A Short Course in Intermediate Microeconomics with Calculus

Second edition

ROBERTO SERRANO
Brown University, Rhode Island

ALLAN M. FELDMAN
Brown University, Rhode Island

CAMBRIDGE
UNIVERSITY PRESS

CONTENTS

Preface *page* xiii

1. Introduction 1

Part I. Theory of the Consumer 5

2. Preferences and Utility 7
   - 2.1 Introduction 7
   - 2.2 The Consumer's Preference Relation 8
   - 2.3 The Marginal Rate of Substitution 14
   - 2.4 The Consumer's Utility Function 16
   - 2.5 Utility Functions and the Marginal Rate of Substitution 19
   - 2.6 A Solved Problem 21
   - Exercises 22
   - Appendix: Differentiation of Functions 25

3. The Budget Constraint and the Consumer's Optimal Choice 26
   - 3.1 Introduction 26
   - 3.2 The Standard Budget Constraint, the Budget Set, and the Budget Line 26
   - 3.3 Shifts of the Budget Line 28
   - 3.4 Odd Budget Constraints 29
   - 3.5 Income and Consumption Over Time 31
   - 3.6 The Consumer's Optimal Choice: Graphical Analysis 33
   - 3.7 The Consumer's Optimal Choice: Utility Maximization Subject to the Budget Constraint 36
   - 3.8 Two Solved Problems 38
   - Exercises 40
   - Appendix: Maximization Subject to a Constraint: The Lagrange Function Method 43

4. Demand Functions 47
   - 4.1 Introduction 47
   - 4.2 Demand as a Function of Income 48
   - 4.3 Demand as a Function of Price 50
   - 4.4 Demand as a Function of Price of the Other Good 54
   - 4.5 Substitution and Income Effects 56
   - 4.6 The Compensated Demand Curve 60
   - 4.7 Elasticity 61

4.8 The Market Demand Curve 64
4.9 A Solved Problem 66
Exercises 67
Appendix: The Slutsky Equation 68
5. Supply Functions for Labor and Savings 70
5.1 Introduction to the Supply of Labor 70
5.2 Choice between Consumption and Leisure 70
5.3 Substitution and Income Effects in Labor Supply 73
5.4 Other Types of Budget Constraints 75
5.5 Taxing the Consumer's Wages 79
5.6 Saving and Borrowing: The Intertemporal Choice of Consumption 83
5.7 The Supply of Savings 86
5.8 A Solved Problem 89
Exercises 91
6. Welfare Economics 1: The One-Person Case 94
6.1 Introduction 94
6.2 Welfare Comparison of a Per-Unit Tax and an Equivalent Lump-Sum Tax 94
6.3 Rebating a Per-Unit Tax 97
6.4 Measuring a Change in Welfare for One Person 98
6.5 Measuring Welfare for Many People: A Preliminary Example 103
6.6 A Solved Problem 104
Exercises 106
Appendix: Revealed Preference 108
7. Welfare Economics 2: The Many-Person Case 112
7.1 Introduction 112
7.2 Quasilinear Preferences 113
7.3 Consumer's Surplus 114
7.4 A Consumer's Surplus Example with Quasilinear Preferences 118
7.5 Consumers' Surplus 121
7.6 A Last Word on the Quasilinearity Assumption 123
7.7 A Solved Problem 124
Exercises 125

Part II. Theory of the Producer 127

8. Theory of the Firm 1: The Single-Input Model 129
8.1 Introduction 129
8.2 The Competitive Firm's Problem: Focusing on Its Output 130
8.3 The Competitive Firm's Problem: Focusing on Its Input 139
8.4 Multiple Outputs 143
8.5 A Solved Problem 146
Exercises 147

9. Theory of the Firm 2: The Long-Run, Multiple-Input Model 150
9.1 Introduction 150
9.2 The Production Function in the Long Run 151
9.3 Cost Minimization in the Long Run 158
9.4 Profit Maximization in the Long Run 163
9.5 A Solved Problem 167
Exercises 169
Appendix: Two Slightly More Mathematical Techniques 171
10. Theory of the Firm 3: The Short-Run, Multiple-Input Model 174
10.1 Introduction 174
10.2 The Production Function in the Short Run 174
10.3 Cost Minimization in the Short Run 175
10.4 Profit Maximization in the Short Run 180
10.5 A Solved Problem 182
Exercises 184

Part III. Partial Equilibrium: Market Structure 187

11. Perfectly Competitive Markets 189
11.1 Introduction 189
11.2 Perfect Competition 189
11.3 Market/Industry Supply 191
11.4 Equilibrium in a Competitive Market 196
11.5 Competitive Equilibrium and Social Surplus Maximization 197
11.6 The Deadweight Loss of a Per-Unit Tax 202
11.7 A Solved Problem 206
Exercises 209
12. Monopoly and Monopolistic Competition 212
12.1 Introduction 212
12.2 The Classical Solution to Monopoly 213
12.3 Deadweight Loss from Monopoly: Comparing Monopoly and Competition 216
12.4 Price Discrimination 219
12.5 Monopolistic Competition 224
12.6 A Solved Problem 228
Exercises 232
13. Duopoly 235
13.1 Introduction 235
13.2 Cournot Competition 236
13.3 More on Dynamics 241
13.4 Collusion 242
13.5 Stackelberg Competition 246
13.6 Bertrand Competition 248
13.7 A Solved Problem 252

Exercises 254
Appendix: The Competitive Limit 256

14. Game Theory 258
14.1 Introduction 258
14.2 The Prisoners' Dilemma, and the Idea of Dominant Strategy Equilibrium 259
14.3 The Battle of the Sexes, and the Idea of Nash Equilibrium 261
14.4 Multiple or No Nash Equilibria, and Mixed Strategies 263
14.5 The Expanded Battle of the Sexes: When More Choices Make Players Worse Off 265
14.6 Sequential-Move Games 267
14.7 Threats 271
14.8 Experimental Evidence, Behavioral Economics, and Repeated Games 272
14.9 A Solved Problem 274
Exercises 276

Part IV. General Equilibrium 279

15. An Exchange Economy 281
15.1 Introduction 281
15.2 An Economy with Two Consumers and Two Goods 281
15.3 Pareto Efficiency 283
15.4 Competitive or Walrasian Equilibrium 290
15.5 The Two Fundamental Theorems of Welfare Economics 293
15.6 A Solved Problem 297
Exercises 300
Appendix: A Simple Proof of the First Welfare Theorem 302

16. A Production Economy 306
16.1 Introduction 306
16.2 A Robinson Crusoe Production Economy 306
16.3 Pareto Efficiency 307
16.4 Walrasian or Competitive Equilibrium 311
16.5 When There Are Two Goods, Bread and Rum 315
16.6 The Two Welfare Theorems Revisited 319
16.7 A Solved Problem 321
Exercises 323

Part V. Market Failure 327

17. Externalities 329
17.1 Introduction 329
17.2 Examples of Externalities 330
17.3 The Oil Refiner and the Fish Farm 331
17.4 Classical Solutions to the Externality Problem: Pigou and Coase 336

17.5 Modern Solutions for the Externality Problem: Markets for Pollution Rights 339
17.6 Modern Solutions for the Externality Problem: Cap and Trade 341
17.7 A Solved Problem 344
Exercises 346
Appendix: Efficient Pollution Abatement in Cap and Trade 349
18. Public Goods 351
18.1 Introduction 351
18.2 Examples of Public Goods 352
18.3 A Simple Model of an Economy with a Public Good 353
18.4 The Samuelson Optimality Condition 358
18.5 The "Free Rider" Problem and Voluntary Contribution Mechanisms 359
18.6 How To Get Efficiency in Economies with Public Goods 361
18.7 A Solved Problem 367
Exercises 369
19. Uncertainty and Expected Utility 372
19.1 Introduction and Examples 372
19.2 Von Neumann–Morgenstern Expected Utility: Preliminaries 373
19.3 Von Neumann–Morgenstern Expected Utility: Assumptions and Conclusion 375
19.4 Von Neumann–Morgenstern Expected Utility: Examples 377
19.5 A Solved Problem 382
Exercises 383
20. Uncertainty and Asymmetric Information 386
20.1 Introduction 386
20.2 When Sellers Know More Than Buyers: The Market for "Lemons" 387
20.3 When Buyers Know More Than Sellers: A Market for Health Insurance 388
20.4 When Insurance Encourages Risk Taking: Moral Hazard 390
20.5 The Principal–Agent Problem 392
20.6 What Should Be Done about Market Failures Caused by Asymmetric Information? 398
20.7 A Solved Problem 399
Exercises 401

Index 405