

GLOBAL  
EDITION



# Microeconomics

EIGHTH EDITION

Robert S. Pindyck • Daniel L. Rubinfeld



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# LIST OF EXAMPLES

---

- 1.1 The Market for Sweeteners 34
- 1.2 A Bicycle Is a Bicycle. Or Is It? 35
- 1.3 The Price of Eggs and the Price of a College Education 37
- 1.4 The Minimum Wage 39
- 2.1 The Price of Eggs and the Price of a College Education Revisited 52
- 2.2 Wage Inequality in the United States 53
- 2.3 The Long-Run Behavior of Natural Resources Prices 53
- 2.4 The Effects of 9/11 on the Supply and Demand for New York City Office Space 53
- 2.5 The Market for Wheat 61
- 2.6 The Demand for Gasoline and Automobiles 67
- 2.7 The Weather in Brazil and the Price of Coffee in New York 70
- 2.8 The Behavior of Copper Prices 76
- 2.9 Upheaval in the World Oil Market 78
- 2.10 Price Controls and Natural Gas Shortages 83
- 3.1 Designing New Automobiles (I) 101
- 3.2 Can Money Buy Happiness? 105
- 3.3 Designing New Automobiles (II) 112
- 3.4 Consumer Choice of Health Care 114
- 3.5 A College Trust Fund 116
- 3.6 Revealed Preference for Recreation 118
- 3.7 Marginal Utility and Happiness 121
- 3.8 The Bias in the CPI 129
- 4.1 Consumer Expenditures in the United States 141
- 4.2 The Effects of a Gasoline Tax 146
- 4.3 The Aggregate Demand for Wheat 152
- 4.4 The Demand for Housing 153
- 4.5 The Long-Run Demand for Gasoline 155
- 4.6 The Value of Clean Air 158
- 4.7 Facebook 162
- 4.8 The Demand for Ready-to-Eat Cereal 166
- 5.1 Detering Crime 178
- 5.2 Business Executives and the Choice of Risk 183
- 5.3 The Value of Title Insurance When Buying a House 187
- 5.4 The Value of Information in an Online Consumer Electronics Market 189
- 5.5 Doctors, Patients, and the Value of Information 189
- 5.6 Investing in the Stock Market 197
- 5.7 The Housing Price Bubble (I) 200
- 5.8 The Housing Price Bubble (II) 202
- 5.9 Selling a House 206
- 5.10 New York City Taxicab Drivers 210
- 6.1 A Production Function for Health Care 225
- 6.2 Malthus and the Food Crisis 226
- 6.3 Labor Productivity and the Standard of Living 229
- 6.4 A Production Function for Wheat 235
- 6.5 Returns to Scale in the Carpet Industry 239
- 7.1 Choosing the Location for a New Law School Building 246
- 7.2 Sunk, Fixed, and Variable Costs: Computers, Software, and Pizzas 249
- 7.3 The Short-Run Cost of Aluminum Smelting 254
- 7.4 The Effect of Effluent Fees on Input Choices 261
- 7.5 Reducing the Use of Energy 265
- 7.6 Economies of Scope in the Trucking Industry 274
- 7.7 The Learning Curve in Practice 278
- 7.8 Cost Functions for Electric Power 282
- 8.1 Condominiums versus Cooperatives in New York City 291
- 8.2 The Short-Run Output Decision of an Aluminum Smelting Plant 298
- 8.3 Some Cost Considerations for Managers 299
- 8.4 The Short-Run Production of Petroleum Products 302
- 8.5 The Short-Run World Supply of Copper 305
- 8.6 Constant-, Increasing-, and Decreasing-Cost Industries: Coffee, Oil, and Automobiles 318
- 8.7 The Supply of Taxicabs in New York 320
- 8.8 The Long-Run Supply of Housing 321
- 9.1 Price Controls and Natural Gas Shortages 330
- 9.2 The Market for Human Kidneys 333
- 9.3 Airline Regulation 338
- 9.4 Supporting the Price of Wheat 343
- 9.5 Why Can't I Find a Taxi? 346

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# MICROECONOMICS

EIGHTH EDITION

GLOBAL EDITION

**Robert S. Pindyck**

*Massachusetts Institute of Technology*

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*University of California, Berkeley*

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*To our daughters,*



Maya, Talia, and Shira  
Sarah and Rachel





## ABOUT THE AUTHORS



The authors, back again for a new edition, reflect on their years of successful textbook collaboration. Pindyck is on the right and Rubinfeld on the left.

Revising a textbook every three or four years is hard work, and the last edition was well-liked by students. “So why is our publisher pushing for a new edition?” the authors wondered. “Were some of the examples becoming stale? Or might it have something to do with the used book market?” Could be both. In any case, here they are again, with a new edition that has substantial improvements and lots of new examples.

Robert S. Pindyck is the Bank of Tokyo-Mitsubishi Ltd. Professor of Economics and Finance in the Sloan School of Management at M.I.T. Daniel L. Rubinfeld is the Robert L. Bridges Professor of Law and Professor of Economics Emeritus at the University of California, Berkeley, and Professor of Law at NYU. Both received their Ph.Ds from M.I.T., Pindyck in 1971 and Rubinfeld in 1972. Professor Pindyck’s research and writing have covered a variety of topics in microeconomics, including the effects of uncertainty on firm behavior and market structure; the behavior of natural resource, commodity, and financial markets; environmental economics; and criteria for investment decisions. Professor Rubinfeld, who served as chief economist at the Department of Justice in 1997 and 1998, is the author of a variety of articles relating to antitrust, competition policy, law and economics, law and statistics, and public economics.

Pindyck and Rubinfeld are also co-authors of *Econometric Models and Economic Forecasts*, another best-selling textbook that makes a perfect gift (birthdays, weddings, bar mitzvahs, you name it) for the man or woman who has everything. (Buy several—bulk pricing is available.) These two authors are always looking for ways to earn some extra spending money, so they enrolled as human subjects in a double-blind test of a new hair restoration medication. Rubinfeld strongly suspects that he is being given the placebo.

This is probably more than you want to know about these authors, but for further information, see their Web sites: <http://web.mit.edu/rpindyck/www> and <http://www.law.berkeley.edu/faculty/rubinfeld>.



# BRIEF CONTENTS

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## • PART ONE

### Introduction: Markets and Prices 25

- 1** Preliminaries 27
- 2** The Basics of Supply and Demand 45

## • PART TWO

### Producers, Consumers, and Competitive Markets 89

- 3** Consumer Behavior 91
- 4** Individual and Market Demand 135
- 5** Uncertainty and Consumer Behavior 173
- 6** Production 215
- 7** The Cost of Production 243
- 8** Profit Maximization and Competitive Supply 287
- 9** The Analysis of Competitive Markets 325

## • PART THREE

### Market Structure and Competitive Strategy 363

- 10** Market Power: Monopoly and Monopsony 365
- 11** Pricing with Market Power 407
- 12** Monopolistic Competition and Oligopoly 447
- 13** Game Theory and Competitive Strategy 483
- 14** Markets for Factor Inputs 525
- 15** Investment, Time, and Capital Markets 555

## • PART FOUR

### Information, Market Failure, and the Role of Government 589

- 16** General Equilibrium and Economic Efficiency 591
- 17** Markets with Asymmetric Information 627
- 18** Externalities and Public Goods 657

Appendix: The Basics of Regression 696

Glossary 704

Answers to Selected Exercises 714

Photo Credits 727

Index 728



# CONTENTS



Preface 17

## • PART ONE Introduction: Markets and Prices 25

### 1 Preliminaries 27

- 1.1 The Themes of Microeconomics 28
  - Trade-Offs* 28
  - Prices and Markets* 29
  - Theories and Models* 29
  - Positive versus Normative Analysis* 30
- 1.2 What Is a Market? 31
  - Competitive versus Noncompetitive Markets* 32
  - Market Price* 32
  - Market Definition—The Extent of a Market* 33
- 1.3 Real versus Nominal Prices 36
- 1.4 Why Study Microeconomics? 40
  - Corporate Decision Making: The Toyota Prius* 40
  - Public Policy Design: Fuel Efficiency Standards for the Twenty-First Century* 41

**Summary** 42

**Questions for Review** 43

**Exercises** 43

### 2 The Basics of Supply and Demand 45

- 2.1 Supply and Demand 46
  - The Supply Curve* 46
  - The Demand Curve* 47
- 2.2 The Market Mechanism 49
- 2.3 Changes in Market Equilibrium 50
- 2.4 Elasticities of Supply and Demand 57
  - Point versus Arc Elasticities* 60
- 2.5 Short-Run versus Long-Run Elasticities 63
  - Demand* 64
  - Supply* 69
- \*2.6 Understanding and Predicting the Effects of Changing Market Conditions 72
- 2.7 Effects of Government Intervention—Price Controls 82

**Summary** 84

**Questions for Review** 85

**Exercises** 86

## • PART TWO Producers, Consumers, and Competitive Markets 89

### 3 Consumer Behavior 91

- Consumer Behavior* 91
- 3.1 Consumer Preferences 93
  - Market Baskets* 93
  - Some Basic Assumptions about Preferences* 94
  - Indifference Curves* 95
  - Indifference Maps* 96
  - The Shape of Indifference Curves* 97
  - The Marginal Rate of Substitution* 98
  - Perfect Substitutes and Perfect Complements* 99
- 3.2 Budget Constraints 106
  - The Budget Line* 106
  - The Effects of Changes in Income and Prices* 108
- 3.3 Consumer Choice 110
  - Corner Solutions* 113
- 3.4 Revealed Preference 116
- 3.5 Marginal Utility and Consumer Choice 119
  - Rationing* 122
- \*3.6 Cost-of-Living Indexes 124
  - Ideal Cost-of-Living Index* 125
  - Laspeyres Index* 126
  - Paasche Index* 127
  - Price Indexes in the United States: Chain Weighting* 128

**Summary** 129

**Questions for Review** 130

**Exercises** 131

## 4 Individual and Market Demand 135

- 4.1 Individual Demand 136
    - Price Changes* 136
    - The Individual Demand Curve* 136
    - Income Changes* 138
    - Normal versus Inferior Goods* 139
    - Engel Curves* 140
    - Substitutes and Complements* 142
  - 4.2 Income and Substitution Effects 143
    - Substitution Effect* 144
    - Income Effect* 145
    - A Special Case: The Giffen Good* 146
  - 4.3 Market Demand 148
    - From Individual to Market Demand* 148
    - Elasticity of Demand* 150
    - Speculative Demand* 153
  - 4.4 Consumer Surplus 156
    - Consumer Surplus and Demand* 156
  - 4.5 Network Externalities 159
    - Positive Network Externalities* 159
    - Negative Network Externalities* 161
  - \*4.6 Empirical Estimation of Demand 163
    - The Statistical Approach to Demand Estimation* 163
    - The Form of the Demand Relationship* 164
    - Interview and Experimental Approaches to Demand Determination* 167
- Summary** 167  
**Questions for Review** 168  
**Exercises** 169

## 5 Uncertainty and Consumer Behavior 173

- 5.1 Describing Risk 174
  - Probability* 174
  - Expected Value* 175
  - Variability* 175
  - Decision Making* 177
- 5.2 Preferences Toward Risk 179
  - Different Preferences Toward Risk* 180
- 5.3 Reducing Risk 184
  - Diversification* 184

- Insurance* 185
  - The Value of Information* 188
  - \*5.4 The Demand for Risky Assets 190
    - Assets* 190
    - Risky and Riskless Assets* 191
    - Asset Returns* 191
    - The Trade-Off Between Risk and Return* 193
    - The Investor's Choice Problem* 194
  - 5.5 Bubbles 199
    - Informational Cascades* 201
  - 5.6 Behavioral Economics 203
    - Reference Points and Consumer Preferences* 204
    - Fairness* 206
    - Rules of Thumb and Biases in Decision Making* 208
    - Summing Up* 210
- Summary** 211  
**Questions for Review** 211  
**Exercises** 212

## 6 Production 215

- The Production Decisions of a Firm* 215
  - 6.1 Firms and Their Production Decisions 216
    - Why Do Firms Exist?* 217
    - The Technology of Production* 218
    - The Production Function* 218
    - The Short Run versus the Long Run* 219
  - 6.2 Production with One Variable Input (Labor) 220
    - Average and Marginal Products* 220
    - The Slopes of the Product Curve* 221
    - The Average Product of Labor Curve* 223
    - The Marginal Product of Labor Curve* 223
    - The Law of Diminishing Marginal Returns* 223
    - Labor Productivity* 228
  - 6.3 Production with Two Variable Inputs 230
    - Isoquants* 230
    - Input Flexibility* 231
    - Diminishing Marginal Returns* 231
    - Substitution Among Inputs* 232
    - Production Functions—Two Special Cases* 233
  - 6.4 Returns to Scale 237
    - Describing Returns to Scale* 238
- Summary** 240  
**Questions for Review** 240  
**Exercises** 241



## 7 The Cost of Production 243

- 7.1 Measuring Cost: Which Costs Matter? 243
    - Economic Cost versus Accounting Cost* 244
    - Opportunity Cost* 244
    - Sunk Costs* 245
    - Fixed Costs and Variable Costs* 247
    - Fixed versus Sunk Costs* 248
    - Marginal and Average Cost* 250
  - 7.2 Cost in the Short Run 251
    - The Determinants of Short-Run Cost* 251
    - The Shapes of the Cost Curves* 252
  - 7.3 Cost in the Long Run 257
    - The User Cost of Capital* 257
    - The Cost-Minimizing Input Choice* 258
    - The Isocost Line* 259
    - Choosing Inputs* 259
    - Cost Minimization with Varying Output Levels* 263
    - The Expansion Path and Long-Run Costs* 264
  - 7.4 Long-Run versus Short-Run Cost Curves 267
    - The Inflexibility of Short-Run Production* 267
    - Long-Run Average Cost* 268
    - Economies and Diseconomies of Scale* 269
    - The Relationship between Short-Run and Long-Run Cost* 271
  - 7.5 Production with Two Outputs—Economies of Scope 272
    - Product Transformation Curves* 272
    - Economies and Diseconomies of Scope* 273
    - The Degree of Economies of Scope* 273
  - \*7.6 Dynamic Changes in Costs—The Learning Curve 275
    - Graphing the Learning Curve* 275
    - Learning versus Economies of Scale* 276
  - \*7.7 Estimating and Predicting Cost 279
    - Cost Functions and the Measurement of Scale Economies* 281
- Summary** 283  
**Questions for Review** 284  
**Exercises** 285

## 8 Profit Maximization and Competitive Supply 287

- 8.1 Perfectly Competitive Markets 287
  - When Is a Market Highly Competitive?* 289

- 8.2 Profit Maximization 290
    - Do Firms Maximize Profit?* 290
    - Alternative Forms of Organization* 291
  - 8.3 Marginal Revenue, Marginal Cost, and Profit Maximization 292
    - Demand and Marginal Revenue for a Competitive Firm* 293
    - Profit Maximization by a Competitive Firm* 295
  - 8.4 Choosing Output in the Short Run 295
    - Short-Run Profit Maximization by a Competitive Firm* 295
    - When Should the Firm Shut Down?* 297
  - 8.5 The Competitive Firm's Short-Run Supply Curve 300
    - The Firm's Response to an Input Price Change* 301
  - 8.6 The Short-Run Market Supply Curve 303
    - Elasticity of Market Supply* 304
    - Producer Surplus in the Short Run* 306
  - 8.7 Choosing Output in the Long Run 308
    - Long-Run Profit Maximization* 308
    - Long-Run Competitive Equilibrium* 309
    - Economic Rent* 312
    - Producer Surplus in the Long Run* 313
  - 8.8 The Industry's Long-Run Supply Curve 314
    - Constant-Cost Industry* 315
    - Increasing-Cost Industry* 316
    - Decreasing-Cost Industry* 317
    - The Effects of a Tax* 318
    - Long-Run Elasticity of Supply* 319
- Summary** 322  
**Questions for Review** 322  
**Exercises** 323

## 9 The Analysis of Competitive Markets 325

- 9.1 Evaluating the Gains and Losses from Government Policies—Consumer and Producer Surplus 325
  - Review of Consumer and Producer Surplus* 326
  - Application of Consumer and Producer Surplus* 327
- 9.2 The Efficiency of a Competitive Market 331
- 9.3 Minimum Prices 336



- 9.4 Price Supports and Production Quotas 340
  - Price Supports* 340
  - Production Quotas* 341
- 9.5 Import Quotas and Tariffs 348
- 9.6 The Impact of a Tax or Subsidy 353
  - The Effects of a Subsidy* 356
- Summary** 359
- Questions for Review** 360
- Exercises** 360

### • PART THREE

## Market Structure and Competitive Strategy 363

### 10 Market Power: Monopoly and Monopsony 365

- 10.1 Monopoly 366
  - Average Revenue and Marginal Revenue* 366
  - The Monopolist's Output Decision* 367
  - An Example* 369
  - A Rule of Thumb for Pricing* 371
  - Shifts in Demand* 373
  - The Effect of a Tax* 374
  - \*The Multiplant Firm* 375
- 10.2 Monopoly Power 376
  - Production, Price, and Monopoly Power* 379
  - Measuring Monopoly Power* 379
  - The Rule of Thumb for Pricing* 380
- 10.3 Sources of Monopoly Power 383
  - The Elasticity of Market Demand* 384
  - The Number of Firms* 384
  - The Interaction Among Firms* 385
- 10.4 The Social Costs of Monopoly Power 385
  - Rent Seeking* 386
  - Price Regulation* 387
  - Natural Monopoly* 388
  - Regulation in Practice* 389
- 10.5 Monopsony 390
  - Monopsony and Monopoly Compared* 393
- 10.6 Monopsony Power 393
  - Sources of Monopsony Power* 394
  - The Social Costs of Monopsony Power* 395
  - Bilateral Monopoly* 396
- 10.7 Limiting Market Power: The Antitrust Laws 397
  - Restricting What Firms Can Do* 398

- Enforcement of the Antitrust Laws* 399
- Antitrust in Europe* 400

#### **Summary** 403

#### **Questions for Review** 403

#### **Exercises** 404

### 11 Pricing with Market Power 407

- 11.1 Capturing Consumer Surplus 408
- 11.2 Price Discrimination 409
  - First-Degree Price Discrimination* 409
  - Second-Degree Price Discrimination* 412
  - Third-Degree Price Discrimination* 412
- 11.3 Intertemporal Price Discrimination and Peak-Load Pricing 418
  - Intertemporal Price Discrimination* 419
  - Peak-Load Pricing* 420
- 11.4 The Two-Part Tariff 422
- \*11.5 Bundling 427
  - Relative Valuations* 428
  - Mixed Bundling* 431
  - Bundling in Practice* 434
  - Tying* 436
- \*11.6 Advertising 437
  - A Rule of Thumb for Advertising* 439
- Summary** 442
- Questions for Review** 442
- Exercises** 443

### 12 Monopolistic Competition and Oligopoly 447

- 12.1 Monopolistic Competition 448
  - The Makings of Monopolistic Competition* 448
  - Equilibrium in the Short Run and the Long Run* 449
  - Monopolistic Competition and Economic Efficiency* 450
- 12.2 Oligopoly 452
  - Equilibrium in an Oligopolistic Market* 453
  - The Cournot Model* 454
  - The Linear Demand Curve—An Example* 457
  - First Mover Advantage—The Stackelberg Model* 459
- 12.3 Price Competition 460
  - Price Competition with Homogeneous Products—The Bertrand Model* 460
  - Price Competition with Differentiated Products* 461
- 12.4 Competition versus Collusion: The Prisoners' Dilemma 465





- 12.5 Implications of the Prisoners' Dilemma for Oligopolistic Pricing 468  
*Price Rigidity* 469  
*Price Signaling and Price Leadership* 470  
*The Dominant Firm Model* 472
- 12.6 Cartels 473  
*Analysis of Cartel Pricing* 474  
**Summary** 478  
**Questions for Review** 478  
**Exercises** 479
- 13 Game Theory and Competitive Strategy 483**
- 13.1 Gaming and Strategic Decisions 483  
*Noncooperative versus Cooperative Games* 484
- 13.2 Dominant Strategies 486
- 13.3 The Nash Equilibrium Revisited 488  
*Maximin Strategies* 490  
*\*Mixed Strategies* 492
- 13.4 Repeated Games 494
- 13.5 Sequential Games 498  
*The Extensive Form of a Game* 499  
*The Advantage of Moving First* 500
- 13.6 Threats, Commitments, and Credibility 501  
*Empty Threats* 502  
*Commitment and Credibility* 502  
*Bargaining Strategy* 504
- 13.7 Entry Deterrence 506  
*Strategic Trade Policy and International Competition* 508
- \*13.8 Auctions 512  
*Auction Formats* 513  
*Valuation and Information* 513  
*Private-Value Auctions* 514  
*Common-Value Auctions* 515  
*Maximizing Auction Revenue* 516  
*Bidding and Collusion* 517  
**Summary** 520  
**Questions for Review** 521  
**Exercises** 521
- 14 Markets for Factor Inputs 525**
- 14.1 Competitive Factor Markets 525  
*Demand for a Factor Input When Only One Input Is Variable* 526  
*Demand for a Factor Input When Several Inputs Are Variable* 529

- The Market Demand Curve* 530  
*The Supply of Inputs to a Firm* 533  
*The Market Supply of Inputs* 535
- 14.2 Equilibrium in a Competitive Factor Market 538  
*Economic Rent* 538
- 14.3 Factor Markets with Monopsony Power 542  
*Monopsony Power: Marginal and Average Expenditure* 542  
*Purchasing Decisions with Monopsony Power* 543  
*Bargaining Power* 544
- 14.4 Factor Markets with Monopoly Power 546  
*Monopoly Power over the Wage Rate* 547  
*Unionized and Nonunionized Workers* 548  
**Summary** 551  
**Questions for Review** 552  
**Exercises** 552
- 15 Investment, Time, and Capital Markets 555**
- 15.1 Stocks versus Flows 556
- 15.2 Present Discounted Value 557  
*Valuing Payment Streams* 558
- 15.3 The Value of a Bond 560  
*Perpetuities* 561  
*The Effective Yield on a Bond* 562
- 15.4 The Net Present Value Criterion for Capital Investment Decisions 565  
*The Electric Motor Factory* 566  
*Real versus Nominal Discount Rates* 567  
*Negative Future Cash Flows* 568
- 15.5 Adjustments for Risk 569  
*Diversifiable versus Nondiversifiable Risk* 570  
*The Capital Asset Pricing Model* 571
- 15.6 Investment Decisions by Consumers 574
- 15.7 Investments in Human Capital 576
- \*15.8 Intertemporal Production Decisions—Depletable Resources 580  
*The Production Decision of an Individual Resource Producer* 580  
*The Behavior of Market Price* 581  
*User Cost* 581  
*Resource Production by a Monopolist* 582
- 15.9 How Are Interest Rates Determined? 584  
*A Variety of Interest Rates* 585



|                      |     |
|----------------------|-----|
| Summary              | 586 |
| Questions for Review | 587 |
| Exercises            | 587 |

## • PART FOUR

# Information, Market Failure, and the Role of Government 589

## 16 General Equilibrium and Economic Efficiency 591

|      |   |     |
|------|---|-----|
| 16.1 | General Equilibrium Analysis                                    | 591 |
|      | <i>Two Interdependent Markets—Moving to General Equilibrium</i> | 592 |
|      | <i>Reaching General Equilibrium</i>                             | 593 |
|      | <i>Economic Efficiency</i>                                      | 597 |
| 16.2 | Efficiency in Exchange  | 598 |
|      | <i>The Advantages of Trade</i>                                  | 598 |
|      | <i>The Edgeworth Box Diagram</i>                                | 599 |
|      | <i>Efficient Allocations</i>                                    | 600 |
|      | <i>The Contract Curve</i>                                       | 602 |
|      | <i>Consumer Equilibrium in a Competitive Market</i>             | 603 |
|      | <i>The Economic Efficiency of Competitive Markets</i>           | 605 |
| 16.3 | Equity and Efficiency   | 606 |
|      | <i>The Utility Possibilities Frontier</i>                       | 606 |
|      | <i>Equity and Perfect Competition</i>                           | 608 |
| 16.4 | Efficiency in Production  | 609 |
|      | <i>Input Efficiency</i>   | 609 |
|      | <i>The Production Possibilities Frontier</i>                    | 610 |
|      | <i>Output Efficiency</i>  | 611 |
|      | <i>Efficiency in Output Markets</i>                             | 613 |
| 16.5 | The Gains from Free Trade                                       | 614 |
|      | <i>Comparative Advantage</i>                                    | 614 |
|      | <i>An Expanded Production Possibilities Frontier</i>            | 615 |
| 16.6 | An Overview—The Efficiency of Competitive Markets               | 619 |
| 16.7 | Why Markets Fail  | 621 |
|      | <i>Market Power</i>   | 621 |
|      | <i>Incomplete Information</i>                                   | 621 |
|      | <i>Externalities</i>  | 622 |
|      | <i>Public Goods</i>   | 622 |
|      | <b>Summary</b>  | 623 |

|                      |     |
|----------------------|-----|
| Questions for Review | 624 |
| Exercises            | 624 |

## 17 Markets with Asymmetric Information 627

|       |   |     |
|-------|---|-----|
| 17.1  | Quality Uncertainty and the Market for Lemons                             | 628 |
|       | <i>The Market for Used Cars</i>   | 628 |
|       | <i>Implications of Asymmetric Information</i>                             | 630 |
|       | <i>The Importance of Reputation and Standardization</i>                   | 632 |
| 17.2  | Market Signaling  | 634 |
|       | <i>A Simple Model of Job Market Signaling</i>                             | 635 |
|       | <i>Guarantees and Warranties</i>  | 638 |
| 17.3  | Moral Hazard  | 639 |
| 17.4  | The Principal–Agent Problem   | 641 |
|       | <i>The Principal–Agent Problem in Private Enterprises</i>                 | 642 |
|       | <i>The Principal–Agent Problem in Public Enterprises</i>                  | 644 |
|       | <i>Incentives in the Principal–Agent Framework</i>                        | 646 |
| *17.5 | Managerial Incentives in an Integrated Firm                               | 647 |
|       | <i>Asymmetric Information and Incentive Design in the Integrated Firm</i> | 648 |
|       | <i>Applications</i>   | 650 |
| 17.6  | Asymmetric Information in Labor Markets: Efficiency Wage Theory           | 650 |
|       | <b>Summary</b>  | 652 |
|       | <b>Questions for Review</b>   | 653 |
|       | <b>Exercises</b>  | 653 |

## 18 Externalities and Public Goods 657

|      |  |     |
|------|--|-----|
| 18.1 | Externalities                                  | 657 |
|      | <i>Negative Externalities and Inefficiency</i> | 658 |
|      | <i>Positive Externalities and Inefficiency</i> | 660 |
| 18.2 | Ways of Correcting Market Failure              | 663 |
|      | <i>An Emissions Standard</i>                   | 664 |
|      | <i>An Emissions Fee</i>                        | 664 |
|      | <i>Standards versus Fees</i>                   | 665 |
|      | <i>Tradeable Emissions Permits</i>             | 667 |
|      | <i>Recycling</i>                               | 671 |



- 18.3 Stock Externalities 674
  - Stock Buildup and Its Impact* 675
- 18.4 Externalities and Property Rights 680
  - Property Rights* 680
  - Bargaining and Economic Efficiency* 681
  - Costly Bargaining—The Role of Strategic Behavior* 682
  - A Legal Solution—Suing for Damages* 682
- 18.5 Common Property Resources 683
- 18.6 Public Goods 686
  - Efficiency and Public Goods* 687
  - Public Goods and Market Failure* 688
- 18.7 Private Preferences for Public Goods 690
  - Summary** 692
  - Questions for Review** 692
  - Exercises** 693

**APPENDIX:****The Basics of Regression 696**

- An Example 696
- Estimation 697
- Statistical Tests 698
- Goodness of Fit 700
- Economic Forecasting 700
- Summary 703

**Glossary 704****Answers to Selected Exercises 714****Photo Credits 727****Index 728**



# PREFACE

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For students who care about how the world works, microeconomics is probably the most relevant, interesting, and important subject they can study. (Macroeconomics is the second-most important subject.) A good grasp of microeconomics is vital for managerial decision making, for designing and understanding public policy, and more generally, for appreciating how a modern economy functions. In fact, even understanding the news each day often requires knowledge of microeconomics.

We wrote this book, *Microeconomics*, because we believe that students need to be exposed to the new topics that have come to play a central role in microeconomics over the years—topics such as game theory and competitive strategy, the roles of uncertainty and information, and the analysis of pricing by firms with market power. We also felt that students need to be shown how microeconomics can help us to understand what goes on in the world and how it can be used as a practical tool for decision making. Microeconomics is an exciting and dynamic subject, but students need to be given an appreciation of its relevance and usefulness. They want and need a good understanding of how microeconomics can actually be used outside the classroom.

To respond to these needs, the eighth edition of *Microeconomics* provides a treatment of microeconomic theory that stresses its relevance and application to both managerial and public policy decision making. This applied emphasis is accomplished by including examples that cover such topics as the analysis of demand, cost, and market efficiency; the design of pricing strategies; investment and production decisions; and public policy analysis. Because of the importance that we attach to these examples, they are included in the flow of the text. (A complete list is included on the endpapers inside the front cover.)

The coverage in this edition of *Microeconomics* incorporates the dramatic changes that have occurred in the field in recent years. There has been growing interest in game theory and the strategic interactions of firms (Chapters 12 and 13), in the role and implications of uncertainty and asymmetric information (Chapters 5 and 17), in the pricing strategies of firms with market power (Chapters 10 and 11), and in the design of policies to deal efficiently with externalities such as environmental pollution (Chapter 18).

That the coverage in *Microeconomics* is comprehensive and up to date does not mean that it is “advanced” or difficult. We have worked hard to make the exposition clear and accessible as well as lively and engaging. We believe that the study of microeconomics should be enjoyable and stimulating. We hope that our book reflects this belief. Except for appendices and footnotes, *Microeconomics* uses no calculus. As a result, it should be suitable for students with a broad range of backgrounds. (Those sections that are more demanding are marked with an asterisk and can be easily omitted.)



## Changes in the Eighth Edition

Each new edition of this book has built on the success of prior editions by adding a number of new topics, by adding and updating examples, and by improving the exposition of existing materials.

The eighth edition continues that tradition with a number of new and modern topics.

- We have introduced new material on speculative demand and have expanded our discussion of network externalities to include social networks (Chapter 4).
- In Chapter 5 we added a new section on bubbles and informational cascades, along with examples showing applications to housing markets and the financial crisis. We also expanded and updated the material on behavioral economics.

We added a number of new examples and updated most of the existing ones.

- We introduced a series of examples relating to the economics of health care, including the demand for and production of health care (Chapters 3, 6, 16, and 17).
- We also added a series of examples on taxicab markets that illustrate the effects of government policies that restrict output (Chapters 8, 9, and 15).
- We added examples on energy demand and energy efficiency (Chapters 4 and 7), and “contagion” in global financial markets (Chapter 16).
- We have even added an example that explains the pricing of this textbook (Chapter 12).

As in each new addition, we worked hard to improve the exposition wherever possible. For this edition, we revised and improved the treatment of some of the core material on production and cost (Chapters 7 and 8), as well as the treatment of general equilibrium and economic efficiency (Chapter 16). We made a variety of other changes, including revisions of some of the figures, to make the exposition as clear and readable as possible.

The layout of this edition is similar to that of the prior edition. This has allowed us to continue to define key terms in the margins (as well as in the Glossary at the end of the book) and to use the margins to include Concept Links that relate newly developed ideas to concepts introduced previously in the text.

## Alternative Course Designs

This new edition of *Microeconomics* offers instructors considerable flexibility in course design. For a one-quarter or one-semester course stressing the basic core material, we would suggest using the following chapters and sections of chapters: 1 through 6, 7.1–7.4, 8 through 10, 11.1–11.3, 12, 14, 15.1–15.4, 18.1–18.2, and 18.5. A somewhat more ambitious course might also include parts





of Chapters 5 and 16 and additional sections in Chapters 7 and 9. To emphasize uncertainty and market failure, an instructor should also include substantial parts of Chapters 5 and 17.

Depending on one's interests and the goals of the course, other sections could be added or used to replace the materials listed above. A course emphasizing modern pricing theory and business strategy would include all of Chapters 11, 12, and 13 and the remaining sections of Chapter 15. A course in managerial economics might also include the appendix on regression analysis at the end of the book. A course stressing welfare economics and public policy should include Chapter 16 and additional sections of Chapter 18.

Finally, we want to stress that those sections or subsections that are more demanding and/or peripheral to the core material have been marked with an asterisk. These sections can easily be omitted without detracting from the flow of the book.

## Supplementary Materials

**A**ncillaries of an exceptionally high quality are available to instructors and students using this book. The *Instructor's Manual*, prepared by Duncan M. Holthausen of North Carolina State University, provides detailed solutions to all end-of-chapter Questions for Review and Exercises. The eighth edition contains many entirely new review questions and exercises, and a number of exercises have been revised and updated. The new instructor's manual has been revised accordingly. Each chapter also contains Teaching Tips to summarize key points.

The *Test Item File*, prepared by Douglas J. Miller of the University of Missouri, contains approximately 2,000 multiple-choice and short-answer questions with solutions. All of this material has been thoroughly reviewed, accuracy checked, and revised for this edition. The Test Item File is designed for use with *TestGen* test-generating software. TestGen's graphical interface enables instructors to view, edit, and add questions; transfer questions to tests; and print different forms of tests. Search and sort features let the instructor quickly locate questions and arrange them in a preferred order.

The *PowerPoint Presentation* has been revised for this edition by Fernando Quijano of Dickinson State University with editorial consultants Shelly Tefft and Michael Brener. Instructors can edit the detailed outlines to create their own full-color, professional-looking presentations and customized handouts for students. The PowerPoint Presentation also contains lecture notes and a complete set of animated textbook figures.

The *Study Guide*, prepared by Valerie Suslow of the University of Michigan and Jonathan Hamilton of the University of Florida, provides a wide variety of review materials and exercises for students. Each chapter contains a list of important concepts, chapter highlights, a concept review, problem sets, and a self-test quiz. Worked-out answers and solutions are provided for all exercises, problem sets, and self-test questions.

For your convenience, all instructor resources are available online via our centralized supplements Web site, the Instructor Resource Center ([www.pearsonglobaleditions.com/Pindyck](http://www.pearsonglobaleditions.com/Pindyck)). For access or more information, contact your local Pearson representative or request access online at the Instructor Resource Center.



## MyEconLab

MyEconLab is a content-rich Web site with homework, quiz, test, and tutorial options related to the eighth edition of *Microeconomics*. MyEconLab offers students an opportunity to sharpen their problem-solving skills and to assess their understanding of text material in one program. Similarly, instructors can manage all assessment needs in one program.

MyEconLab contains:

- End-of-chapter exercises available for practice. These exercises include algorithmic, numerical, and draw-graph exercises.
- Additional exercises for assignment that draws upon material in the text.
- Instant tutorial feedback on a student's problem and graphing responses.
- Interactive Learning Aids including *Help Me Solve This* step-by-step tutorials and graph animations.
- Test Item File questions for homework assignment.
- A Custom Exercise Builder that allows instructors to create their own problems.
- A Gradebook that records student performance and generates reports by student or chapter.
- Experiments in two versions, *Single Player* (for easy, asynchronous, interactive homework assignments) and *Multiplayer* (for a fast paced, instructor-led, synchronous, interactive experience). Available experiments include Public Goods and the Lemons Market. For a complete list of available experiments, visit [www.myeconlab.com](http://www.myeconlab.com).
- An enhanced eText, available within the online course materials and offline via an iPad app, that allows instructors and students to highlight, bookmark, and take notes.
- Communication tools that enable students and instructors to communicate through email, discussion board, chat, and ClassLive.
- Customization options that provide additional ways to share documents and add content.
- Prebuilt courses offer a turn-key way for instructors to create a course that includes pre-built assignments distributed by chapter.

The MyEconLab exercises for *Microeconomics* were created by Duncan M. Holthausen at North Carolina State University. For additional information and a demonstration, visit [www.myeconlab.com](http://www.myeconlab.com).



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*R.S.P.*  
*D.L.R.*



# Part One

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## Introduction: Markets and Prices

**Part 1 surveys the scope of microeconomics and introduces some basic concepts and tools.**

Chapter 1 discusses the range of problems that microeconomics addresses, and the kinds of answers it can provide. It also explains what a market is, how we determine the boundaries of a market, and how we measure market price.

Chapter 2 covers one of the most important tools of microeconomics: supply-demand analysis. We explain how a competitive market works and how supply and demand determine the prices and quantities of goods and services. We also show how supply-demand analysis can be used to determine the effects of changing market conditions, including government intervention.



### CHAPTERS

**1**  
Preliminaries  
27

**2**  
The Basics of Supply and  
Demand  
45



# CHAPTER 1

## Preliminaries

Economics is divided into two main branches: microeconomics and macroeconomics. **Microeconomics** deals with the behavior of individual economic units. These units include consumers, workers, investors, owners of land, business firms—in fact, any individual or entity that plays a role in the functioning of our economy.<sup>1</sup> Microeconomics explains how and why these units make economic decisions. For example, it explains how consumers make purchasing decisions and how their choices are affected by changing prices and incomes. It also explains how firms decide how many workers to hire and how workers decide where to work and how much work to do.

Another important concern of microeconomics is how economic units interact to form larger units—markets and industries. Microeconomics helps us to understand, for example, why the American automobile industry developed the way it did and how producers and consumers interact in the market for automobiles. It explains how automobile prices are determined, how much automobile companies invest in new factories, and how many cars are produced each year. By studying the behavior and interaction of individual firms and consumers, microeconomics reveals how industries and markets operate and evolve, why they differ from one another, and how they are affected by government policies and global economic conditions.

By contrast, **macroeconomics** deals with aggregate economic quantities, such as the level and growth rate of national output, interest rates, unemployment, and inflation. But the boundary between macroeconomics and microeconomics has become less and less distinct in recent years. The reason is that macroeconomics also involves the analysis of markets—for example, the aggregate markets for goods and services, labor, and corporate bonds. To understand how these aggregate markets operate, we must first understand the behavior of the firms, consumers, workers, and investors who constitute them. Thus macroeconomists have become increasingly concerned with the microeconomic foundations of aggregate economic phenomena, and much of macroeconomics is actually an extension of microeconomic analysis.

<sup>1</sup>The prefix *micro-* is derived from the Greek word meaning “small.” However, many of the individual economic units that we will study are small only in relation to the U.S. economy as a whole. For example, the annual sales of General Motors, IBM, or Microsoft are larger than the gross national products of many countries.

### CHAPTER OUTLINE

- 1.1 The Themes of Microeconomics 28
- 1.2 What Is a Market? 31
- 1.3 Real versus Nominal Prices 36
- 1.4 Why Study Microeconomics? 40

### LIST OF EXAMPLES

- 1.1 The Market for Sweeteners 34
- 1.2 A Bicycle Is a Bicycle. Or Is It? 35
- 1.3 The Price of Eggs and the Price of a College Education 37
- 1.4 The Minimum Wage 39



- **microeconomics** Branch of economics that deals with the behavior of individual economic units—consumers, firms, workers, and investors—as well as the markets that these units comprise.

- **macroeconomics** Branch of economics that deals with aggregate economic variables, such as the level and growth rate of national output, interest rates, unemployment, and inflation.

## 1.1 The Themes of Microeconomics

The Rolling Stones once said: “You can’t always get what you want.” This is true. For most people (even Mick Jagger), that there are limits to what you can have or do is a simple fact of life learned in early childhood. For economists, however, it can be an obsession.

Much of microeconomics is about *limits*—the limited incomes that consumers can spend on goods and services, the limited budgets and technical know-how that firms can use to produce things, and the limited number of hours in a week that workers can allocate to labor or leisure. But microeconomics is also about *ways to make the most of these limits*. More precisely, it is about *the allocation of scarce resources*. For example, microeconomics explains how consumers can best allocate their limited incomes to the various goods and services available for purchase. It explains how workers can best allocate their time to labor instead of leisure, or to one job instead of another. And it explains how firms can best allocate limited financial resources to hiring additional workers versus buying new machinery, and to producing one set of products versus another.

In a planned economy such as that of Cuba, North Korea, or the former Soviet Union, these allocation decisions are made mostly by the government. Firms are told what and how much to produce, and how to produce it; workers have little flexibility in choice of jobs, hours worked, or even where they live; and consumers typically have a very limited set of goods to choose from. As a result, many of the tools and concepts of microeconomics are of limited relevance in those countries.

### Trade-Offs

In modern market economies, consumers, workers, and firms have much more flexibility and choice when it comes to allocating scarce resources. Microeconomics describes the *trade-offs* that consumers, workers, and firms face, and *shows how these trade-offs are best made*.

The idea of making optimal trade-offs is an important theme in microeconomics—one that you will encounter throughout this book. Let’s look at it in more detail.

**CONSUMERS** Consumers have limited incomes, which can be spent on a wide variety of goods and services, or saved for the future. *Consumer theory*, the subject matter of Chapters 3, 4, and 5 of this book, describes how consumers, based on their preferences, maximize their well-being by trading off the purchase of more of some goods for the purchase of less of others. We will also see how consumers decide how much of their incomes to save, thereby trading off current consumption for future consumption.

**WORKERS** Workers also face constraints and make trade-offs. First, people must decide whether and when to enter the workforce. Because the kinds of jobs—and corresponding pay scales—available to a worker depend in part on educational attainment and accumulated skills, one must trade off working now (and earning an immediate income) for continued education (and the hope of earning a higher future income). Second, workers face trade-offs in their choice of employment. For example, while some people choose to work for large corporations that offer job security but limited potential for advancement, others prefer to work for small companies where there is more opportunity for