Managerial Economics and Strategy

THIRD EDITION

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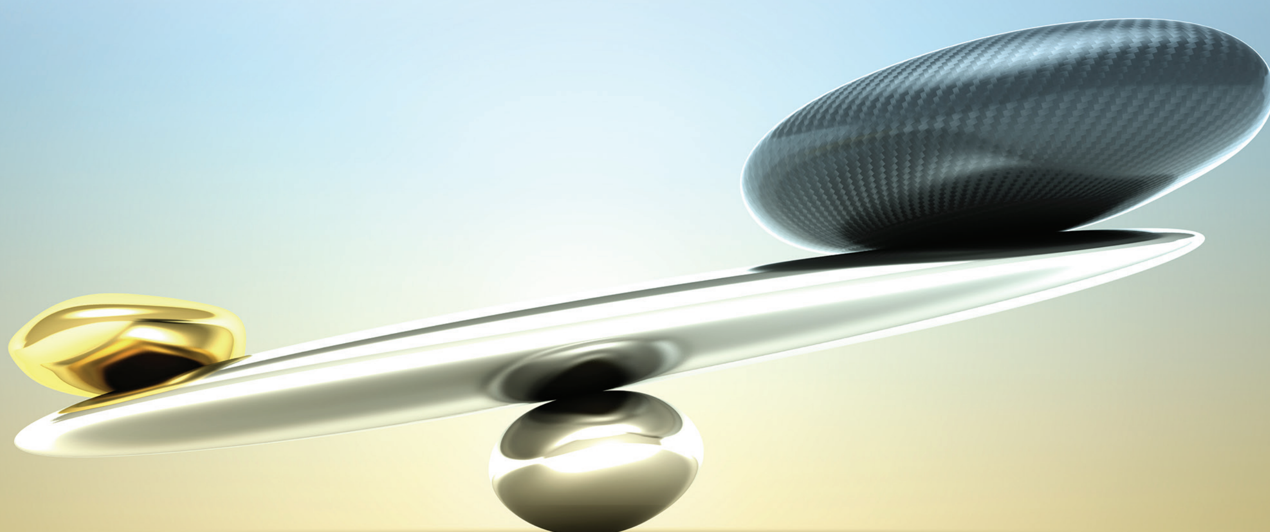

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Brief Contents

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Preface

What's New in the Third Edition

We have substantially revised the third edition based in large part on the very helpful suggestions of instructors and students who used the second edition. We have updated and revised every chapter. Key revisions include:

- Spreadsheet-based Q&A Exercises are a new feature in Chapters 3, 6–10, and 12–16. This major innovation helps students learn how to address real-world business problems using spreadsheets, which is an increasingly important skill in today's business world.
- Chapters 1, 5, 6, 7, 9, and 14 have a new theme on *disruptive innovations*: innovations, such as online retailing, 3D printing, and social media, that dramatically change consumer options or the way an industry is structured, possibly creating new industries and destroying old ones.
- A new feature is the 21 *Common Confusions*, which explain why a widely held belief is incorrect.
- Over three-quarters of the Mini-Cases (brief applications of the theory) are new (22) or revised (48).
- Of the 655 end-of-chapter questions, 150 are new or revised.
- Nearly a quarter of the Managerial Implications (brief discussions of how to use economic theory to improve managerial decisions) are new or substantially revised.
- This edition is even more user-friendly. It drops some of the more technical material from Chapters 2, 4, 6, 7, 8, and 11, and adds more emphasis on current managerial issues in both the main text and the features.
- Because instructors and students enjoyed the cartoons in the second edition, this edition has 45% more cartoons. In addition to providing entertainment, these cartoons convey important economic points in a memorable way.

The Managerial Economics Program

This book differs from other managerial economics books in three main ways:

1. **Modern Theories.** We place greater emphasis than other texts on modern theories that are increasingly useful to managers. These include:
   - Modern contract theory to show students how to write contracts to avoid or minimize problems
   - Behavioral economics to explain why people deviate from rational behavior

- Game theory to help students think about business strategies and choose strategies that maximize profits
- Analysis of real-world pricing tools.

2. **Real-world Examples.** We make more extensive use of real-world business examples to illustrate how to use economic theory in making business decisions. To illustrate important economic concepts, we use calculations, graphs, and spreadsheets based on actual markets and real data.
3. **Problem-based Learning.** We employ a problem-based learning approach to demonstrate how to apply economic theory to specific business decisions. In each chapter, we solve problems using a step-by-step approach to model good problem-solving techniques, and each end of chapter section includes an extensive set of questions.

These innovative hallmarks are woven throughout the text.

To improve student results, we recommend pairing the text content with **MyLab Economics,** which is the teaching and learning platform that empowers instructors to reach every student. By combining trusted author content with digital tools and a flexible platform, MyLab personalizes the learning experience and will help students learn and retain key course concepts while developing skills that future employers are seeking in their candidates. MyLab Economics allows professors increased flexibility in designing and teaching their courses. Learn more at www.pearson.com/mylab/economics.

Solving Teaching and Learning Challenges

As teachers, we understand the challenges of managerial economics courses. Our experience teaching managerial economics at the Wharton School (University of Pennsylvania) and the Sauder School of Business (University of British Columbia) as well as teaching a wide variety of students at the Massachusetts Institute of Technology; Queen's University; and the University of California, Berkeley, has convinced us that students do best with an emphasis on problem solving and real-world issues and examples from actual markets. In the features of the book and MyLab Economics, we show how to apply economic theory to managerial decisions using actual business examples and real data.

We demonstrate that economics is practical and useful to managers by examining real markets and actual business decisions. Successful managers make extensive use of economic tools to reduce the cost of production, to choose pricing structures or output levels to maximize profit, and to make many other managerial decisions. We highlight applications of these tools in the *Managerial Problems, Mini-Cases, Managerial Implications,* and *Q&As* throughout the book, and the videos in MyLab Economics.

Managerial Problems

After the introductory chapter, each chapter starts with a *Managerial Problem* that motivates the chapter by posing a real-world managerial question. At the end of each chapter, we answer this question in the *Managerial Solution* using the economic principles discussed in that chapter. Thus, each Managerial Problem–Managerial Solution pair combines the essence of a Mini-Case and a Q&A.

Managerial Problem

Paying Employees to Relocate

When Google wants to transfer an employee from its Washington, D.C., office to its London branch, it must decide how much compensation to offer the worker to move. International firms are increasingly relocating workers throughout their home countries and internationally.

As you might expect, workers are not always enthusiastic about being relocated. In a survey by Runzheimer International, 79% of firms' relocation managers responded that they experienced resistance from employees who were asked to relocate to high-cost locations. A survey of some of their employees found that 81% objected to moving because of fear of a lowered standard of living.

One possible approach to enticing employees to relocate is for the firm to determine the goods and services consumed by employees in the original location and then pay those employees enough to allow them to consume essentially the same items in the new location. According to a survey by Mercer, 79% of international firms reported that they provided their workers with enough income abroad to maintain their home lifestyle.

However, economists who advise on compensation packages point out that such an approach will typically overcompensate employees by paying them more than they need to obtain the same level of economic well-being they have in the original city. How can a firm's human resources (HR) manager use consumer theory to optimally compensate employees who are transferred to other cities?

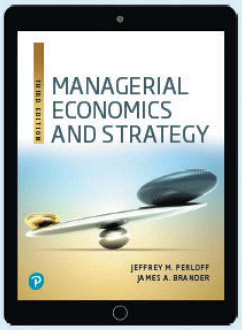
Mini-Cases

The *Mini-Cases* apply economic theory to interesting and important managerial problems. For example, Mini-Cases demonstrate how price increases on iTunes affect music downloads using actual data, how to estimate Crocs' production function for shoes using real-world data, why top-end designers limit the number of designer bags customers can buy, the effect of cyberattacks, how Pfizer used limit pricing to slow the entry of rivals, why advertisers pay so much for Super Bowl commercials, and how managers of auto manufacturing firms organize production and trade to avoid taxes and tariffs.

Mini-Case

Apple's iPad

Apple's iPad was the first commercially successful tablet. Users interact with the iPad using Apple's multi-touch, finger-sensitive touchscreen (rather than the pressure-triggered stylus that most previous tablets used) and a virtual onscreen keyboard (rather than a physical one). Most importantly, the iPad offers an intuitive interface and is well integrated with Apple's iTunes, eBooks, and various application programs.



People loved the original iPad. Even at $499 for the basic model, Apple had a virtual monopoly in its first year in 2010, with 87% of the tablet market. Moreover, the other tablets available in 2010 were not viewed by most consumers as close substitutes. Apple reported that it sold 25 million iPads worldwide in its first full year.

Unfortunately for Apple, its monopoly was short lived. Within a year of the iPad's introduction, over a hundred iPad want-to-be tablets were available. Apple's share of the tablet market fell to 29% by early 2018.

Managerial Implications

The *Managerial Implications* feature provides bottom-line statements of economic principles that managers can use to make key managerial decisions. For example, we describe how managers can assess whether they are maximizing profit. We also show how they can structure discounts to maximize profits, promote customer loyalty, design auctions, prevent gray markets, and use important insights from game theory to make good managerial decisions.

Managerial Implication

Taking Advantage of Limited Strategic Thinking

Managers should consider the level of strategic sophistication of customers (and rivals). For example, successful managers of Hollywood movie studios anticipate limited strategic thinking by moviegoers. Normally Hollywood studios release movies for prescreening by critics before general release to generate buzz through positive reviews. This technique works well for good movies, but has the opposite effect for movies that get poor reviews.

If a studio is not confident about a movie's quality it can use a *cold opening*, releasing the movie with no prescreenings for movie critics. A fully rational moviegoer understands this tactic and is less likely to go to movies with cold opens. Thus, if everyone were rational, studios wouldn't use cold openings.

However, Brown, Camerer, and Lovallo (2012) found that while some moviegoers instantly understand the system, some never catch on to this pattern. As a result, cold opens generate more revenue and more profit on average than comparable not-very-good movies that are prescreened. And, on average, moviegoers are disappointed by cold opens relative to other movies. Thus, a manager should not overestimate the reasoning ability of the general movie-going public.

Q&As and End-of-Chapter Questions

The largest challenge facing students is learning how to apply economics concepts to solve problems. To help them learn this crucial skill, we provide three to five *Q&As* (Questions & Answers) in each chapter after the introductory chapter. Each *Q&A* poses a qualitative or quantitative problem and then uses a step-by-step approach to solve the problem. The *Q&As* focus on important managerial issues such as how a cost-minimizing firm should adjust to changing factor prices, how a manager prices bundles of goods to maximize profits, how to determine Intel's and AMD's profit-maximizing quantities and prices using their estimated demand curves and marginal costs, and how to allocate production across plants internationally.

Q&A 3.1

In 2018, Amazon raised the annual subscription fee for its Prime membership service, which provides free two-day shipping on many goods and other benefits, from \$99 to \$119. Piper Jaffray, an investment bank, estimated that before the price increase, Prime had 77 million U.S. subscribers.[3] The bank speculated that the number of members would fall to about 62 million. If so, what is the arc elasticity of demand for a Prime membership?

Answer

Use Equation 3.2 to calculate the arc elasticity. The change in the price is $\Delta p = \$119 - \$99 = \$20$, and the change in quantity is $\Delta Q = 62 - 77 = -15$. The average price is $\bar{p} = (\$99 + \$119)/2 = \$109$, and the average quantity is $\bar{Q} = (77 + 62)/2 = 69.5$ million. Plugging these values into Equation 3.2, we find that the arc price elasticity of demand for Prime memberships is

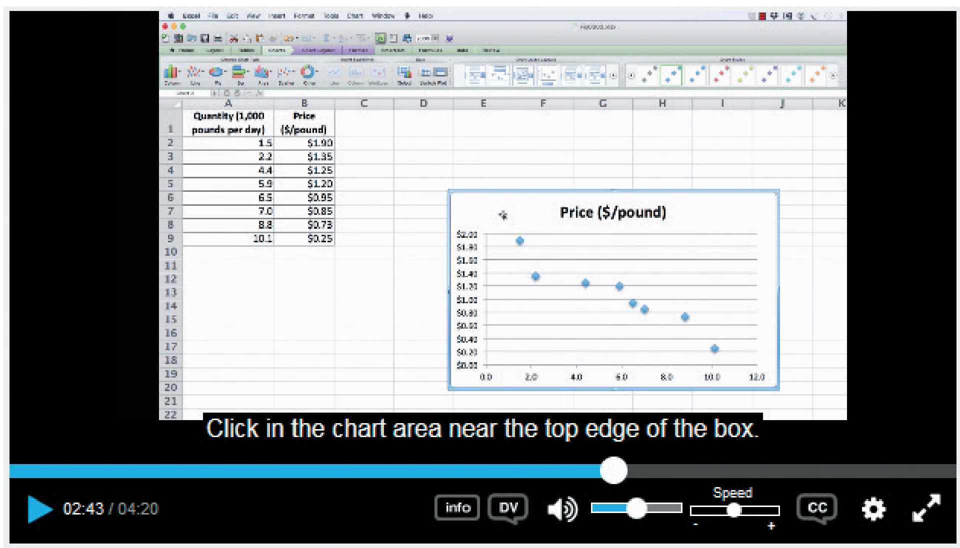
$$\varepsilon = \frac{\Delta Q/\bar{Q}}{\Delta p/\bar{p}} = \frac{-15/69.5}{20/109} \approx -\frac{0.216}{0.183} \approx -1.18.$$

When price rose by 18.3%, the quantity demanded was estimated to fall by 21.6%, so the arc elasticity of demand is $\varepsilon = -1.18$. Based on this elasticity, a 1% rise in price would cause the quantity demanded to fall by 1.18 percent.

At the end of the book, we provide solutions to selected end-of-chapter questions. In addition, detailed answers to all the end-of-chapter questions are provided in MyLab Economics so that students can confirm their understanding without having to contact a professor and also be better prepared for exams.

MyLab Economics Videos

Today's students learn best when they analyze and discuss topics in the text outside of class. To further students' understanding of what they are reading and discussing in the classroom, we provide a set of videos in MyLab Economics. In these videos, Tony Lima presents key figures, tables, Excel applications and concepts in step-by-step animations with audio explanations that discuss the economics behind each step. For example, some of these show students how to use Excel to run regressions, analyze different pricing strategies, cover applications of game theory, address risk and diversification, and choose contracts that reduce moral hazard in principal-agent relationships.



Using Calculus Sections and Calculus Exercises

Some students learn economics best using verbal or graphical explanations. However, others find mathematical explanations clearer. Consequently, some managerial economics courses use calculus while others do not. Both types of course can use this book effectively due to the optional *Using Calculus* sections in the text. Non-calculus courses can omit these short sections with no loss of continuity. For courses that require calculus, *Using Calculus* sections reinforce the graphical, verbal, and algebraic treatment of major topics.

In contrast, many other books relegate calculus to appendices, mix calculus in with other material where it cannot easily be skipped, or avoid calculus entirely. Our approach has proven effective in courses that use no calculus and have very limited mathematical prerequisites, and in courses with significant calculus content. End-of-chapter questions that require calculus are clearly indicated.

Using Calculus

Profit Maximization with a Specific Tax

We can use calculus to solve the problem in Q&A 8.1. After the government imposes the specific tax t, the competitive firm's profit is

$$\pi = pq - [C(q) + tq],$$

where $C(q)$ is the firm's before-tax cost and $C(q) + tq$ is its after-tax cost. We obtain a necessary condition for the firm to maximize its after-tax profit by taking the first derivative of profit with respect to quantity and setting it equal to zero:

$$\frac{d\pi}{dq} = \frac{d(pq)}{dq} - \frac{d[C(q) + tq]}{dq} = p - \left[\frac{dC(q)}{dq} + t\right] = p - [MC + t] = 0.$$

Thus, the competitive firm maximizes its profit by choosing q such that its after-tax marginal cost, $MC + t$, equals the market price.

Developing Career Skills

You may be asking yourself, why study economics if I want to manage a business or work as a consultant, as a financial analyst, as an investment banker, in human resources, or in marketing? The reason is that employers know that you need economic skills to perform well. To get a great job upon graduation and have a successful career, you need a range of economic skills and need to know how to apply these skills to solve traditional and new managerial challenges.

How to Use Economic Reasoning on the Job

This book starts by illustrating how to use economic reasoning to analyze and solve a variety of problems. It trains you to use logical analysis based on empirical evidence. You will learn how to apply a variety of techniques that firms value such as how to work with spreadsheets to solve decision problems, conduct regression analyses and interpret the results, use game trees to map strategic decisions, and analyze the effects of pricing decisions.

The book shows you how to approach problems that you are likely to encounter on the job. These applications include using basic economic tools to predict the effects of input price changes or government actions on a market. But they also include using modern economic theories to address new managerial challenges such as

- developing strategies to compete in oligopolistic markets,
- structuring stock options to motivate executives,
- using online platforms (two-sided markets) that bring buyers and sellers together, such as eBay,
- responding to cyberattacks and to potentially disruptive innovations such as 3D printing.

Spreadsheet Exercises

In contrast to other managerial economics textbooks, a major feature of this book helps you develop a facility in using spreadsheets and shows how to use them to solve real-world managerial problems.

Managers increasingly rely on spreadsheets. Spreadsheets make it easier than ever to apply economic principles to managerial decisions. Earlier editions of this book included spreadsheet-based end-of-chapter questions. In this edition, we've added 11 spreadsheet *Q&As*, which train you by taking you step-by-step through spreadsheets to solve a managerial problem. These *Q&As* show how to use spreadsheets to calculate elasticities, determine the effect of price changes on revenue and profit, calculate present values, assess the benefits of dynamic pricing, simplify decision-making under uncertainty, and analyze other important questions.

Q&A 6.2

Suppose that a small guitar firm has experimented with the cost of producing different quantities of output per hour by varying the number of workers, holding the size of the plant fixed and using just one CNC machine. It has estimated its cost function as $C = 125 + 10q - 5q^2 + q^3$ where q is quantity produced per hour and C is measured in dollars. The corresponding marginal cost function is $MC = 10 - 10q + 3q^2$.[4] Use an Excel spreadsheet to show the fixed cost, and to calculate variable cost, total cost, average cost, and marginal cost for output levels from 1 to 10 in one-unit increments. Use the spreadsheet to find the output level at which average cost is minimized and verify that $AC = MC$ at this output level.

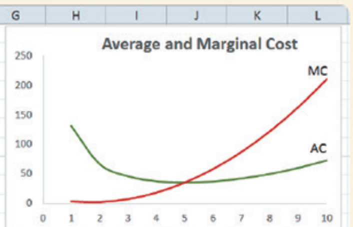
Answer

1. *Open an Excel spreadsheet and put titles* Quantity, Fixed Cost, Variable Cost, Total Cost, Average Cost, *and* Marginal Cost *in cells A1 through F1*. Fill in the numbers 1 through 10 in one-unit increments in cells A2–A11 and enter the number 125 (fixed cost) in each cell from B2 through B11.
2. *Fill in the other columns using appropriate formulas*. Enter "=10*A2–5*A2^2+A2^3" in cell C2 and copy this formula into the remaining cells in column C. Enter "=B2+C2" in cell D2, then copy that formula into the rest of column D up to cell D11. Enter "=D2/A2" into cell E2 and copy that formula into the rest of column E. Enter "=10–10*A2+3*A2^2" into cell F2 and also copy that formula into the rest of column F. The formulas are shown in the screenshot.

	A	B	C	D	E	F
1	Quantity	Fixed Cost	Variable Cost	Total Cost	Average Cost	Marginal Cost
2	1	125	=10*A2-5*A2^2 +A2^3	=B2+C2	=D2/A2	=10-10*A2+3*A2^2
3	2	125	=10*A3-5*A3^2 +A3^3	=B3+C3	=D3/A3	=10-10*A3+3*A3^2
4	3	125	=10*A4-5*A4^2 +A4^3	=B4+C4	=D4/A4	=10-10*A4+3*A4^2
5	4	125	=10*A5-5*A5^2 +A5^3	=B5+C5	=D5/A5	=10-10*A5+3*A5^2
6	5	125	=10*A6-5*A6^2 +A6^3	=B6+C6	=D6/A6	=10-10*A6+3*A6^2
7	6	125	=10*A7-5*A7^2 +A7^3	=B7+C7	=D7/A7	=10-10*A7+3*A7^2
8	7	125	=10*A8-5*A8^2 +A8^3	=B8+C8	=D8/A8	=10-10*A8+3*A8^2
9	8	125	=10*A9-5*A9^2 +A9^3	=B9+C9	=D9/A9	=10-10*A9+3*A9^2
10	9	125	=10*A10-5*A10^2 +A10^3	=B10+C10	=D10/A10	=10-10*A10+3*A10^2
11	10	125	=10*A11-5*A11^2 +A11^3	=B11+C11	=D11/A11	=10-10*A11+3*A11^2

3. *Look in the Average Cost column to identify the output at which average cost is minimized*. Average cost reaches its lowest level in cell E6, where the quantity produced is 5 and average cost is 35. At this output level, marginal cost is also equal to 35, as the screenshot shows. (The average cost column has been formatted to show two digits after the decimal point.)

	A	B	C	D	E	F
1	Quantity	Fixed Cost	Variable Cost	Total Cost	Average Cost	Marginal Cost
2	1	125	6	131	131.00	3
3	2	125	8	133	66.50	2
4	3	125	12	137	45.67	7
5	4	125	24	149	37.25	18
6	5	125	50	175	35.00	35
7	6	125	96	221	36.83	58
8	7	125	168	293	41.86	87
9	8	125	272	397	49.63	122
10	9	125	414	539	59.89	163
11	10	125	600	725	72.50	210



Note: It is possible to use Excel to draw any of the cost curves by inserting a scatterplot. The screenshot shows the average and marginal cost curves.

In addition to these *Q&As*, each chapter except the first has three end-of-chapter spreadsheet exercises addressing topics such as choosing the profit-maximizing level of advertising and designing compensation contracts to motivate employees. All spreadsheet exercises are available in MyLab Economics as static exercises, and select exercises (marked with an X in the text) are available in an auto-graded format. Using proven, field-tested technology, auto-graded Excel Projects let professors seamlessly integrate Microsoft® Excel® content into the course without having to manually grade spreadsheets. Students can practice important skills in Excel, helping you master key concepts and gain proficiency with the program. Simply download a spreadsheet, work live on a problem in Excel, and then upload that file back to MyLab Economics. Within minutes, you will receive a report that provides personalized, detailed feedback and, if necessary, pinpoints where you went astray in the problem. This feedback helps nurture your understanding of the key topics in the course while building confidence in your Excel skills, preparing you for success in class and in your career.

8. MyLab Economics Spreadsheet Exercises[23]

8.1 A monopolist's inverse demand function is $p = 100 - 2Q$, so its marginal revenue is $MR = 100 - 4Q$. Its cost function is $C = 25 + 4Q + 2Q^2$ and its marginal cost is therefore $MC = 4 + 4Q$.

a. Create a spreadsheet with column headings Q, p, MR, MC, R, C, profit, and CS (consumer surplus). Enter the values 1 to 25 in one-unit increments in the quantity column and enter the appropriate formulas in all the other cells. Determine the profit maximizing output and price for an unregulated monopoly. What is the monopoly's profit and the consumer surplus at this output and price?

b. Now use your spreadsheet to determine the price, quantity, profit, and consumer surplus if the regulator imposes a price cap (ceiling) of 70.

c. Which of the two pricing structures yields the highest total surplus? If the regulator wants to use price cap regulation *and* wants to maximize total surplus, what price cap should the regulator choose?

Table of Contents Overview

Because instructors differ in the order in which they cover material and in the range of topics they choose to teach, this text allows for flexibility. The most common approach to teaching managerial economics is to follow the sequence of the chapters in order. However, many variations are possible. For example, some instructors choose to address empirical methods (Chapter 3) first.

Instructors may skip consumer theory (Chapter 4) without causing problems in later chapters. Or, they may cover consumer theory after the chapters on production and cost (Chapters 5 and 6).

Chapter 7, "Firm Organization and Market Structure," provides an overview of the key issues that are discussed in later chapters, such as types of firms, profit maximization and its alternatives, and the structure of markets. We think that presenting this material early in the course is ideal, but an instructor can cover all of this material except for the section on profit maximization later.

An instructor may teach pricing with market power (Chapter 10) at any point after discussing monopoly (Chapter 9). Because game theory is introduced in two chapters (Chapters 12 and 13), instructors can conveniently choose how much game theory to present. Although Chapter 11 on oligopoly and monopolistic competition precedes the game theory chapters, a course could cover the game theory chapters first.

A common variant is to present Chapter 14 on uncertainty earlier in the course. A course could present asymmetric information (Chapter 15) at any point after the uncertainty chapter. Thus, a course could cover both the uncertainty and information chapters early.

Chapter 16 on government and business discusses market failures, government regulation, externalities, public goods, and intellectual property. A course could cover this material earlier. For example, the regulation and intellectual property material could follow monopoly. The externality and public good treatment could be presented at any point after Chapter 8 on competitive firms and markets.

The final chapter, Global Business (Chapter 17), is valuable in a course that stresses international issues. An instructor could cover this chapter at any point after the competition and monopoly chapters.

Instructor Teaching Resources

This book has a full range of supplementary materials that support teaching and learning. This program comes with the following teaching resources:

Supplements available to instructors at www.pearsonhighered.com	Features of the Supplement
Instructor's Manual Authored by Matt Roelofs of Western Washington University	• *Chapter Outlines* include key terminology, teaching notes, and lecture suggestions. • *Teaching Tips* and *Additional Discussion Questions* provide tips for alternative ways to cover the material and brief reminders on additional help to provide students. • *Solutions* are provided for all problems in the book.
Test Bank Authored by Todd Fitch of the University of California, Berkeley	• Multiple-choice problems of varying levels of complexity, suitable for homework assignments and exams • Many of these draw on current news and events
Computerized TestGen	TestGen allows instructors to: • Customize, save, and generate classroom tests • Edit, add, or delete questions from the Test Item Files • Analyze test results • Organize a database of tests and student results.

PowerPoints
Authored by Nelson Altamirano of National University
	• Slides include all the graphs, tables, and equations in the textbook, as well as lecture notes.
	• PowerPoints meet accessibility standards for students with disabilities. Features include, but not limited to:
	  • Keyboard and Screen Reader access
	  • Alternative text for images
	  • High color contrast between background and foreground colors

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J. A. B.