Contents

Preface xi
References xvi

I The Nature of Innovation 1

1 The Nature and Importance of Innovation 3
  1.1 Introduction 3
  1.2 What Is Innovation? 4
  1.3 The Microeconomic Effects of Innovation 9
  1.4 Interaction between Producers and Users of Innovation 16
  1.5 Innovations and Market Failure 17
  1.6 Restoring Incentives to Invent and Innovate 23
  1.7 Firms Competing through Innovation 28
  1.8 Conclusion 29
References 30

2 The Nature and Role of Intellectual Property 32
  2.1 Introduction 32
  2.2 Why Are Intellectual Property Rights Awarded? 32
  2.3 Patents 34
  2.4 Trademarks 39
  2.5 Designs and Utility Models 43
  2.6 Copyright 45
  2.7 Further Questions about IPRs 49
  2.8 Conclusions 53
References 55

3 The Measurement of Innovation, Productivity, and Growth 57
  3.1 Introduction 57
  3.2 How Can Innovation Be Measured? 58
  3.3 Illustrations of Innovation Statistics 64
  3.4 Productivity at the Firm, Industry, and Economy Level 70
  3.5 Comparing Productivity and Growth across Countries 74
  3.6 Conclusion 80
References 82
The National Innovation System 85

4 The National Innovation System 87
4.1 Introduction 87
4.2 The National Innovation System 87
4.3 The Central Role of R&D 88
4.4 The Government-University Axis 92
4.5 The University-Business Axis 95
4.6 The Government-Business Axis 103
4.7 National Innovation Systems in Emerging Markets 106
4.8 Conclusions 110
References 112

Innovative Firms and Markets 116

5 Innovative Firms and Markets 116
5.1 Introduction 116
5.2 Entrepreneurship and New Firms 116
5.3 Innovation and Firms 119
5.4 Markets and Innovation 121
5.5 Empirical Evidence on the Returns to Innovation 132
5.6 Evidence on Interactions between Competition and Innovation 140
5.7 Conclusions 142
References 145

Intellectual Property Rights and Firms 149

6 Intellectual Property Rights and Firms 149
6.1 Introduction 149
6.2 How Can Firms Benefit from IPRs? 150
6.3 Exploring the Returns to IPRs 152
6.4 Markets for IPRs 157
6.5 Costs of Obtaining and Enforcing IPRs 160
6.6 IPR Strategies 162
6.7 Empirical Studies on the Value of IPRs 164
6.8 Conclusions 171
References 173

Diffusion and Social Returns 177

7 Diffusion and Social Returns 177
7.1 Introduction 177
7.2 Modeling the Rate of Adoption of an Innovation 179
7.3 Statistical Evidence on Rates of Adoption 186
7.4 Spillovers and Social Returns to Innovation 190
7.5 Empirical Studies of Social Returns 199
7.6 Spatial Dimensions of Spillovers 204
7.7 Conclusions 205
References 207

The Macroeconomics of Innovation 211

III The Macroeconomics of Innovation 211

8 Models of Economic Growth 213
8.1 Introduction 213
8.2 The Neoclassical Growth Model 215
8.3 Endogenous Growth Models 225
## Contents

8.4 Evolutionary and Other Models 237  
8.5 Conclusions 239  
References 241  

9 Innovation and Globalization 243  
9.2 World Trade in Historical Perspective 245  
9.3 Theories of Trade and Growth 246  
9.4 International Knowledge and Technology Flows: Theory and Evidence 250  
9.5 International Financial Flows 256  
9.6 International Aspects of IPRs 260  
9.7 Conclusions 263  
References 266  

10 Technology, Wages, and Jobs 268  
10.1 Introduction 268  
10.2 Microeconomic Models of Innovation and Labor Markets 268  
10.3 Innovation and Labor Markets: Evidence from Firms 275  
10.4 Macroeconomic and Trade Models of Innovation and Labor Markets 280  
10.5 Conclusions 289  
References 291  

IV Economic Policy 295  

11 Microeconomic Policies to Promote Firm-Level Innovation 297  
11.1 Introduction 297  
11.2 Is the Intellectual Property System Working? 297  
11.3 Incentive Systems for Encouraging Firm-Level R&D 313  
11.4 Other Innovation Policies 317  
11.5 Conclusions 323  
References 325  

12 Macroeconomic Issues and Policy 329  
12.1 Introduction 329  
12.2 Macroeconomic Evidence on IPRs and Economic Growth 330  
12.3 Trade-Related Aspects of Intellectual Property (TRIPS) 334  
12.4 Intellectual Property Rights, Exhaustion, and Parallel Imports 340  
12.5 Piracy and Counterfeit 342  
12.6 R&D in the Global Economy 344  
12.7 International Migration of Skilled Labor 346  
12.8 Conclusions 347  
References 349  

Mathematical Appendix 353  
A.1 Production Functions 353  
A.2 Present Discounted Value 354  
A.3 Derivatives 355
| A.4       | Marginal Products and Diminishing Returns | 356 |
| A.5       | Accumulation Equations and Growth Rates   | 357 |
| A.6       | Logarithms and Production Functions       | 358 |
| A.7       | Differential Equations and a Catch-up Model | 358 |
| A.8       | Estimating Production Functions           | 359 |
| References|                                           | 360 |
| Index     |                                           | 361 |