (absolute value), the greater is the change in demand and the larger is the shift in the demand curve.

If two items are close substitutes, such as two brands of spring water, the cross elasticity is large. If two items are close complements, such as movies and popcorn, the cross elasticity is large.

If two items are somewhat unrelated to each other, such as newspapers and orange juice, the cross elasticity is small—perhaps even zero.



## REVIEW QUIZ

- 1 What does the income elasticity of demand measure?
- 2 What does the sign (positive/negative) of the income elasticity tell us about a good?
- 3 What does the cross elasticity of demand measure?
- 4 What does the sign (positive/negative) of the cross elasticity of demand tell us about the relationship between two goods?

Work these questions in Study Plan 4.2 and get instant feedback. Do a Key Terms Quiz.

[MyEconLab](#)

## Elasticity of Supply

You know that when demand increases, the equilibrium price rises and the equilibrium quantity increases. But does the price rise by a large amount and the quantity increase by a little? Or does the price barely rise and the quantity increase by a large amount?

The answer depends on the responsiveness of the quantity supplied to a change in the price. If the quantity supplied is not very responsive to price, then an increase in demand brings a large rise in the price and a small increase in the equilibrium quantity. If the quantity supplied is highly responsive to price, then an increase in demand brings a small rise in the price and a large increase in the equilibrium quantity.

The problems that arise from using the slope of the supply curve to indicate responsiveness are the same as those we considered when discussing the responsiveness of the quantity demanded, so we use a units-free measure—the elasticity of supply.

### Calculating the Elasticity of Supply

The **elasticity of supply** measures the responsiveness of the quantity supplied to a change in the price of a good when all other influences on selling plans remain the same. It is calculated by using the formula:

$$\text{Elasticity of supply} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}.$$

We use the same method that you learned when you studied the elasticity of demand. (Refer back to p. 84 to check this method.)

**Elastic and Inelastic Supply** If the elasticity of supply is greater than 1, we say that supply is elastic; and if the elasticity of supply is less than 1, we say that supply is inelastic.

Suppose that when the price rises from \$20 to \$21, the quantity supplied increases from 10 to 20 pizzas per hour. The price rise is \$1 and the average price is \$20.50, so the price rises by 4.9 percent of the average price. The quantity increases from 10 to 20 pizzas an hour, so the increase is 10 pizzas, the average quantity is 15 pizzas, and the quantity

increases by 67 percent. The elasticity of supply is equal to 67 percent divided by 4.9 percent, which equals 13.67. Because the elasticity of supply exceeds 1 (in this case by a lot), supply is elastic.

In contrast, suppose that when the price rises from \$20 to \$30, the quantity of pizza supplied increases from 10 to 13 per hour. The price rise is \$10 and the average price is \$25, so the price rises by 40 percent of the average price. The quantity increases from 10 to 13 pizzas an hour, so the increase is 3 pizzas, the average quantity is 11.5 pizzas an hour, and the quantity increases by 26 percent. The elasticity of supply is equal to 26 percent divided by 40 percent, which equals 0.65. Now, because the elasticity of supply is less than 1, supply is inelastic.

Figure 4.6 shows the range of elasticities of supply. If the quantity supplied is fixed regardless of the price, the supply curve is vertical and the elasticity of supply is zero. Supply is perfectly inelastic. This case is shown in Fig. 4.6(a). A special intermediate case occurs when the percentage change in price equals the percentage change in quantity. Supply is then unit elastic. This case is shown in Fig. 4.6(b). No matter how steep the supply curve is, if it is linear and passes through the origin, supply is unit elastic. If there is a price at which sellers are willing to offer any quantity for sale, the supply curve is horizontal and the elasticity of supply is infinite. Supply is perfectly elastic. This case is shown in Fig. 4.6(c).

## The Factors That Influence the Elasticity of Supply

The elasticity of supply of a good depends on:

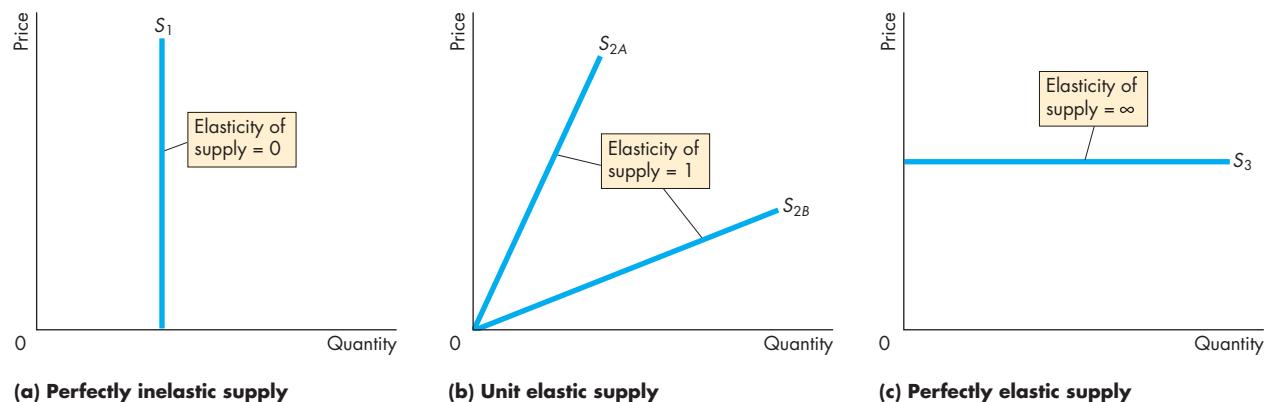
- Resource substitution possibilities
- Time frame for the supply decision

**Resource Substitution Possibilities** Some goods and services can be produced only by using unique or rare productive resources. These items have a low, perhaps even a zero, elasticity of supply. Other goods and services can be produced by using commonly available resources that could be allocated to a wide variety of alternative tasks. Such items have a high elasticity of supply.

A Van Gogh painting is an example of a good with a vertical supply curve and a zero elasticity of supply. At the other extreme, wheat can be grown on land that is almost equally good for growing corn, so it is just as easy to grow wheat as corn. The opportunity cost of wheat in terms of forgone corn is almost constant. As a result, the supply curve of wheat is almost horizontal and its elasticity of supply is very large. Similarly, when a good is produced in many different countries (for example, sugar and beef), the supply of the good is highly elastic.

The supply of most goods and services lies between these two extremes. The quantity produced

**FIGURE 4.6** Inelastic and Elastic Supply



**(a) Perfectly inelastic supply**

Each supply illustrated here has a constant elasticity. The supply curve in part (a) illustrates the supply of a good that has a zero elasticity of supply. Each supply curve in part (b) illustrates the supply of a good with a unit elasticity of

**(b) Unit elastic supply**

supply. All linear supply curves that pass through the origin illustrate supplies that are unit elastic. The supply curve in part (c) illustrates the supply of a good with an infinite elasticity of supply.

can be increased but only by incurring a higher cost. If a higher price is offered, the quantity supplied increases. Such goods and services have an elasticity of supply between zero and infinity.

**Time Frame for the Supply Decision** To study the influence of the amount of time elapsed since a price change, we distinguish three time frames of supply:

- Momentary supply
- Short-run supply
- Long-run supply

**Momentary Supply** When the price of a good changes, the immediate response of the quantity supplied is determined by the *momentary supply* of that good.

Some goods, such as fruits and vegetables, have a perfectly inelastic momentary supply—a vertical supply curve. The quantities supplied depend on crop-planting decisions made earlier. In the case of oranges, for example, planting decisions have to be made many years in advance of the crop being available. Momentary supply is perfectly inelastic because, on a given day, no matter what the price of oranges, producers cannot change their output. They have picked, packed, and shipped their crop to market, and the quantity available for that day is fixed.

In contrast, some goods have a perfectly elastic momentary supply. Long-distance phone calls are an example. When many people simultaneously make a call, there is a big surge in the demand for telephone cables, computer switching, and satellite time. The quantity supplied increases, but the price remains constant. Long-distance carriers monitor fluctuations in demand and reroute calls to ensure that the quantity supplied equals the quantity demanded without changing the price.

**Short-Run Supply** The response of the quantity supplied to a price change when only *some* of the possible adjustments to production can be made is determined by *short-run supply*. Most goods have an inelastic short-run supply. To increase output in the short run, firms must work their labour force overtime and perhaps hire additional workers. To decrease their output in the short run, firms either lay off workers or reduce their hours of work. With the passage of time, firms can make more adjustments, perhaps training additional workers or buying additional tools and other equipment.

For the orange grower, if the price of oranges falls, some pickers can be laid off and oranges left on the trees to rot. Or if the price of oranges rises, the grower can use more fertilizer and improved irrigation to increase the yield of the existing trees.

But an orange grower can't change the number of trees producing oranges in the short run.

**Long-Run Supply** The response of the quantity supplied to a price change after *all* the technologically possible ways of adjusting supply have been exploited is determined by *long-run supply*. For most goods and services, long-run supply is elastic and perhaps perfectly elastic.

For the orange grower, the long run is the time it takes new tree plantings to grow to full maturity—about 15 years. In some cases, the long-run adjustment occurs only after a completely new production plant has been built and workers have been trained to operate it—typically a process that might take several years.

## REVIEW QUIZ

- 1 Why do we need a units-free measure of the responsiveness of the quantity supplied of a good or service to a change in its price?
- 2 Define the elasticity of supply and show how it is calculated.
- 3 What are the main influences on the elasticity of supply that make the supply of some goods elastic and the supply of other goods inelastic?
- 4 Provide examples of goods or services whose elasticities of supply are (a) zero, (b) greater than zero but less than infinity, and (c) infinity.
- 5 How does the time frame over which a supply decision is made influence the elasticity of supply? Explain your answer.

Work these questions in Study Plan 4.3 and get instant feedback. Do a Key Terms Quiz. **MyEconLab**

◆ You have now learned about the elasticities of demand and supply. Table 4.1 summarizes all the elasticities that you've met in this chapter. In the next chapter, we study the efficiency of competitive markets. But first study *Economics in the News* on pp. 98–99, which puts the elasticity of demand to work and looks at the market for coffee.

**TABLE 4.1** A Compact Glossary of Elasticities**Price Elasticities of Demand****A relationship is described as**

	<b>When its magnitude is</b>	<b>Which means that</b>
Perfectly elastic	Infinity	The smallest possible increase in price causes an infinitely large decrease in the quantity demanded*
Elastic	Less than infinity but greater than 1	The percentage decrease in the quantity demanded exceeds the percentage increase in price
Unit elastic	1	The percentage decrease in the quantity demanded equals the percentage increase in price
Inelastic	Less than 1 but greater than zero	The percentage decrease in the quantity demanded is less than the percentage increase in price
Perfectly inelastic	Zero	The quantity demanded is the same at all prices

**Cross Elasticities of Demand****A relationship is described as**

	<b>When its value is</b>	<b>Which means that</b>
Close substitutes	Large	The smallest possible increase in the price of one good causes an infinitely large increase in the quantity demanded* of the other good
Substitutes	Positive	If the price of one good increases, the quantity demanded of the other good also increases
Unrelated goods	Zero	If the price of one good increases, the quantity demanded of the other good remains the same
Complements	Negative	If the price of one good increases, the quantity demanded of the other good decreases

**Income Elasticities of Demand****A relationship is described as**

	<b>When its value is</b>	<b>Which means that</b>
Income elastic (normal good)	Greater than 1	The percentage increase in the quantity demanded is greater than the percentage increase in income*
Income inelastic (normal good)	Less than 1 but greater than zero	The percentage increase in the quantity demanded is greater than zero but less than the percentage increase in income
Negative (inferior good)	Less than zero	When income increases, quantity demanded decreases

**Elasticities of Supply****A relationship is described as**

	<b>When its magnitude is</b>	<b>Which means that</b>
Perfectly elastic	Infinity	The smallest possible increase in price causes an infinitely large increase in the quantity supplied*
Elastic	Less than infinity but greater than 1	The percentage increase in the quantity supplied exceeds the percentage increase in the price
Unit elastic	1	The percentage increase in the quantity supplied equals the percentage increase in the price
Inelastic	Greater than zero but less than 1	The percentage increase in the quantity supplied is less than the percentage increase in the price
Perfectly inelastic	Zero	The quantity supplied is the same at all prices

\*In each description, the directions of change may be reversed. For example, in the perfectly elastic demand case, the smallest possible *decrease* in price causes an infinitely large *increase* in the quantity demanded.



## The Elasticity of Demand for Coffee

### Drop in Global Coffee Prices Shrinks Farmers' Revenue

*Daily Monitor*

November 6, 2013

Global coffee prices have continued on a downward trend, casting a gloomy picture on ... farmers' income.

Latest records from the International Coffee Organization (ICO) show the drop has continued even as the new coffee calendar begins.

By close of October, ICO [average price] dropped to 100.38 cents, down from the 111.82 cents per pound in September. ...

In an interview with the *Daily Monitor*, Mr David Barry, the managing director of Kyagalanyi Coffee Ltd, Uganda's leading coffee exporting Company, said: "We may not know what's ahead of us but trends show a further fall in prices and everyone has to brave for this."

The drop in price has been attributed to increased production, with the biggest producers being Brazil and Vietnam whose production reached 90 million bags, with the latter posting 60 million bags and the former 30 million.

Crop year 2012/13 has now closed in all exporting countries and according to available information, total production is estimated at 145.2 million bags. This is 12.8 million bags more than 2011/12, representing a 9.6 percent increase. ...

Written by Dorothy Nakaweesi. Copyright © 2013 by *Daily Monitor*. Used by permission of Dorothy Nakaweesi.

### ESSENCE OF THE STORY

- Global coffee prices fell from 111.82 cents per pound in September 2013 to 100.38 cents per pound in November 2013.
- The fall in price was the result of increased production.
- Output in Brazil, the world's largest producer, was 60 million bags, and in Vietnam, the second-largest producer, it was 30 million bags.
- For the crop year 2012/13, total production was estimated at 145.2 million bags.
- Production in 2012/13 was 12.8 million bags more than 2011/12, a 9.6 percent increase.

## ECONOMIC ANALYSIS

- The table below summarizes data provided by the International Coffee Organization. The data supplements and updates some of the information in the news article.

### Summary of Coffee Data

Year	Quantity produced (millions of bags)	Price (U.S. cents per pound)
2012	134	135
2013	145	100

- Figure 1 provides yet more data and shows that after falling through 2013, the price of coffee climbed steeply in 2014.
- The price of coffee fluctuates because the supply of coffee fluctuates. And the price fluctuates by much more than the quantity of coffee produced because the demand for coffee is inelastic.
- The news headline provides the first clue that demand is inelastic: When the price falls, revenue shrinks. This information enables us to use the *total revenue test*: "If a price cut decreases total revenue, then demand is inelastic."
- We can estimate the price elasticity of demand for coffee, assuming that demand didn't change, by using the events in the market in 2012 and 2013.
- Figure 2 illustrates the global market for coffee in these two years. The demand curve for coffee is  $D$ , and in 2012 the supply curve of coffee was  $S_{12}$ . The equilibrium price was 135 cents per pound, and the equilibrium quantity was 134 million bags.
- In 2013, supply increased to  $S_{13}$ , the price fell to 100 cents per pound, and the quantity increased to 145 million bags.
- Figure 3 focuses on the demand curve and summarizes the elasticity calculation. The price fell by 35 cents, which is 30 percent of the average price of 117 cents. The quantity demanded increased by 11 million bags, which is 7.9 percent of the average quantity.
- The price elasticity of demand is 7.9 percent/30 percent, which equals 0.26. A 1 percent fall in price brings a 0.26 percent increase in the quantity demanded. And a 1 percent increase in the quantity brings a fall in price equal to  $1/0.26$ , or almost 4 percent.
- When demand is inelastic, a small percentage change in supply brings a large percentage change in price.

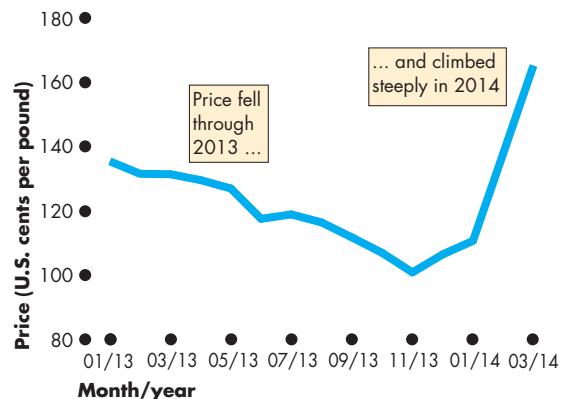


Figure 1 The Coffee-Price Roller Coaster

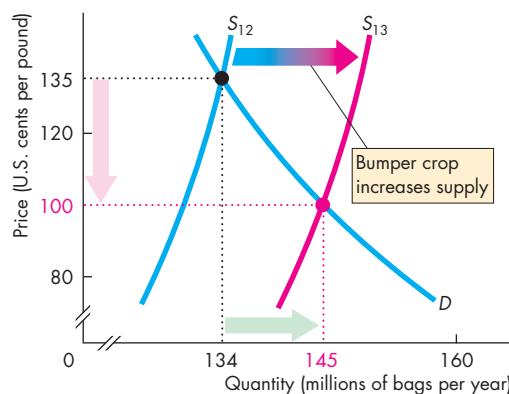


Figure 2 The Market for Coffee: 2012 and 2013

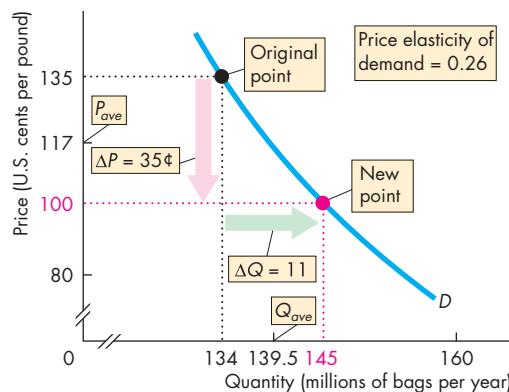


Figure 3 The Price Elasticity of Demand for Coffee

## SUMMARY

### Key Points

#### Price Elasticity of Demand (pp. 84–90)

- Elasticity is a measure of the responsiveness of the quantity demanded of a good to a change in its price, other things remaining the same.
- Price elasticity of demand equals the percentage change in the quantity demanded divided by the percentage change in the price.
- The larger the magnitude of the price elasticity of demand, the greater is the responsiveness of the quantity demanded to a given price change.
- If demand is elastic, a cut in price leads to an increase in total revenue. If demand is unit elastic, a cut in price leaves total revenue unchanged. And if demand is inelastic, a cut in price leads to a decrease in total revenue.
- Price elasticity of demand depends on how easily one good serves as a substitute for another, the proportion of income spent on the good, and the length of time elapsed since the price change.

Working Problems 1 to 5 will give you a better understanding of the price elasticity of demand.

#### More Elasticities of Demand (pp. 91–94)

- Income elasticity of demand measures the responsiveness of demand to a change in income, other things remaining the same. For a normal good, the income elasticity of demand is positive. For an inferior good, the income elasticity of demand is negative.
- When the income elasticity of demand is greater than 1 (income elastic), the percentage of income spent on the good increases as income increases.
- When the income elasticity of demand is less than 1 (income inelastic or inferior), the percentage

of income spent on the good decreases as income increases.

- Cross elasticity of demand measures the responsiveness of the demand for one good to a change in the price of a substitute or a complement, other things remaining the same.
- The cross elasticity of demand with respect to the price of a substitute is positive. The cross elasticity of demand with respect to the price of a complement is negative.

Working Problems 6 to 8 will give you a better understanding of cross and income elasticities of demand.

#### Elasticity of Supply (pp. 94–96)

- Elasticity of supply measures the responsiveness of the quantity supplied of a good to a change in its price, other things remaining the same.
- The elasticity of supply is usually positive and ranges between zero (vertical supply curve) and infinity (horizontal supply curve).
- Supply decisions have three time frames: momentary, short run, and long run.
- Momentary supply refers to the response of the quantity supplied to a price change at the instant that the price changes.
- Short-run supply refers to the response of the quantity supplied to a price change after some of the technologically feasible adjustments in production have been made.
- Long-run supply refers to the response of the quantity supplied to a price change when all the technologically feasible adjustments in production have been made.

Working Problem 9 will give you a better understanding of the elasticity of supply.

### Key Terms

Cross elasticity of demand, 92  
 Elastic demand, 86  
 Elasticity of supply, 94  
 Income elasticity of demand, 91

Inelastic demand, 85  
 Perfectly elastic demand, 85  
 Perfectly inelastic demand, 85  
 Price elasticity of demand, 84

### MyEconLab Key Terms Quiz

Total revenue, 88  
 Total revenue test, 88  
 Unit elastic demand, 85

## WORKED PROBLEM

**MyEconLab** You can work this problem in Chapter 4 Study Plan.

A rise in the price of a smoothie from \$2 to \$3 results in a fall in the quantity of smoothies demanded from 220 million to 180 million a day and at today's price of a muffin, \$1.50, the quantity of muffins demanded increases from 80 million to 100 million a day.

### Questions

- Calculate the percentage change in the price of a smoothie and the percentage change in the quantity demanded of smoothies.
- Calculate the price elasticity of demand for smoothies.
- Is the demand for smoothies elastic or inelastic?
- Calculate the cross elasticity of demand for muffins with respect to the price of a smoothie.

### Solutions

- The price of a smoothie rises by \$1 and the quantity demanded falls by 40 million a day.

To calculate the percentage changes in the price and quantity demanded use the average price and average quantity. The figure illustrates the calculations.

The average price of a smoothie is \$2.50, so the percentage change in the price was  $(\$1/\$2.50) \times 100$ , or 40 percent.

The average quantity of smoothies is 200 million, so the percentage change in the quantity demanded was  $(40 \text{ million}/200 \text{ million}) \times 100$ , or 20 percent.

**Key Point:** When working with elasticity, the percentage change in the price and quantity is the percentage of the average price and average quantity.

- The price elasticity of demand is the ratio of the percentage change in the quantity to the percentage change in price.

To calculate the price elasticity of demand for smoothies divide the percentage change in quantity by the percentage change in the price. The ratio of two percentage changes is just a number.

**Key Point:** The price elasticity calculated is the price elasticity of demand at the price midway between the original and the new prices. That is, it calculates the elasticity at the average price.

- The price elasticity of demand for smoothies is *less than* 1, so the demand is inelastic.

**Key Point:** When the percentage change in the quantity is *less than* the percentage change in the price, demand is inelastic and the price elasticity of demand is less than 1.

- To calculate the cross elasticity of demand for muffins with respect to the price of a smoothie divide the percentage change in quantity of muffins demanded by the percentage change in the price of a smoothie.

When the price of a smoothie rises by 40 percent, the quantity of muffins demanded increases from 80 million to 100 million, a change of 20 million.

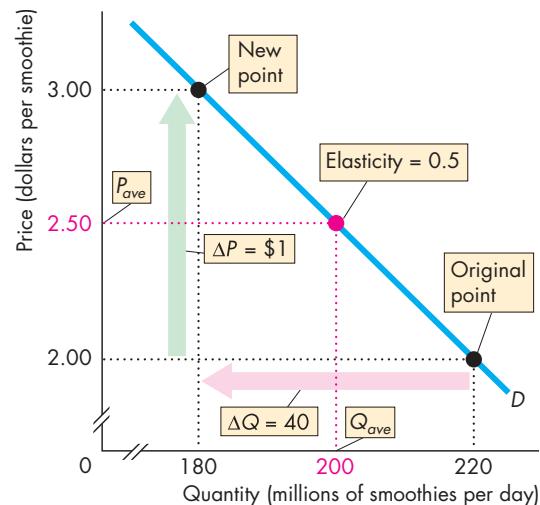
The average quantity of muffins is 90 million, so the percentage change in the quantity of muffins is  $(20 \text{ million}/90 \text{ million}) \times 100$ , which equals 22.2 percent.

The cross elasticity of demand for muffins with respect to the price of a smoothie equals 22.2 percent/40 percent, which equals 0.55.

The cross elasticity of demand for muffins with respect to the price of a smoothie is *positive*, which means that muffins and smoothies are substitutes—just as you thought!

**Key Point:** The cross elasticity of demand is positive for substitutes and negative for complements.

### Key Figure



**MyEconLab** Interactive Animation

## ◆ STUDY PLAN PROBLEMS AND APPLICATIONS

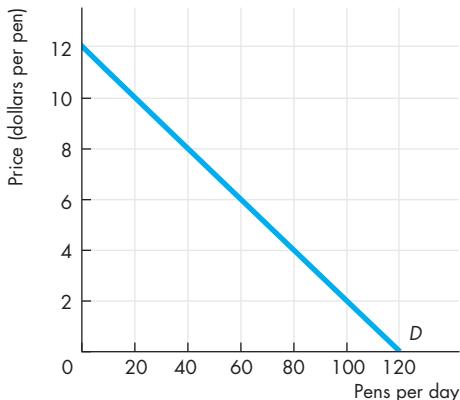
**MyEconLab** You can work Problems 1 to 9 in Chapter 4 Study Plan and get instant feedback.

### Price Elasticity of Demand (Study Plan 4.1)

1. Rain spoils the strawberry crop, the price rises from \$4 to \$6 a box, and the quantity demanded decreases from 1,000 to 600 boxes a week.
  - a. Calculate the price elasticity of demand over this price range.
  - b. Describe the demand for strawberries.
2. If the quantity of dental services demanded increases by 10 percent when the price of dental services falls by 10 percent, is the demand for dental services inelastic, elastic, or unit elastic?
3. The demand schedule for hotel rooms is:

Price (dollars per room per night)	Quantity demanded (millions of rooms per night)
200	100
250	80
400	50
500	40
800	25

- a. What happens to total revenue when the price falls from \$400 to \$250 a room per night and from \$250 to \$200 a room per night?
- b. Is the demand for hotel rooms elastic, inelastic, or unit elastic?
4. The figure shows the demand for pens.



Calculate the elasticity of demand when the price rises from \$4 to \$6 a pen. Over what price range is the demand for pens elastic?

5. In 2003, when music downloading first took off, Universal Music slashed the average price of a

CD from \$21 to \$15. The company expected the price cut to boost the quantity of CDs sold by 30 percent, other things remaining the same.

- a. What was Universal Music's estimate of the price elasticity of demand for CDs?
- b. If you were making the pricing decision at Universal Music, what would be your pricing decision? Explain your decision.

### More Elasticities of Demand (Study Plan 4.2)

6. When Judy's income increased from \$130 to \$170 a week, she increased her demand for concert tickets by 15 percent and decreased her demand for bus rides by 10 percent. Calculate Judy's income elasticity of demand for (a) concert tickets and (b) bus rides.
7. If a 12 percent rise in the price of orange juice decreases the quantity of orange juice demanded by 22 percent and increases the quantity of apple juice demanded by 14 percent, calculate the:
  - a. Price elasticity of demand for orange juice.
  - b. Cross elasticity of demand for apple juice with respect to the price of orange juice.
8. If a rise in the price of sushi from 98¢ to \$1.02 a piece decreases the quantity of soy sauce demanded from 101 units to 99 units an hour and decreases the quantity of sushi demanded by 1 percent an hour, calculate the:
  - a. Price elasticity of demand for sushi.
  - b. Cross elasticity of demand for soy sauce with respect to the price of sushi.

### Elasticity of Supply (Study Plan 4.3)

9. The table sets out the supply schedule of jeans.

Price (dollars per pair)	Quantity supplied (millions of pairs per year)
120	24
125	28
130	32
135	36

- a. Calculate the elasticity of supply when the price rises from \$125 to \$135 a pair.
- b. Calculate the elasticity of supply when the average price is \$125 a pair.
- c. Is the supply of jeans elastic, inelastic, or unit elastic?



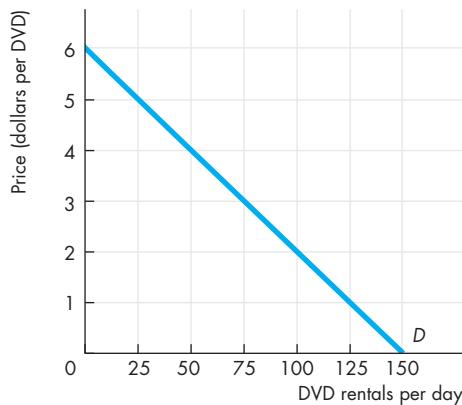
## ADDITIONAL PROBLEMS AND APPLICATIONS

### MyEconLab

You can work these problems in MyEconLab if assigned by your instructor.

#### Price Elasticity of Demand

10. With higher fuel costs, airlines raised their average fare from 75¢ to \$1.25 per passenger kilometre and the number of passenger kilometres decreased from 2.5 million a day to 1.5 million a day.
  - a. What is the price elasticity of demand for air travel over this price range?
  - b. Describe the demand for air travel.
11. The figure shows the demand for DVD rentals.



- a. Calculate the elasticity of demand when the price of a DVD rental rises from \$3 to \$5.
- b. At what price is the elasticity of demand for DVD rentals equal to 1?

Use the following table to work Problems 12 to 14. The demand schedule for computer chips is:

Price (dollars per chip)	Quantity demanded (millions of chips per year)
200	50
250	45
300	40
350	35
400	30

12. a. What happens to total revenue if the price falls from \$400 to \$350 a chip and from \$350 to \$300 a chip?  
b. At what price is total revenue at a maximum?
13. At an average price of \$350, is the demand for chips elastic, inelastic, or unit elastic? Use the total revenue test to answer this question.
14. At \$250 a chip, is the demand for chips elastic or inelastic? Use the total revenue test to answer this question.

15. Your price elasticity of demand for bananas is 4. If the price of bananas rises by 5 percent, what is:

- a. The percentage change in the quantity of bananas you buy?
- b. The change in your expenditure on bananas?

#### As Gasoline Prices Soar, Drivers Slowly Adapt

As gas prices rose in March 2008, people drove shorter distances than in March 2007. Realizing that prices were not going down, drivers adapted to higher energy costs. We spend 3.7 percent of disposable income on transportation fuels. How much we spend on gasoline depends on the choices we make: what car we drive, where we live, how much time we spend driving, and where we choose to go. For many people, higher energy costs mean fewer restaurant meals, deferred weekend outings with the kids, less air travel, and more time closer to home.

Source: *International Herald Tribune*, May 23, 2008

- a. List and explain the elasticities of demand that are implicitly referred to in the news clip.
- b. Why, according to the news clip, is the demand for gasoline inelastic?

#### More Elasticities of Demand

Use this information to work Problems 17 and 18.

##### Economy Forces Many to Shorten Holiday Plans

This year Americans are taking fewer exotic holidays by air and instead are visiting local scenic places by car. The global financial crisis has encouraged many Americans to cut their holiday budgets.

Source: *USA Today*, May 22, 2009

17. Given the prices of the two holidays, is the income elasticity of demand for exotic holidays positive or negative? Are exotic holidays a normal good or an inferior good? Are local holidays a normal good or an inferior good?
18. Are exotic holidays and local holidays substitutes? Explain your answer.
19. When Alex's income was \$3,000, he bought 4 bagels and 12 donuts a month. Now his income is \$5,000 and he buys 8 bagels and 6 donuts a month. Calculate Alex's income elasticity of demand for (a) bagels and (b) donuts.

**20. Walmart's Recession-Time Pet Project**

During the recession, Walmart moved its pet food and supplies to the front with its other fast-growing business, baby products. Retail experts point out that kids and pets tend to be fairly recession-resistant businesses—even in a recession, dogs will be fed and kids will get their toys.

Source: CNN, May 13, 2008

- What does this news clip imply about the income elasticity of demand for pet food and baby products?
  - Would the income elasticity of demand be greater or less than 1? Explain.
21. If a 5 percent fall in the price of chocolate sauce increases the quantity demanded of chocolate sauce by 10 percent and increases the quantity of ice cream demanded by 15 percent, calculate the:
- Price elasticity of demand for chocolate sauce.
  - Cross elasticity of demand for ice cream with respect to the price of chocolate sauce.

**22. To Love, Honour, and Save Money**

In a survey of caterers and event planners, nearly half of them said that they were seeing declines in wedding spending in response to the economic slowdown; 12% even reported wedding cancellations because of financial concerns.

Source: *Time*, June 2, 2008

- Based upon this news clip, are wedding events a normal good or an inferior good? Explain.
- Are wedding events more a necessity or a luxury? Would the income elasticity of demand be greater than 1, less than 1, or equal to 1? Explain.

**Elasticity of Supply**

23. The table sets out the supply schedule of long-distance phone calls.

Price (cents per minute)	Quantity supplied (millions of minutes per day)
10	200
20	400
30	600
40	800

Calculate the elasticity of supply when:

- The price falls from 40¢ to 30¢ a minute.
- The average price is 20¢ a minute.

**24. Weak Coal Prices Hit China's Third-Largest Coal Miner**

The chairman of Yanzhou Coal Mining reported that the recession had decreased the demand for coal, with its sales falling by 11.9 percent to 7.92 million tonnes from 8.99 million tonnes a year earlier, despite a 10.6 percent cut in the price.

Source: Dow Jones, April 27, 2009

Calculate the price elasticity of supply of coal. Is the supply of coal elastic or inelastic?

**Economics in the News**

25. After you have studied *Economics in the News* on pp. 98–99, answer the following questions.
- Looking at Fig. 1 on p. 99, explain what must have happened in 2014 to the supply of coffee.
  - Given the information in Fig. 1 and the estimated elasticity of demand for coffee, by what percentage did the quantity of coffee change in 2014 and in which direction?
  - The news article says that farmers' revenue shrank as the price of coffee fell. Explain why this fact tells us that the demand for coffee is inelastic.
  - How does the total revenue test work for a rise in the price? What do you predict happened to total revenue in 2014? Why?
  - Coffee isn't just coffee. It comes in different varieties, the main two being Arabica and Robusta. Would you expect the elasticity of demand for Arabica to be the same as the elasticity of demand for coffee? Explain why or why not.

**26. Comcast Deal Won't Lead to Netflix Price Hike**

Under the deal, Netflix will buy Internet service from Comcast, rather than connect directly for free with some smaller ISPs like Cablevision as it does now.

Source: CNN, April 24, 2014

- How will Netflix's decision to buy more expensive Internet service influence Netflix's supply of online movie viewing?
- Given your answer to part (a), explain why Netflix says it will not hike its price.
- What can you say about the price elasticity of demand for Netflix online movie viewing?



# 5

## EFFICIENCY AND EQUITY

After studying this chapter,  
you will be able to:

- ◆ Describe the alternative methods of allocating scarce resources
- ◆ Explain the connection between demand and marginal benefit and define consumer surplus; and explain the connection between supply and marginal cost and define producer surplus
- ◆ Explain the conditions under which markets are efficient and inefficient
- ◆ Explain the main ideas about fairness and evaluate claims that markets result in unfair outcomes

**Every day, millions of people make self-interested** choices to drive to work rather than take the bus or train. The outcome of these choices is gridlock and a lot of lost time. Are we using our highways and our time efficiently?

One way of eliminating traffic jams is to make people pay for road use—to make all the highways toll-roads. Rich people can easily pay a toll, but poor people can't afford to pay. Would tolls be fair?

We'll answer these questions about highway use in *Economics in the News* at the end of the chapter. But first, we examine the efficiency and fairness of alternative ways of allocating scarce resources.

## Resource Allocation Methods

If resources were abundant, and not scarce, we would not need to allocate them among alternative uses. But resources *are* scarce: They must be allocated somehow. Our goal is to discover how resources might be allocated efficiently and fairly. So what are the alternative methods of allocating scarce resources?

Eight alternative methods that might be used are:

- Market price
- Command
- Majority rule
- Contest
- First-come, first-served
- Lottery
- Personal characteristics
- Force

Let's briefly examine each method.

### Market Price

When a market price allocates a scarce resource, the people who are willing and able to pay that price get the resource. Two kinds of people decide not to pay the market price: those who can afford to pay but choose not to buy and those who are too poor and simply can't afford to buy.

For many goods and services, distinguishing between those who choose not to buy and those who can't afford to buy doesn't matter. But for a few items, it does matter. For example, poor people can't afford to pay school fees and doctors' fees. Because poor people can't afford items that most people consider to be essential, these items are usually allocated by one of the other methods.

### Command

A **command system** allocates resources by the order (command) of someone in authority. In the Canadian economy, the command system is used extensively inside firms and government departments. For example, if you have a job, most likely someone tells you what to do. Your labour is allocated to specific tasks by a command.

A command system works well in organizations in which the lines of authority and responsibility are clear and it is easy to monitor the activities being

performed. But a command system works badly when the range of activities to be monitored is large and when it is easy for people to fool those in authority. North Korea uses a command system and it works so badly that it even fails to deliver an adequate supply of food.

### Majority Rule

Majority rule allocates resources in the way that a majority of voters choose. Societies use majority rule to elect representative governments that make some of the biggest decisions. For example, majority rule decides the tax rates that end up allocating scarce resources between private use and public use. And majority rule decides how tax dollars are allocated among competing uses such as education and healthcare.

Majority rule works well when the decisions being made affect large numbers of people and self-interest must be suppressed to use resources most effectively.

### Contest

A contest allocates resources to a winner (or a group of winners). Sporting events use this method. Milos Raonic competes with other tennis professionals, and the winner gets the biggest payoff. But contests are more general than those in a sports arena, though we don't normally call them contests. For example, Bill Gates won a contest to provide the world's personal computer operating system.

Contests do a good job when the efforts of the "players" are hard to monitor and reward directly. When a manager offers everyone in the company the opportunity to win a big prize, people are motivated to work hard and try to become the winner. Only a few people end up with a big prize, but many people work harder in the process of trying to win. The total output produced by the workers is much greater than it would be without the contest.

### First-Come, First-Served

A first-come, first-served method allocates resources to those who are first in line. Many casual restaurants won't accept reservations. They use first-come, first-served to allocate their scarce tables. Highway space is allocated in this way too: The first to arrive at the on-ramp gets the road space. If too many

vehicles enter the highway, the speed slows and people wait in line for some space to become available.

First-come, first-served works best when, as in the above examples, a scarce resource can serve just one user at a time in a sequence. By serving the user who arrives first, this method minimizes the time spent waiting for the resource to become free.

## Lottery

Lotteries allocate resources to those who pick the winning number, draw the lucky cards, or come up lucky on some other gaming system. State lotteries and casinos reallocate millions of dollars worth of goods and services every year.

But lotteries are more widespread than jackpots and roulette wheels in casinos. They are used to allocate landing slots to airlines at some airports, places in the New York and Boston marathons, and have been used to allocate fishing rights and the electromagnetic spectrum used by cellphones.

Lotteries work best when there is no effective way to distinguish among potential users of a scarce resource.

## Personal Characteristics

When resources are allocated on the basis of personal characteristics, people with the “right” characteristics get the resources. Some of the resources that matter most to you are allocated in this way. For example, you will choose a marriage partner on the basis of personal characteristics. But this method can also be used in unacceptable ways. Allocating the best jobs to white, Anglo-Saxon males and discriminating against visible minorities and women is an example.

## Force

Force plays a crucial role, for both good and ill, in allocating scarce resources. Let’s start with the ill.

War, the use of military force by one nation against another, has played an enormous role historically in allocating resources. The economic supremacy of European settlers in the Americas and Australia owes much to the use of this method.

Theft, the taking of the property of others without their consent, also plays a large role. Both large-scale organized crime and small-scale petty crime collectively allocate billions of dollars worth of resources annually.

But force plays a crucial positive role in allocating resources. It provides the state with an effective method of transferring wealth from the rich to the poor, and it provides the legal framework in which voluntary exchange in markets takes place.

A legal system is the foundation on which our market economy functions. Without courts to enforce contracts, it would not be possible to do business. But the courts could not enforce contracts without the ability to apply force if necessary. The state provides the ultimate force that enables the courts to do their work.

More broadly, the force of the state is essential to uphold the principle of the rule of law. This principle is the bedrock of civilized economic (and social and political) life. With the rule of law upheld, people can go about their daily economic lives with the assurance that their property will be protected—that they can sue for violations against their property (and be sued if they violate the property of others).

Free from the burden of protecting their property and confident in the knowledge that those with whom they trade will honour their agreements, people can get on with focusing on the activity in which they have a comparative advantage and trading for mutual gain.

## REVIEW QUIZ

- 1 Why do we need methods of allocating scarce resources?
- 2 Describe the alternative methods of allocating scarce resources.
- 3 Provide an example of each allocation method that illustrates when it works well.
- 4 Provide an example of each allocation method that illustrates when it works badly.

Work these questions in Study Plan 5.1 and get instant feedback. Do a Key Terms Quiz. [MyEconLab](#)

In the next sections, we’re going to see how a market can achieve an efficient use of resources, examine the obstacles to efficiency, and see how sometimes an alternative method might improve on the market. After looking at efficiency, we’ll turn our attention to the more difficult issue of fairness.

## Benefit, Cost, and Surplus

Resources are allocated efficiently and in the *social interest* when they are used in the ways that people value most highly. You saw in Chapter 2 that this outcome occurs when the quantities produced are at the point on the *PPF* at which marginal benefit equals marginal cost (see pp. 35–37). We're now going to see whether competitive markets produce the efficient quantities.

We begin on the demand side of a market.

### Demand, Willingness to Pay, and Value

In everyday life, we talk about “getting value for money.” When we use this expression, we are distinguishing between *value* and *price*. Value is what we get, and price is what we pay.

The value of one more unit of a good or service is its marginal benefit. We measure marginal benefit by the maximum price that is willingly paid for another unit of the good or service. But willingness to pay determines demand. *A demand curve is a marginal benefit curve.*

In Fig. 5.1(a), Lisa is willing to pay \$1 for the 30th slice of pizza and \$1 is her marginal benefit from that slice. In Fig. 5.1(b), Nick is willing to pay \$1 for the 10th slice of pizza and \$1 is his marginal benefit from that slice. But at what quantity is the market willing to pay \$1 for the marginal slice? The answer is provided by the *market demand curve*.

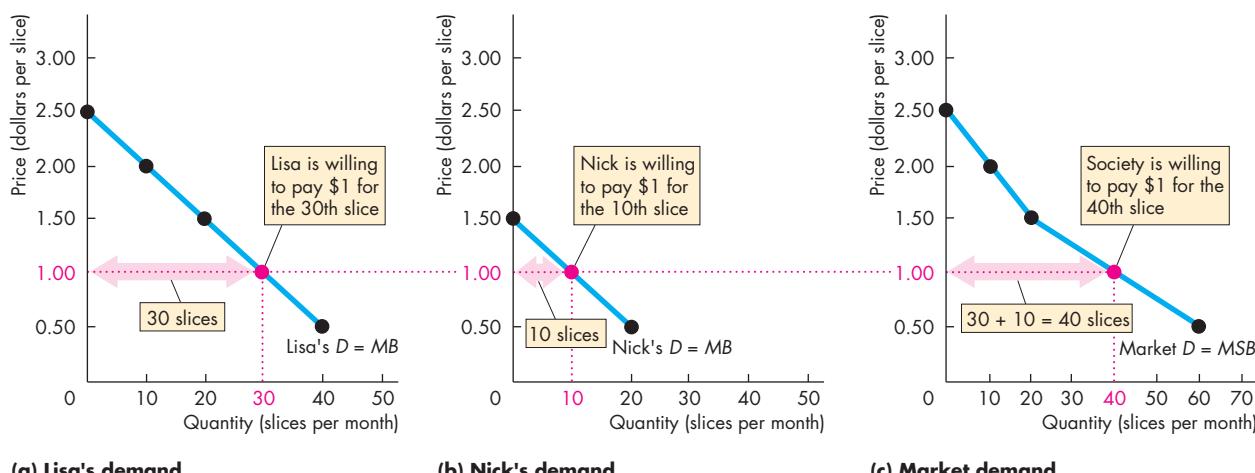
### Individual Demand and Market Demand

The relationship between the price of a good and the quantity demanded by one person is called *individual demand*. And the relationship between the price of a good and the quantity demanded by all buyers is called *market demand*.

The market demand curve is the horizontal sum of the individual demand curves and is formed by adding the quantities demanded by all the individuals at each price.

Figure 5.1(c) illustrates the market demand for pizza if Lisa and Nick are the only people in the market. Lisa's demand curve in part (a) and Nick's demand curve in part (b) sum horizontally to the market demand curve in part (c).

**FIGURE 5.1** Individual Demand, Market Demand, and Marginal Social Benefit



**(a) Lisa's demand**

**(b) Nick's demand**

**(c) Market demand**

At a price of \$1 a slice, the quantity demanded by Lisa is 30 slices and the quantity demanded by Nick is 10 slices, so the quantity demanded by the market is 40 slices. Lisa's demand

curve in part (a) and Nick's demand curve in part (b) sum horizontally to the market demand curve in part (c). The market demand curve is the marginal social benefit (MSB) curve.

**MyEconLab Animation**

At a price of \$1 a slice, Lisa demands 30 slices and Nick demands 10 slices, so the market quantity demanded at \$1 a slice is 40 slices.

For Lisa and Nick, their demand curves are their marginal benefit curves. For society, the market demand curve is the marginal benefit curve. We call the marginal benefit to the entire society *marginal social benefit*. So the market demand curve is also the *marginal social benefit (MSB) curve*.

## Consumer Surplus

We don't always have to pay as much as we are willing to pay. We get a bargain. When people buy something for less than it is worth to them, they receive a consumer surplus. **Consumer surplus** is the excess of the benefit received from a good over the amount paid for it. We can calculate consumer surplus as the marginal benefit (or value) of a good minus its price, summed over the quantity bought.

Figure 5.2(a) shows Lisa's consumer surplus from pizza when the price is \$1 a slice. At this price, she buys 30 slices a month because the 30th slice is worth exactly \$1 to her. But Lisa is willing to pay \$2 for the 10th slice, so her marginal benefit from this slice is

\$1 more than she pays for it—she receives a surplus of \$1 on the 10th slice.

Lisa's consumer surplus is the sum of the surpluses on *all of the slices she buys*. This sum is the area of the green triangle—the area below the demand curve and above the market price line. The area of this triangle is equal to its base (30 slices) multiplied by its height (\$1.50) divided by 2, which is \$22.50. The area of the blue rectangle in Fig. 5.2(a) shows what Lisa pays for 30 slices of pizza.

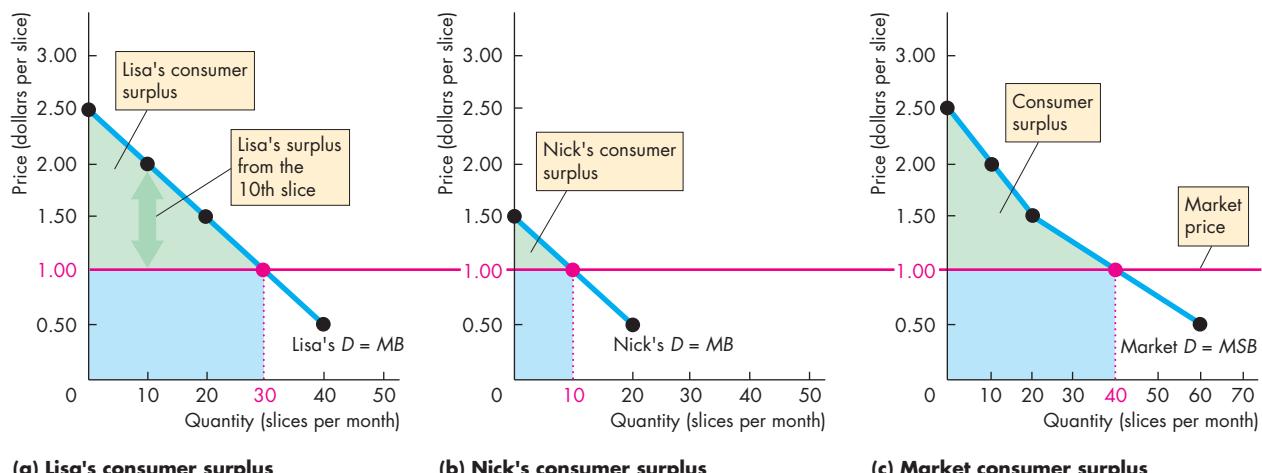
Figure 5.2(b) shows Nick's consumer surplus, and part (c) shows the consumer surplus for the market. The consumer surplus for the market is the sum of the consumer surpluses of Lisa and Nick.

All goods and services have decreasing marginal benefit, so people receive more benefit from their consumption than the amount they pay.

## Supply and Marginal Cost

Your next task is to see how market supply reflects marginal cost. The connection between supply and cost closely parallels the related ideas about demand and benefit that you've just studied. Firms are in business to make a profit. To do so, they must sell

**FIGURE 5.2** Demand and Consumer Surplus



**(a) Lisa's consumer surplus**

Lisa is willing to pay \$2 for her 10th slice of pizza in part (a). At a market price of \$1 a slice, Lisa receives a surplus of \$1 on the 10th slice. The green triangle shows her consumer surplus on the 30 slices she buys at \$1 a slice. The

**(b) Nick's consumer surplus**

green triangle in part (b) shows Nick's consumer surplus on the 10 slices that he buys at \$1 a slice. The green area in part (c) shows the consumer surplus for the market. The blue rectangles show the amounts spent on pizza.

their output for a price that exceeds the cost of production. Let's investigate the relationship between cost and price.

### Supply, Cost, and Minimum Supply-Price

Firms make a profit when they receive more from the sale of a good or service than the cost of producing it. Just as consumers distinguish between value and price, so producers distinguish between *cost* and *price*. Cost is what a firm gives up when it produces a good or service and price is what a firm receives when it sells the good or service.

The cost of producing one more unit of a good or service is its marginal cost. Marginal cost is the minimum price that producers must receive to induce them to offer one more unit of a good or service for sale. But the minimum supply-price determines supply. *A supply curve is a marginal cost curve.*

In Fig. 5.3(a), Maria is willing to produce the 100th pizza for \$15, her marginal cost of that pizza. In Fig. 5.3(b), Max is willing to produce the 50th pizza for \$15, his marginal cost.

What quantity is this market willing to produce for \$15 a pizza? The answer is provided by the *market supply curve*.

### Individual Supply and Market Supply

The relationship between the price of a good and the quantity supplied by one producer is called *individual supply*. And the relationship between the price of a good and the quantity supplied by all producers is called *market supply*.

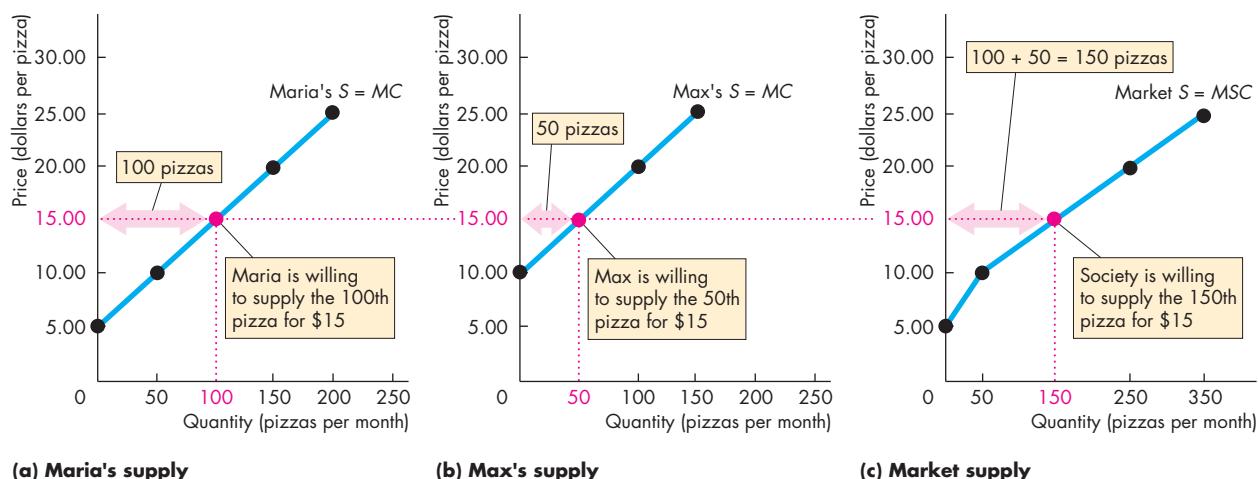
The market supply curve is the horizontal sum of the individual supply curves and is formed by adding the quantities supplied by all the producers at each price.

Figure 5.3(c) illustrates the market supply of pizzas if Maria and Max are the only producers. Maria's supply curve in part (a) and Max's supply curve in part (b) sum horizontally to the market supply curve in part (c).

At a price of \$15 a pizza, Maria supplies 100 pizzas and Max supplies 50 pizzas, so the quantity supplied by the market at \$15 a pizza is 150 pizzas.

For Maria and Max, their supply curves are their marginal cost curves. For society, the market supply curve is its marginal cost curve. We call the society's marginal cost *marginal social cost*. So the market supply curve is also the *marginal social cost (MSC) curve*.

**FIGURE 5.3** Individual Supply, Market Supply, and Marginal Social Cost



At a price of \$15 a pizza, the quantity supplied by Maria is 100 pizzas and the quantity supplied by Max is 50 pizzas, so the quantity supplied by the market is 150 pizzas. Maria's

supply curve in part (a) and Max's supply curve in part (b) sum horizontally to the market supply curve in part (c). The market supply curve is the marginal social cost (MSC) curve.

## Producer Surplus

When price exceeds marginal cost, the firm receives a producer surplus. **Producer surplus** is the excess of the amount received from the sale of a good or service over the cost of producing it. We calculate producer surplus as the price received minus the marginal cost (or minimum supply-price), summed over the quantity sold.

Figure 5.4(a) shows Maria's producer surplus from pizza when the price is \$15 a pizza. At this price, she sells 100 pizzas a month because the 100th pizza costs her \$15 to produce. But Maria is willing to produce the 50th pizza for her marginal cost, which is \$10, so she receives a surplus of \$5 on this pizza.

Maria's producer surplus is the sum of the surpluses on the pizzas she sells. This sum is the area of the blue triangle—the area below the market price and above the supply curve. The area of this triangle is equal to its base (100) multiplied by its height (\$10) divided by 2, which is \$500.

The red area below the supply curve in Fig. 5.4(a) shows what it costs Maria to produce 100 pizzas.

The area of the blue triangle in Fig. 5.4(b) shows Max's producer surplus and the blue area in Fig. 5.4(c) shows the producer surplus for the market.

The producer surplus for the market is the sum of the producer surpluses of Maria and Max.

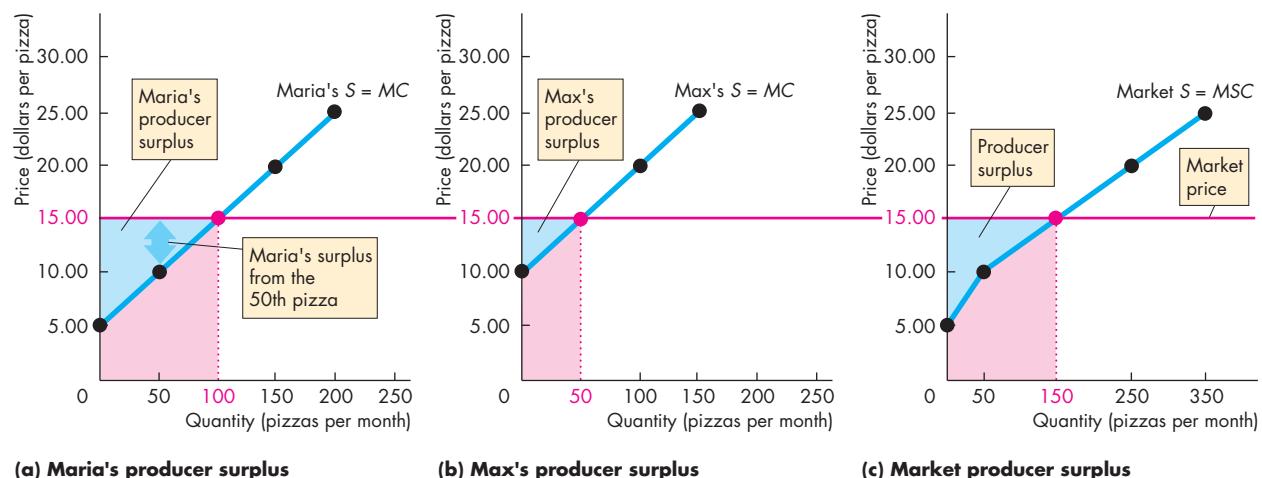
## REVIEW QUIZ

- 1 What is the relationship between the marginal benefit, value, and demand?
- 2 What is the relationship between individual demand and market demand?
- 3 What is consumer surplus? How is it measured?
- 4 What is the relationship between the marginal cost, minimum supply-price, and supply?
- 5 What is the relationship between individual supply and market supply?
- 6 What is producer surplus? How is it measured?

Work these questions in Study Plan 5.2 and get instant feedback. Do a Key Terms Quiz. **MyEconLab**

Consumer surplus and producer surplus can be used to measure the efficiency of a market. Let's see how we can use these concepts to study the efficiency of a competitive market.

**FIGURE 5.4** Supply and Producer Surplus



**(a) Maria's producer surplus**

**(b) Max's producer surplus**

**(c) Market producer surplus**

Maria is willing to produce the 50th pizza for \$10 in part (a). At a market price of \$15 a pizza, Maria gets a surplus of \$5 on the 50th pizza. The blue triangle shows her producer surplus on the 100 pizzas she sells at \$15 each.

The blue triangle in part (b) shows Max's producer surplus on the 50 pizzas that he sells at \$15 each. The blue area in part (c) shows producer surplus for the market. The red areas show the cost of producing the pizzas sold.

**MyEconLab Animation and Draw Graph**

## Is the Competitive Market Efficient?

Figure 5.5(a) shows the market for pizza. The market forces that you studied in Chapter 3 (pp. 66–67) pull the pizza market to its equilibrium price of \$15 a pizza and equilibrium quantity of 10,000 pizzas a day. Buyers enjoy a consumer surplus (green area) and sellers enjoy a producer surplus (blue area), but is this competitive equilibrium efficient?

### Efficiency of Competitive Equilibrium

You've seen that the market demand curve for a good or service tells us the marginal social benefit from it. You've also seen that the market supply curve of a good or service tells us the marginal social cost of producing it.

Equilibrium in a competitive market occurs when the quantity demanded equals the quantity supplied at the intersection of the demand curve and the supply curve. At this intersection point, marginal social benefit on the demand curve equals marginal social cost on the supply curve. This equality is the condition for allocative efficiency. So in equilibrium, a competitive market achieves allocative efficiency.

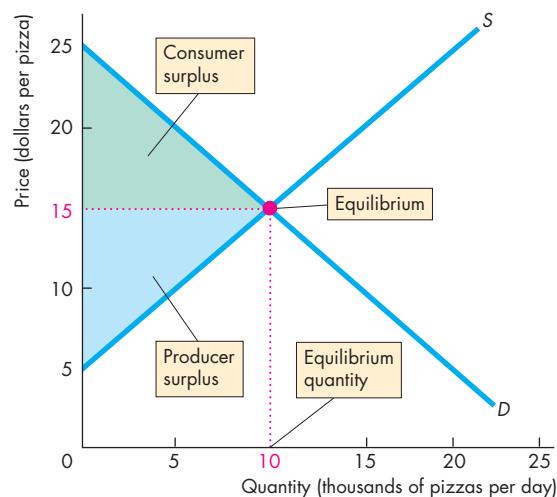
Figure 5.5 illustrates the efficiency of competitive equilibrium. The demand curve and the supply curve intersect in part (a) and marginal social benefit equals marginal social cost in part (b).

If production is less than 10,000 pizzas a day, the marginal pizza is valued more highly than it costs to produce. If production exceeds 10,000 pizzas a day, the marginal pizza costs more to produce than the value that consumers place on it. Only when 10,000 pizzas a day are produced is the marginal pizza worth exactly what it costs.

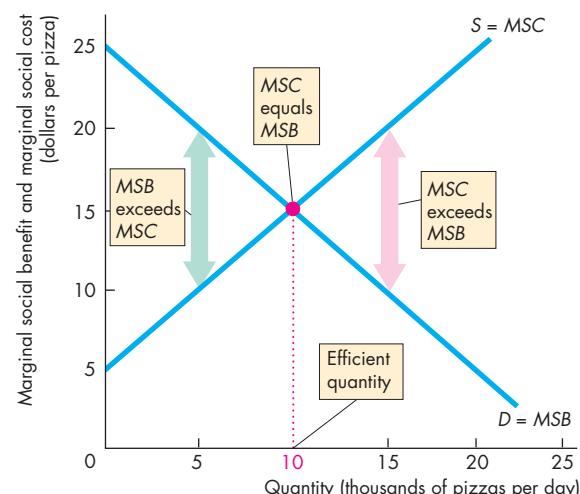
The competitive market pushes the quantity of pizzas produced to its efficient level of 10,000 a day. If production is less than 10,000 pizzas a day, a shortage raises the price, which increases production. If production exceeds 10,000 pizzas a day, a surplus of pizzas lowers the price, which decreases production. So a competitive pizza market is efficient.

Figure 5.5(a) also shows the consumer surplus and producer surplus. The sum of consumer surplus and producer surplus is called **total surplus**. When the efficient quantity is produced, total surplus is maximized. Buyers and sellers acting in their self-interest end up promoting the social interest.

**FIGURE 5.5** An Efficient Market for Pizza



**(a) Equilibrium and surpluses**



**(b) Efficiency**

Competitive equilibrium in part (a) occurs when the quantity demanded equals the quantity supplied. Resources are used efficiently in part (b) when marginal social benefit,  $MSB$ , equals marginal social cost,  $MSC$ . Total surplus, which is the sum of consumer surplus (the green triangle) and producer surplus (the blue triangle), is maximized.

The efficient quantity in part (b) is the same as the equilibrium quantity in part (a). The competitive pizza market produces the efficient quantity of pizzas.

**MyEconLab Animation and Draw Graph**

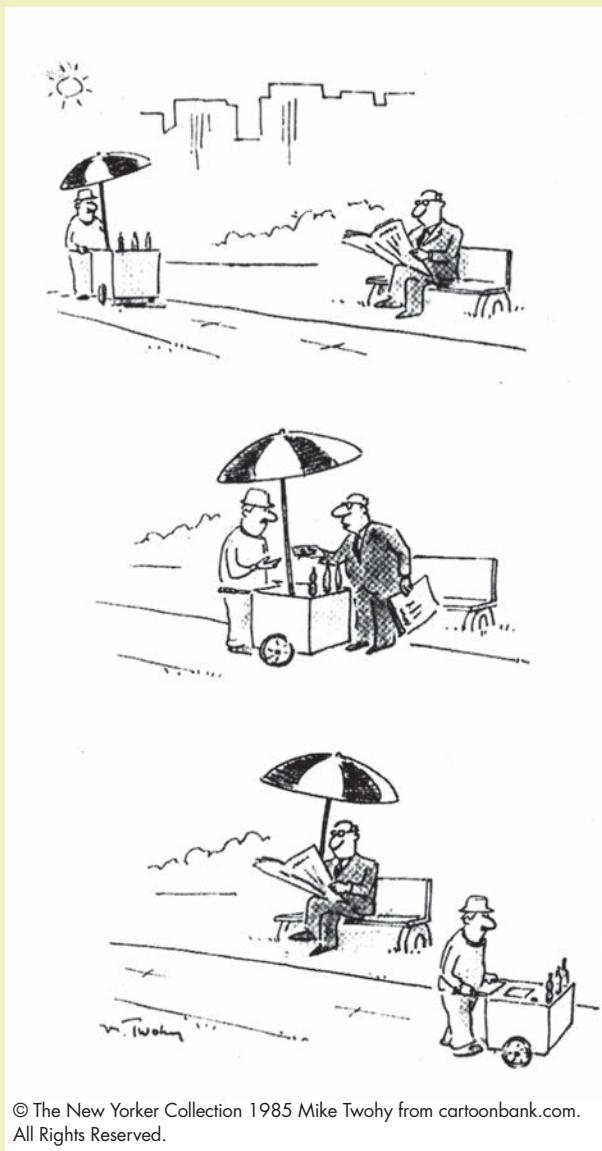
## Economics in Action

### Seeing the Invisible Hand

Adam Smith said that a seller in a competitive market is “led by *an invisible hand* to promote an end which was no part of his intention” (see p. 8). Smith believed that the invisible hand sends resources to the uses in which they have the highest value.

You can’t *see* the invisible hand, but you can imagine it, and you can see its consequences in the cartoon and in today’s world.

**Umbrella for Sale** The cold drinks vendor has cold drinks and shade and he has a marginal cost and a minimum supply-price of each. The reader on the park bench has a marginal benefit and willingness



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to pay for each. The reader’s marginal benefit from shade exceeds the vendor’s marginal cost; but the vendor’s marginal cost of a cold drink exceeds the reader’s marginal benefit. They trade the umbrella. The vendor gets a producer surplus from selling the shade for more than its marginal cost, and the reader gets a consumer surplus from buying the shade for less than its marginal benefit. Both are better off and the umbrella has moved to a higher-valued use.

**The Invisible Hand at Work Today** Many of the markets in which you trade work like that in the cartoon to achieve an efficient allocation of resources.

When you order a pizza for home delivery, you make a choice about how scarce resources will be used. You make your choice in your self-interest. The pizza cook and the person who delivers your pizza also make their choices in their self-interest.

The pizza market coordinates these choices. You buy the quantity of pizza that makes the price you pay equal to your marginal benefit. And the pizza producer sells the quantity at which the price equals his marginal cost. Total surplus is maximized in an efficient pizza market.



## Market Failure

Markets are not always efficient, and when a market is inefficient, we call the outcome **market failure**. In a market failure, either too little (underproduction) or too much (overproduction) of an item is produced.

**Underproduction** In Fig. 5.6(a), the quantity of pizzas produced is 5,000 a day. At this quantity, consumers are willing to pay \$20 for a pizza that costs only \$10 to produce. The quantity produced is inefficient—there is underproduction—and total surplus is smaller than its maximum possible level.

We measure the scale of inefficiency by **deadweight loss**, which is the decrease in total surplus that results from an inefficient level of production. The grey triangle in Fig. 5.6(a) shows the deadweight loss.

**Overproduction** In Fig. 5.6(b), the quantity of pizzas produced is 15,000 a day. At this quantity, consumers are willing to pay only \$10 for a pizza that costs \$20 to produce. By producing the 15,000th pizza, \$10 of resources are wasted. Again, the grey triangle shows the deadweight loss, which reduces the total surplus to less than its maximum.

Inefficient production creates a deadweight loss that is borne by the entire society: It is a social loss.

## Sources of Market Failure

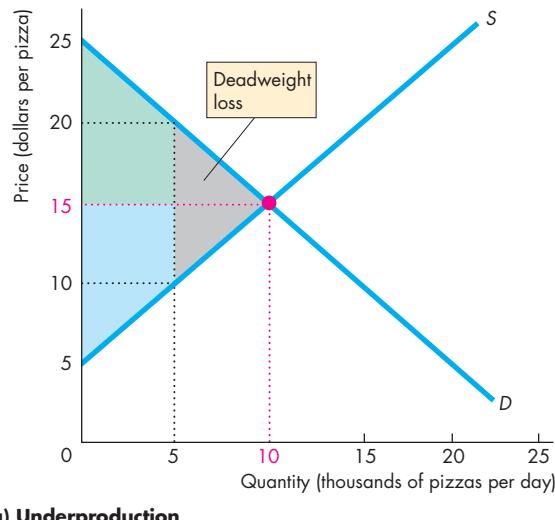
Obstacles to efficiency that bring market failure are:

- Price and quantity regulations
- Taxes and subsidies
- Externalities
- Public goods and common resources
- Monopoly
- High transactions costs

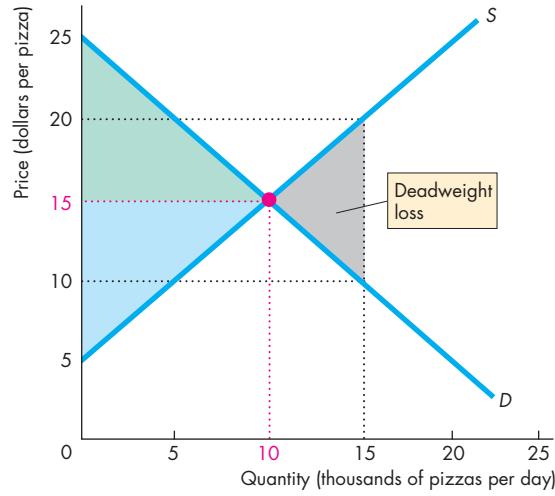
**Price and Quantity Regulations** A *price regulation*, either a price cap or a price floor, blocks the price adjustments that balance the quantity demanded and the quantity supplied and lead to underproduction. A *quantity regulation* that limits the amount that a farm is permitted to produce also leads to underproduction.

**Taxes and Subsidies** *Taxes* increase the prices paid by buyers, lower the prices received by sellers, and lead to underproduction. *Subsidies*, which are payments by the government to producers, decrease the prices paid by buyers, increase the prices received by sellers, and lead to overproduction.

**FIGURE 5.6** Underproduction and Overproduction



(a) Underproduction



(b) Overproduction

If 5,000 pizzas a day are produced, in part (a), total surplus (the sum of the green and blue areas) is smaller than its maximum by the amount of the deadweight loss (the grey triangle). At all quantities below 10,000 pizzas a day, the benefit from one more pizza exceeds its cost.

If 15,000 pizzas a day are produced, in part (b), total surplus is also smaller than its maximum by the amount of the deadweight loss. At all quantities in excess of 10,000 pizzas a day, the cost of one more pizza exceeds its benefit.

**MyEconLab Animation and Draw Graph**

**Externalities** An *externality* is a cost or a benefit that affects someone other than the seller or the buyer. An *external cost* arises when an electric utility burns coal and emits carbon dioxide. The utility doesn't consider the cost of climate change when it decides how much power to produce. The result is overproduction. An *external benefit* arises when an apartment owner installs a smoke detector and decreases her neighbour's fire risk. She doesn't consider the benefit to her neighbour when she decides how many detectors to install. The result is underproduction.

**Public Goods and Common Resources** A *public good* is a good or service from which everyone benefits and no one can be excluded. National defence is an example. A competitive market would underproduce national defence because everyone would try to free ride on everyone else.

A *common resource* is owned by no one but is available to be used by everyone. Atlantic salmon is an example. It is in everyone's self-interest to ignore the costs they impose on others when they decide how much of a common resource to use: It is overused.

**Monopoly** A *monopoly* is a firm that is the sole provider of a good or service. Local water supply and cable television are supplied by firms that are monopolies. The monopoly's self-interest is to maximize its profit, and because it has no competitors, it produces too little and charges too high a price: It underproduces.

**High Transactions Costs** When you buy your first house, you will also buy the services of an agent and a lawyer to do the transaction. Economists call the costs of the services that enable a market to bring buyers and sellers together **transactions costs**. It is costly to operate *any* market, but some markets are so costly to operate that they simply don't. For example, there's no market in time slots on a local tennis court. Instead, the court uses first-come, first-served: You hang around until the court becomes vacant and "pay" with your waiting time. When transactions costs are high, the market might underproduce.

You now know the conditions under which resource allocation is efficient. You've seen how a competitive market can be efficient, and you've seen some obstacles to efficiency. Can alternative allocation methods improve on the market?

## Alternatives to the Market

When a market is inefficient, can one of the alternative nonmarket methods that we described at the beginning of this chapter do a better job? Sometimes it can.

Often, majority rule might be used in an attempt to improve the allocation of resources. But majority rule has its own shortcomings. A group that pursues the self-interest of its members can become the majority. For example, a price or quantity regulation that creates inefficiency is almost always the result of a self-interested group becoming the majority and imposing costs on the minority. Also, with majority rule, votes must be translated into actions by bureaucrats who have their own agendas based on their self-interest.

Managers in firms issue commands and avoid the transactions costs that they would incur if they went to a market every time they needed a job done.

First-come, first-served works best in some situations. Think about the scene at a busy ATM. Instead of waiting in line people might trade places at a "market" price. But someone would need to ensure that trades were honoured. At a busy ATM, first-come, first-served is the most efficient arrangement.

There is no one efficient mechanism that allocates all resources efficiently. But markets, when supplemented by other mechanisms such as majority rule, command systems, and first-come, first-served, do an amazingly good job.

## REVIEW QUIZ

- 1 Do competitive markets use resources efficiently? Explain why or why not.
- 2 What is deadweight loss and under what conditions does it occur?
- 3 What are the obstacles to achieving an efficient allocation of resources in the market economy?

Work these questions in Study Plan 5.3 and get instant feedback. Do a Key Terms Quiz. **MyEconLab**

Is an efficient allocation of resources also a fair allocation? Does the competitive market provide people with fair incomes for their work? Do people always pay a fair price for the things they buy? Don't we need the government to step into some competitive markets to prevent the price from rising too high or falling too low? Let's now study these questions.



## Is the Competitive Market Fair?

When a natural disaster strikes, such as a severe winter storm or a hurricane, the prices of many essential items jump. The reason prices jump is that the demand and willingness to pay for these items has increased, but the supply has not changed. So the higher prices achieve an efficient allocation of scarce resources. News reports of these price hikes almost never talk about efficiency. Instead, they talk about equity or fairness. The claim that is often made is that it is unfair for profit-seeking dealers to cheat the victims of natural disaster.

Similarly, when low-skilled people work for a wage that is below what most would regard as a “living wage,” the media and politicians talk of employers taking unfair advantage of their workers.

How do we decide whether something is fair or unfair? You know when you *think* something is unfair, but how do you *know*? What are the *principles* of fairness?

Philosophers have tried for centuries to answer this question. Economists have offered their answers too. But before we look at the proposed answers, you should know that there is no universally agreed upon answer.

Economists agree about efficiency. That is, they agree that it makes sense to make the economic pie as large as possible and to produce it at the lowest possible cost. But they do not agree about equity. That is, they do not agree about what are fair shares of the economic pie for all the people who make it. The reason is that ideas about fairness are not exclusively economic ideas. They touch on politics, ethics, and religion. Nevertheless, economists have thought about these issues and have a contribution to make. Let's examine the views of economists on this topic.

To think about fairness, think of economic life as a game—a serious game. All ideas about fairness can be divided into two broad groups. They are:

- It's not fair if the *result* isn't fair.
- It's not fair if the *rules* aren't fair.

### It's Not Fair if the Result Isn't Fair

The earliest efforts to establish a principle of fairness were based on the view that the result is what matters. The general idea was that it is unfair if people's incomes are too unequal. For example, it is unfair

that a bank president earns millions of dollars a year while a bank teller earns only thousands of dollars. It is unfair that a store owner makes a larger profit and her customers pay higher prices in the aftermath of a winter storm.

During the nineteenth century, economists thought they had made an incredible discovery: Efficiency requires equality of incomes. To make the economic pie as large as possible, it must be cut into equal pieces, one for each person. This idea turns out to be wrong. But there is a lesson in the reason that it is wrong, so this idea is worth a closer look.

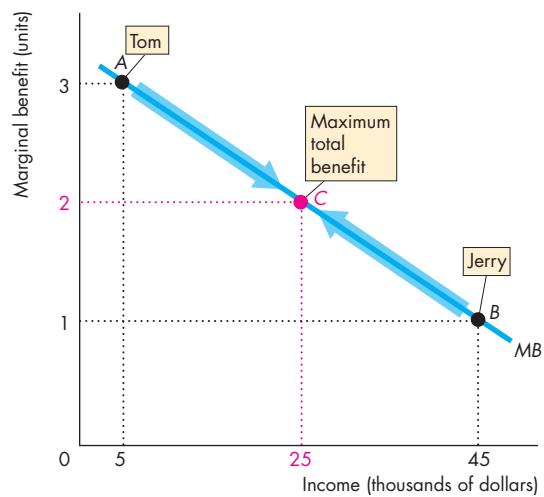
**Utilitarianism** The nineteenth-century idea that only equality brings efficiency is called *utilitarianism*.

**Utilitarianism** is a principle that states that we should strive to achieve “the greatest happiness for the greatest number.” The people who developed this idea were known as utilitarians. They included eminent thinkers such as Jeremy Bentham and John Stuart Mill.

Utilitarians argued that to achieve “the greatest happiness for the greatest number,” income must be transferred from the rich to the poor up to the point of complete equality—to the point at which there are no rich and no poor.

They reasoned in the following way: First, everyone has the same basic wants and a similar capacity to enjoy life. Second, the greater a person's income, the smaller is the marginal benefit of a dollar. The millionth dollar spent by a rich person brings a smaller marginal benefit to that person than the marginal benefit that the thousandth dollar spent brings to a poorer person. So by transferring a dollar from the millionaire to the poorer person, more is gained than is lost. The two people added together are better off.

Figure 5.7 illustrates this utilitarian idea. Tom and Jerry have the same marginal benefit curve,  $MB$ . (Marginal benefit is measured on the same scale of 1 to 3 for both Tom and Jerry.) Tom is at point *A*. He earns \$5,000 a year, and his marginal benefit from a dollar is 3 units. Jerry is at point *B*. He earns \$45,000 a year, and his marginal benefit from a dollar is 1 unit. If a dollar is transferred from Jerry to Tom, Jerry loses 1 unit of marginal benefit and Tom gains 3 units. So together, Tom and Jerry are better off—they are sharing the economic pie more efficiently. If a second dollar is transferred, the same thing happens: Tom gains more than Jerry loses. And the same is true for every dollar transferred until they both reach point *C*. At point *C*, Tom and Jerry have \$25,000

**FIGURE 5.7** Utilitarian Fairness

Tom earns \$5,000 and has 3 units of marginal benefit at point A. Jerry earns \$45,000 and has 1 unit of marginal benefit at point B. If income is transferred from Jerry to Tom, Jerry's loss is less than Tom's gain. Only when each of them has \$25,000 and 2 units of marginal benefit (at point C) can the sum of their total benefit increase no further.

[MyEconLab Animation](#)

each and a marginal benefit of 2 units. Now they are sharing the economic pie in the most efficient way. It brings the greatest happiness to Tom and Jerry.

**The Big Tradeoff** One big problem with the utilitarian ideal of complete equality is that it ignores the costs of making income transfers. Recognizing the costs of making income transfers leads to what is called the **big tradeoff**, which is a tradeoff between efficiency and fairness.

The big tradeoff is based on the following facts. Income can be transferred from people with high incomes to people with low incomes only by taxing the high incomes. Taxing people's income from employment makes them work less. It results in the quantity of labour being less than the efficient quantity. Taxing people's income from capital makes them save less. It results in the quantity of capital being less than the efficient quantity. With smaller quantities of both labour and capital, the quantity of goods and services produced is less than the efficient quantity. The economic pie shrinks.

The tradeoff is between the size of the economic pie and the degree of equality with which it is shared. The greater the amount of income redistribution through income taxes, the greater is the inefficiency—the smaller is the economic pie.

There is a second source of inefficiency. A dollar taken from a rich person does not end up as a dollar in the hands of a poorer person. Some of the dollar is spent on administration of the tax and transfer system. The cost of the tax-collecting agency, Canada Revenue Agency (CRA), and the welfare-administering agencies, such as Employment and Social Development Canada, must be paid with some of the taxes collected. Also, taxpayers hire accountants, auditors, and lawyers to help them ensure that they pay the correct amount of taxes. These activities use skilled labour and capital resources that could otherwise be used to produce goods and services that people value.

When all these costs are taken into account, taking a dollar from a rich person does not give a dollar to a poor person. It is possible that with high taxes, people with low incomes might end up being worse off. Suppose, for example, that highly taxed entrepreneurs decide to work less hard and shut down some of their businesses. Low-income workers get fired and must seek other, perhaps even lower-paid, work.

Today, because of the big tradeoff, no one says that fairness requires complete equality of incomes.

**Make the Poorest as Well Off as Possible** A new solution to the big-tradeoff problem was proposed by philosopher John Rawls in a classic book entitled *A Theory of Justice*, published in 1971. Rawls says that, taking all the costs of income transfers into account, the fair distribution of the economic pie is the one that makes the poorest person as well off as possible. The incomes of rich people should be taxed, and after paying the costs of administering the tax and transfer system, what is left should be transferred to the poor. But the taxes must not be so high that they make the economic pie shrink to the point at which the poorest person ends up with a smaller piece. A bigger share of a smaller pie can be less than a smaller share of a bigger pie. The goal is to make the piece enjoyed by the poorest person as big as possible. Most likely, this piece will not be an equal share.

The “fair results” idea requires a change in the results after the game is over. Some economists say that these changes are themselves unfair and propose a different way of thinking about fairness.

## It's Not Fair if the Rules Aren't Fair

The idea that it's not fair if the rules aren't fair is based on a fundamental principle that seems to be hardwired into the human brain: the symmetry principle. The **symmetry principle** is the requirement that people in similar situations be treated similarly. It is the moral principle that lies at the centre of all the big religions and that says, in some form or other, "Behave toward other people in the way you expect them to behave toward you."

In economic life, this principle translates into *equality of opportunity*. But equality of opportunity to do what? This question is answered by the philosopher Robert Nozick in a book entitled *Anarchy, State, and Utopia*, published in 1974.

Nozick argues that the idea of fairness as an outcome or result cannot work and that fairness must be based on the fairness of the rules. He suggests that fairness obeys two rules:

1. The state must enforce laws that establish and protect private property.
2. Private property may be transferred from one person to another only by voluntary exchange.

The first rule says that everything that is valuable must be owned by individuals and that the state must ensure that theft is prevented. The second rule says that the only legitimate way a person can acquire property is to buy it in exchange for something else that the person owns. If these rules, which are the only fair rules, are followed, then the result is fair. It doesn't matter how unequally the economic pie is shared, provided that the pie is made by people, each one of whom voluntarily provides services in exchange for the share of the pie offered in compensation.

These rules satisfy the symmetry principle. If these rules are not followed, the symmetry principle is broken. You can see these facts by imagining a world in which the laws are not followed.

First, suppose that some resources or goods are not owned. They are common property. Then everyone is free to participate in a grab to use them. The strongest will prevail. But when the strongest prevails, the strongest effectively *owns* the resources or goods in question and prevents others from enjoying them.

Second, suppose that we do not insist on voluntary exchange for transferring ownership of resources from one person to another. The alternative is *involuntary transfer*. In simple language, the alternative is theft.

Both of these situations violate the symmetry principle. Only the strong acquire what they want. The weak end up with only the resources and goods that the strong don't want.

In a majority-rule political system, the strong are those in the majority or those with enough resources to influence opinion and achieve a majority.

In contrast, if the two rules of fairness are followed, everyone, strong and weak, is treated in a similar way. All individuals are free to use their resources and human skills to create things that are valued by themselves and others and to exchange the fruits of their efforts with all others. This set of arrangements is the only one that obeys the symmetry principle.

**Fair Rules and Efficiency** If private property rights are enforced and if voluntary exchange takes place in a competitive market with none of the obstacles described above (p. 114), resources will be allocated efficiently.

According to the Nozick fair-rules view, no matter how unequal is the resulting distribution of income and wealth, it will be fair.

It would be better if everyone were as well off as those with the highest incomes, but scarcity prevents that outcome and the best attainable outcome is the efficient one.

## Case Study: A Generator Shortage in a Natural Disaster

Hurricane Katrina shut down electricity supplies over a wide area and increased the demand for portable generators. What is the fair way to allocate the available generators?

If the market price is used, the outcome is efficient. Sellers and buyers are better off and no one is worse off. But people who own generators make a larger profit and the generators go to those who want them most and can afford them. Is that fair?

On the Nozick rules view, the outcome is fair. On the fair outcome view, the outcome might be considered unfair. But what are the alternatives? They are command; majority rule; contest; first-come, first-served; lottery; personal characteristics; and force. Except by chance, none of these methods delivers an allocation of generators that is either fair or efficient. It is unfair in the rules view because the distribution involves involuntary transfers of resources among citizens. It is unfair in the results view because the poorest don't end up being made as well off as possible.

## AT ISSUE

### Price Gouging

**Price gouging** is the practice of offering an essential item for sale following a natural disaster at a price much higher than its normal price.

When floods wiped out the Calgary Stampede and inundated the city in the summer of 2013, bags of ice, bottled water, and fruit were all in short supply. Stores with items for sale were getting exceptionally high prices. One store offered ice for \$20 a bag. Another sold bottled water but not at the normal price. Angry shoppers took to social media to denounce price gougers and call for boycotts of their stores.

#### In Favour of a Law Against Price Gouging

Supporters of laws against price gouging say:

- It unfairly exploits vulnerable needy buyers.
- It unfairly rewards unscrupulous sellers.
- In situations of extraordinary shortage, prices should be regulated to prevent these abuses and scarce resources should be allocated by one of the nonmarket mechanisms such as majority vote or equal shares for all.

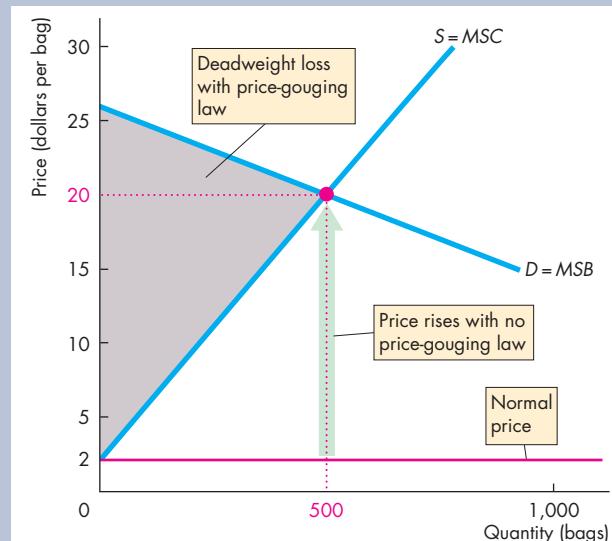


Should the price that a seller of ice may charge be regulated?

#### The Economist's Response

Economists say that preventing a voluntary market transaction leads to inefficiency—it makes some people worse off without making anyone better off.

- In the figure below, when the supply of ice is much less than normal, the equilibrium price rises from \$2 to \$20 per bag.
- Calling the price rise “gouging” and blocking it with a law prevents additional units from being made available and creates a deadweight loss.



The Effects of a Price-Gouging Law

## REVIEW QUIZ

- 1 What are the two big approaches to thinking about fairness?
- 2 What is the utilitarian idea of fairness and what is wrong with it?
- 3 Explain the big tradeoff. What idea of fairness has been developed to deal with it?
- 4 What is the idea of fairness based on fair rules?

Work these questions in Study Plan 5.4 and get instant feedback. Do a Key Terms Quiz.

[MyEconLab](#)

◆ You've now studied efficiency and equity (fairness), the two biggest issues that run through the whole of economics. *Economics in the News* on pp. 120–121 looks at an example of an *inefficiency* in our economy today. At many points throughout this book—and in your life—you will return to and use the ideas you've learned in this chapter. We start to apply these ideas in the next chapter where we study some sources of *inefficiency* and *unfairness*.



## Making Traffic Flow Efficiently

### A Fundamental Law of Road Congestion

*American Economic Review*

October 2011

It is not an everyday occurrence for economic research to make the news. But an article in the *American Economic Review* by Gilles Duranton and Matthew A. Turner of the University of Toronto entitled “The Fundamental Law of Road Congestion: Evidence from U.S. Cities,” caught the attention of several newspapers and magazines for its eye-popping findings and implicit recommendation.

Noting that an average American household spends almost 3 hours a day in a passenger vehicle achieving an average speed of less than 50 kilometres per hour, Professors Duranton and Turner wanted to find out how it might be possible to end the rush-hour crawl, ease traffic congestion, and make the nation’s highways more productive.

To get the answers, they studied traffic flows and highways in all the major U.S. cities in 1983, 1993, and 2003 to determine the effect of adding highway capacity on traffic volumes and flows.

Their startling discovery is that on interstate highways, increasing highway capacity increases the vehicle-kilometres travelled by the same percentage. Residents and businesses drive more, and better highways attract inward migration.

Duranton and Turner also found that increasing the capacity of one type of road diverts little traffic from other types of roads.

And they found that increasing the provision of public transportation does not lower congestion.

They concluded that the only candidate for improving traffic flow is to use a congestion pricing system.

Source of information: “The Fundamental Law of Road Congestion: Evidence from U.S. Cities,” *American Economic Review*, 101(6): 2616–52.

### ESSENCE OF THE STORY

- Researchers say that adding a lane to a highway eases congestion only temporarily.
- Highway use increases in proportion to the available roadways.
- Increasing the capacity of one road does not reduce congestion on others.
- Widening highways does not reduce congestion on city streets.
- Congestion pricing has successfully reduced congestion in some cities, one of which is London.
- Congestion pricing works by encouraging people to drive less or to find alternative ways to get to their destinations.

**MyEconLab More Economics in the News**

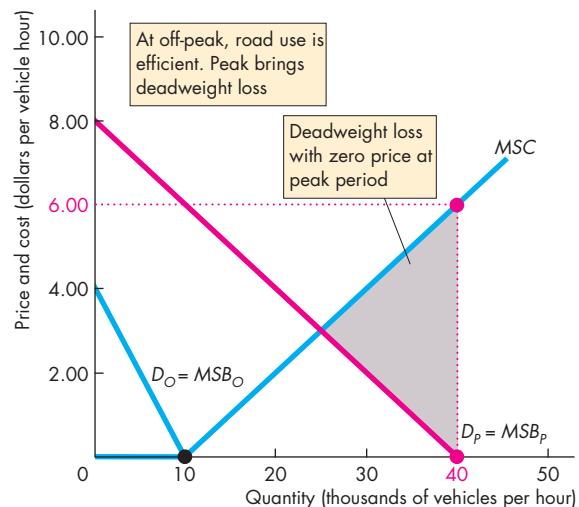
## ECONOMIC ANALYSIS

- The discovery that adding a highway does not ease congestion points to congestion pricing as a solution. Let's see how a congestion price works.
- A highway has the marginal social cost curve  $MSC$  in the figures. The highway can carry only 10,000 vehicles per hour with no congestion.
- At off-peak times, the demand curve and marginal benefit curve is  $D_o = MSB_o$ ; and the peak time demand curve and marginal benefit curve is  $D_p = MSB_p$ .
- Figure 1 illustrates inefficient road use. At off-peak, the outcome is efficient but at the peak demand time, at a zero price, 40,000 vehicles per hour enter the road. The marginal social cost is \$6 and there is a deadweight loss (of time and gasoline) shown by the grey triangle.
- Figure 2 illustrates efficient road use at the peak period. Imposing a congestion charge of \$3 per vehicle hour brings an equilibrium at 25,000 vehicles per hour, which is the efficient quantity. Total surplus, the sum of consumer surplus (green) and producer surplus (blue), is maximized.
- Congestion charges would be paid by all road users, regardless of whether they are rich or poor, but they don't have to leave the poor worse off.
- Revenue raised from congestion charges can be redistributed to low-income households if there is a fairness problem.
- So long as road users pay the marginal social cost of their decision, road use is efficient.

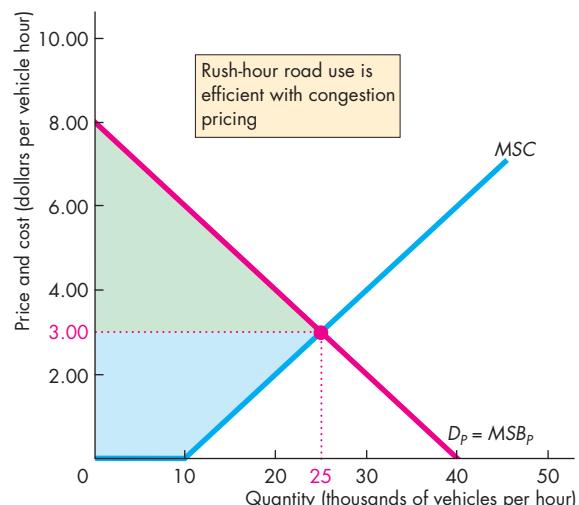


While traffic grinds to a halt on North American highways, Electronic Road Pricing (ERP) keeps vehicles moving in Singapore.

- London has a simple system of congestion pricing that imposes a charge when a vehicle enters a central congestion zone.
- Singapore has the world's most sophisticated congestion pricing with the price displayed on gantries (see photo), and the price rises as congestion increases and falls as congestion eases.
- Advances in technology make congestion pricing an attractive alternative to congestion.



**Figure 1 Inefficient Rush-Hour Road Use**



**Figure 2 Efficient Rush-Hour Road Use**



## SUMMARY

### Key Points

#### Resource Allocation Methods (pp. 106–107)

- Because resources are scarce, some mechanism must allocate them.
- The alternative allocation methods are market price; command; majority rule; contest; first-come, first-served; lottery; personal characteristics; and force.

Working Study Plan Problem 1 will give you a better understanding of resource allocation methods.

#### Benefit, Cost, and Surplus (pp. 108–111)

- The maximum price willingly paid is marginal benefit, so a demand curve is also a marginal benefit curve.
- The market demand curve is the horizontal sum of the individual demand curves and is the marginal social benefit curve.
- Value is what people are *willing to pay*; price is what people *must pay*.
- Consumer surplus is the excess of the benefit received from a good or service over the amount paid for it.
- The minimum supply-price is marginal cost, so a supply curve is also a marginal cost curve.
- The market supply curve is the horizontal sum of the individual supply curves and is the marginal social cost curve.
- Cost is what producers pay; price is what producers receive.

- Producer surplus is the excess of the amount received from the sale of a good or service over the cost of producing it.

Working Study Plan Problems 2 to 7 will give you a better understanding of benefit, cost, and surplus.

#### Is the Competitive Market Efficient? (pp. 112–115)

- In a competitive equilibrium, marginal social benefit equals marginal social cost and resource allocation is efficient.
- Buyers and sellers acting in their self-interest end up promoting the social interest.
- Total surplus, consumer surplus plus producer surplus, is maximized.
- Producing less than or more than the efficient quantity creates deadweight loss.
- Price and quantity regulations; taxes and subsidies; externalities; public goods and common resources; monopoly; and high transactions costs can lead to market failure.

Working Study Plan Problem 8 will give you a better understanding of the efficiency of competitive markets.

#### Is the Competitive Market Fair? (pp. 116–119)

- Ideas about fairness can be divided into two groups: fair *results* and fair *rules*.
- Fair-results ideas require income transfers from the rich to the poor.
- Fair-rules ideas require property rights and voluntary exchange.

Working Study Plan Problems 9 and 10 will give you a better understanding of the fairness of competitive markets.

### Key Terms

- Big tradeoff, 117
- Command system, 106
- Consumer surplus, 109
- Deadweight loss, 114

- Market failure, 114
- Producer surplus, 111
- Symmetry principle, 118
- Total surplus, 112

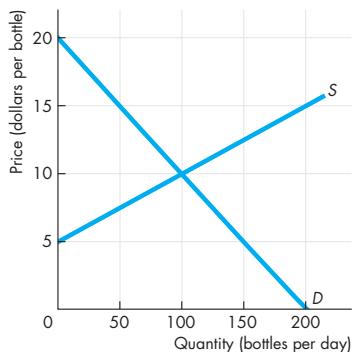
### MyEconLab Key Terms Quiz

- Transactions costs, 115
- Utilitarianism, 116

## WORKED PROBLEM

**MyEconLab** You can work this problem in Chapter 5 Study Plan.

The figure illustrates the market for sunscreen.

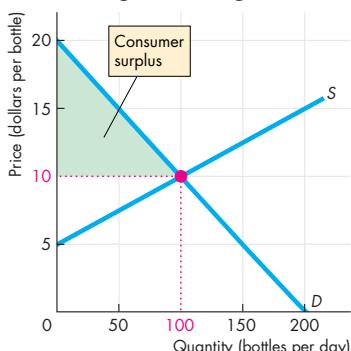


### Questions

- At the market equilibrium, calculate:
  - consumer surplus and (b) producer surplus.
- Is the market for sunscreen efficient? Why?
- What is deadweight loss? Calculate it if factories produce only 50 bottles of sunscreen.

### Solutions

- a. Consumer surplus is the excess of the benefit received over the amount buyers paid for it. The demand curve tells us the benefit, so consumer surplus equals the area under the demand curve above the market price, summed over the quantity bought. The price paid is \$10 a bottle, the quantity bought is 100 bottles, so consumer surplus equals the area of the green triangle in the figure below.



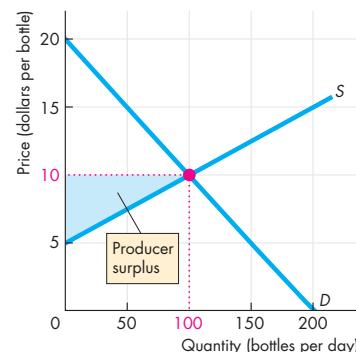
Area of the triangle =  $(\text{Base} \times \text{Height}) \div 2$ . The base is the quantity bought (100 bottles) and the height is the maximum price (\$20 a bottle) minus the market price (\$10 a bottle). Consumer surplus equals  $100 \times (\$20 - \$10) \div 2$ , which is \$500.

**Key Point:** Consumer surplus equals the area under the demand curve above the market price.

- b. Producer surplus is the excess of the amount received by sellers over the cost of production.

The supply curve tells us the cost of producing the good, so producer surplus is equal to the area under the market price above the supply curve, summed over the quantity sold.

Producer surplus is equal to the area of the blue triangle in the following figure.



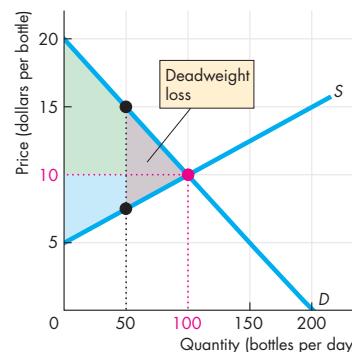
In this triangle, the base is the quantity sold (100 bottles) and the height is the market price (\$10 a bottle) minus the minimum cost (\$5 a bottle), so producer surplus equals  $100 \times (\$10 - \$5) \div 2$ , or \$250.

**Key Point:** Producer surplus equals the area under the market price above the supply curve.

- Total surplus (consumer surplus plus producer surplus) is a maximum, so the market is efficient.

**Key Point:** A competitive market is always efficient.

- When factories produce less than the efficient quantity (100 bottles), some total surplus is lost. This loss is called the deadweight loss and it is equal to the area of the grey triangle in the following figure.



### MyEconLab Interactive Animation

The base is the benefit of the 50th bottle minus the cost of producing it (\$7.50), the height is the quantity not produced (50 bottles), so deadweight loss equals  $(\$15 - \$7.50) \times 50 \div 2$ , which is \$187.50.

**Key Point:** Underproduction creates a deadweight loss.



## STUDY PLAN PROBLEMS AND APPLICATIONS

**MyEconLab** You can work Problems 1 to 10 in Chapter 5 Study Plan and get instant feedback.

### Resource Allocation Methods (Study Plan 5.1)

- At West, a restaurant in Vancouver, reservations are essential. At Cibo, a restaurant in downtown Vancouver, reservations are recommended. At Vij's, a restaurant near the University of British Columbia, reservations are not accepted. Describe the method of allocating scarce table resources at these three restaurants. Why do you think restaurants don't use the market price to allocate their tables?

### Benefit, Cost, and Surplus (Study Plan 5.2)

Use the following table to work Problems 2 to 4. The table gives the demand schedules for train travel for the only buyers in the market, Ann, Beth, and Cy.

Price (dollars per kilometre)	Quantity demanded (kilometres)		
	Ann	Beth	Cy
3	30	25	20
4	25	20	15
5	20	15	10
6	15	10	5
7	10	5	0
8	5	0	0
9	0	0	0

- a. Construct the market demand schedule.
- b. What is the maximum price that each traveller is willing to pay to travel 20 kilometres? Why?
- a. What is the marginal social benefit when the total distance travelled is 60 kilometres?
- b. When the total distance travelled is 60 kilometres, how many kilometres does each travel and what is their marginal private benefit?
- What is each traveller's consumer surplus when the price is \$4 a kilometre? What is the market consumer surplus when the price is \$4 a kilometre?

Use the following table to work Problems 5 to 7.

The table in the next column gives the supply schedules of the only sellers of hot air balloon rides: Xavier, Yasmin, and Zack.

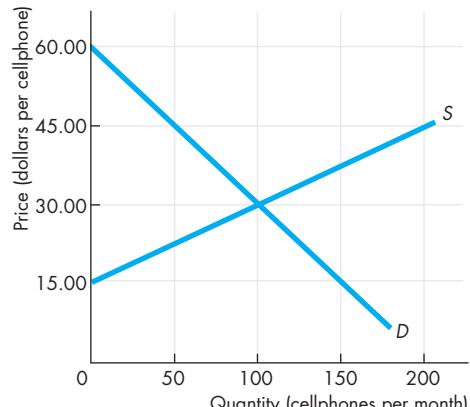
- a. Construct the market supply schedule.
- b. What are the minimum prices that Xavier, Yasmin, and Zack are willing to accept to supply 20 rides? Why?

Price (dollars per ride)	Quantity supplied (rides per week)		
	Xavier	Yasmin	Zack
100	30	25	20
90	25	20	15
80	20	15	10
70	15	10	5
60	10	5	0
50	5	0	0
40	0	0	0

- a. What is the marginal social cost when the total number of rides is 30?
- b. What is the marginal cost for each supplier when the total number of rides is 30 and how many rides does each seller supply?
- When the price is \$70 a ride, what is each seller's producer surplus? What is the market producer surplus?

### Is the Competitive Market Efficient? (Study Plan 5.3)

- The figure shows the competitive market for cellphones.



- a. What is the market equilibrium?
- b. Shade in the consumer surplus and label it.
- c. Shade in the producer surplus and label it.
- d. Calculate total surplus.
- e. Is the market for cellphones efficient?

### Is the Competitive Market Fair? (Study Plan 5.4)

- Explain why the allocation method used by each restaurant in Problem 1 is fair or not fair.
- In the Worked Problem (p. 123), how can the 50 bottles available be allocated to beach-goers? Would the possible methods be fair or unfair?



## ADDITIONAL PROBLEMS AND APPLICATIONS

**MyEconLab** You can work these problems in MyEconLab if assigned by your instructor.

### Resource Allocation Methods

11. At the Stratford Festival Theatre no reservations are accepted on the day of the performance; at matinees reservations are accepted; at opening night performances reservations are essential. Describe the method of allocating seats in these three performances. Why do you think the Stratford Festival Theatre has different reservations policies?

### Benefit, Cost, and Surplus

Use the following table to work Problems 12 to 15. The table gives the supply schedules for jet-ski rides by the only suppliers: Rick, Sam, and Tom.

Price (dollars per ride)	Quantity supplied (rides per day)		
	Rick	Sam	Tom
10.00	0	0	0
12.50	5	0	0
15.00	10	5	0
17.50	15	10	5
20.00	20	15	10

12. What is each owner's minimum supply-price of 10 rides a day?  
 13. Which owner has the largest producer surplus when the price of a ride is \$17.50? Explain.  
 14. What is the marginal social cost of 45 rides a day?  
 15. Construct the market supply schedule of rides.  
 16. The table gives the demand and supply schedules for sandwiches.

Price (dollars per sandwich)	Quantity demanded	Quantity supplied
	(sandwiches per hour)	
0	300	0
1	250	50
2	200	100
3	150	150
4	100	200
5	50	250
6	0	300

- a. What is the maximum price that a consumer is willing to pay for the 200th sandwich?  
 b. What is the minimum price that a producer is willing to accept for the 200th sandwich?  
 c. If 200 sandwiches a day are available, what is the total surplus?

### 17. Home Heating Bills Surge Amid Record Cold

If there's one thing that can set home heating costs soaring, it's a long, frigid blast from one of the coldest winters in 20 years, and people are going to use 10 to 12 percent more natural gas this year than they have normally.

Source: CBC News, March 3, 2014

- How is the price of natural gas determined?
- When demand increases, explain the process by which the market adjusts.
- On a graph, show the effect of the increase in demand on consumer surplus and producer surplus.

### Is the Competitive Market Efficient?

18. Use the data in the table in Problem 16.

- If the sandwich market is efficient, what is the consumer surplus, what is the producer surplus, and what is the total surplus?
- If the demand for sandwiches increases and sandwich makers produce the efficient quantity, what happens to producer surplus and deadweight loss?

Use the following news clip to work Problems 19 to 21.

### The Right Price for Digital Music

Apple's \$1.29-for-the-latest-songs model isn't perfect and isn't it too much to pay for music that appeals to just a few people? What we need is a system that will be profitable but fair to music lovers. The solution: Price song downloads according to demand. The more people who download a particular song, the higher will be the price of that song; the fewer people who buy a particular song, the lower will be the price of that song. That is a free-market solution—the market would determine the price.

Source: *Slate*, December 5, 2005

Assume that the marginal social cost of downloading a song from the iTunes Store is zero. (This assumption means that the cost of operating the iTunes Store doesn't change if people download more songs.)

19. a. Draw a graph of the market for downloadable music with a price of \$1.29 for all the latest songs. On your graph, show consumer surplus and producer surplus.

- b. With a price of \$1.29 for all the latest songs, is the market efficient or inefficient? If it is inefficient, show the deadweight loss on your graph.
20. If the pricing scheme described in the news clip were adopted, how would consumer surplus, producer surplus, and the deadweight loss change?
21. a. If the pricing scheme described in the news clip were adopted, would the market be efficient or inefficient? Explain.  
 b. Is the pricing scheme described in the news clip a “free-market solution”? Explain.
22. Only 1 percent of the world supply of water is fit for human consumption. Some places have more water than they can use; some could use much more than they have. The 1 percent available would be sufficient if only it were in the right place.  
 a. What is the major problem in achieving an efficient use of the world’s water?  
 b. If there were a global market in water, like there is in oil, how do you think the market would be organized?  
 c. Would a free world market in water achieve an efficient use of the world’s water resources? Explain why or why not.

### Is the Competitive Market Fair?

23. Use the information in Problem 22. Would a free world market in water achieve a fair use of the world’s water resources? Explain why or why not and be clear about the concept of fairness that you are using.
24. The winner of the men’s and women’s tennis singles at the Canadian Open is paid twice as much as the runner-up, but it takes two players to have a singles final. Is the compensation arrangement fair?
25. **The Scandal of Phone Call Price Gouging by Prisons**

In most U.S. states, the phone company guarantees the prison a commission of a percentage on every call. The average commission is 42% of the cost of the call, but in some states it is 60%. So 60% of what families pay to receive a collect call from their imprisoned relative has nothing to do with the cost of the phone service. Also, the phone company that offers the highest commission is often the company to get the prison contract.

Source: *The Guardian*, May 23, 2012

- a. Who is practising price gouging: the prison, the phone company, or both? Explain.  
 b. Evaluate the “fairness” of the prison’s commission.

### Economics in the News

26. After you have studied *Economics in the News* on pp. 120–121, answer the following questions.
- What is the method used to allocate highway space in Canada and what is the method used in Singapore?
  - Who benefits from the Canadian method of highway resource allocation? Explain your answer using the ideas of marginal social benefit, marginal social cost, consumer surplus, and producer surplus.
  - Who benefits from the Singaporean method of highway resource allocation? Explain your answer using the ideas of marginal social benefit, marginal social cost, consumer surplus, and producer surplus.
  - If road use were rationed by limiting drivers with even-date birthdays to drive only on even days (and odd-date birthdays to drive only on odd days), would highway use be more efficient? Explain your answer.
27. **Fight over Water Rates; Escondido Farmers Say Increase Would Put Them Out of Business**  
 Agricultural users of water pay less than residential and business users. Since 1993, water rates have increased by more than 90 percent for residential customers and by only 50 percent for agricultural users.

Source: *The San Diego Union-Tribune*, June 14, 2006

- Do you think that the allocation of water between agricultural and residential users is likely to be efficient? Explain your answer.
- If agricultural users paid a higher price, would the allocation of resources be more efficient?
- If agricultural users paid a higher price, what would happen to consumer surplus and producer surplus from water?
- Is the difference in price paid by agricultural and residential users fair?



# 6

## GOVERNMENT ACTIONS IN MARKETS

After studying this chapter,  
you will be able to:

- ◆ Explain how a rent ceiling creates a housing shortage
- ◆ Explain how a minimum wage law creates unemployment
- ◆ Explain the effects of a tax
- ◆ Explain the effects of production quotas and subsidies
- ◆ Explain how markets for illegal goods work

In Toronto, where food servers and grocery clerks earn the minimum wage of \$11 an hour, a budget one-bedroom apartment rents for \$1,000 a month. For the lowest paid, that leaves \$500 a month for food, clothing, and other necessities. What can governments do to help these people?

This chapter explains the effects of minimum wage laws and rent ceilings, and *Economics in the News* at the end of the chapter looks at some recent changes in the Ontario minimum wage. The chapter also explains the effects of taxes, production quotas and subsidies, and laws that make trading in some things illegal.



## A Housing Market with a Rent Ceiling

We spend more of our income on housing than on any other good or service, so it isn't surprising that rents can be a political issue. When rents are high, or when they jump by a large amount, renters might lobby the government for limits on rents.

A government regulation that makes it illegal to charge a price higher than a specified level is called a **price ceiling** or **price cap**.

The effects of a price ceiling on a market depend crucially on whether the ceiling is imposed at a level that is above or below the equilibrium price.

A price ceiling set *above the equilibrium price* has no effect. The reason is that the price ceiling does not constrain the market forces. The force of the law and the market forces are not in conflict. But a price ceiling *below the equilibrium price* has powerful effects on a market. The reason is that the price ceiling attempts to prevent the price from regulating the quantities demanded and supplied. The force of the law and the market forces are in conflict.

When a price ceiling is applied to a housing market, it is called a **rent ceiling**. A rent ceiling set below the equilibrium rent creates:

- A housing shortage
- Increased search activity
- A black market

### A Housing Shortage

At the equilibrium price, the quantity demanded equals the quantity supplied. In a housing market, when the rent is at the equilibrium level, the quantity of housing supplied equals the quantity of housing demanded and there is neither a shortage nor a surplus of housing.

But at a rent set below the equilibrium rent, the quantity of housing demanded exceeds the quantity of housing supplied—there is a shortage. So if a rent ceiling is set below the equilibrium rent, there will be a shortage of housing.

When there is a shortage, the quantity available is the quantity supplied, and somehow this quantity must be allocated among the frustrated demanders. One way in which this allocation occurs is through increased search activity.

### Increased Search Activity

The time spent looking for someone with whom to do business is called **search activity**. We spend some time in search activity almost every time we make a purchase. When you're shopping for the latest hot new cellphone, and you know four stores that stock it, how do you find which store has the best deal? You spend a few minutes on the Internet, checking out the various prices. In some markets, such as the housing market, people spend a lot of time checking the alternatives available before making a choice.

When a price is regulated and there is a shortage, search activity increases. In the case of a rent-controlled housing market, frustrated would-be renters scan the newspapers, not only for housing ads but also for death notices! Any information about newly available housing is useful, and apartment seekers race to be first on the scene when news of a possible supplier breaks.

The **opportunity cost** of a good is equal not only to its price but also to the value of the search time spent finding the good. So the opportunity cost of housing is equal to the rent (a regulated price) plus the time and other resources spent searching for the restricted quantity available. Search activity is costly. It uses time and other resources, such as phone calls, automobiles, and gasoline that could have been used in other productive ways.

A rent ceiling controls only the rent portion of the cost of housing. The cost of increased search activity might end up making the full cost of housing *higher* than it would be without a rent ceiling.

### A Black Market

A rent ceiling also encourages illegal trading in a **black market**, an illegal market in which the equilibrium price exceeds the price ceiling. Black markets occur in rent-controlled housing and many other markets. For example, scalpers run black markets in tickets for big sporting events and rock concerts.

When a rent ceiling is in force, frustrated renters and landlords constantly seek ways of increasing rents. One common way is for a new tenant to pay a high price for worthless fittings, such as charging \$2,000 for threadbare drapes. Another is for the tenant to pay an exorbitant price for new locks and keys—called “key money.”

The level of a black market rent depends on how tightly the rent ceiling is enforced. With loose

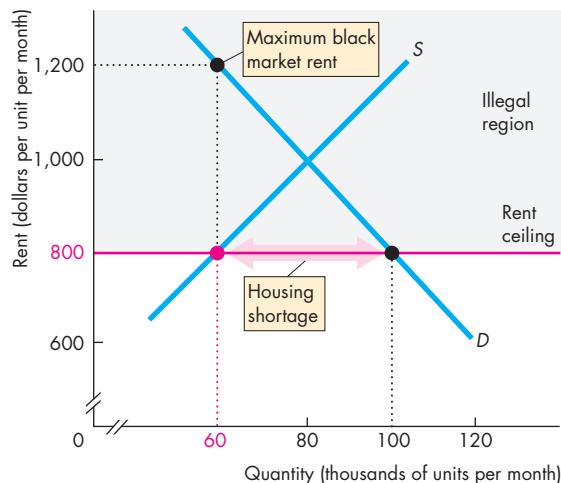
enforcement, the black market rent is close to the unregulated rent. But with strict enforcement, the black market rent is equal to the maximum price that a renter is willing to pay.

Figure 6.1 illustrates the effects of a rent ceiling. The demand curve for housing is  $D$  and the supply curve is  $S$ . A rent ceiling is imposed at \$800 a month. Rents that exceed \$800 a month are in the grey-shaded illegal region in the figure. You can see that the equilibrium rent, where the demand and supply curves intersect, is in the illegal region.

At a rent of \$800 a month, the quantity of housing supplied is 60,000 units and the quantity demanded is 100,000 units. So with a rent of \$800 a month, there is a shortage of 40,000 units of housing.

To rent the 60,000th unit, someone is willing to pay \$1,200 a month. They might pay this amount by incurring search costs that bring the total cost of housing to \$1,200 a month, or they might pay a black market price of \$1,200 a month. Either way, they end up incurring a cost that exceeds what the equilibrium rent would be in an unregulated market.

**FIGURE 6.1** A Rent Ceiling



A rent above the rent ceiling of \$800 a month is illegal (in the grey-shaded illegal region). At a rent of \$800 a month, the quantity of housing supplied is 60,000 units. Frustrated renters spend time searching for housing and they make deals with landlords in a black market. Someone is willing to pay \$1,200 a month for the 60,000th unit.

[MyEconLab Animation and Draw Graph](#)

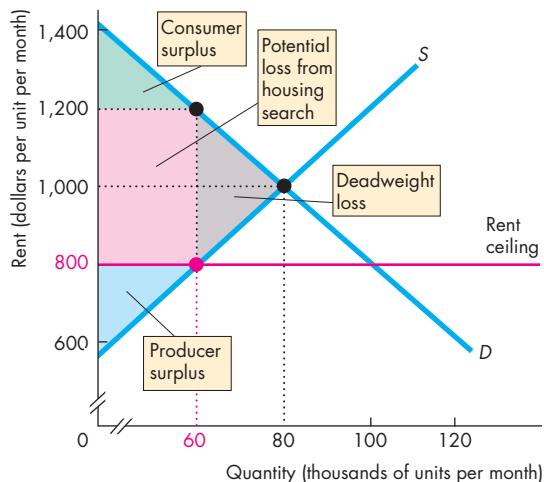
## Inefficiency of a Rent Ceiling

A rent ceiling set below the equilibrium rent results in an inefficient underproduction of housing services. The *marginal social benefit* of housing exceeds its *marginal social cost* and a deadweight loss shrinks the producer surplus and consumer surplus (Chapter 5, pp. 112–114).

Figure 6.2 shows this inefficiency. The rent ceiling (\$800 per month) is below the equilibrium rent (\$1,000 per month) and the quantity of housing supplied (60,000 units) is less than the efficient quantity (80,000 units).

Because the quantity of housing supplied (the quantity available) is less than the efficient quantity, there is a deadweight loss, shown by the grey triangle. Producer surplus shrinks to the blue triangle and consumer surplus shrinks to the green triangle. The red rectangle represents the potential loss from increased search activity. This loss is borne by consumers, and the full loss from the rent ceiling is the sum of the deadweight loss and the increased cost of search.

**FIGURE 6.2** The Inefficiency of a Rent Ceiling



Without a rent ceiling, the market produces an efficient 80,000 units of housing at a rent of \$1,000 a month. A rent ceiling of \$800 a month decreases the quantity of housing supplied to 60,000 units. Producer surplus and consumer surplus shrink and a deadweight loss arises. The red rectangle represents the cost of resources used in increased search activity. The full loss from the rent ceiling equals the sum of the red rectangle and grey triangle.

[MyEconLab Animation and Draw Graph](#)

## Are Rent Ceilings Fair?

Rent ceilings might be inefficient, but don't they achieve a fairer allocation of scarce housing? Let's explore this question.

Chapter 5 (pp. 116–118) reviews two key ideas about fairness. According to the *fair-rules* view, anything that blocks voluntary exchange is unfair, so rent ceilings are unfair. But according to the *fair-result* view, a fair outcome is one that benefits the less well off. So according to this view, the fairest outcome is the one that allocates scarce housing to the poorest. To see whether rent ceilings help to achieve a fairer outcome in this sense, we need to consider how the market allocates scarce housing resources in the face of a rent ceiling.

Blocking rent adjustments doesn't eliminate scarcity. Rather, because it decreases the quantity of housing available, it creates an even bigger challenge for the housing market. Somehow, the market must ration a smaller quantity of housing and allocate that housing among the people who demand it.

When the rent is not permitted to allocate scarce housing, what other mechanisms are available, and are *they* fair? Some possible mechanisms are:

- A lottery
- First-come, first-served
- Discrimination

A lottery allocates housing to those who are lucky, not to those who are poor. First-come, first-served (a method used to allocate housing in England after World War II) allocates housing to those who have the greatest foresight and who get their names on a list first, not to the poorest. Discrimination allocates scarce housing based on the views and self-interest of the owner of the housing. In the case of public housing, what counts is the self-interest of the bureaucracy that administers the allocation.

In principle, self-interested owners and bureaucrats could allocate housing to satisfy some criterion of fairness, but they are not likely to do so. Discrimination based on friendship, family ties, and criteria such as race, ethnicity, or sex is more likely to enter the equation. We might make such discrimination illegal, but we cannot prevent it from occurring.

It is hard, then, to make a case for rent ceilings on the basis of fairness. When rent adjustments are blocked, other methods of allocating scarce housing resources operate that do not produce a fair outcome.

## Economics in Action

### Rent Control Winners: The Rich and Famous

New York, San Francisco, London, and Paris, four of the world's great cities, have rent ceilings in some part of their housing markets. Winnipeg has rent ceilings, and Toronto had them until the late 1990s. Other Canadian cities, including Calgary, Edmonton, and Vancouver, do not have rent ceilings.

To see the effects of rent ceilings in practice we can compare the housing markets in cities with ceilings with those without ceilings. We learn two main lessons from such a comparison.

First, rent ceilings definitely create a housing shortage. Second, they do lower the rents for some but raise them for others.

A survey\* conducted in the United States in 1997 showed that the rents of housing units *actually available for rent* were 2.5 times the average of all rents in New York but equal to the average rent in Philadelphia. The winners from rent ceilings are the families that have lived in a city for a long time. In New York, these families include some rich and famous ones. The voting power of the winners keeps the rent ceilings in place. Mobile newcomers are the losers in a city with rent ceilings.

The bottom line is that, in principle and in practice, rent ceilings are inefficient and unfair.

\* William Tucker, "How Rent Control Drives Out Affordable Housing," Cato Policy Analysis No. 274, May 21, 1997, Cato Institute.

## REVIEW QUIZ

- 1 What is a rent ceiling and what are its effects if it is set above the equilibrium rent?
- 2 What are the effects of a rent ceiling that is set below the equilibrium rent?
- 3 How are scarce housing resources allocated when a rent ceiling is in place?
- 4 Why does a rent ceiling create an inefficient and unfair outcome in the housing market?

Work these questions in Study Plan 6.1 and get instant feedback. Do a Key Terms Quiz. **MyEconLab**

You now know how a price ceiling (rent ceiling) works. Next, we'll learn about the effects of a price floor by studying a minimum wage in a labour market.

## A Labour Market with a Minimum Wage

For each one of us, the labour market is the market that influences the jobs we get and the wages we earn. Firms decide how much labour to demand, and the lower the wage rate, the greater is the quantity of labour demanded. Households decide how much labour to supply, and the higher the wage rate, the greater is the quantity of labour supplied. The wage rate adjusts to make the quantity of labour demanded equal to the quantity supplied.

When wage rates are low, or when they fail to keep up with rising prices, labour unions might turn to governments and lobby for a higher wage rate.

A government regulation that makes it illegal to charge a price lower than a specified level is called a **price floor**.

The effects of a price floor on a market depend crucially on whether the floor is imposed at a level that is above or below the equilibrium price.

A price floor set *below the equilibrium price* has no effect. The reason is that the price floor does not constrain the market forces. The force of the law and the market forces are not in conflict. But a price floor set *above the equilibrium price* has powerful effects on a market. The reason is that the price floor attempts to prevent the price from regulating the quantities demanded and supplied. The force of the law and the market forces are in conflict.

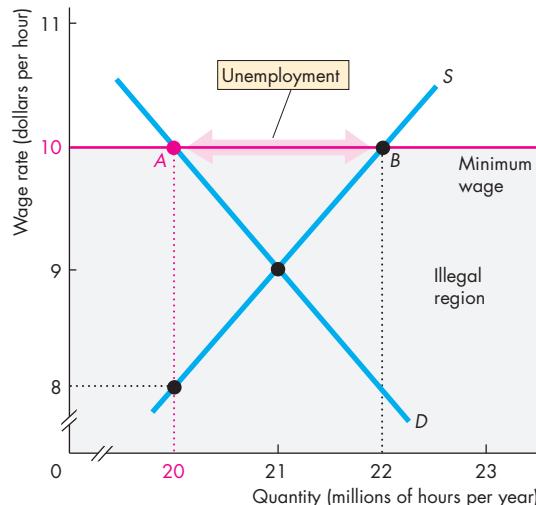
When a price floor is applied to a labour market, it is called a **minimum wage**. A minimum wage imposed at a level that is above the equilibrium wage creates unemployment. Let's look at the effects of a minimum wage.

### Minimum Wage Brings Unemployment

At the equilibrium price, the quantity demanded equals the quantity supplied. In a labour market, when the wage rate is at the equilibrium level, the quantity of labour supplied equals the quantity of labour demanded: There is neither a shortage of labour nor a surplus of labour.

But at a wage rate above the equilibrium wage, the quantity of labour supplied exceeds the quantity of labour demanded—there is a surplus of labour. So when a minimum wage is set above the equilibrium wage, there is a surplus of labour. The demand for labour determines the level of employment, and the surplus of labour is unemployed.

**FIGURE 6.3** Minimum Wage and Unemployment



The minimum wage rate is set at \$10 an hour. Any wage rate below \$10 an hour is illegal (in the grey-shaded illegal region). At the minimum wage of \$10 an hour, 20 million hours are hired but 22 million hours are available. Unemployment—AB—of 2 million hours a year is created. With only 20 million hours demanded, someone is willing to supply the 20 millionth hour for \$8.

### MyEconLab Animation and Draw Graph

Figure 6.3 illustrates the effect of the minimum wage on unemployment. The demand for labour curve is *D* and the supply of labour curve is *S*. The horizontal red line shows the minimum wage set at \$10 an hour. A wage rate below this level is illegal, in the grey-shaded illegal region of the figure. At the minimum wage rate, 20 million hours of labour are demanded (point *A*) and 22 million hours of labour are supplied (point *B*), so 2 million hours of available labour are unemployed.

With only 20 million hours demanded, someone is willing to supply that 20 millionth hour for \$8. Frustrated unemployed workers spend time and other resources searching for hard-to-find jobs.

### Is the Minimum Wage Fair?

The minimum wage is unfair on both views of fairness: It delivers an unfair *result* and imposes an unfair *rule*.

The *result* is unfair because only those people who have jobs and keep them benefit from the minimum

wage. The unemployed end up worse off than they would be with no minimum wage. Some of those who search for jobs and find them end up worse off because of the increased cost of job search they incur. Also, those who search and find jobs aren't always the least well off. When the wage rate doesn't allocate labour, other mechanisms determine who finds a job. One such mechanism is discrimination, which is yet another source of unfairness.

The minimum wage imposes an unfair *rule* because it blocks voluntary exchange. Firms are willing to hire more labour and people are willing to work more, but they are not permitted by the minimum wage law to do so.

### Inefficiency of a Minimum Wage

In the labour market, the supply curve measures the marginal social cost of labour to workers. This cost is leisure forgone. The demand curve measures the marginal social benefit from labour. This benefit is the value of the goods and services produced. An unregulated labour market allocates the economy's scarce

labour resources to the jobs in which they are valued most highly. The market is efficient.

The minimum wage frustrates the market mechanism and results in unemployment and increased job search. At the quantity of labour employed, the marginal social benefit of labour exceeds its marginal social cost and a deadweight loss shrinks the firms' surplus and the workers' surplus.

Figure 6.4 shows this inefficiency. The minimum wage (\$10 an hour) is above the equilibrium wage (\$9 an hour) and the quantity of labour demanded and employed (20 million hours) is less than the efficient quantity (21 million hours).

Because the quantity of labour employed is less than the efficient quantity, there is a deadweight loss, shown by the grey triangle. The firms' surplus shrinks to the blue triangle and the workers' surplus shrinks to the green triangle. The red rectangle shows the potential loss from increased job search, which is borne by workers. The full loss from the minimum wage is the sum of the deadweight loss and the increased cost of job search.

## AT ISSUE

### Does the Minimum Wage Cause Unemployment?

Minimum wage rates in Canada are set by the provincial governments, and in January 2014 they ranged from a low of \$9.95 an hour in Alberta to a high of \$11.00 an hour in Nunavut.

Does the minimum wage result in unemployment, and if so, how much unemployment does it create?

#### No, It Doesn't

David Card of the University of California at Berkeley (see p. 512) and Alan Krueger of Princeton University say:

- An increase in the minimum wage *increases teenage employment and decreases unemployment*.
- Their study of minimum wages in California, New Jersey, and Texas found that the employment rate of low-income workers increased following an increase in the minimum wage.
- A higher wage *increases* employment by making workers more conscientious and productive as well as less likely to quit, which lowers unproductive labour turnover.
- A higher wage rate also encourages managers to seek ways to increase labour productivity.

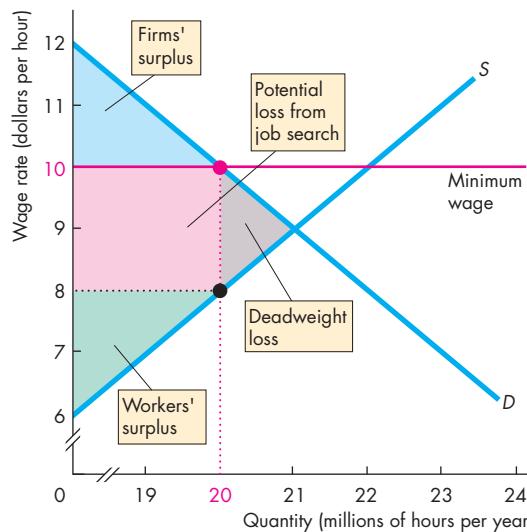
#### Yes, It Does

Michele Campolieti and Morley Gunderson of the University of Toronto and Tony Fang of the University of Northern British Columbia\* say:

- A 10 percent rise in the minimum wage decreases employment by between 3 percent and 5 percent.
- They studied employment data for thousands of individuals whose wage rates were higher than the old minimum but lower than the new minimum.
- They observed how employment changed when the minimum wage changed compared to a control group in the same wage range but in provinces where the minimum wage didn't change.
- Dozens of other studies for 20 countries agree that the minimum wage kills jobs.

\*Michele Campolieti, Tony Fang, and Morley Gunderson, "Minimum Wage Impacts on Youth Employment Transitions, 1993–1999," *Canadian Journal of Economics*, Vol. 38, No. 1, February 2005, pp. 81–104.

**FIGURE 6.4** The Inefficiency of a Minimum Wage



A minimum wage decreases employment. Firms' surplus (blue area) and workers' surplus (green area) shrink and a dead-weight loss (grey area) arises. Job search increases and the red area shows the loss from this activity.

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## REVIEW QUIZ

- 1 What is a minimum wage and what are its effects if it is set above the equilibrium wage?
- 2 What are the effects of a minimum wage set below the equilibrium wage?
- 3 Explain how scarce jobs are allocated when a minimum wage is in place.
- 4 Explain why a minimum wage creates an inefficient allocation of labour resources.
- 5 Explain why a minimum wage is unfair.

Work these questions in Study Plan 6.2 and get instant feedback. Do a Key Terms Quiz.

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Next we're going to study a more widespread government action in markets: taxes. We'll see how taxes change prices and quantities. You will discover the surprising fact that while the government can impose a tax, it can't decide who will pay the tax! You will also see that a tax creates a deadweight loss.

## Taxes

Everything you earn and almost everything you buy is taxed. Income taxes and social security taxes are deducted from your earnings, and sales taxes such as the GST and HST are added to the bill when you buy something. Employers also pay social security taxes such as the Employment Insurance tax for their workers, and producers of tobacco products, alcoholic drinks, and gasoline pay a tax every time they sell something.

Who *really* pays these taxes? Because the income tax and social security taxes are deducted from your pay, and the sales tax is added to the prices that you pay, isn't it obvious that *you* pay these taxes? And isn't it equally obvious that your employer pays the employer's contribution to the Employment Insurance tax and that tobacco producers pay the tax on cigarettes?

You're going to discover that it isn't obvious who *really* pays a tax and that lawmakers don't make that decision. We begin with a definition of tax incidence.

### Tax Incidence

**Tax incidence** is the division of the burden of a tax between buyers and sellers. When the government imposes a tax on the sale of a good,\* the price paid by buyers might rise by the full amount of the tax, by a lesser amount, or not at all. If the price paid by buyers rises by the full amount of the tax, then the burden of the tax falls entirely on buyers—the buyers pay the tax. If the price paid by buyers rises by a lesser amount than the tax, then the burden of the tax falls partly on buyers and partly on sellers. And if the price paid by buyers doesn't change at all, then the burden of the tax falls entirely on sellers.

Tax incidence does not depend on the tax law. The law might impose a tax on sellers or on buyers, but the outcome is the same in either case. To see why, let's look at the tax on cigarettes in Ontario.

### A Tax on Sellers

On February 1, 2006, Ontario upped the tax on the sale of cigarettes to \$3.09 a pack of 25. To work out the effects of this tax (rounded to \$3) on the sellers of cigarettes, we begin by examining the effects on demand and supply in the market for cigarettes.

\*These outcomes also apply to services and factors of production (land, labour, and capital).

In Fig. 6.5, the demand curve is  $D$  and the supply curve is  $S$ . With no tax, the equilibrium price is \$6 per pack and 350 million packs a year are bought and sold.

A tax on sellers is like an increase in cost, so it decreases supply. To determine the position of the new supply curve, we add the tax to the minimum price that sellers are willing to accept for each quantity sold. You can see that without the tax, sellers are willing to offer 350 million packs a year for \$6 a pack. So with a \$3 tax, they will offer 350 million packs a year only if the price is \$9 a pack. The supply curve shifts to the red curve labelled  $S + \text{tax on sellers}$ .

Equilibrium occurs where the new supply curve intersects the demand curve at 325 million packs a year. The price paid by buyers rises by \$2 to \$8 a pack. And the price received by sellers falls by \$1 to \$5 a pack. So buyers pay \$2 of the tax on a pack and sellers pay the other \$1.

### A Tax on Buyers

Suppose that instead of taxing sellers, Ontario taxes cigarette buyers \$3 a pack.

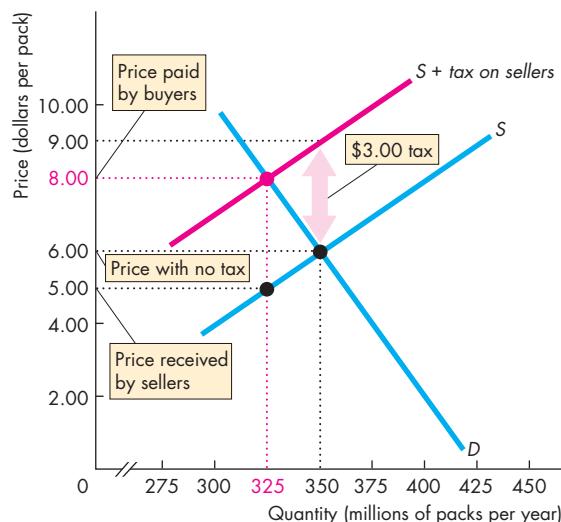
A tax on buyers lowers the amount they are willing to pay sellers, so it decreases demand and shifts the demand curve leftward. To determine the position of this new demand curve, we subtract the tax from the maximum price that buyers are willing to pay for each quantity bought. You can see, in Fig. 6.6, that without the tax, buyers are willing to buy 350 million packs a year for \$6 a pack. So with a \$3 tax, they are willing to buy 350 million packs a year only if the price including the tax is \$6 a pack, which means that they're willing to pay sellers only \$3 a pack. The demand curve shifts to become the red curve labelled  $D - \text{tax on buyers}$ .

Equilibrium occurs where the new demand curve intersects the supply curve at a quantity of 325 million packs a year. The price received by sellers is \$5 a pack, and the price paid by buyers is \$8 a pack.

### Equivalence of Tax on Buyers and Sellers

You can see that the tax on buyers in Fig. 6.6 has the same effects as the tax on sellers in Fig. 6.5. In both cases, the equilibrium quantity decreases to 325 million packs a year, the price paid by buyers rises to \$8 a pack, and the price received by sellers falls to \$5 a pack. Buyers pay \$2 of the \$3 tax, and sellers pay the other \$1 of the tax on a pack.

**FIGURE 6.5 A Tax on Sellers**



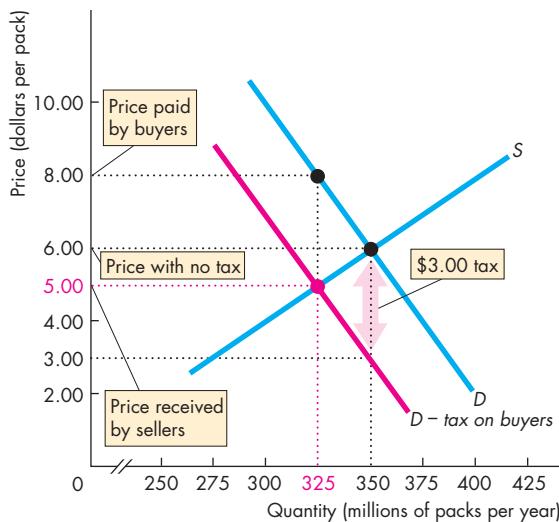
With no tax, 350 million packs a year are bought and sold at \$6 a pack. A tax on sellers of \$3 a pack shifts the supply curve from  $S$  to  $S + \text{tax on sellers}$ . The equilibrium quantity decreases to 325 million packs a year, the price paid by buyers rises to \$8 a pack, and the price received by sellers falls to \$5 a pack. The tax raises the price paid by buyers by less than the tax and lowers the price received by sellers, so buyers and sellers share the burden of the tax.

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**Can We Share the Burden Equally?** Suppose that Ontario wants the burden of the cigarette tax to fall equally on buyers and sellers and declares that a \$1.50 tax be imposed on each. Is the burden of the tax then shared equally?

You can see that it is not. The tax is still \$3 a pack. You've seen that the tax has the same effect regardless of whether it is imposed on sellers or buyers. So imposing half the tax on sellers and half on buyers is like an average of the two cases you've just examined. (Draw the demand-supply graph and work out what happens in this case. The demand curve shifts downward by \$1.50 and the supply curve shifts upward by \$1.50. The new equilibrium quantity is still 325 million packs a year. Buyers pay \$8 a pack, of which \$1.50 is tax. Sellers receive \$6.50 from buyers, but pay a \$1.50 tax, so sellers net \$5 a pack.)

When a transaction is taxed, there are two prices: the price paid by buyers, which includes the tax; and the price received by sellers, which excludes the tax.

**FIGURE 6.6** A Tax on Buyers

With no tax, 350 million packs a year are bought and sold at \$6 a pack. A tax on buyers of \$3 a pack shifts the demand curve from  $D$  to  $D - \text{tax on buyers}$ . The equilibrium quantity decreases to 325 million packs a year, the price paid by buyers rises to \$8 a pack, and the price received by sellers falls to \$5 a pack. The tax raises the price paid by buyers by less than the tax and lowers the price received by sellers, so buyers and sellers share the burden of the tax.

[MyEconLab Animation](#)

Buyers respond to the price that *includes* the tax and sellers respond to the price that *excludes* the tax.

A tax is like a wedge between the price buyers pay and the price sellers receive. The size of the wedge determines the effects of the tax, not the side of the market on which the government imposes the tax.

**The Employment Insurance Tax** The Employment Insurance tax is an example of a tax that the federal government imposes on *both* workers (buyers) and firms (sellers). But the principles you've just learned apply to this tax too. The market for labour, *not* the federal government, decides how the burden of the Employment Insurance tax is divided between firms and workers.

In the Ontario cigarette tax example, buyers bear twice the burden of the tax borne by sellers. In special cases, either buyers or sellers bear the entire burden. The division of the burden of a tax between buyers and sellers depends on the elasticities of demand and supply, as you will now see.

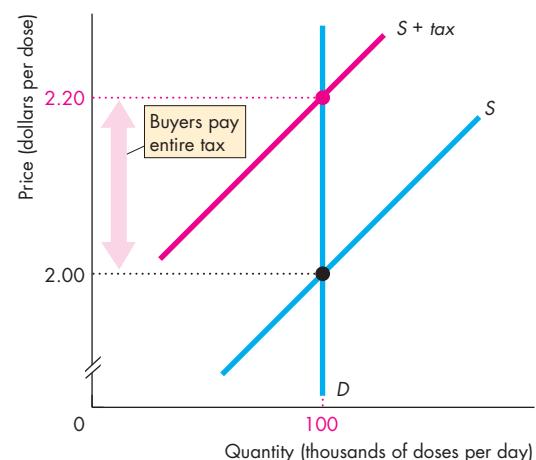
## Tax Incidence and Elasticity of Demand

The division of the tax between buyers and sellers depends in part on the elasticity of demand. There are two extreme cases:

- Perfectly inelastic demand—buyers pay.
- Perfectly elastic demand—sellers pay.

**Perfectly Inelastic Demand** Figure 6.7 shows the market for insulin, a vital daily medication for those with diabetes. Demand is perfectly inelastic at 100,000 doses a day, regardless of the price, as shown by the vertical demand curve  $D$ . That is, a diabetic would sacrifice all other goods and services rather than not consume the insulin dose that provides good health. The supply curve of insulin is  $S$ . With no tax, the price is \$2 a dose and the quantity is 100,000 doses a day.

If insulin is taxed at 20¢ a dose, we must add the tax to the minimum price at which drug companies are willing to sell insulin. The result is the new supply curve  $S + \text{tax}$ . The price rises to \$2.20 a dose, but the quantity does not change. Buyers pay the entire tax of 20¢ a dose.

**FIGURE 6.7** Tax with Perfectly Inelastic Demand

In this market for insulin, demand is perfectly inelastic. With no tax, the price is \$2 a dose and the quantity is 100,000 doses a day. A tax of 20¢ a dose shifts the supply curve to  $S + \text{tax}$ . The price rises to \$2.20 a dose, but the quantity bought does not change. Buyers pay the entire tax.

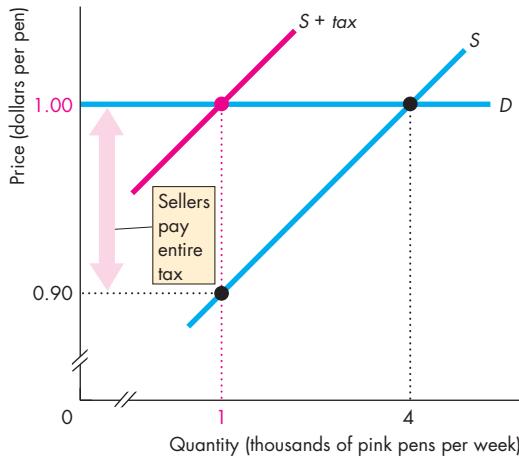
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**Perfectly Elastic Demand** Figure 6.8 shows the market for pink marker pens. Demand is perfectly elastic at \$1 a pen, as shown by the horizontal demand curve  $D$ . If pink pens are less expensive than the other colours, everyone uses pink. If pink pens are more expensive than other colours, no one uses pink. The supply curve is  $S$ . With no tax, the price of a pink pen is \$1 and the quantity is 4,000 pens a week.

Suppose that the government imposes a tax of 10¢ a pen on pink marker pens but not on other colours. The new supply curve is  $S + \text{tax}$ . The price remains at \$1 a pen, and the quantity decreases to 1,000 pink pens a week. The 10¢ tax leaves the price paid by buyers unchanged but lowers the amount received by sellers by the full amount of the tax. Sellers pay the entire tax of 10¢ a pink pen.

We've seen that when demand is perfectly inelastic, buyers pay the entire tax, and when demand is perfectly elastic, sellers pay the entire tax. In the usual case, demand is neither perfectly inelastic nor perfectly elastic and the tax is split between buyers and sellers. But the division depends on the elasticity of demand: The more inelastic the demand, the larger is the amount of the tax paid by buyers.

**FIGURE 6.8** Tax with Perfectly Elastic Demand



In this market for pink pens, demand is perfectly elastic. With no tax, the price of a pen is \$1 and the quantity is 4,000 pens a week. A tax of 10¢ a pink pen shifts the supply curve to  $S + \text{tax}$ . The price remains at \$1 a pen, and the quantity of pink pens sold decreases to 1,000 a week. Sellers pay the entire tax.

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## Tax Incidence and Elasticity of Supply

The division of the tax between buyers and sellers also depends, in part, on the elasticity of supply. Again, there are two extreme cases:

- Perfectly inelastic supply—sellers pay.
- Perfectly elastic supply—buyers pay.

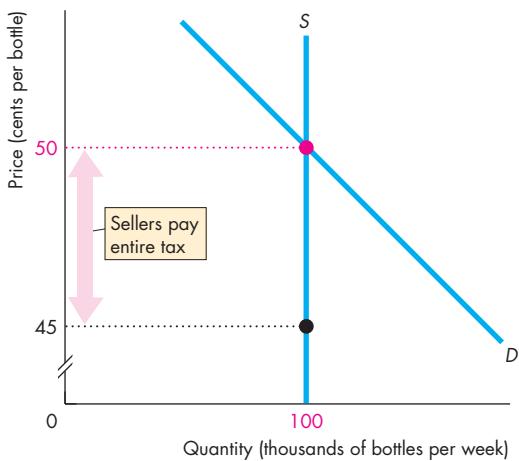
**Perfectly Inelastic Supply** Figure 6.9(a) shows the market for water from a mineral spring that flows at a constant rate that can't be controlled. Supply is perfectly inelastic at 100,000 bottles a week, as shown by the supply curve  $S$ . The demand curve for the water from this spring is  $D$ . With no tax, the price is 50¢ a bottle and the quantity is 100,000 bottles.

Suppose this spring water is taxed at 5¢ a bottle. The supply curve does not change because the spring owners still produce 100,000 bottles a week, even though the price they receive falls. But buyers are willing to buy the 100,000 bottles only if the price is 50¢ a bottle, so the price remains at 50¢ a bottle. The tax reduces the price received by sellers to 45¢ a bottle, and sellers pay the entire tax.

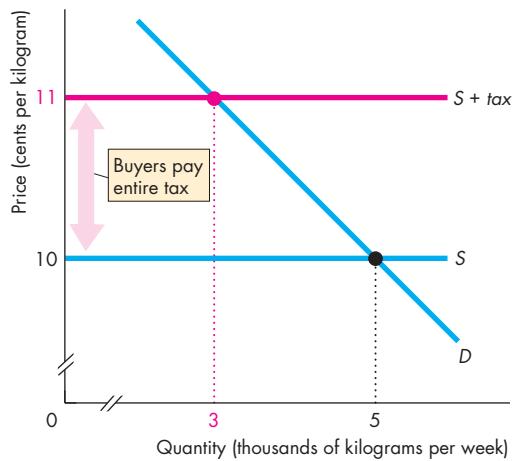
**Perfectly Elastic Supply** Figure 6.9(b) shows the market for sand from which computer-chip makers extract silicon. Supply of this sand is perfectly elastic at a price of 10¢ a kilogram, as shown by the supply curve  $S$ . The demand curve for sand is  $D$ . With no tax, the price is 10¢ a kilogram and 5,000 kilograms a week are bought.

If this sand is taxed at 1¢ a kilogram, we must add the tax to the minimum supply-price. Sellers are now willing to offer any quantity at 11¢ a kilogram along the curve  $S + \text{tax}$ . A new equilibrium is determined where the new supply curve intersects the demand curve: at a price of 11¢ a kilogram and a quantity of 3,000 kilograms a week. The tax has increased the price buyers pay by the full amount of the tax—1¢ a kilogram—and has decreased the quantity sold. Buyers pay the entire tax.

We've seen that when supply is perfectly inelastic, sellers pay the entire tax, and when supply is perfectly elastic, buyers pay the entire tax. In the usual case, supply is neither perfectly inelastic nor perfectly elastic and the tax is split between buyers and sellers. But how the tax is split depends on the elasticity of supply: The more elastic the supply, the larger is the amount of the tax paid by buyers.

**FIGURE 6.9** Tax and the Elasticity of Supply

(a) Perfectly inelastic supply



(b) Perfectly elastic supply

Part (a) shows the market for water from a mineral spring. Supply is perfectly inelastic. With no tax, the price is 50¢ a bottle. With a tax of 5¢ a bottle, the price remains at 50¢ a bottle. The number of bottles bought remains the same, but the price received by sellers decreases to 45¢ a bottle. Sellers pay the entire tax.

Part (b) shows the market for sand. Supply is perfectly elastic. With no tax, the price is 10¢ a kilogram. A tax of 1¢ a kilogram increases the minimum supply-price to 11¢ a kilogram. The supply curve shifts to  $S + \text{tax}$ . The price increases to 11¢ a kilogram. Buyers pay the entire tax.

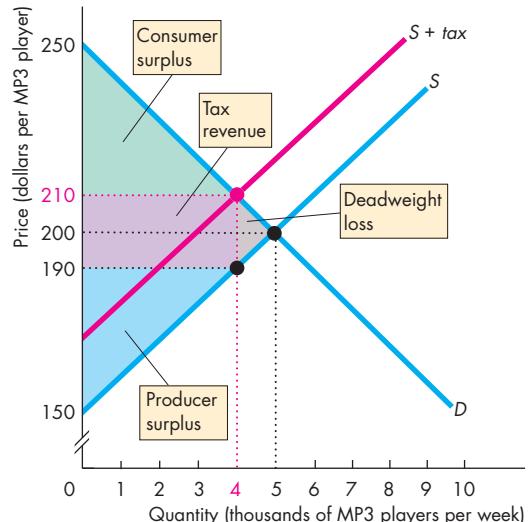
## Taxes and Efficiency

A tax drives a wedge between the buying price and the selling price and results in inefficient underproduction. The price buyers pay is also the buyers' willingness to pay, which measures *marginal social benefit*. The price sellers receive is also the sellers' minimum supply-price, which equals *marginal social cost*.

A tax makes marginal social benefit exceed marginal social cost, shrinks the producer surplus and consumer surplus, and creates a deadweight loss.

Figure 6.10 shows the inefficiency of a tax on MP3 players. The demand curve,  $D$ , shows marginal social benefit, and the supply curve,  $S$ , shows marginal social cost. Without a tax, the market produces the efficient quantity (5,000 players a week).

With a tax, the sellers' minimum supply-price rises by the amount of the tax and the supply curve shifts to  $S + \text{tax}$ . This supply curve does *not* show marginal social cost. The tax component isn't a *social*

**FIGURE 6.10** Taxes and Efficiency

With no tax, 5,000 players a week are produced. With a \$20 tax, the buyers' price rises to \$210, the sellers' price falls to \$190, and the quantity decreases to 4,000 players a week. Consumer surplus shrinks to the green area, and the producer surplus shrinks to the blue area. Part of the loss of consumer surplus and producer surplus goes to the government as tax revenue (the purple area) and part becomes a deadweight loss (the grey area).

cost of production. It is a transfer of resources to the government. At the new equilibrium quantity (4,000 players a week), both consumer surplus and producer surplus shrink. Part of each surplus goes to the government in tax revenue—the purple area; part becomes a deadweight loss—the grey area.

Only in the extreme cases of perfectly inelastic demand and perfectly inelastic supply does a tax not change the quantity bought and sold so that no dead-weight loss arises.

### Taxes and Fairness

We've examined the incidence and the efficiency of taxes. But when political leaders debate tax issues, it is fairness, not incidence and efficiency, that gets the most attention. The NDP complain that tax cuts are unfair because they give the benefits of lower taxes to the rich. Conservatives counter that it is fair that the rich get most of the tax cuts because they pay most of the taxes. No easy answers are available to the questions about the fairness of taxes.

Economists have proposed two conflicting principles of fairness to apply to a tax system:

- The benefits principle
- The ability-to-pay principle

**The Benefits Principle** The *benefits principle* is the proposition that people should pay taxes equal to the benefits they receive from the services provided by government. This arrangement is fair because it means that those who benefit most pay the most taxes. It makes tax payments and the consumption of government-provided services similar to private consumption expenditures.

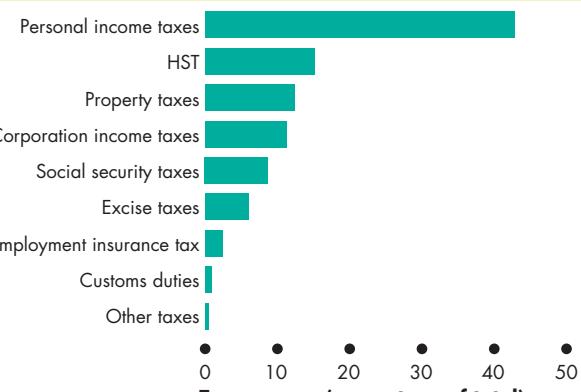
The benefits principle can justify high fuel taxes to pay for highways, high taxes on alcoholic beverages and tobacco products to pay for public health-care services, and high rates of income tax on high incomes to pay for the benefits from law and order and from living in a secure environment, from which the rich might benefit more than the poor.

**The Ability-to-Pay Principle** The *ability-to-pay principle* is the proposition that people should pay taxes according to how easily they can bear the burden of the tax. A rich person can more easily bear the burden than a poor person can, so the ability-to-pay principle can reinforce the benefits principle to justify high rates of income tax on high incomes.

### Economics in Action

#### Workers and Consumers Pay the Most Tax

Because the elasticity of the supply of labour is low and the elasticity of demand for labour is high, workers pay most of the personal income taxes and most of the social security taxes. Because the elasticities of demand for alcohol, tobacco, and gasoline are low and the elasticities of supply are high, the burden of these taxes (excise taxes) falls more heavily on buyers than on sellers.



**Canadian Taxes**

Source of data: Statistics Canada, CANSIM Table 385-0001.

### REVIEW QUIZ

- 1 How does the elasticity of demand influence the incidence of a tax, the tax revenue, and the deadweight loss?
- 2 How does the elasticity of supply influence the incidence of a tax, the quantity bought, the tax revenue, and the deadweight loss?
- 3 Why is a tax inefficient?
- 4 When would a tax be efficient?
- 5 What are the two principles of fairness that are applied to tax systems?

Work these questions in Study Plan 6.3 and get instant feedback. Do a Key Terms Quiz.

**MyEconLab**

Your next task is to study production quotas and subsidies, tools that are used to influence the markets for farm products.

## Production Quotas and Subsidies

An early or late frost, a hot dry summer, and a wet spring present just a few of the challenges that fill the lives of farmers with uncertainty and sometimes with economic hardship. Fluctuations in the weather bring fluctuations in farm output and prices and sometimes leave farmers with low incomes. To help farmers avoid low prices and low incomes, governments intervene in the markets for farm products.

Price floors that work a bit like the minimum wage that you've already studied might be used. But as you've seen, this type of government action creates a surplus and is inefficient. These same conclusions apply to the effects of a price floor for farm products.

Governments often use two other methods of intervention in the markets for farm products:

- Production quotas
- Subsidies

### Production Quotas

In the markets for milk, eggs, and poultry (among others), governments have, from time to time, imposed production quotas. A **production quota** is an upper limit to the quantity of a good that may be produced in a specified period. To discover the effects of a production quota, let's look at what a production quota does to the market for milk.

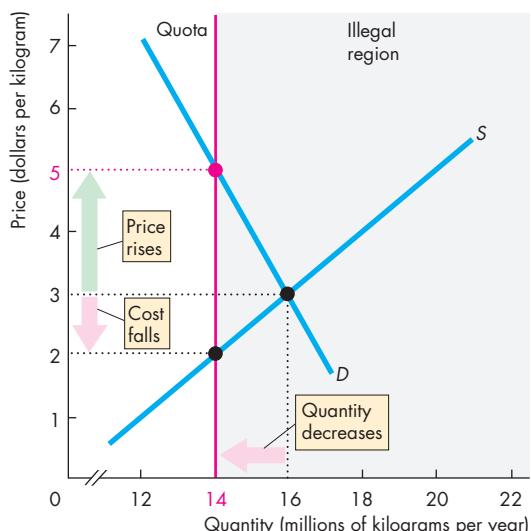
Suppose that the dairy farmers want to limit total production of milk to get a higher price. They persuade the government to introduce a production quota on milk.

The effect of the production quota depends on whether it is set below or above the equilibrium quantity. If the government introduced a production quota above the equilibrium quantity, nothing would change because dairy farmers would already be producing less than the quota. But a production quota set *below the equilibrium quantity* has big effects, which are:

- A decrease in supply
- A rise in price
- A decrease in marginal cost
- Inefficient underproduction
- An incentive to cheat and overproduce

Figure 6.11 illustrates these effects.

**FIGURE 6.11** The Effects of a Production Quota



With no quota, farmers produce 16 million kilograms of milk (powder) a year and the price is \$3 a kilogram. A production quota of 14 million kilograms a year restricts total production to that amount. The quantity produced decreases to 14 million kilograms a year, the price rises to \$5 a kilogram, and the farmers' marginal cost falls to \$2 a kilogram. Because marginal social cost (on the supply curve) is less than marginal social benefit (on the demand curve), a dead-weight loss arises from the underproduction.

#### MyEconLab Animation

**A Decrease in Supply** A production quota on milk decreases the supply of milk. Each grower is assigned a production limit that is less than the amount that would be produced—and supplied—without the quota. The total of the growers' limits equals the quota, and any production in excess of the quota is illegal.

The quantity supplied becomes the amount permitted by the production quota, and this quantity is fixed. The supply of milk becomes perfectly inelastic at the quantity permitted under the quota.

In Fig. 6.11, with no quota, growers would produce 16 million kilograms of milk (powder) a year—the market equilibrium quantity. With a production quota set at 14 million kilograms a year, the grey-shaded area shows the illegal region. As in the case of price ceilings and price floors, market forces and political forces are in conflict in this illegal region.

The vertical red line labelled "Quota" becomes the supply curve of milk at prices above \$2 a kilogram.

**A Rise in Price** The production quota raises the price of milk. When the government sets a production quota, it leaves market forces free to determine the price. Because the quota decreases the supply of milk, it raises the price. In Fig. 6.11, with no quota, the price is \$3 a kilogram. With a quota of 14 million kilograms, the price rises to \$5 a kilogram.

**A Decrease in Marginal Cost** The production quota lowers the marginal cost of producing milk. Marginal cost decreases because farmers produce less and stop using the resources with the highest marginal cost. Dairy farmers slide down their supply (and marginal cost) curves. In Fig. 6.11, marginal cost decreases to \$2 a kilogram.

**Inefficiency** The production quota results in inefficient underproduction. Marginal social benefit at the quantity produced is equal to the market price, which has increased. Marginal social cost at the quantity produced has decreased and is less than the market price. So marginal social benefit exceeds marginal social cost and a deadweight loss arises.

**An Incentive to Cheat and Overproduce** The production quota creates an incentive for farmers to cheat and produce more than their individual production limit. With the quota, the price exceeds marginal cost, so the farmer can get a larger profit by producing one more unit. Of course, if all farmers produce more than their assigned limit, the production quota becomes ineffective, and the price falls to the equilibrium (no quota) price.

To make the production quota effective, farmers must set up a monitoring system to ensure that no one cheats and overproduces. But it is costly to set up and operate a monitoring system and it is difficult to detect and punish producers who violate their quotas.

Because of the difficulty of operating a quota, producers often lobby governments to establish a quota and provide the monitoring and punishment systems that make it work.

## Subsidies

In Canada, the European Union, and the United States, the producers of many farm products, including grain, meat, milk, and eggs, receive government subsidies. A **subsidy** is a payment made by the government to a producer.

The effects of a subsidy are similar to the effects of a tax but they go in the opposite direction. These effects are:

- An increase in supply
- A fall in price and increase in quantity produced
- An increase in marginal cost
- Payments by government to farmers
- Inefficient overproduction

Figure 6.12 illustrates the effects of a subsidy to grain farmers.

**An Increase in Supply** In Fig. 6.12, with no subsidy, the demand curve  $D$  and the supply curve  $S$  determine the price of grain at \$40 a tonne and the quantity of grain at 40 million tonnes a year.

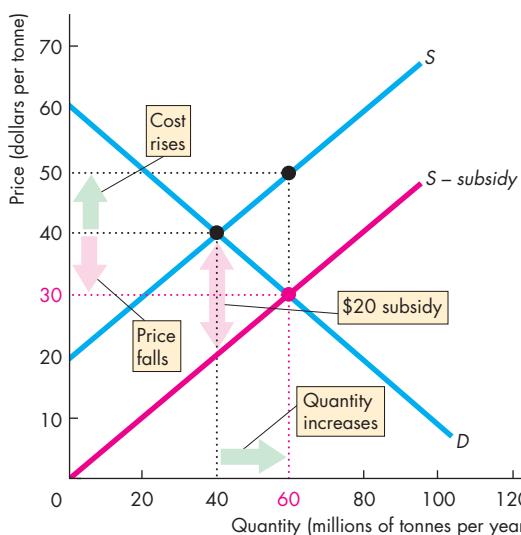
Suppose that the government introduces a subsidy of \$20 a tonne to grain farmers. A subsidy is like a negative tax. A tax is equivalent to an increase in cost, so a subsidy is equivalent to a decrease in cost. The subsidy brings an increase in supply.

To determine the position of the new supply curve, we subtract the subsidy from the farmers' minimum supply-price. In Fig. 6.12, with no subsidy, farmers are willing to offer 40 million tonnes a year at a price of \$40 a tonne. With a subsidy of \$20 a tonne, they will offer 40 million tonnes a year if the price is as low as \$20 a tonne. The supply curve shifts to the red curve labelled  $S - \text{subsidy}$ .

**A Fall in Price and Increase in Quantity Produced** The subsidy lowers the price of grain and increases the quantity produced. In Fig. 6.12, equilibrium occurs where the new supply curve intersects the demand curve at a price of \$30 a tonne and a quantity of 60 million tonnes a year.

**An Increase in Marginal Cost** The subsidy lowers the price paid by consumers but increases the marginal cost of growing grain. Marginal cost increases because farmers grow more grain, which means that they must begin to use some resources that are less ideal for growing grain. Farmers slide up their supply (and marginal cost) curves. In Fig. 6.12, marginal cost increases to \$50 a tonne.

**Payments by Government to Farmers** The government pays a subsidy to farmers on each tonne of grain produced. In this example, farmers increase production to 60 million tonnes a year and receive a

**FIGURE 6.12** The Effects of a Subsidy

With no subsidy, farmers produce 40 million tonnes a year at \$40 a tonne. A subsidy of \$20 a tonne shifts the supply curve rightward to  $S - \text{subsidy}$ . The equilibrium quantity increases to 60 million tonnes a year, the price falls to \$30 a tonne, and the price plus the subsidy received by farmers rises to \$50 a tonne. In the new equilibrium, marginal social cost (on the supply curve) exceeds marginal social benefit (on the demand curve) and the subsidy results in inefficient overproduction.

[MyEconLab Animation](#)

subsidy of \$20 a tonne. So farmers receive payments from the government that total \$1,200 million a year.

**Inefficient Overproduction** The subsidy results in inefficient overproduction. At the quantity produced with the subsidy, marginal social benefit is equal to the market price, which has fallen. Marginal social cost has increased and it exceeds the market price. Because marginal social cost exceeds marginal social benefit, the increased production brings inefficiency.

Subsidies spill over to the rest of the world. Because a subsidy lowers the domestic market price, subsidized farmers will offer some of their output for sale on the world market. The increase in supply on the world market lowers the price in the rest of the world. Faced with lower prices, farmers in other countries decrease production and receive smaller revenues.

## Economics in Action

### Rich High-Cost Farmers the Winners

Farm subsidies are a major obstacle to achieving an efficient use of resources in the global markets for farm products and are a source of tension between rich and developing nations.

Canada, the United States, and the European Union pay their farmers subsidies, which create inefficient overproduction of food in these rich economies.

One international study concluded that Canadians would be better off if they imported all their food rather than produce any themselves!

At the same time, Canadian, U.S., and European subsidies make it more difficult for farmers in the developing nations of Africa, Asia, and Central and South America to compete in global food markets. Farmers in these countries can often produce at a lower opportunity cost than Canadian, U.S., and European farmers.

Two rich countries, Australia and New Zealand, have stopped subsidizing farmers. The result has been an improvement in the efficiency of farming in these countries. New Zealand is so efficient at producing lamb and dairy products that it has been called the Saudi Arabia of milk (an analogy to Saudi Arabia's huge oil reserve and production).

International opposition to farm subsidies is strong. Opposition to farm subsidies inside Canada, the European Union, and the United States is growing, but it isn't as strong as the pro-farm lobby, so don't expect an early end to these subsidies.

## REVIEW QUIZ

- 1 Summarize the effects of a production quota on the market price and the quantity produced.
- 2 Explain why a production quota is inefficient.
- 3 Explain why a voluntary production quota is difficult to operate.
- 4 Summarize the effects of a subsidy on the market price and the quantity produced.
- 5 Explain why a subsidy is inefficient.

Work these questions in Study Plan 6.4 and get instant feedback. Do a Key Terms Quiz.

[MyEconLab](#)

Governments intervene in some markets by making it illegal to trade in a good. Let's now see how these markets work.

## Markets for Illegal Goods

The markets for many goods and services are regulated, and buying and selling some goods is illegal. The best-known examples of such goods are drugs such as marijuana, cocaine, ecstasy, and heroin.

Despite the fact that these drugs are illegal, trade in them is a multibillion-dollar business. This trade can be understood by using the same economic model and principles that explain trade in legal goods. To study the market for illegal goods, we're first going to examine the prices and quantities that would prevail if these goods were not illegal. Next, we'll see how prohibition works. Then we'll see how a tax might be used to limit the consumption of these goods.

### A Free Market for a Drug

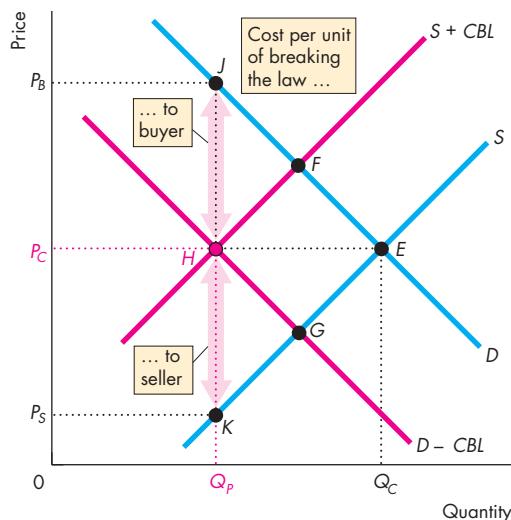
Figure 6.13 shows the market for a drug. The demand curve,  $D$ , shows that, other things remaining the same, the lower the price of the drug, the larger is the quantity of the drug demanded. The supply curve,  $S$ , shows that, other things remaining the same, the lower the price of the drug, the smaller is the quantity supplied. If the drug were not illegal, the quantity bought and sold would be  $Q_C$  and the price would be  $P_C$ .

### A Market for an Illegal Drug

When a good is illegal, the cost of trading in the good increases. By how much the cost increases and who bears the cost depend on the penalties for violating the law and the degree to which the law is enforced. The larger the penalties and the better the policing, the higher are the costs. Penalties might be imposed on sellers, buyers, or both.

**Penalties on Sellers** Drug dealers in Canada face large penalties if their activities are detected. For example, a marijuana dealer caught with less than 3 kilograms could serve a 1-year prison term. A heroin dealer or marijuana dealer caught with 3 kilograms could be imprisoned for 2 years. These penalties are part of the cost of supplying illegal drugs, and they bring a decrease in supply—a leftward shift in the supply curve. To determine the new supply curve, we add the cost of breaking the law to the minimum price that drug dealers are willing to accept. In Fig. 6.13, the cost of breaking the law by selling drugs ( $CBL$ ) is added to the minimum price that

**FIGURE 6.13** Market for an Illegal Good



The demand curve for drugs is  $D$ , and the supply curve is  $S$ . If drugs are not illegal, the quantity bought and sold is  $Q_C$  at a price of  $P_C$ —point  $E$ . If selling drugs is illegal, the cost of breaking the law by selling drugs ( $CBL$ ) is added to the minimum supply-price and supply decreases to  $S + CBL$ . The market moves to point  $F$ . If buying drugs is illegal, the cost of breaking the law is subtracted from the maximum price that buyers are willing to pay, and demand decreases to  $D - CBL$ . The market moves to point  $G$ . With both buying and selling illegal, the supply curve and the demand curve shift and the market moves to point  $H$ . The market price remains at  $P_C$ , but the market price plus the penalty for buying rises—point  $J$ —and the market price minus the penalty for selling falls—point  $K$ .

**MyEconLab Animation**

dealers will accept and the supply curve shifts leftward to  $S + CBL$ . If penalties were imposed only on sellers, the market equilibrium would move from point  $E$  to point  $F$ .

**Penalties on Buyers** In Canada, it is illegal to possess drugs such as marijuana, cocaine, ecstasy, and heroin. Possession of marijuana can bring a prison term of 6 months and a fine of \$1,000. Possession of heroin can bring a prison term of 7 years. Penalties fall on buyers, and the cost of breaking the law must be subtracted from the value of the good to determine the maximum price buyers are willing to pay for the drugs. Demand decreases, and the demand curve shifts leftward. In Fig. 6.13, the demand curve shifts

to  $D - CBL$ . If penalties were imposed only on buyers, the market equilibrium would move from point  $E$  to point  $G$ .

**Penalties on Both Sellers and Buyers** If penalties are imposed on both sellers *and* buyers, both supply and demand decrease and both the supply curve and the demand curve shift. In Fig. 6.13, the costs of breaking the law are the same for both buyers and sellers, so both curves shift leftward by the same amount. The market equilibrium moves to point  $H$ . The market price remains at the competitive market price  $P_C$ , but the quantity bought decreases to  $Q_P$ . Buyers pay  $P_C$  plus the cost of breaking the law, which equals  $P_B$ . Sellers receive  $P_C$  minus the cost of breaking the law, which equals  $P_S$ .

The larger the penalties and the greater the degree of law enforcement, the larger is the decrease in demand and/or supply. If the penalties are heavier on sellers, the supply curve shifts farther than the demand curve and the market price rises above  $P_C$ . If the penalties are heavier on buyers, the demand curve shifts farther than the supply curve and the market price falls below  $P_C$ . In the United States, the penalties on sellers are larger than those on buyers, so the quantity of drugs traded decreases and the market price increases compared with a free market.

With high enough penalties and effective law enforcement, it is possible to decrease demand and/or supply to the point at which the quantity bought is zero. But in reality, such an outcome is unusual. It does not happen in Canada in the case of illegal drugs. The key reason is the high cost of law enforcement and insufficient resources for the police to achieve effective enforcement. Because of this situation, some people suggest that drugs (and other illegal goods) should be legalized and sold openly but also taxed at a high rate in the same way that legal drugs such as alcohol are taxed. How would such an arrangement work?

## Legalizing and Taxing Drugs

From your study of the effects of taxes, it is easy to see that the quantity bought of a drug could decrease if the drug were legalized and taxed. Imposing a sufficiently high tax could decrease the supply, raise the price, and achieve the same decrease in the quantity bought as does a prohibition on drugs. The government would collect a large tax revenue.

**Illegal Trading to Evade the Tax** It is likely that an extremely high tax rate would be needed to cut the quantity of drugs bought to the level prevailing with a prohibition. It is also likely that many drug dealers and consumers would try to cover up their activities to evade the tax. If they did act in this way, they would face the cost of breaking the law—the tax law. If the penalty for tax law violation is as severe and as effectively policed as drug-dealing laws, the analysis we've already conducted applies also to this case. The quantity of drugs bought would depend on the penalties for law breaking and on the way in which the penalties are assigned to buyers and sellers.

### Taxes Versus Prohibition: Some Pros and Cons

Which is more effective: prohibition or taxes? In favour of taxes and against prohibition is the fact that the tax revenue can be used to make law enforcement more effective. It can also be used to run a more effective education campaign against illegal drug use. In favour of prohibition and against taxes is the fact that prohibition sends a signal that might influence preferences, decreasing the demand for illegal drugs. Also, some people intensely dislike the idea of the government profiting from trade in harmful substances.

## REVIEW QUIZ

- How does the imposition of a penalty for selling an illegal drug influence demand, supply, price, and the quantity of the drug consumed?
- How does the imposition of a penalty for possessing an illegal drug influence demand, supply, price, and the quantity of the drug consumed?
- How does the imposition of a penalty for selling *or* possessing an illegal drug influence demand, supply, price, and the quantity of the drug consumed?
- Is there any case for legalizing drugs?

Work these questions in Study Plan 6.5 and get instant feedback.  
**MyEconLab**

◆ You now know how to use the demand and supply model to predict prices, to study government actions in markets, and to study the sources and costs of inefficiency. In *Economics in the News* on pp. 144–145, you will see how to apply what you've learned by looking at the effects of the minimum wage rate in the market for low-skilled labour.

# Push to Raise the Minimum Wage

## Ontario's Minimum Wage to Rise to \$11 an Hour This June, an Increase of 75 Cents an Hour.

*Financial Post*

Canadian Press, January 30, 2014

Ontario's Liberal government is raising the minimum wage to \$11 an hour, promising annual increases will be tied to the rate of inflation.

Premier Kathleen Wynne announced the 75-cent-an-hour hike on Thursday — the first minimum wage increase in the province since 2010 — calling it a “fair adjustment” that reflects the rise in the Consumer Price Index.

“I think the vast majority of people in Ontario understand that it’s very difficult to make ends meet living on minimum wage, and that there needs to be a fair way of allowing minimum wage to keep up with the cost of living,” she said.

At \$11 an hour, Ontario will join Nunavut in having the highest minimum wage in Canada. ...

Anti-poverty activists and unions have been demanding an immediate increase to a \$14-an-hour minimum wage, but the government has said that would hurt businesses and end up reducing jobs. ...

However, the Canadian Restaurant and Foodservices Association warned the 75-cent hike will result in fewer jobs, especially among youth, calling it “unnecessary, tough for small business and counter-productive.” ...

The Progressive Conservatives warned the \$11 minimum wage amounted to a seven per cent increase in business costs, and predicted it would result in reduced hours for workers or even job losses.

“If labour costs go up seven per cent, they’ve got to lay people off, putting them on unemployment,” [said] PC critic Jane McKenna. “What’s stopping a 40-hour week from becoming a 37-hour week?”

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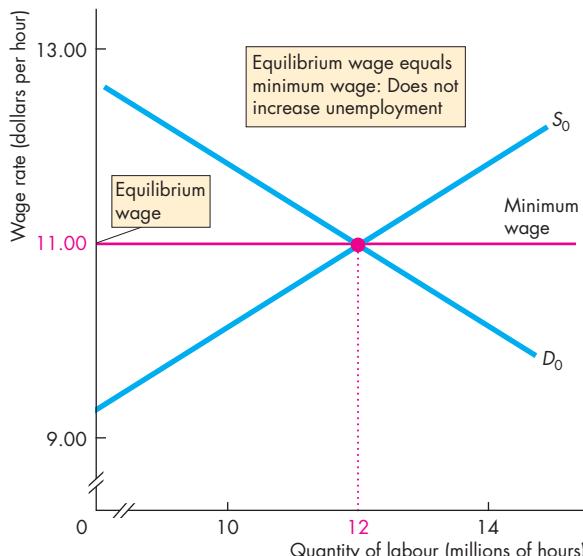
### ESSENCE OF THE STORY

- The Ontario government is raising the minimum wage by 75¢ to \$11 an hour and plans to increase the rate in future years in line with the cost of living (measured by the Consumer Price Index).
- Ontario will join Nunavut with the highest minimum wage in Canada.
- Anti-poverty activists and unions want an increase to \$14 an hour.
- The government says that \$14 an hour would decrease the number of jobs.
- Employers and the Ontario Progressive Conservative opposition say that a rise to \$11 will lower employment.

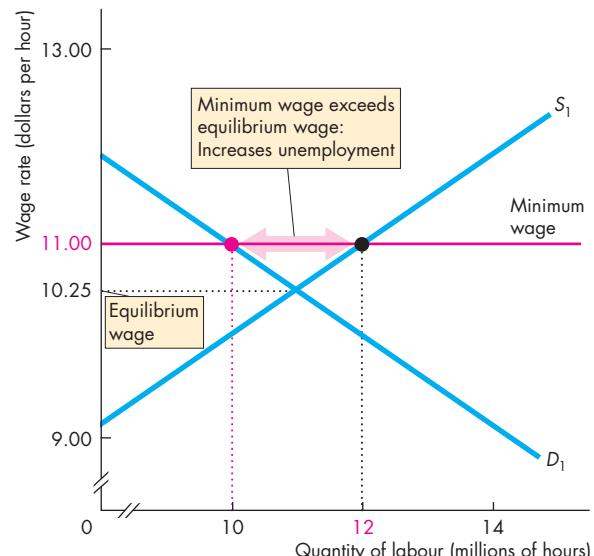
## ECONOMIC ANALYSIS

- The news article reports that the Ontario government is increasing the provincial minimum wage rate by 75¢ to \$11 per hour.
- The Ontario minimum wage was set at \$10.25 an hour in 2010.
- Other wage rates have risen and the cost of living has increased, and there was a widely held view that the minimum wage rate needed to rise.
- With the increase to \$11 per hour, Ontario's minimum wage will join Nunavut's as the highest in Canada.
- Supporters of the increases believed that employment would not be adversely affected, while opponents argued that the higher minimum wage would bring job losses.
- The figures illustrate these two opinions about the effect of a higher minimum wage rate.
- Figure 1 illustrates a market for low-skilled labour in which the equilibrium wage rate exceeds the minimum wage.
- The demand for labour is  $D_0$  and the supply of labour is  $S_0$ , so the equilibrium wage rate is \$11 an hour, which is also the minimum wage rate.

- Because the equilibrium wage rate equals the minimum wage rate, the quantity of labour demanded equals the quantity of labour supplied and the minimum wage rate has no effect on the market outcome.
- Figure 2 illustrates a market for low-skilled labour in which the equilibrium wage rate is lower than the minimum wage rate.
- The demand for labour is  $D_1$  and the supply of labour is  $S_1$ , so the equilibrium wage rate is \$10.25 an hour.
- The minimum wage rate is \$11 an hour, and the quantity of labour employed equals the quantity demanded at the minimum wage rate.
- The quantity of labour demanded and employed is 10 million (an assumed quantity).
- At the equilibrium wage rate, the quantity of labour supplied is 12 million (also an assumed quantity), so 2 million workers are unemployed.
- With the equilibrium wage rate less than the minimum wage rate, the quantity of labour demanded is less than the quantity of labour supplied and the minimum wage rate brings an increase in unemployment.



**Figure 1** Government and Union View of Labour Market



**Figure 2** PC Opposition and Employer View of Labour Market

## SUMMARY

### Key Points

#### A Housing Market with a Rent Ceiling (pp. 128–130)

- A rent ceiling that is set above the equilibrium rent has no effect.
- A rent ceiling that is set below the equilibrium rent creates a housing shortage, increased search activity, and a black market.
- A rent ceiling that is set below the equilibrium rent is inefficient and unfair.

Working Problems 1 and 2 will give you a better understanding of a housing market with a rent ceiling.

#### A Labour Market with a Minimum Wage (pp. 131–133)

- A minimum wage set below the equilibrium wage rate has no effect.
- A minimum wage set above the equilibrium wage rate creates unemployment and increases the amount of time people spend searching for a job.
- A minimum wage set above the equilibrium wage rate is inefficient, unfair, and hits low-skilled young people hardest.

Working Problems 3 and 4 will give you a better understanding of a labour market with a minimum wage.

#### Taxes (pp. 133–138)

- A tax raises the price paid by buyers, but usually by less than the tax.
- The elasticity of demand and the elasticity of supply determine the share of a tax paid by buyers and sellers.

- The less elastic the demand or the more elastic the supply, the larger is the share of the tax paid by buyers.
- If demand is perfectly elastic or supply is perfectly inelastic, sellers pay the entire tax. And if demand is perfectly inelastic or supply is perfectly elastic, buyers pay the entire tax.

Working Problem 5 will give you a better understanding of taxes.

#### Production Quotas and Subsidies (pp. 139–141)

- A production quota leads to inefficient underproduction, which raises the price.
- A subsidy is like a negative tax. It lowers the price, increases the cost of production, and leads to inefficient overproduction.

Working Problems 6 and 7 will give you a better understanding of production quotas and subsidies.

#### Markets for Illegal Goods (pp. 142–143)

- Penalties on sellers increase the cost of selling the good and decrease the supply of the good.
- Penalties on buyers decrease their willingness to pay and decrease the demand for the good.
- Penalties on buyers and sellers decrease the quantity of the good, raise the price buyers pay, and lower the price sellers receive.
- Legalizing and taxing can achieve the same outcome as penalties on buyers and sellers.

Working Problem 8 will give you a better understanding of markets for illegal goods.

### Key Terms

Black market, 128

Price floor, 131

#### MyEconLab Key Terms Quiz

Minimum wage, 131

Production quota, 139

Subsidy, 140

Price cap, 128

Rent ceiling, 128

Tax incidence, 133

Price ceiling, 128

Search activity, 128



## WORKED PROBLEM

**MyEconLab** You can work this problems in Chapter 6 Study Plan.

The table gives the demand and supply schedules for tickets to a concert in the park.

Price (dollars per ticket)	Quantity demanded (tickets per concert)		Quantity supplied (tickets per concert)
5	600	200	
6	500	300	
7	400	400	
8	300	500	
9	200	600	
10	100	700	

### Questions

- If there is no tax on concert tickets, what is the price of a ticket and how many tickets are bought?
- If a sales tax of \$2 a ticket is levied on sellers of concert tickets:

  - What is the price a concert-goer pays for a ticket and how many tickets are bought?
  - Who pays the tax and what is the government's tax revenue?
  - Is the market for concert tickets efficient? Explain.

### Solutions

- With no sales tax on concert tickets, the price of a ticket is the market equilibrium price, which is \$7 a ticket. At \$7 a ticket, the quantity of tickets bought is 400 per concert.
- With a sales tax of \$2 a ticket levied on sellers of concert tickets, the supply of tickets will decrease. It decreases because at any ticket price paid by buyers, concert organizers will receive \$2 less per ticket.

For example, concert organizers are willing to supply 700 tickets per concert if they receive \$10 a ticket. But with a tax of \$2 a ticket, concert organizers will receive only \$8 a ticket after paying the government the \$2 tax per ticket. So concert organizers will not be willing to supply 700 tickets at the after-tax price of \$8 a ticket. The table above tells us that concert organizers are willing to supply only 500 tickets per concert when they receive \$8 a ticket.

We need to create the new supply schedule. We have already found one point on the new supply schedule: At a market price of \$10 a ticket, concert organizers are willing to supply 500 tickets.

The table in the next column shows the new supply schedule.

Price (dollars per ticket)	Quantity demanded (tickets per concert)	New quantity supplied (tickets per concert)	
6	500		
7	400	200	
8	300	300	
9	200	400	
10	100	500	

Check that you can explain why at a market price of \$7 a ticket, concert organizers are willing to supply 400 tickets when tickets are not taxed but only 200 tickets when tickets are taxed \$2 per ticket.

With the \$2 tax, concert-goers pay \$8 a ticket and buy 300 tickets.

**Key Point:** A sales tax raises the market price and the quantity bought decreases.

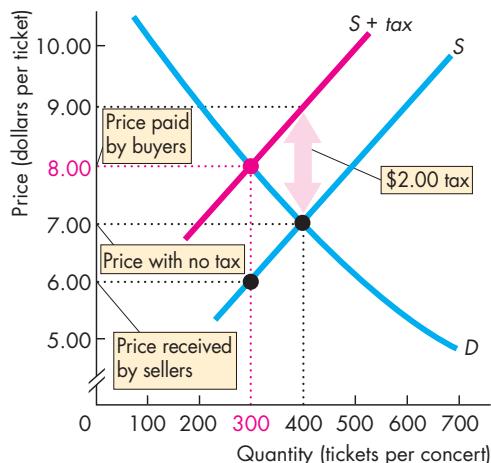
- If a sales tax of \$2 a ticket is levied on concert tickets, the price concert-goers pay rises from \$7 a ticket to \$8 a ticket. So concert-goers pay \$1 of the \$2 tax. The other \$1 of tax is paid by concert organizers. The government's tax revenue is \$2 × 300, or \$600.

**Key Point:** Some of the tax is paid by buyers and some by sellers.

- With no tax, 400 tickets per concert is efficient. With the tax, the ticket price rises and the quantity bought decreases to 300 per concert. The outcome is inefficient and a deadweight loss arises.

**Key Point:** A sales tax that decreases the quantity sold is inefficient and creates a deadweight loss.

### Key Figure



**MyEconLab** Interactive Animation

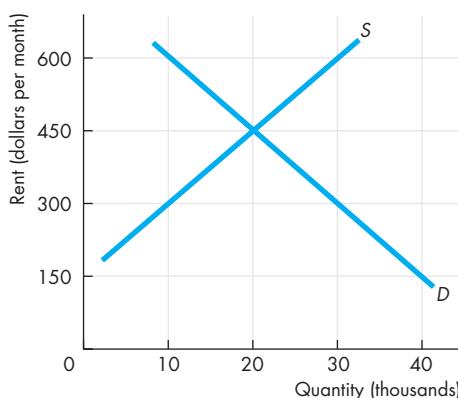


## STUDY PLAN PROBLEMS AND APPLICATIONS

**MyEconLab** You can work Problems 1 to 8 in Chapter 6 Study Plan and get instant feedback.

### A Housing Market with a Rent Ceiling (Study Plan 6.1)

Use the following graph of the market for rental housing in Townsville to work Problems 1 and 2.



1. a. What are the equilibrium rent and the quantity of housing rented?  
b. If a rent ceiling is set at \$600 a month, what is the rent paid? What is the shortage of housing?
2. If the rent ceiling is \$300 a month, what is the quantity rented, the shortage of housing, and the maximum price that someone is willing to pay for the last unit of housing available?

### A Labour Market with a Minimum Wage (Study Plan 6.2)

Use the following data on the demand and supply schedules of teenage labour to work Problems 3 and 4.

Wage rate (dollars per hour)	Quantity demanded		Quantity supplied	
	(hours per month)			
5	2,500		1,500	
6	2,000		2,000	
7	1,500		2,500	
8	1,000		3,000	

3. Calculate the equilibrium wage rate, the hours worked, and the quantity of unemployment.
4. The minimum wage for teenagers is \$7 an hour.
  - a. How many hours are unemployed?
  - b. If the demand for teenage labour increases by 500 hours a month, what is the wage rate and how many hours are unemployed?

### Taxes (Study Plan 6.3)

5. The table in the next column sets out the demand and supply schedules for chocolate brownies.

Price (cents per brownie)	Quantity demanded		Quantity supplied (millions per day)
		(millions per day)	
50	5		3
60	4		4
70	3		5
80	2		6

- a. If sellers are taxed 20¢ a brownie, what is the price and who pays the tax?
- b. If buyers are taxed 20¢ a brownie, what is the price and who pays the tax?

### Production Quotas and Subsidies (Study Plan 6.4)

Use the following data to work Problems 6 and 7. The demand and supply schedules for rice are:

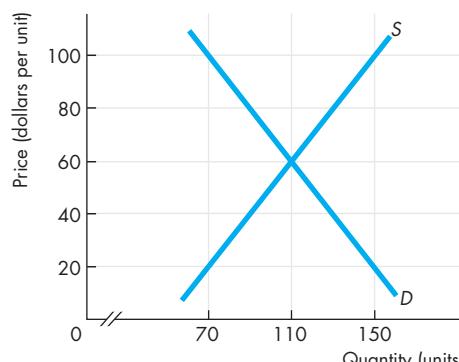
Price (dollars per box)	Quantity demanded		Quantity supplied	
	(boxes per week)			
1.20	3,000		1,500	
1.30	2,750		2,000	
1.40	2,500		2,500	
1.50	2,250		3,000	
1.60	2,000		3,500	

Calculate the price, the marginal cost of rice, and the quantity produced if the government:

6. Sets a production quota of 2,000 boxes a week.
7. Introduces a subsidy of \$0.30 a box.

### Markets for Illegal Goods (Study Plan 6.5)

8. The figure shows the market for an illegal good.



Calculate the market price and the quantity bought if a penalty of \$20 a unit is imposed on:

- a. Sellers only or buyers only.
- b. Both sellers and buyers.



## ADDITIONAL PROBLEMS AND APPLICATIONS

### MyEconLab

You can work these problems in MyEconLab if assigned by your instructor.

#### A Housing Market with a Rent Ceiling

Use the following table to work Problems 9 and 10. The table sets out the demand and supply schedules for college meals:

Price (dollars per meal)	Quantity demanded	Quantity supplied
	(meals per week)	
4	3,000	1,500
5	2,750	2,000
6	2,500	2,500
7	2,250	3,000
8	2,000	3,500

9. a. What are the equilibrium meal price and equilibrium quantity of meals?  
b. If the college put a price ceiling on meals at \$7 a meal, what is the price students pay for a meal? How many meals do they buy?
10. If the college put a price ceiling on meals at \$4 a meal, what is the quantity bought, the shortage of meals, and the maximum price that someone is willing to pay for the last meal available?

#### A Labour Market with a Minimum Wage

Use the following news clip to work Problems 11 and 12.

##### Malaysia Passes Its First Minimum Wage Law

About 3.2 million low-income workers across Malaysia are expected to benefit from the country's first minimum wage, which the government says will transform Malaysia into a high-income nation. Employer groups argue that paying the minimum wage, which is not based on productivity or performance, would raise their costs and reduce business profits.

Source: *The New York Times*, May 1, 2012

11. On a graph of the market for low-skilled labour, show the effect of the minimum wage on the quantity of labour employed.
12. Explain the effects of the minimum wage on the workers' surplus, the firms' surplus, and the efficiency of the market for low-skilled workers.

#### Taxes

13. Use the news clip in Problem 11.
  - a. If the Malaysian government cut the tax on business profits, would it offset the effect of the minimum wage on employment? Explain.

- b. Would a cut in the social security tax that small businesses pay offset the effect of the higher minimum wage on employment? Explain.

14. The demand and supply schedules for tulips are:

Price (dollars per bunch)	Quantity demanded	Quantity supplied
	(bundles per week)	
10	100	40
12	90	60
14	80	80
16	70	100
18	60	120

- a. If tulips are not taxed, what is the price and how many bunches are bought?
- b. If tulips are taxed \$6 a bunch, what are the price and quantity bought? Who pays the tax?

15. **Cigarette Taxes, Black Markets, and Crime: Lessons from New York's 50-Year Losing Battle**

New York City has the highest cigarette taxes in the United States. During the four months following the recent tax hike, sales of taxed cigarettes in the city fell by more than 50 percent as consumers turned to the city's bustling black market. The thriving illegal market for cigarettes has diverted billions of dollars from legitimate businesses and governments to criminals.

Source: Cato Institute, February 6, 2003

- a. How has the market for cigarettes in New York City responded to the high cigarette taxes?
- b. How does the emergence of a black market impact the elasticity of demand in a legal market?
- c. Why might an increase in the tax rate actually cause a decrease in the tax revenue?

#### Production Quotas and Subsidies

Use the following news clip to work Problems 16 to 18.

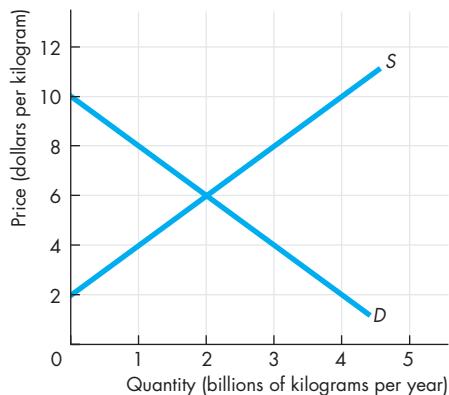
##### Crop Prices Erode Farm Subsidy Program

High corn and soybean prices mean farmers are making the most money in their lives. The reason: Grain prices are far too high to trigger payouts under the U.S. primary farm-subsidy program's "price support" formula. The market has done what Congress couldn't do and that is "slash farm subsidies."

Source: *The Wall Street Journal*, July 25, 2011

16. a. Why are U.S. soybean farmers subsidized?  
 b. Explain how a subsidy paid to soybean farmers affects the price of soybean and the marginal cost of producing it.
17. Show in a graph how a subsidy paid to soybean farmers affects the consumer surplus and the producer surplus from soybeans. Does the subsidy make the soybean market more efficient or less efficient? Explain.
18. In the market for corn with a price support, explain why the corn price has risen and ended up being too high to “trigger payouts.”

Use the following figure, which shows the market for tomatoes, to work Problems 19 and 20.



19. If the government subsidizes growers at \$4 a kilogram, what is the quantity produced, the quantity demanded, and the subsidy paid to growers?
20. If the government subsidizes tomato growers at \$4 a kilogram, who gains and who loses from the subsidy? What is the deadweight loss? Could the subsidy be regarded as being fair?

### Markets for Illegal Goods

21. The table gives the demand and supply schedules for an illegal drug.

Price (dollars per unit)	Quantity demanded	Quantity supplied
	(units per day)	
50	500	300
60	400	400
70	300	500
80	200	600
90	100	700

- a. What is the price and how many units are bought if there is no penalty on drugs?  
 b. If the penalty on sellers is \$20 a unit, what are the price and quantity consumed?

- c. If the penalty on buyers is \$20 a unit, what are the price and quantity consumed?

### Economics in the News

22. Study *Economics in the News* on pp. 144–145, and note that the minimum wage was last increased in 2010 and that since then other wage rates and the cost of most things that people buy have increased. Then answer the following questions.
- How would you expect the demand for and supply of low-skilled labour to have changed from 2010 to 2014?
  - How would you expect the equilibrium wage rate of low-skilled labour to have changed from 2010 to 2014?
  - Would you expect the minimum wage to have increased, decreased, or had no effect on the unemployment rate from 2010 to 2014?
  - Draw a graph to illustrate your answers to parts (a), (b), and (c).

23. **Hollywood: Organized Crime Hits the Movies**

The Mexican army seized 1,180 disc burners and 3.14 million copies of movies and TV shows from 23 warehouses in a move to fight piracy that costs Hollywood about \$590 million a year.

Source: Bloomberg *Businessweek*, April 7, 2011

Assume that the marginal cost of producing a DVD (legal or illegal) is a constant \$3 and that legal DVDs bear an additional marginal cost of \$5 each in royalty payments to film studios.

- Draw a graph of the market for counterfeit DVDs, assuming that there are no effective penalties on either buyers or sellers for breaking the law.
- How do the events reported in the news clip change the market outcome? Show the effects in your graph.
- With no penalty on buyers, if a penalty for breaking the law is imposed on sellers at more than \$5 a disc, how does the market work and what is the equilibrium price?
- With no penalty on sellers, if a penalty for breaking the law is imposed on buyers at more than \$5 a disc, how does the market work and what is the equilibrium price?
- What is the marginal benefit of an illegal DVD in the situations described in parts (c) and (d)?
- In light of your answer to part (e), why does law enforcement usually focus on sellers rather than buyers?



H

# 7

## GLOBAL MARKETS IN ACTION

After studying this chapter,  
you will be able to:

- ◆ Explain how markets work with international trade
- ◆ Identify the gains from international trade and its winners and losers
- ◆ Explain the effects of international trade barriers
- ◆ Explain and evaluate arguments used to justify restricting international trade

iPhones, Wii games, and Nike shoes are just three of the items that you might buy that are not produced in Canada. Why don't we produce phones, games, and shoes in Canada? Isn't the globalization of production killing good Canadian jobs?

You will find the answers in this chapter. And you will see why global trade is a win-win deal for buyers and sellers. You will also see why governments restrict trade, and in *Economics in the News* at the end of the chapter, why it is difficult for Canada to reach a free-trade deal with Japan and other Pacific nations.

But first, we study the gains from international trade.

## How Global Markets Work

Because we trade with people in other countries, the goods and services that we can buy and consume are not limited by what we can produce. The goods and services that we buy from other countries are our **imports**, and the goods and services that we sell to people in other countries are our **exports**.

### International Trade Today

Global trade today is enormous. In 2013, global exports and imports were \$23 trillion, which is one-third of the value of global production. The United States is the world's largest international trader and accounts for 10 percent of world exports and 12 percent of world imports. Germany and China, which rank 2 and 3 behind the United States, lag by a large margin.

In 2013, total Canadian exports were \$566 billion, which is 27 percent of the value of Canadian production. Total Canadian imports were \$486 billion, which is about 23 percent of total expenditure in Canada.

We trade both goods and services. In 2013, exports of services were about 15 percent of total exports and imports of services were about 19 percent of total imports.

### What Drives International Trade?

*Comparative advantage* is the fundamental force that drives international trade. Comparative advantage (see Chapter 2, p. 40) is a situation in which a person can perform an activity or produce a good or service at a lower opportunity cost than anyone else. This same idea applies to nations. We can define *national comparative advantage* as a situation in which a nation can perform an activity or produce a good or service at a lower opportunity cost than any other nation.

The opportunity cost of producing a T-shirt is lower in China than in Canada, so China has a comparative advantage in producing T-shirts. The opportunity cost of producing a regional jet is lower in Canada than in China, so Canada has a comparative advantage in producing regional jets.

You saw in Chapter 2 how Liz and Joe reap gains from trade by specializing in the production of the good at which they have a comparative advantage and then trading with each other. Both are better off.

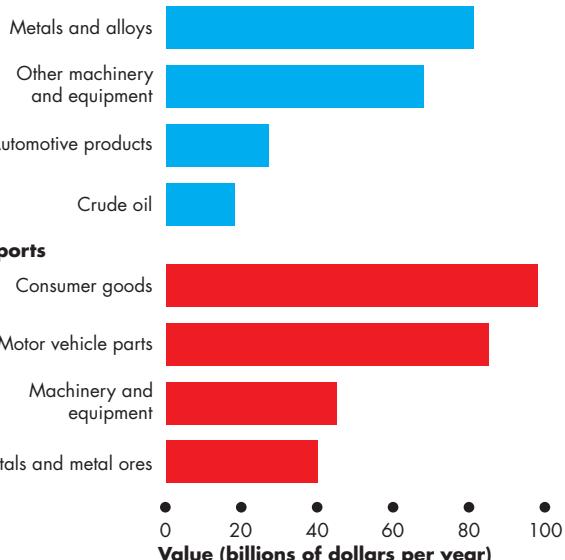
This same principle applies to trade among nations. Because China has a comparative advantage

## Economics in Action

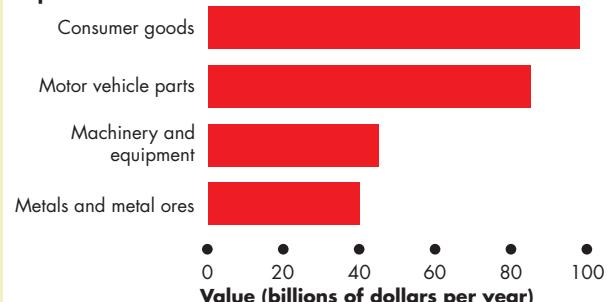
### We Trade Metals for Consumer Goods

The figure shows Canada's four largest exports and imports by value. Metals and alloys and machinery and equipment are our biggest exports and consumer goods and motor vehicle parts are our biggest imports. Trade in automobiles—both exports and imports—has slipped from top spot in earlier years.

#### Exports



#### Imports



**Canadian Exports and Imports in 2012**

Source of data: Statistics Canada.

at producing T-shirts and Canada has a comparative advantage at producing regional jets, the people of both countries can gain from specialization and trade. China can buy regional jets from Canada at a lower opportunity cost than that at which Chinese firms can produce them. And Canadians can buy T-shirts from China for a lower opportunity cost than that at which Canadian firms can produce them. Also, through international trade, Chinese producers can get higher prices for their T-shirts and Canadian firms can sell regional jets for a higher price. Both countries gain from international trade.

Let's now illustrate the gains from trade that we've just described by studying demand and supply in the global markets for T-shirts and regional jets.

## Why Canada Imports T-Shirts

Canada imports T-shirts because the rest of the world has a comparative advantage in producing T-shirts. Figure 7.1 illustrates how this comparative advantage generates international trade and how trade affects the price of a T-shirt and the quantities produced and bought.

The demand curve  $D_C$  and the supply curve  $S_C$  show the demand and supply in the Canadian domestic market only. The demand curve tells us the quantity of T-shirts that Canadians are willing to buy at various prices. The supply curve tells us the quantity of T-shirts that Canadian garment makers are willing to sell at various prices—that is, the quantity supplied at each price when all T-shirts sold in Canada are produced in Canada.

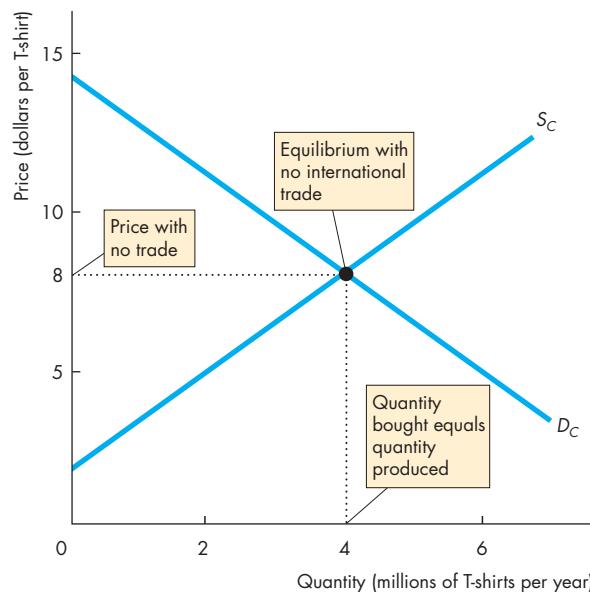
Figure 7.1(a) shows what the Canadian T-shirt market would be like with no international trade.

The price of a shirt would be \$8 and 4 million shirts a year would be produced by Canadian garment makers and bought by Canadian consumers.

Figure 7.1(b) shows the market for T-shirts with international trade. Now the price of a T-shirt is determined in the world market, not the Canadian domestic market. The world price of a T-shirt is less than \$8, which means that the rest of the world has a comparative advantage in producing T-shirts. The world price line shows the world price at \$5 a shirt.

The Canadian demand curve,  $D_C$ , tells us that at \$5 a shirt, Canadians buy 6 million shirts a year. The Canadian supply curve,  $S_C$ , tells us that at \$5 a shirt, Canadian garment makers produce 2 million T-shirts a year. To buy 6 million T-shirts when only 2 million are produced in Canada, we must import T-shirts from the rest of the world. The quantity of T-shirts imported is 4 million a year.

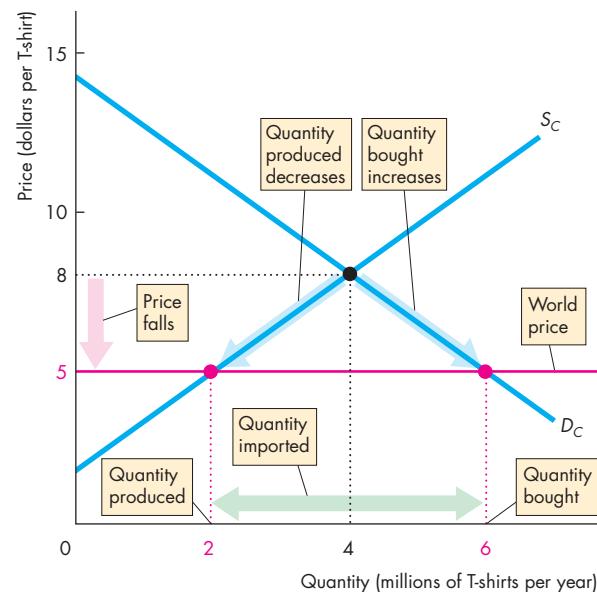
**FIGURE 7.1** A Market with Imports



(a) Equilibrium with no international trade

Part (a) shows the Canadian market for T-shirts with no international trade. The Canadian domestic demand curve  $D_C$  and Canadian domestic supply curve  $S_C$  determine the price of a T-shirt at \$8 and the quantity of T-shirts produced and bought in Canada at 4 million a year.

Part (b) shows the Canadian market for T-shirts with international trade. World demand for and world supply of



(b) Equilibrium in a market with imports

T-shirts determine the world price of a T-shirt, which is \$5. The price in the Canadian market falls to \$5 a shirt. Canadian purchases of T-shirts increase to 6 million a year, and Canadian production of T-shirts decreases to 2 million a year. Canada imports 4 million T-shirts a year.

## Why Canada Exports Regional Jets

Figure 7.2 illustrates international trade in regional jets. The demand curve  $D_C$  and the supply curve  $S_C$  show the demand and supply in the Canadian domestic market only. The demand curve tells us the quantity of regional jets that Canadian airlines are willing to buy at various prices. The supply curve tells us the quantity of regional jets that Canadian aircraft makers are willing to sell at various prices.

Figure 7.2(a) shows what the Canadian regional jet market would be like with no international trade. The price of a regional jet would be \$100 million and 40 airplanes a year would be produced by Bombardier and bought by Canadian airlines.

Figure 7.2(b) shows the Canadian airplane market with international trade. Now the price of a regional jet is determined in the world market and the world price of a regional jet is higher than \$100 million, which means that Canada has a comparative advantage

in producing regional jets. The world price line shows the world price at \$150 million.

The Canadian demand curve,  $D_C$ , tells us that at \$150 million each, Canadian airlines buy 20 regional jets a year. The Canadian supply curve,  $S_C$ , tells us that at \$150 million each, Bombardier produces 70 regional jets a year. The quantity produced in Canada (70 a year) minus the quantity purchased by Canadian airlines (20 a year) is the quantity exported, which is 50 regional jets a year.

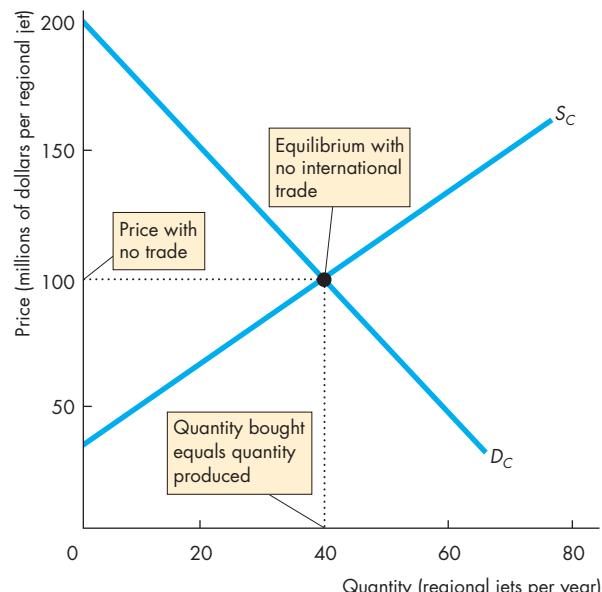
### REVIEW QUIZ

- 1 Describe the situation in the market for a good or service that Canada imports.
- 2 Describe the situation in the market for a good or service that Canada exports.

Work these questions in Study Plan 7.1 and get instant feedback. Do a Key Terms Quiz.

**MyEconLab**

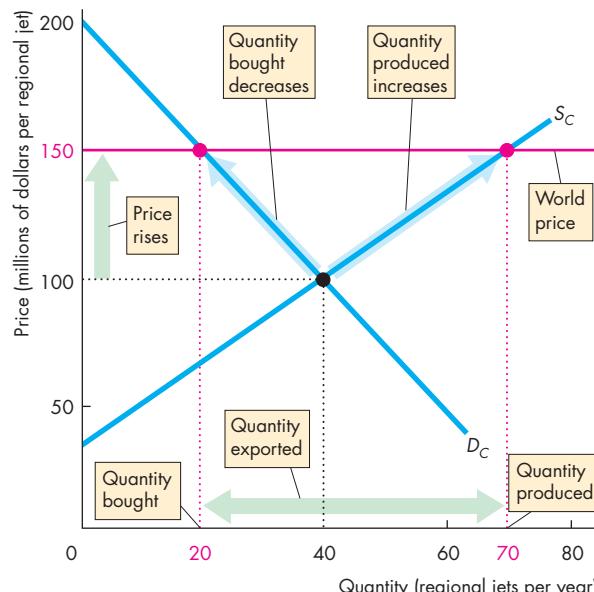
**FIGURE 7.2** A Market with Exports



(a) Equilibrium without international trade

In part (a), the Canadian market with no international trade, the domestic demand curve  $D_C$  and the domestic supply curve  $S_C$  determine the price of a regional jet in Canada at \$100 million and 40 regional jets are produced and bought each year.

In part (b), the Canadian market with international trade, world demand and world supply determine the



(b) Equilibrium in a market with exports

world price of a regional jet at \$150 million. The price in Canada rises. Canadian production increases to 70 a year, Canadian purchases decrease to 20 a year, and Canada exports 50 regional jets a year.

**MyEconLab Animation**

## Winners, Losers, and the Net Gain from Trade

In Chapter 1 (see p. 6), we asked whether globalization is in the self-interest of the low-wage worker in Malaysia who sews your new running shoes and the displaced shoemaker in Toronto. Is globalization in the social interest? We're now going to answer these questions. You will learn why producers complain about cheap foreign imports, but consumers of imports never complain.

### Gains and Losses from Imports

We measure the gains and losses from imports by examining their effect on consumer surplus, producer surplus, and total surplus. In the importing country the winners are those whose surplus increases and the losers are those whose surplus decreases.

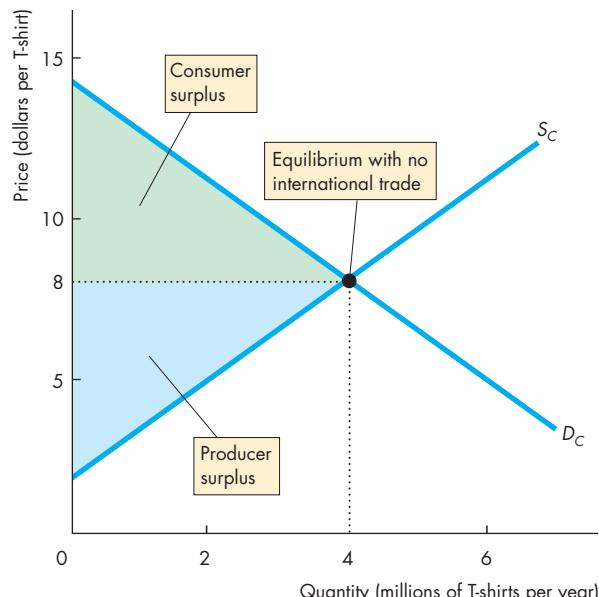
Figure 7.3(a) shows what consumer surplus and producer surplus would be with no international

trade in T-shirts. Domestic demand,  $D_C$ , and domestic supply,  $S_C$ , determine the price and quantity. The green area shows consumer surplus and the blue area shows producer surplus. Total surplus is the sum of consumer surplus and producer surplus.

Figure 7.3(b) shows how these surpluses change when the Canadian market opens to imports. The price in Canada falls to the world price. The quantity bought increases to the quantity demanded at the world price and consumer surplus expands from  $A$  to the larger green area  $A + B + D$ . The quantity produced in Canada decreases to the quantity supplied at the world price and producer surplus shrinks to the smaller blue area  $C$ .

Part of the gain in consumer surplus, the area  $B$ , is a loss of producer surplus—a redistribution of total surplus. But the other part of the increase in consumer surplus, the area  $D$ , is a net gain. This increase in total surplus results from the lower price and increased purchases and is the gain from imports.

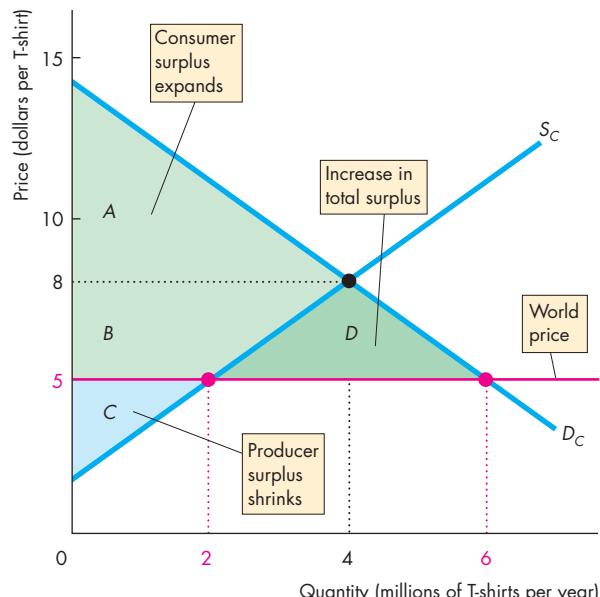
**FIGURE 7.3** Gains and Losses in a Market with Imports



(a) Consumer surplus and producer surplus with no international trade

In part (a), with no international trade, the green area shows the consumer surplus and the blue area shows the producer surplus.

In part (b), with international trade, the price falls to the world price of \$5 a shirt. Consumer surplus expands from



(b) Gains and losses from imports

area  $A$  to the area  $A + B + D$ . Producer surplus shrinks to area  $C$ . Area  $B$  is a transfer of surplus from producers to consumers. Area  $D$  is an increase in total surplus—the gain from imports.

## Gains and Losses from Exports

We measure the gains and losses from exports just like we measured those from imports, by their effect on consumer surplus, producer surplus, and total surplus.

Figure 7.4(a) shows the situation with no international trade. Domestic demand,  $D_C$ , and domestic supply,  $S_C$ , determine the price and quantity, the consumer surplus, and the producer surplus.

Figure 7.4(b) shows how the consumer surplus and producer surplus change when the good is exported. The price rises to the world price. The quantity bought decreases to the quantity demanded at the world price and the consumer surplus shrinks to the green area  $A$ . The quantity produced increases to the quantity supplied at the world price and the producer surplus expands to the blue area  $B + C + D$ .

Part of the gain in producer surplus, the area  $B$ , is a loss in consumer surplus—a redistribution of the total surplus. But the other part of the increase in producer surplus, the area  $D$ , is a net gain. This increase in total

surplus results from the higher price and increased production and is the gain from exports.

## Gains for All

You've seen that both imports and exports bring gains. Because one country's exports are other countries' imports, international trade brings gain for all countries. International trade is a win-win game.

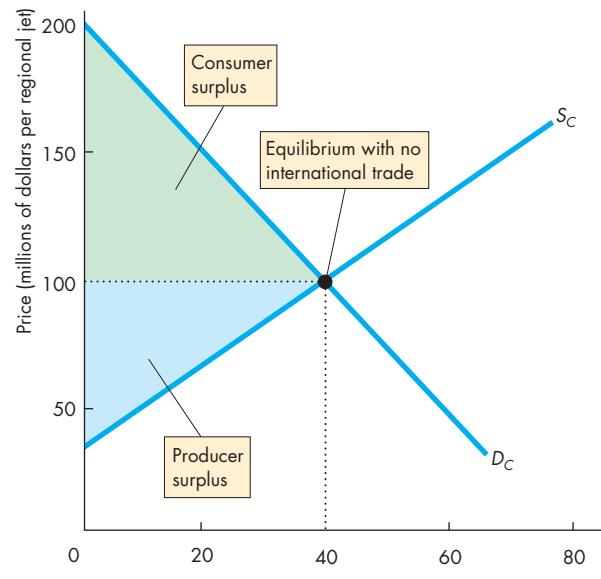
### REVIEW QUIZ

- How is the gain from imports distributed between consumers and domestic producers?
- How is the gain from exports distributed between consumers and domestic producers?
- Why is the net gain from international trade positive?

Work these questions in Study Plan 7.2  
and get instant feedback.

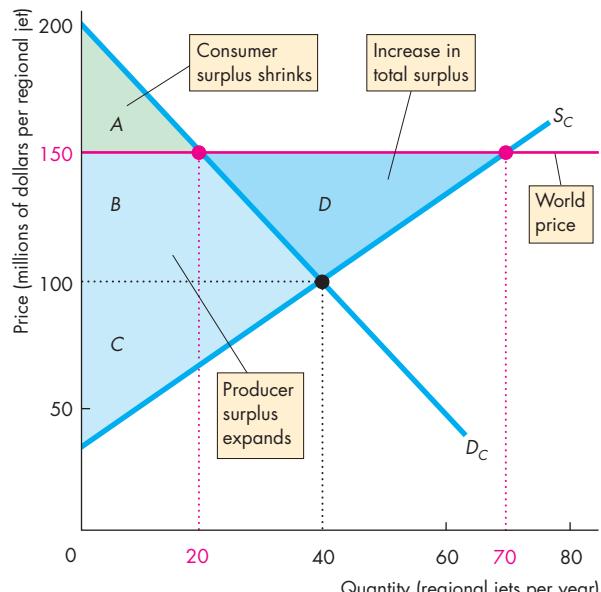
**MyEconLab**

**FIGURE 7.4** Gains and Losses in a Market with Exports



**(a) Consumer surplus and producer surplus with no international trade**

In part (a), the Canadian market with no international trade, the green area shows the consumer surplus and the blue area shows the producer surplus. In part (b), the Canadian market with international trade, the price rises to the world



**(b) Gains and losses from exports**

price. Consumer surplus shrinks to area  $A$ . Producer surplus expands from area  $C$  to the area  $B + C + D$ . Area  $B$  is a transfer of surplus from consumers to producers. Area  $D$  is an increase in total surplus—the gain from exports.

**MyEconLab Animation and Draw Graph**

## International Trade Restrictions

Governments use four sets of tools to influence international trade and protect domestic industries from foreign competition. They are:

- Tariffs
- Import quotas
- Other import barriers
- Export subsidies

### Tariffs

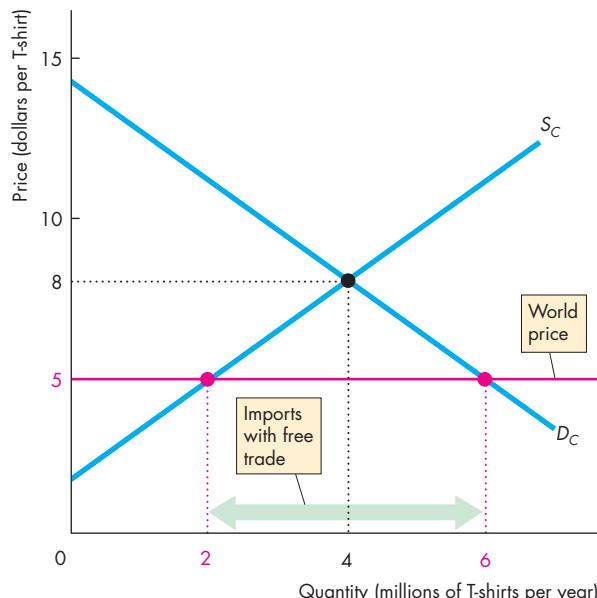
A **tariff** is a tax on a good that is imposed by the importing country when an imported good crosses its international boundary. For example, the government of India imposes a 100 percent tariff on wine imported from Ontario. So when an Indian imports a \$10 bottle of Ontario wine, he pays the Indian government a \$10 import duty.

Tariffs raise revenue for governments and serve the self-interest of people who earn their incomes in import-competing industries. But as you will see, restrictions on free international trade decrease the gains from trade and are not in the social interest.

**The Effects of a Tariff** To see the effects of a tariff, let's return to the example in which Canada imports T-shirts. With free trade, the T-shirts are imported and sold at the world price. Then, under pressure from Canadian garment makers, the government imposes a tariff on imported T-shirts. Buyers of T-shirts must now pay the world price plus the tariff. Several consequences follow and Fig. 7.5 illustrates them.

Figure 7.5(a) shows the situation with free international trade. Canada produces 2 million T-shirts a year and imports 4 million a year at the world price of \$5 a shirt. Figure 7.5(b) shows what happens when the Canadian government imposes a tariff of \$2 per T-shirt.

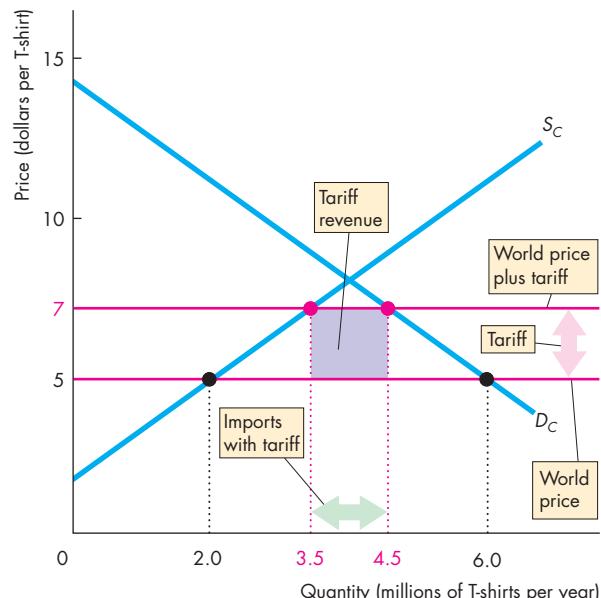
**FIGURE 7.5** The Effects of a Tariff



(a) Free trade

The world price of a T-shirt is \$5. With free trade in part (a), Canadians buy 6 million T-shirts a year. Canadian garment makers produce 2 million T-shirts a year and Canada imports 4 million a year.

With a tariff of \$2 per T-shirt in part (b), the price in



(b) Market with tariff

the Canada rises to \$7 a T-shirt. Canadian production increases, Canadian purchases decrease, and the quantity imported decreases. The Canadian government collects a tariff revenue of \$2 on each T-shirt imported, which is shown by the purple rectangle.

The following changes occur in the market for T-shirts in Canada:

- The price of a T-shirt rises by \$2.
- The quantity of T-shirts bought decreases.
- The quantity of T-shirts produced in Canada increases.
- The quantity of T-shirts imported into Canada decreases.
- The Canadian government collects a tariff revenue.

**Rise in Price of a T-Shirt** To buy a T-shirt, Canadians must pay the world price plus the tariff, so the price of a T-shirt rises by the \$2 tariff to \$7. Figure 7.5(b) shows the new domestic price line, which lies \$2 above the world price line. The price rises by the full amount of the tariff. The buyer pays the entire tariff because supply from the rest of the world is perfectly elastic (see Chapter 6, pp. 136–137).

**Decrease in Purchases** The higher price of a T-shirt brings a decrease in the quantity demanded along the demand curve. Figure 7.5(b) shows the decrease from 6 million T-shirts a year at \$5 a shirt to 4.5 million a year at \$7 a shirt.

**Increase in Domestic Production** The higher price of a T-shirt stimulates domestic production, and Canadian garment makers increase the quantity supplied along the supply curve. Figure 7.5(b) shows the

increase from 2 million T-shirts at \$5 a shirt to 3.5 million a year at \$7 a shirt.

**Decrease in Imports** T-shirt imports decrease by 3 million, from 4 million to 1 million a year. Both the decrease in Canadian purchases and the increase in Canadian production contribute to this decrease in Canadian imports.

**Tariff Revenue** The government's tariff revenue is \$2 million—\$2 per shirt on 1 million imported shirts—shown by the purple rectangle.

**Winners, Losers, and the Social Loss from a Tariff** A tariff on an imported good creates winners and losers and a social loss. When the Canadian government imposes a tariff on an imported good:

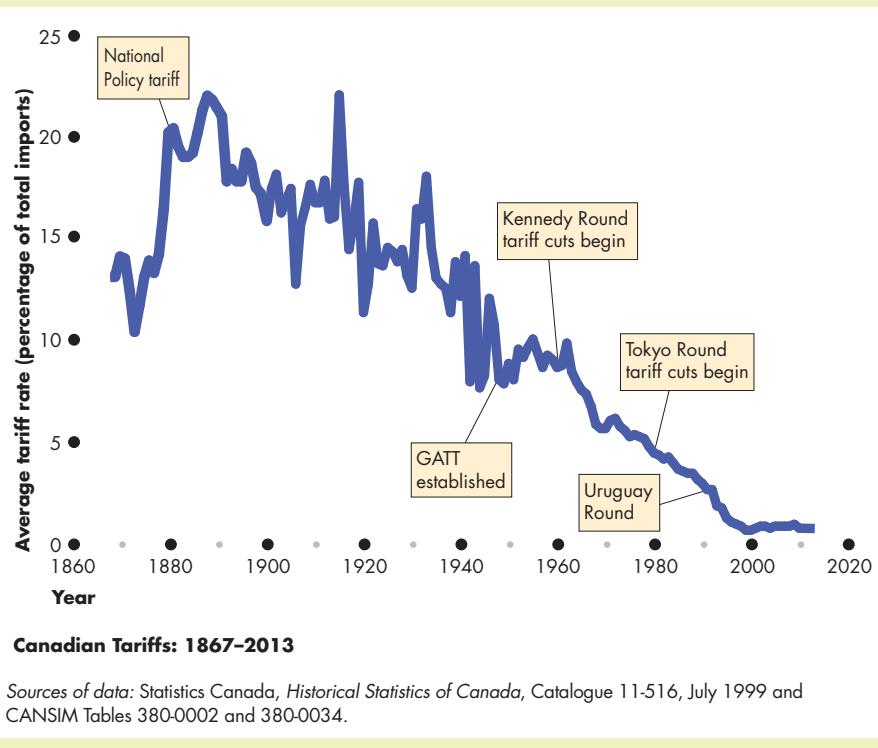
- Canadian consumers of the good lose.
- Canadian producers of the good gain.
- Canadian consumers lose more than Canadian producers gain.
- Society loses: a deadweight loss arises.

**Canadian Consumers of the Good Lose** Because the price of a T-shirt in Canada rises, the quantity of T-shirts demanded decreases. The combination of a higher price and smaller quantity bought decreases consumer surplus—the loss to Canadian consumers that arises from a tariff.

## Economics in Action

### Tariffs Almost Gone

Canadian tariffs were in place before Confederation. They increased sharply in the 1870s and remained high until the 1930s. In 1947, the **General Agreement on Tariffs and Trade (GATT)** was established to reduce international tariffs. Since then, tariffs have fallen in a series of negotiating rounds, the most significant of which are identified in the figure. Tariffs are now as low as they have ever been, but import quotas and other trade barriers persist.



**Canadian Producers of the Good Gain** Because the price of an imported T-shirt rises by the amount of the tariff, Canadian T-shirt producers are now able to sell their T-shirts for the world price plus the tariff, so the quantity of T-shirts supplied by Canadian producers increases. The combination of a higher price and larger quantity produced increases producer surplus—the gain to Canadian producers from the tariff.

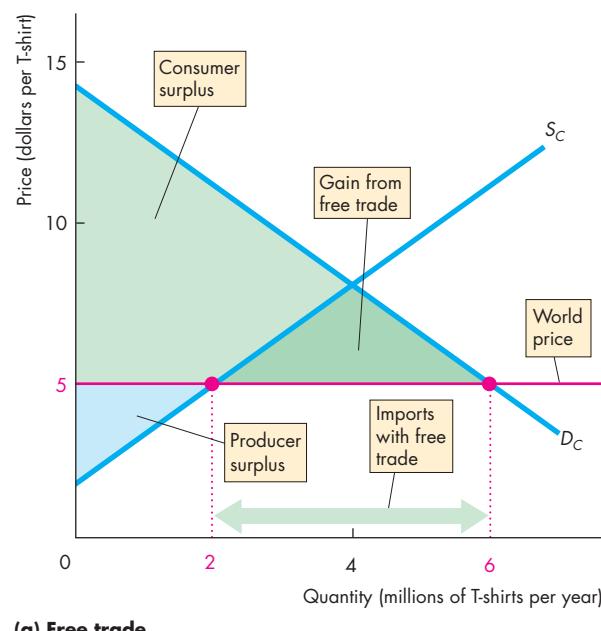
**Canadian Consumers Lose More Than Canadian Producers Gain** Consumer surplus decreases for four reasons: Some becomes producer surplus, some is lost in a higher cost of production (domestic producers have higher costs than foreign producers), some is lost because imports decrease, and some goes to the government as tariff revenue. Figure 7.6 shows these sources of lost consumer surplus.

Figure 7.6(a) shows the consumer surplus and producer surplus with free international trade in T-shirts. Figure 7.6(b) shows the consumer surplus and producer surplus with a \$2 tariff on imported T-shirts. By comparing Fig. 7.6(b) with Fig. 7.6(a), you can see how a tariff changes these surpluses.

Consumer surplus—the green area—shrinks for four reasons. First, the higher price transfers surplus from consumers to producers. The blue area *B* represents this loss (and gain of producer surplus). Second, domestic production costs more than imports. The supply curve  $S_C$  shows the higher cost of production, and the grey area *C* shows this loss of consumer surplus. Third, some of the consumer surplus is transferred to the government. The purple area *D* shows this loss (and gain of government revenue). Fourth, some of the consumer surplus is lost because imports decrease. The grey area *E* shows this loss.

**Society Loses: A Deadweight Loss Arises** Some of the loss of consumer surplus is transferred to producers and some is transferred to the government and spent on government programs that people value. But the increase in production cost and the loss from decreased imports is transferred to no one: It is a social loss—a deadweight loss. The grey areas labelled *C* and *E* represent this deadweight loss. Total surplus decreases by the area  $C + E$ .

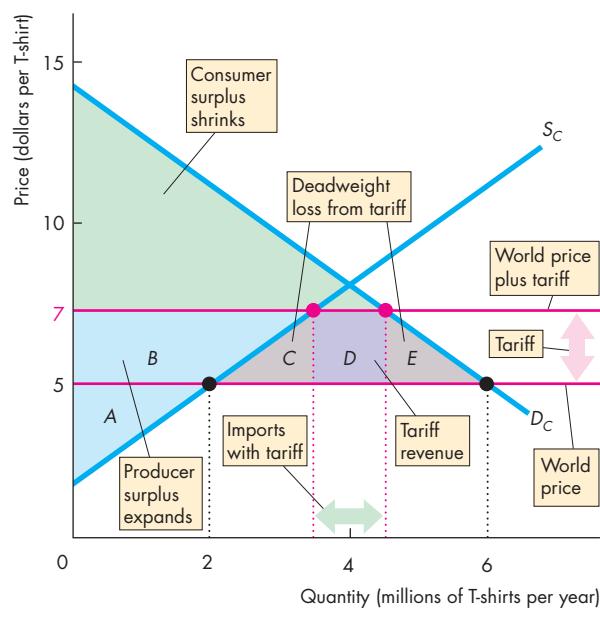
**FIGURE 7.6** The Winners and Losers from a Tariff



(a) Free trade

The world price of a T-shirt is \$5. In part (a), with free trade, Canada imports 4 million T-shirts. Consumer surplus, producer surplus, and the gains from free trade are as large as possible.

In part (b), a tariff of \$2 per T-shirt raises the price of a T-shirt in Canada to \$7. The quantity imported decreases.



(b) Market with tariff

Consumer surplus shrinks by the area  $B + C + D + E$ . Producer surplus expands by area *B*. The government's tariff revenue is area *D*, and the tariff creates a deadweight loss equal to the area  $C + E$ .

## Import Quotas

We now look at the second tool for restricting trade: import quotas. An **import quota** is a restriction that limits the quantity of a good that may be imported in a given period.

Most countries impose import quotas on a wide range of items. Canada imposes them on food products such as meat, eggs, and dairy and manufactured goods such as textiles and steel.

Import quotas enable the government to satisfy the self-interest of the people who earn their incomes in the import-competing industries. But you will discover that, like a tariff, an import quota decreases the gains from trade and is not in the social interest.

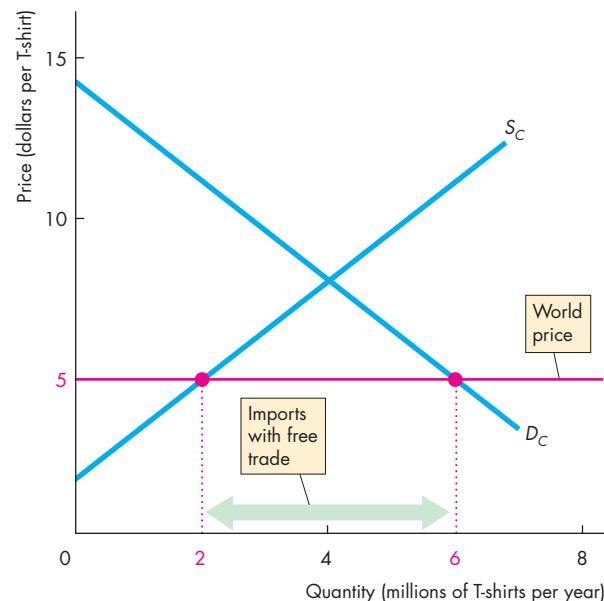
**The Effects of an Import Quota** The effects of an import quota are similar to those of a tariff. The price rises, the quantity bought decreases, and the quantity produced in Canada increases. Figure 7.7 illustrates the effects.

Figure 7.7(a) shows the situation with free international trade. Figure 7.7(b) shows what happens with an import quota of 1 million T-shirts a year. The Canadian supply curve of T-shirts becomes the domestic supply curve,  $S_C$ , plus the quantity that the import quota permits. So the supply curve becomes  $S_C + \text{quota}$ . The price of a T-shirt rises to \$7, the quantity of T-shirts bought in Canada decreases to 4.5 million a year, the quantity of T-shirts produced in Canada increases to 3.5 million a year, and the quantity of T-shirts imported decreases to the quota quantity of 1 million a year. All the effects of this quota are identical to the effects of a \$2 per shirt tariff, as you can check in Fig. 7.5(b).

### Winners, Losers, and the Social Loss from an Import Quota

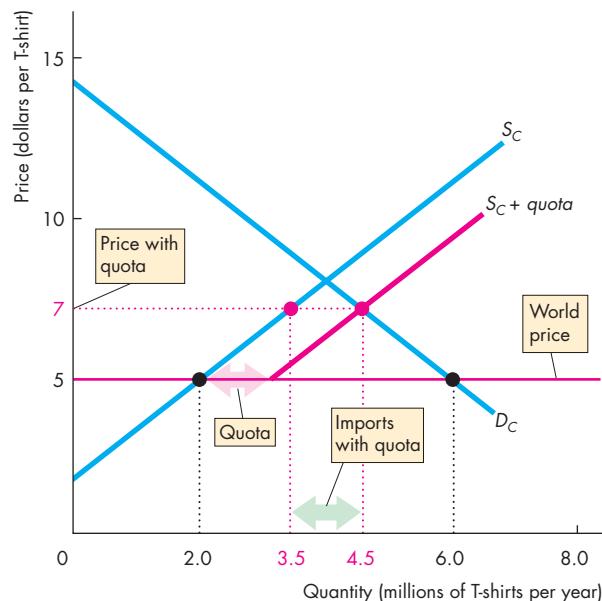
An import quota creates winners and losers that are similar to those of a tariff but with an interesting difference.

**FIGURE 7.7** The Effects of an Import Quota



(a) Free trade

With free international trade, in part (a), Canadians buy 6 million T-shirts at the world price. Canada produces 2 million T-shirts and imports 4 million a year. With an import quota of 1 million T-shirts a year, in part (b), the supply of



(b) Market with import quota

T-shirts in Canada is shown by the curve  $S_C + \text{quota}$ . The price in Canada rises to \$7 a T-shirt. Canadian production increases, Canadian purchases decrease, and the quantity of T-shirts imported decreases.

When the government imposes an import quota:

- Canadian consumers of the good lose.
- Canadian producers of the good gain.
- Importers of the good gain.
- Society loses: a deadweight loss arises.

Figure 7.8 shows these gains and losses from a quota. By comparing Fig. 7.8(b) with a quota and Fig. 7.8(a) with free trade, you can see how an import quota of 1 million T-shirts a year changes the consumer and producer surpluses.

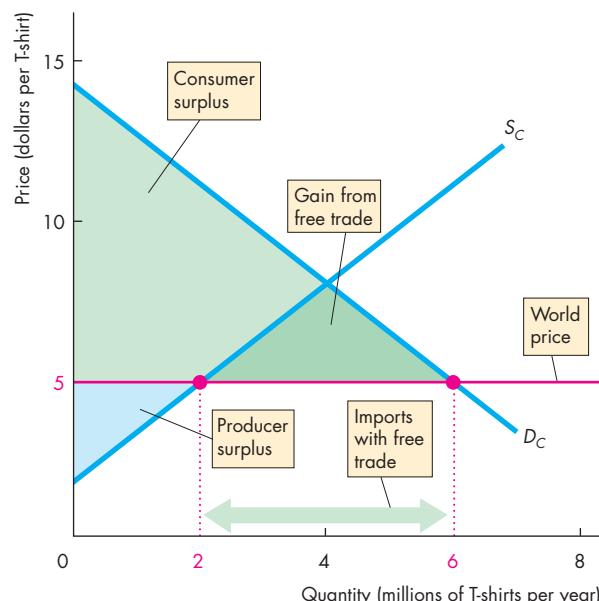
Consumer surplus—the green area—shrinks. This decrease is the loss to consumers from the import quota. The decrease in consumer surplus is made up of four parts. First, some of the consumer surplus is transferred to producers. The blue area  $B$  represents this loss of consumer surplus (and gain of producer surplus). Second, part of the consumer surplus is lost because the domestic cost of production is

higher than the world price. The grey area  $C$  represents this loss. Third, part of the consumer surplus is transferred to importers who buy T-shirts for \$5 (the world price) and sell them for \$7 (the Canadian domestic price). The two blue areas  $D$  represent this loss of consumer surplus and profit for importers. Fourth, part of the consumer surplus is lost because imports decrease. The grey area  $E$  represents this loss.

The loss of consumer surplus from the higher cost of production and the decrease in imports is a social loss—a deadweight loss. The grey areas labelled  $C$  and  $E$  represent this deadweight loss. Total surplus decreases by the area  $C + E$ .

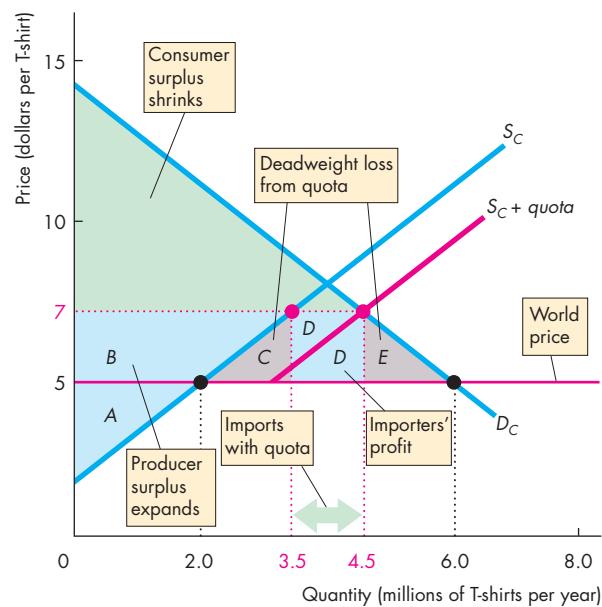
You can now see the one difference between a quota and a tariff. A tariff brings in revenue for the government while a quota brings a profit for the importers. All the other effects are the same, provided the quota is set at the same quantity of imports that results from the tariff.

**FIGURE 7.8** The Winners and Losers from an Import Quota



(a) Free trade

The world price of a T-shirt is \$5. In part (a), with free trade, Canada produces 2 million T-shirts a year and imports 4 million T-shirts. Consumer surplus, producer surplus, and the gain from free international trade (darker green area) are as large as possible.



(b) Market with import quota

In part (b), the import quota raises the price of a T-shirt to \$7. The quantity imported decreases. Consumer surplus shrinks by the area  $B + C + D + E$ . Producer surplus expands by area  $B$ . Importers' profit is the two areas  $D$ , and the quota creates a deadweight loss equal to  $C + E$ .



## ECONOMICS IN THE NEWS

### The Changing Market for Coat Hangers

**Your Dry Cleaning Bill Is About to Get Worse**  
 The price of wire hangers is a big deal for a dry cleaner, and that price will rise when the U.S. Commerce Department puts a 21 percent tariff on hangers made in Vietnam. The tariff is in response to a wire-hanger export subsidy paid to producers in Vietnam.

Source: CNN Money, June 4, 2012

#### SOME FACTS

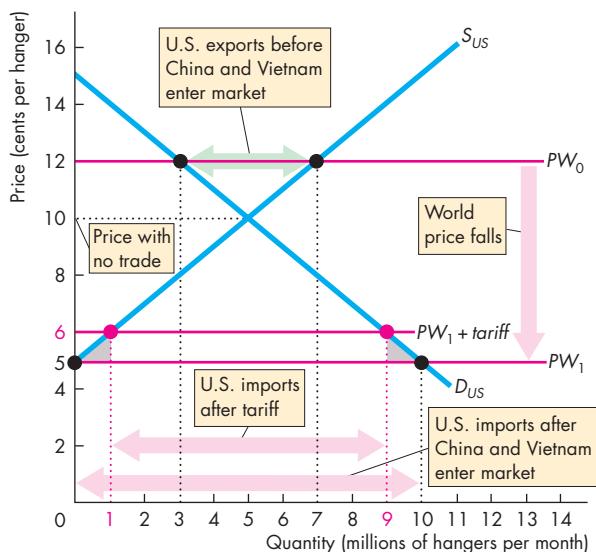
Albert J. Parkhouse invented the wire hanger in Jackson, Michigan, in 1903, and for almost 100 years the United States produced and exported wire hangers. During the past 20 years, China and Vietnam have become the major lowest-cost producers.

#### THE PROBLEM

Explain why the United States has switched from exporting to importing wire hangers. Also explain the effects of the 21 percent tariff. Does Vietnam's export subsidy make the tariff efficient? Illustrate your explanations with a graph.

#### THE SOLUTION

- Initially, the opportunity cost of producing a wire hanger was lower in the United States than in the rest of the world. The United States had a comparative advantage in producing wire hangers and exported them.
- Today, the opportunity cost of producing a wire hanger is lower in China and Vietnam than in the United States (and Canada). China and Vietnam have a comparative advantage in producing wire hangers, so the United States imports them.
- By imposing a 21 percent tariff on wire hangers, the price in the United States rises above the world price by this percentage.
- The higher price decreases the quantity of wire hangers demanded in the United States, increases the quantity that U.S. producers supply, and decreases U.S. imports of wire hangers.
- The figure illustrates the U.S. market for wire hangers. The demand curve  $D_{US}$  and the supply curve  $S_{US}$  are assumed not to change. The U.S. price with no international trade is 10 cents per hanger.



#### U.S. Market for Wire Hangers

- With a world price  $PW_0$  of 12 cents a hanger, the United States had a comparative advantage in hangers, so it produced 7 million hangers a month, used 3 million, and exported 4 million. The figure shows the quantity of U.S. exports.
- When the world price falls to  $PW_1$  at 5 cents a hanger, the United States stops producing hangers and imports 10 million a month.
- With a 21 percent tariff, the price in the United States rises to  $PW_1 + \text{tariff}$ . U.S. hanger production now becomes 1 million a month, the quantity used decreases to 9 million, and imports decrease to 8 million.
- The fact that the tariff is a response to Vietnam's export subsidy does not make the tariff efficient. It creates a deadweight loss shown by the two grey triangles.

## Other Import Barriers

Two sets of policies that influence imports are:

- Health, safety, and regulation barriers
- Voluntary export restraints

**Health, Safety, and Regulation Barriers** Thousands of detailed health, safety, and other regulations restrict international trade. For example, Canadian food imports are examined by the Canadian Food Inspection Agency, which is “mandated to safeguard Canada’s food supply and the plants and animals upon which safe and high-quality food depends.” The discovery of BSE (mad cow disease) in just one cow in 2003 was enough to close down international trade in Canadian beef. The European Union bans imports of most genetically modified foods, such as Canadian-produced soybeans. Although regulations of the type we’ve just described are not designed to limit international trade, they have that effect.

**Voluntary Export Restraints** A *voluntary export restraint* is like a quota allocated to a foreign exporter of a good. This type of trade barrier isn’t common. It was initially used during the 1980s when Japan voluntarily limited its exports of car parts to the United States.

## Export Subsidies

A *subsidy* is a payment by the government to a producer. You studied the effects of a subsidy on the quantity produced and the price of a subsidized farm product in Chapter 6, pp. 140–141.

An *export subsidy* is a payment by the government to the producer of an exported good. Export subsidies are illegal under a number of international agreements, including the North American Free Trade Agreement (NAFTA), and the rules of the World Trade Organization (WTO).

Although export subsidies are illegal, the subsidies that the Canadian, U.S., and E.U. governments pay to farmers end up increasing domestic production, some of which gets exported. These exports of subsidized farm products make it harder for producers in other countries, notably in Africa and Central and South America, to compete in global markets. Export subsidies bring gains to domestic producers, but they result in inefficient underproduction in the rest of the world and create a deadweight loss.

## Economics in Action

### Self-Interest Beats the Social Interest

The **World Trade Organization (WTO)** is an international body established by the world’s major trading nations for the purpose of supervising international trade and lowering the barriers to trade.

In 2001, at a meeting of trade ministers from all the WTO member-countries held in Doha, Qatar, an agreement was made to begin negotiations to lower tariff barriers and quotas that restrict international trade in farm products and services. These negotiations are called the **Doha Development Agenda** or the **Doha Round**.

In the period since 2001, thousands of hours of conferences in Cancún in 2003, Geneva in 2004, and Hong Kong in 2005, and ongoing meetings at WTO headquarters in Geneva, costing millions of taxpayers’ dollars, have made disappointing progress.

Rich nations, led by the United States, the European Union, and Japan, want greater access to the markets of developing nations in exchange for allowing those nations greater access to the markets of the rich world, especially those for farm products.

Developing nations, led by Brazil, China, India, and South Africa, want access to the markets of farm products of the rich world, but they also want to protect their infant industries.

With two incompatible positions, these negotiations are stalled and show no signs of a breakthrough. The self-interests of rich nations and developing nations are preventing the achievement of the social interest.

## REVIEW QUIZ

- 1 What are the tools that a country can use to restrict international trade?
- 2 Explain the effects of a tariff on domestic production, the quantity bought, and the price.
- 3 Explain who gains and who loses from a tariff and why the losses exceed the gains.
- 4 Explain the effects of an import quota on domestic production, consumption, and price.
- 5 Explain who gains and who loses from an import quota and why the losses exceed the gains.

Work these questions in Study Plan 7.3 and get instant feedback. Do a Key Terms Quiz. **MyEconLab**