

---

## Contents

Preface	xvii
Why This Book?	xvii
For Whom?	xviii
Outline of the Book	xix
Acknowledgments	xxi
<b>Introduction</b>	<b>1</b>
I.1 Why Study Economic Growth?	1
I.2 Some Facts and Puzzles	1
I.2.1 Growth and Poverty Reduction	1
I.2.2 Convergence	2
I.2.3 Growth and Inequality	4
I.2.4 The Transition from Stagnation to Growth	5
I.2.5 Finance and Growth	5
I.3 Growth Policies	6
I.3.1 Competition and Entry	7
I.3.2 Education and Distance to Frontier	8
I.3.3 Macroeconomic Policy and Growth	10
I.3.4 Trade and Growth	10
I.3.5 Democracy and Growth	11
I.4 Four Growth Paradigms	12
I.4.1 The Neoclassical Growth Model	12
I.4.2 The AK Model	13
I.4.3 The Product-Variety Model	14
I.4.4 The Schumpeterian Model	15
<b>PART I: BASIC PARADIGMS OF GROWTH THEORY</b>	<b>19</b>
<b>1 Neoclassical Growth Theory</b>	<b>21</b>
1.1 Introduction	21
1.2 The Solow-Swan Model	21
1.2.1 Population Growth	24
1.2.2 Exogenous Technological Change	27
1.2.3 Conditional Convergence	29
1.3 Extension: The Cass-Koopmans-Ramsey Model	31
1.3.1 No Technological Progress	31

1.3.2 Exogenous Technological Change	37
1.4 Conclusion	39
1.5 Literature Notes	39
Appendix 1A: Steady State and Convergence in the Cass-Koopmans-Ramsey Model	40
Appendix 1B: Dynamic Optimization Using the Hamiltonian Problems	43
<b>2 The AK Model</b>	47
2.1 Introduction	47
2.1.1 The Harrod-Domar Model	48
2.2 A Neoclassical Version of Harrod-Domar	49
2.2.1 Basic Setup	49
2.2.2 Three Cases	51
2.3 An AK Model with Intertemporal Utility Maximization	52
2.3.1 The Setup	53
2.3.2 Long-Run Growth	54
2.3.3 Welfare	55
2.3.4 Concluding Remarks	55
2.4 The Debate between Neoclassical and AK Advocates, in a Nutshell	56
2.5 An Open-Economy AK Model with Convergence	60
2.5.1 A Two-Sector Closed Economy	61
2.5.2 Opening up the Economy with Fixed Terms of Trade	62
2.5.3 Closing the Model with a Two-Country Analysis	64
2.5.4 Concluding Comment	66
2.6 Conclusion	66
2.7 Literature Notes	67
Problems	67
<b>3 Product Variety</b>	69
3.1 Introduction	69
3.2 Endogenizing Technological Change	69
3.2.1 A Simple Variant of the Product-Variety Model	70
3.2.2 The Romer Model with Labor as R&D Input	74
3.3 From Theory to Evidence	77
3.3.1 Estimating the Effect of Variety on Productivity	77

3.3.2	The Importance of Exit in the Growth Process	79
3.4	Conclusion	80
3.5	Literature Notes	81
	Problems	82
<b>4</b>	<b>The Schumpeterian Model</b>	<b>85</b>
4.1	Introduction	85
4.2	A One-Sector Model	85
4.2.1	The Basics	85
4.2.2	Production and Profits	86
4.2.3	Innovation	87
4.2.4	Research Arbitrage	88
4.2.5	Growth	89
4.2.6	A Variant with Nondrastic Innovations	90
4.2.7	Comparative Statics	91
4.3	A Multisector Model	92
4.3.1	Production and Profit	92
4.3.2	Innovation and Research Arbitrage	94
4.3.3	Growth	95
4.4	Scale Effects	96
4.5	Conclusion	99
4.6	Literature Notes	100
	Problems	101
<b>5</b>	<b>Capital, Innovation, and Growth Accounting</b>	<b>105</b>
5.1	Introduction	105
5.2	Measuring the Growth of Total Factor Productivity	106
5.2.1	Empirical Results	107
5.3	Some Problems with Growth Accounting	109
5.3.1	Problems in Measuring Capital, and the Tyranny of Numbers	109
5.3.2	Accounting versus Causation	112
5.4	Capital Accumulation and Innovation	113
5.4.1	The Basics	114
5.4.2	Innovation and Growth	116
5.4.3	Steady-State Capital and Growth	116
5.4.4	Implications for Growth Accounting	118

5.5	Conclusion	119
5.6	Literature Notes	119
	Appendix: Transitional Dynamics	120
	Problems	121
<b>PART II: UNDERSTANDING THE GROWTH PROCESS</b>		<b>127</b>
<b>6</b>	<b>Finance and Growth</b>	<b>129</b>
6.1	Introduction	129
6.2	Innovation and Growth with Financial Constraints	130
6.2.1	Basic Setup	130
6.2.2	Innovation Technology and Growth without Credit Constraint	132
6.2.3	Credit Constraints: A Model with Ex Ante Screening	132
6.2.4	A Model with Ex Post Monitoring and Moral Hazard	134
6.3	Credit Constraints, Wealth Inequality, and Growth	136
6.3.1	Diminishing Marginal Product of Capital	136
6.3.2	Productivity Differences	139
6.4	The Empirical Findings: Levine's Survey, in a Nutshell	142
6.4.1	Cross-Country	143
6.4.2	Cross-Industry	145
6.5	Conclusion	147
6.6	Literature Notes	147
	Problems	148
<b>7</b>	<b>Technology Transfer and Cross-Country Convergence</b>	<b>151</b>
7.1	Introduction	151
7.2	A Model of Club Convergence	152
7.2.1	Basics	152
7.2.2	Innovation	153
7.2.3	Productivity and Distance to Frontier	154
7.2.4	Convergence and Divergence	156
7.3	Credit Constraints as a Source of Divergence	158
7.3.1	Theory	159
7.3.2	Evidence	161
7.4	Conclusion	163
7.5	Literature Notes	165
	Problems	166

<b>8 Market Size and Directed Technical Change</b>	169
8.1 Introduction	169
8.2 Market Size in Drugs	169
8.2.1 Theory	169
8.2.2 Evidence	171
8.3 Wage Inequality	173
8.3.1 The Debate	174
8.3.2 The Market-Size Explanation	176
8.4 Appropriate Technology and Productivity Differences	182
8.4.1 Basic Setup	182
8.4.2 Equilibrium Output and Profits	183
8.4.3 Skill-Biased Technical Change	184
8.4.4 Explaining Cross-Country Productivity Differences	185
8.5 Conclusion	186
8.6 Literature Notes	187
Problems	188
<b>9 General-Purpose Technologies</b>	193
9.1 Introduction	193
9.2 Explaining Productivity Slowdowns	196
9.2.1 General-Purpose Technologies in the Neoclassical Model	196
9.2.2 Schumpeterian Waves	198
9.3 GPT and Wage Inequality	204
9.3.1 Explaining the Increase in the Skill Premium	204
9.3.2 Explaining the Increase in Within-Group Inequality	206
9.4 Conclusion	210
9.5 Literature Notes	211
Problems	212
<b>10 Stages of Growth</b>	217
10.1 Introduction	217
10.2 From Stagnation to Growth	217
10.2.1 Malthusian Stagnation	217
10.2.2 The Transition to Growth	222
10.2.3 Commentary	224
10.3 From Capital Accumulation to Innovation	226
10.3.1 Human-Capital Accumulation	226

10.3.2	Physical-Capital Accumulation	227
10.4	From Manufacturing to Services	230
10.5	Conclusion	232
10.6	Literature Notes	232
	Problems	233
<b>11</b>	<b>Institutions and Nonconvergence Traps</b>	<b>237</b>
11.1	Introduction	237
11.2	Do Institutions Matter?	238
11.2.1	Legal Origins	239
11.2.2	Colonial Origins	240
11.3	Appropriate Institutions and Nonconvergence Traps	243
11.3.1	Some Motivating Facts	243
11.3.2	A Simple Model of Distance to Frontier and Appropriate Institutions	246
11.4	Conclusion	258
11.5	Literature Notes	261
	Problems	263
	<b>PART III: GROWTH POLICY</b>	<b>265</b>
<b>12</b>	<b>Fostering Competition and Entry</b>	<b>267</b>
12.1	Introduction	267
12.2	From Leapfrogging to Step-by-Step Technological Progress	267
12.2.1	Basic Environment	268
12.2.2	Technology and Innovation	269
12.2.3	Equilibrium Profits and Competition in Level and Unlevel Sectors	269
12.2.4	The Schumpeterian and “Escape-Competition” Effects	271
12.2.5	Composition Effect and the Inverted U	272
12.2.6	Empirical Evidence	274
12.3	Entry	274
12.3.1	The Environment	276
12.3.2	Technology and Entry	276
12.3.3	Equilibrium Innovation Investments	277
12.3.4	The Effect of Labor Market Regulations	278
12.3.5	Main Theoretical Predictions	279

12.3.6	Evidence on the Growth Effects of Entry	279
12.3.7	Evidence on the Effects of (De)Regulating Entry	280
12.4	Conclusion	281
12.5	Literature Notes	282
	Problems	283
<b>13</b>	<b>Investing in Education</b>	<b>287</b>
13.1	Introduction	287
13.2	The Capital Accumulation Approach	288
13.2.1	Back to Mankiw, Romer, and Weil	288
13.2.2	Lucas	292
13.2.3	Threshold Effects and Low-Development Traps	295
13.3	Nelson and Phelps and the Schumpeterian Approach	297
13.3.1	The Nelson and Phelps Approach	297
13.3.2	Low-Development Traps Caused by the Complementarity between R&D and Education Investments	300
13.4	Schumpeter Meets Gerschenkron	302
13.4.1	A Model of Distance to Frontier and the Composition of Education Spending	302
13.4.2	Cross-Country and Cross-U.S.-State Evidence	307
13.5	Conclusion	311
13.6	Literature Notes	312
	Problems	314
<b>14</b>	<b>Reducing Volatility and Risk</b>	<b>319</b>
14.1	Introduction	319
14.2	The AK Approach	321
14.2.1	The Jones, Manuelli, and Stacchetti Model	321
14.2.2	Counterfactuals	324
14.3	Short-versus Long-Term Investments	326
14.3.1	The Argument	326
14.3.2	Motivating Evidence	327
14.3.3	The AABM Model	329
14.3.4	Confronting the Credit Constraints Story with Evidence	339
14.3.5	An Alternative Explanation for the Procyclicality of R&D	340
14.4	Risk Diversification, Financial Development, and Growth	341
14.4.1	Basic Framework	341

14.4.2	Analysis	343
14.4.3	Equilibrium Dynamics	345
14.5	Conclusion	347
14.6	Literature Notes	348
	Problems	349
<b>15</b>	<b>Liberalizing Trade</b>	<b>353</b>
15.1	Introduction	353
15.2	Preliminary: Back to the Multisector Closed-Economy Model	355
15.2.1	Production and National Income	355
15.2.2	Innovation	357
15.3	Opening Up to Trade, Abstracting from Innovation	358
15.3.1	The Experiment	358
15.3.2	The Effects of Openness on National Income	360
15.4	The Effects of Openness on Innovation and Long-Run Growth	363
15.4.1	Step-by-Step Innovation	363
15.4.2	Three Cases	364
15.4.3	Equilibrium Innovation and Growth	365
15.4.4	Scale and Escape Entry	365
15.4.5	The Discouragement Effect of Foreign Entry	366
15.4.6	Steady-State Aggregate Growth	367
15.4.7	How Trade Can Enhance Growth in All Countries	368
15.4.8	How Trade Can Reduce Growth in One Country	369
15.5	Conclusion	371
15.6	Literature Notes	372
	Problems	374
<b>16</b>	<b>Preserving the Environment</b>	<b>377</b>
16.1	Introduction	377
16.2	The One-Sector AK Model with an Exhaustible Resource	377
16.3	Schumpeterian Growth with an Exhaustible Resource	379
16.4	Environment and Directed Technical Change	381
16.4.1	Basic Setup	381
16.4.2	Equilibrium Outputs and Profits	382
16.4.3	Taxing Dirty Production	384
16.4.4	Equilibrium Innovation	385
16.4.5	Growth and the Cost of Taxing Dirty Output	387



16.4.6 Evidence of Directed Technical Change Effects in the Energy Sector	389
16.4.7 Concluding Remarks	390
16.5 Literature Notes	391
Appendix: Optimal Schumpeterian Growth with an Exhaustible Resource	392
Problems	395
<b>17 Promoting Democracy</b>	399
17.1 Introduction	399
17.2 Democracy, Income, and Growth in Existing Regressions	399
17.2.1 Irrelevance Results When Controlling for Country Fixed Effects	400
17.2.2 No Apparent Correlation between Democracy and Public Policy	400
17.3 Democracy, Entry, and Growth: A Simple Model	401
17.3.1 Production and Profits	402
17.3.2 Entry and Incumbent Innovation	402
17.3.3 Politics and the Equilibrium Probability of Entry	405
17.3.4 Main Prediction	407
17.4 Evidence on the Relationship between Democracy, Growth, and Technological Development	407
17.4.1 Data and Regression Equation	407
17.4.2 Basic Results	408
17.5 Democracy, Inequality, and Growth	410
17.5.1 The Model	410
17.5.2 Solving the Model	411
17.5.3 Discussion	413
17.6 Conclusion	414
17.7 Literature Notes	414
Problems	415
<b>CONCLUSION</b>	417
<b>18 Looking Ahead: Culture and Development</b>	419
18.1 What We Have Learned, in a Nutshell	419
18.2 Culture and Growth	420

18.2.1	Regulation and Trust	422
18.2.2	Investing in Children's Patience	425
18.3	Growth and Development	429
18.3.1	Growth through the Lens of Development Economics	429
18.3.2	The Case for Targeted Growth Policy	434
18.4	Conclusion	439
	Appendix: Solving the Doepke-Zilibotti Model	441
	<b>Appendix: Basic Elements of Econometrics</b>	443
A.1	The Simple Regression Model	443
A.2	The Ordinary Least Squares Estimator	444
A.3	Multiple Regression Analysis	446
A.4	Inference and Hypothesis Testing	447
A.5	How to Deal with the Endogeneity Problem	449
A.6	Fixed-Effects Regressions	452
A.7	Reading a Regression Table	453
	References	457
	Index	477