Contents

Preface xi

1 **Ideas of the Founding Fathers: Oligopoly Theory and Modern Game Theory** 1

2 **Game Theory Tools** 11
2.1 Games in Normal Form and Nash Equilibrium 12
2.2 Supermodular Games and Lattice Programming 16
2.2.1 Lattices and Tarski's Theorem 17
2.2.2 Monotonicity of Optimal Solutions, Lattice Programming, and Complementarity 23
2.2.3 Supermodular Games 31
2.3 Existence Results for Quasi-increasing and Decreasing Best Replies 39
2.3.1 Quasi-increasing Best Replies in Symmetric Games 39
2.3.2 Decreasing Best Replies in n-Player Games 42
2.4 Mixed Strategies 44
2.5 Uniqueness 47
2.6 Stability 49
2.6.1 Dominance Solvability and Rationalizability 49
2.6.2 Tatônnement Stability 50
2.7 Incomplete Information and Bayesian Nash Equilibrium 58
2.7.1 Lattice Programming under Uncertainty 58
2.7.2 Information Structures and Signals 61
2.7.3 Bayesian Equilibrium 65
Summary 69
Exercises 70

3 Foundations of Partial Equilibrium Analysis 75
3.1 A Canonical Partial Equilibrium Model 75
3.2 Small Expenditure Shares and Small Income Effects 77
Appendix: Consumer Surplus Analysis 85
Summary 90
Exercises 90

4 Quantity Competition: The Cournot Model 93
4.1 The Model and Existence of Equilibrium 93
4.2 Characterization of Smooth Cournot Games 96
4.3 Comparative Statics and Entry 101
4.3.1 Comparative Statics 101
4.3.2 Entry 107
4.4 Large Markets 110
Summary 112
Exercises 113

5 Price Competition: The Models of Bertrand and Edgeworth 117
5.1 Bertrand Competition 117
5.2 Bertrand-Edgeworth Competition 123
5.2.1 Rationing Rules and Contingent Demand 124
5.2.2 Equilibria: The Existence Problem 126
5.2.3 Mixed Strategies 128
5.2.4 Price Competition and the Cournot Model 132
5.2.5 Large Bertrand-Edgeworth Markets 136
5.2.6 Concluding Remark: The Rationale for Mixed Strategies 137
Summary 138
Exercises 138

6 Product Differentiation 143
6.1 Demand Systems 144
6.2 Quantity and Price Competition 148
6.3 Characterization and Comparison of Cournot and Bertrand Equilibria 154
6.4 Large Markets and Monopolistic Competition 160
6.5 Bertand-Edgeworth-Chamberlin Competition 164
6.6 Monopolistic Competition and Entry 167
Appendix: Product Selection and Complementary Products 176

Summary 177
Exercises 178

7 **Conjectures, Reactions, and Commitment** 185
7.1 Conjectural Variations 185
7.2 Supply Functions 187
7.2.1 Capacity Determining Competitive Supply 190
7.2.2 Choice of Strategy Space 192
7.2.3 Discussion 196
7.3 Collusion and Facilitating Practices 197
7.4 Commitment and Pricing 199
7.4.1 The Stackelberg Model 200
7.4.2 Entry Deterrence, Limit Pricing, and Incumbency Advantages 205
7.4.3 A Taxonomy of Strategic Behavior 213
Summary 219
Exercises 220

8 **Competition with Asymmetric Information** 225
8.1 Static Competition with Incomplete Information 225
8.1.1 Existence of Bayesian Equilibrium 229
8.1.2 The Linear-Normal Model 230
8.2 Monopolistic Competition with Private Information 234
8.3 Information Sharing 237
8.3.1 Information Exchange in Oligopoly 237
8.3.2 Monopolistic Competition: Trade Associations and Disclosure Rules 245
8.3.3 Welfare Analysis 248
8.3.4 Strategic Information Transmission 252
8.4 Information Exchange, Collusion, and Mechanism Design 262
8.4.1 Mechanism Design and Collusion 263
8.4.2 Collusion in a Cournot Market 264
8.4.3 Collusion in a Large Market 269
8.4.4 Information Sharing in Large Markets 273
8.5 Commitment under Uncertainty and Information Manipulation 277
8.5.1 Uncertainty, Flexibility, and Commitment 277
8.5.2 Observability, Commitment, and Private Information 279

8.5.3 Limit Pricing and Signaling Distortions 284
8.5.4 Price Setting and Information Manipulation 288
Summary 293
Exercises 294

9 Repeated Interaction and Dynamics 301
9.1 Repeated Interaction and Collusion 301
9.1.1 Finite Horizon 302
9.1.2 Infinite Horizon 305
9.1.3 Uncertainty and Imperfect Monitoring 313
9.1.4 Collusive Pricing and Fluctuations 316
9.1.5 Private Information, Communication, and Collusion 319
9.1.6 Discussion 322
9.2 Dynamic Pricing and Commitment 323
9.2.1 Alternating Move Duopoly Games 325
9.2.2 A Taxonomy of Strategic Behavior with Adjustment Costs 330
9.2.3 Commitment and Pricing in Continuous Time 336
Summary 347
Exercises 348

10 Epilogue 353

Notes 359
References 385
Index 415