

**LONG-WAVE RHYTHMS
IN ECONOMIC DEVELOPMENT
AND POLITICAL BEHAVIOR**

Brian J. L. Berry

THE JOHNS HOPKINS UNIVERSITY PRESS
Baltimore and London

CONTENTS

List of Figures and Tables vii

Acknowledgments xii

Introduction 1

1. The Kondratiev Question: Have There Been Long Waves of Prices? 12
2. Long-Wave Explanations: Kondratiev and His Successors 35
 - What Kondratiev Said 35
 - Long-Wave Theories after Kondratiev 40
 - Rostow on Commodity-Price Movements* 41 / *Volland on Materials-substituting Technology* 42 / *Borchert on Technology Transitions and Epochs of Growth* 43 / *The Infrastructure Life Cycle* 46 / *“Transmaterialization”* 49 / *Capital-Lifespan Theories* 51 / *Schumpeter on Innovation Waves* 53 / *Mensch’s Metamorphosis Model* 56
 - Marxist Long-Wave Theory 59
 - The Profit Cycle* 60 / *Political Business Cycles* 62
3. The Kuznets Question: Have There Been Long Cycles of Growth? 65
 - 4. Explanations of Growth Cycles: Kuznets and Kin 79
 - The Kuznets Growth Cycle 80
 - What the Literature Says about Causal Agents 81
 - The Rhythms of Transport Development* 83 / *The Dynamics of Overshoot in Myopic Capital Markets* 84 / *City-building Booms* 86 / *The Importance of Money-Supply Variables* 86 / *Demographic Factors Shaping Kuznets Cycles: Is the Cycle Dead?* 90
 - 5. The Synchronized Movements of Growth and Prices 99
 - 6. Phases of Development and the Long-Wave Clock 121
 - The Long-Wave Clock 122
 - Long-Wave Rhythms: Multiple Endogenous Causality 127
7. The Question of Elliott Waves: Another Long-Wave Rhythm? 133

8. What about Cycles in American Politics and the Timing of Critical Elections?	144
The Concept of Critical Elections	148
9. Cycles of War and World Leadership	156
Kondratiev Waves as War Cycles	156
Global Wars and Cycles of World Leadership	157
<i>The World-Leadership School 158 / The World-Systems School</i>	161
Back to Rhythms within Rhythms: The Cycle of War	162
Kondratiev Waves and World Power: The “Deeper Structure”	165
10. The Stars or the Genes? Images of Predestination	167
The Stars: Climatic Cycles as Cause	168
The Genes: Long Waves as Mass Psychological Phenomena	172
<i>“Upwave” Characteristics 172 / Manias: Speculative Bubbles That Burst 173 /</i>	
<i>“Downwave” Behavior 173 / From Recession to Depression 174</i>	
11. What Time Is It Now?	176
The 1980s Transition	177
<i>Foundations for the Transition 179 / Growth of the Venture-Capital Industry</i>	181
12. What Lies Ahead? Is There Freedom to Choose?	186
Technological Imperatives	187
But Are We Free to Choose?	192
<i>The Doomslayers 192 / Safety-net Amelioration</i>	194
Long-Wave Clocks in a Digital Age	197
<i>Appendix A. Price Dynamics: The Growth Rates of Prices Smoothed by Successively Longer Moving Averages</i>	
	199
<i>Appendix B. Growth Dynamics: The Growth Rates of Real Per Capita GNP Smoothed by Successively Longer Moving Averages</i>	
	211
<i>Bibliography</i>	
	223
<i>Index</i>	
	237

FIGURES AND TABLES

Figures

1. Accelerations and Decelerations in the Average Annual Growth Rates of Real GNP in the United States, 1790–1980 2
2. Fluctuations in the Average Annual Rates of Growth of Urban Areas due to Migration, Compared with Accelerations and Decelerations in the Growth of Real Per Capita GNP, 1790–1980 3
3. Variations in the U.S. Wholesale Price Index, 1760–1982 5
4. Covariations of Money Growth, Inflation, and the Wholesale Price Index in the United States, 1760–1982 6
5. The Inverse Rhythms of Growth Rates and Price Levels, 1760–1982 7
6. Guide to Reading the Graphs 9
7. Oscillations of the Annual Growth Rate of U.S. Wholesale Prices, 1790–1988 13
8. Four-Year Moving Averages (Computed Annually) Superimposed on the Annual Growth Rates of U.S. Wholesale Prices, 1790–1988 17
9. Four-Year Averages (Computed Every Fifth Year) Superimposed on the Four-Year Moving-Average Growth Rates of U.S. Wholesale Prices 18
10. Ten-Year Moving Averages of the Growth Rates of U.S. Wholesale Prices Computed Annually and Once Every Fifth Year 19
11. Ten-Year Moving Averages of the Growth Rates of U.S. Wholesale Prices (Computed Every Fifth Year) Superimposed on the Four-Year Averages (Computed Every Fifth Year) 20
12. Ten-Year Moving Averages of the Growth Rates of U.S. Wholesale Prices (Computed Every Fifth Year) Superimposed on the Original Annual Growth Rates 21
13. Chaos Phase Diagram: Average Annual Growth Rates of U.S. Wholesale Prices in Year t Plotted as a Function of the Growth Rates in Year $t - 1$ for the Years 1790–1987, with Successive Pairs of Years Joined by Straight-Line Segments 22

14. Convergence on the “Strange Attractor”: Four-Year Moving Averages of the Growth Rates of Prices in Year t Plotted as a Function of the Growth Rates in Year $t-1$ 23
15. The Long-Wave Acceleration-Deceleration Path: Ten-Year Moving Averages of the Growth Rates of Prices in the Chaos Phase Space 25
16. Time Path of the Four-Year Moving Averages between the 1865 and 1920 Inflation Peaks, Plotted in Phase Space 26
17. Interpretation of Figure 16: Chaotic Deceleration and Acceleration of Price Changes between Two Inflation Peaks 27
18. Chaotic Behavior of Price Changes between the 1815 and 1865 Inflation Peaks 28
19. Chaos between 1920 and 1988 29
20. The Long-Wave Trend, Summarized from Figure 11 30
21. The Long Waves Superimposed 31
22. Growth and Decline of Water Power and the Inland Waterways 44
23. Growth and Decline of Railroads and the Coal Industry 44
24. Growth of Surfaced Roads, Automobile Use, and the Oil Industry 45
25. U.S. Energy Use, by Source 45
26. Technology Transitions: Transportation Infrastructure and Dominant Energy Sources 46
27. A Five-Phase Product Life Cycle 47
28. Consumption of Copper, Iron Ore, Tin, and Lead per Unit of GDP 49
29. Consumption of Asbestos, Chromium, and Manganese per Unit of GDP 50
30. Consumption of Aluminum, Platinum, Rare Earths and Yttrium, and Titanium per Unit of GDP 50
31. Forrester’s Long Cycle in the Capital-Goods Sector 52
32. Mensch’s Metamorphosis Model Showing “Innovatory Clusters” That Accompany the Structural Metamorphosis in Which a Saturated Growth Wave Is Succeeded by the Growth of the Next Technologies 59
33. Marshall’s Neo-Marxian Schematic of the Major Features of Long Waves 63
34. Oscillations of the Annual Growth Rate of Real Per Capita GNP in the United States, 1790–1988 67
35. Four-Year Moving Averages (Computed Annually) Superimposed on the Annual Growth Rates of U.S. Real Per Capita GNP, 1790–1988 68

36. Four-Year Averages (Computed Every Fifth Year) Superimposed on the Four-Year Moving Averages of the Growth Rates of U.S. Real Per Capita GNP 69
37. Ten-Year Moving Averages of the Growth Rates of U.S. Real Per Capita GNP Computed Annually and Once Every Five Years 70
38. Ten-Year Moving Averages of the Growth Rates of U.S. Real Per Capita GNP (Computed Every Fifth Year) Superimposed on the Four-Year Averages (Computed Every Fifth Year) 71
39. Ten-Year Moving Averages of the Growth Rates of U.S. Real Per Capita GNP (Computed Every Fifth Year) Superimposed on the Original Annual Growth Rates 72
40. Convergence of Growth Rates on a "Strange Attractor": Four-Year Moving Averages of the Growth Rates of Real Per Capita GNP in Year t Plotted as a Function of the Growth Rates in Year $t-1$ 73
41. Interpretation of the Period 1920–1954: Chaotic Cycling of the Four-Year Moving Averages along an Acceleration-Deceleration Path 74
42. The Longer Growth Cycles, Summarized from Figures 36–38 75
43. Pairs of Kuznets Growth Cycles Centered on Kondratiev Inflation Peaks 76
44. British and American Growth and Prices Compared, 1910–1985 78
45. Kuznets Cycles of Immigration and Urban Development, 1845–1940 83
46. Relationship between the Growth Rate of Money Supply and the Growth Rate of Net National Product 87
47. Cycles of Immigration and Foreign Investment in the United States, 1855–1910 90
48. Accelerations and Decelerations of Average Annual Growth Rates of Per Capita GNP in the United Kingdom and the United States, 1840–1914 93
49. Accelerations and Decelerations in the Average Annual Rate of Change of the U.S. Birth Rate 94
50. Relationships between the Kuznets Growth Cycle and Changes in the U.S. Birth Rate 96
51. Relationship of Growth Cycles to Price Waves, Centered on Stagflation Crises 100
52. Relationship of Growth Cycles to Price Waves, Centered on Deflationary Depressions 101
53. Kuznets Type B/Deflationary Growth Cycles Superimposed at Their Growth-Rate Peaks 103

54. The Chaotic Behavior of the 1815–1844 Kuznets Cycle 104
55. Kuznets Type A/Inflationary Growth Cycles Superimposed at Their Growth-Rate Peaks 105
56. The Chaotic Behavior of the 1844–1865 Kuznets Cycle 106
57. Another View of the Synchronization of Growth and Price Movements: The “Cobweb” from 1800 to 1857 107
 58. The Cobweb Pattern Continued: 1857–1907 109
 59. A More Complex Cobweb, 1907–1964, Embodying the New Deal Transition 110
 60. Back on Track: Cobweb Behavior since 1964 111
 61. The Growth/Price Cobweb Summarized 112
 62. Episodes of Stagnation Leading to Stagflation Crises 113
 63. Stagflation Crises 114
 64. Deflationary Growth Epochs 115
 65. Disinflationary/Deflationary Growth Episodes in the Growth/Price Sequence 116
 66. Periods of Decline Culminating in Depression 117
 67. Episodes of Deflationary Depression 118
 68. Phases of Reflationary Recovery from Depressions 119
 69. Reflationary Recoveries 120
 70. The Long-Wave Clock 126
 71. Oscillations of the Annual Growth Rate of Deflated Stock Market Averages, 1790–1988 135
 72. Phase Diagram: Annual Average Growth Rate of Deflated Stock Prices, 1790–1988 136
 73. Phase Diagram: Ten-Year Moving Averages of the Growth Rates of Deflated Stock Prices, 1790–1988 137
 74. Phase Diagram: Ten-Year Moving Averages of the Growth Rates of Deflated Stock Prices, 1865–1919 138
 75. Ten-Year Moving Averages of the Annual Growth Rates of Deflated Stock Prices Compared with Similar Averages of the Annual Growth Rates of U.S. Wholesale Prices, 1790–1988 139
 76. Depression-to-Depression Segments of the Ten-Year Moving Averages of Stock-Price Growth Rates Superimposed at Stagflation Crises 140
 77. Kondratiev Waves, Kuznets Cycles, and DJ Cycles Superimposed at Stagflation Crises: A Schematic Summary 141
 78. Kondratiev Waves, Kuznets Cycles, and DJ Cycles Superimposed at Depressions: A Schematic Summary 142

- 79. The Long-Wave Clock Showing Stock Market Signals 143
 - 80. The Timing of Critical Elections 152
 - 81. Modelski's Long Cycles of Global Power 160
- 82. World-Leadership Cycles and the Kondratiev/Kuznets Rhythms 160
- 83. Goldstein's Idealized Long Wave of Sequences of Investment, Growth, Inflation, and Wars, in "Cycle Time" 163
- 84. Dewey and Dakin's Correlation of the 11.14-year Sunspot Cycle and the 11-year Juglar Business Cycles, 1875–1930 169
 - 85. Raymond H. Wheeler's "Drought Clock" 169
- 86. Recurrent Drought Episodes Repeat during the Same Phase on the Long-Wave Clock 171
- 87. Real Profits and Investment in Plant and Machinery, 1974–1984 177
- 88. Political and Economic Events of the Last Decade Appear to Be "in Phase" on the Long-Wave Clock 178
- 89. U.S. Trade Balance in R&D-intensive and Non-R&D-intensive Products, 1968–1980 180
 - 90. The Militarization of Federal Research and Development 182
 - 91. AT&T's Long-distance Network 190
- 92. The Timing of the Next Inflationary Growth Cycle Is Suggested by the Correlation between Cycles of Labor-Market Entrants and Kuznets Cycles 192
- 93. Transition of the Ten-Year Moving Averages of the Growth Rates of Prices and Real Per Capita GNP after the New Deal and World War II 195

Tables

- 1. The Combined Kondratiev-Kuznets Chronology 105
- 2. Crises in American Economic History: A Typology 122
- 3. Phases of American Development: The Trend Periods 123
- 4. Modelski's Phases of "Global-Reach Capabilities" 159
 - 5. Wallerstein's Cycles of Global Hegemony 162