Economists since the First Industrial Revolution have been interested in the links between economic growth and resources, often pointing to resource scarcities as a hindrance to growth. Offering a counter perspective, this volume highlights the positive role that scarcities can play in inducing technical progress and economic growth. It outlines a structural framework for the political economy of scarcity and rents, and offers a novel way of organizing the evidence concerning the role of resources in industrial growth. This book proposes a major shift in the treatment of scarcity issues by focusing on bottlenecks and opportunities arising within the production system, and will appeal to economists and policy makers interested in the role of resources as triggers of structural change.

Mauro L. Baranzini is Professor of Economics at the University of Lugano, Switzerland. He is also a Fellow of the National Lincei Academy, Rome, which in 2009 awarded him, jointly with Andreu Mas-Colell, a prize for his contribution to economic theory. He has contributed widely to the theory of income and wealth distribution, and to the theory of accumulation under different saving assumptions.

Claudia Rotondi is Professor of Development Economics at the Catholic University of Milan. Her research interests focus mainly on the economics of institutions, taking into account the history of economic thought, and analyzing the role of liberalism in economic policy, social market economy, and the origin and diffusion of economic ideas.

Roberto Scazzieri is Professor of Economic Analysis at the University of Bologna. He is a Fellow of the National Lincei Academy, Rome, which in 2004 awarded him the Linceo Prize for research in structural economic analysis. He is also a Senior Member of Gonville and Caius College and Life Member of Clare Hall, Cambridge. He has contributed widely to the theory of production and economic dynamics, as well as to the political economy of institutions and the history and epistemology of economic analysis.
To Alberto Quadrio Curzio in recognition of his contribution to economic scholarship
Contents

List of figures page x
List of tables xi
List of contributors xii
Preface xv
Acknowledgements xvii

1 Resources, producibility and economic dynamics: a framework 1
MAURO L. BARANZINI, CLAUDIA ROTONDI AND ROBERTO SCAZZIERI

Part I Resources and distribution in a structural perspective 33

2 On the origin of the theory of rent in economics 35
LUIGI L. PASINETTI

3 The political economy of corn markets 53
D’MARIS DALTON COFFMAN

4 The classical theory of rent 72
HEINZ D. KURZ AND NERI SALVADORI

5 Profit, productive rent and parasitic rent 95
PIER CARLO NICOLA

Part II Structural dynamics: resources and multi-sectoral linkages 105

6 Limits, resources and distributional trade-offs: structural constraints and opportunities 107
ALBERT E. STEENGE

7 Producible resources and producibility prices in a dynamic Leontief-type model 126
CARLO D’ADDA
8 The transformative potential of input–output economics for addressing critical resource challenges of the twenty-first century

FAYE DUCHIN

9 Capital mobility and natural resources dynamics: a classical-Keynesian perspective

HEINRICH BORTIS

10 The chimera of a complete analysis of economic dynamics

KUMARASWAMY VELA VELUPILLAI

11 Ricardian and Schumpeterian rents: fundamental ingredients for structural economic dynamics

MICHAEL A. LANDESMANN

12 Towards a structural political economy of resources

IVANO CARDINALE

Part III Resources, institutions and social structures

13 Monetary analysis, financial innovation and institutions before the Industrial Revolution: a paradigm case

LILIA COSTABILE

14 Institutions, resources and economic growth in transition processes: the case of Russia

CONSTANZE DOBLER AND HARALD HAGEMANN

15 Institutions, resources and the common weal

ALESSANDRO RONCAGLIA

16 Development, capabilities and institutions

STEFANO ZAMAGNI

17 Conquering scarcity: institutions, learning and creativity in the history of economic ideas

PIER LUIGI PORTA

Part IV Resources, industrial change and the structure of the world economy

18 Resources, industrial transformation and the structure of the world economy

MOSHE SYRQUIN
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Author(s)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Transformation and resources in the ‘new’ geo-economy</td>
<td>Marco Fortis</td>
<td>346</td>
</tr>
<tr>
<td>20</td>
<td>Developmental state and structural economic dynamics: necessity of</td>
<td>Sunanda Sen</td>
<td>363</td>
</tr>
<tr>
<td></td>
<td>industrial structure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Resources, institutional forms and structural transformation in</td>
<td>Andrea Goldstein and Keun Lee</td>
<td>384</td>
</tr>
<tr>
<td></td>
<td>the BRICKs: the ‘hybrid model of late capitalism’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>On manufacturing development under resources constraints</td>
<td>Antonio Andreoni</td>
<td>407</td>
</tr>
</tbody>
</table>

**Part V Towards a political economy of resources and structural change**

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Author(s)</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>Resources, scarcities and rents: technological interdependence and</td>
<td>Roberto Scazzieri, Mauro L. Baranzini and</td>
<td>427</td>
</tr>
<tr>
<td></td>
<td>the dynamics of socio-economic structures</td>
<td>Claudia Rotondi</td>
<td></td>
</tr>
</tbody>
</table>

*Name Index* 485  
*Subject Index* 495
Figures

4.1 The production function for extensive rent  
4.2 The relationships between rent rates and the wage rate  
4.3a The q-w relationships (example 1)  
4.3b The q-w relationships (example 2)  
4.4 The production function for extensive and intensive rent  
6.1 Graph of $|I - C(\alpha, \beta)| = 0$  
6.2 Graph of the economically relevant part of $|I - C(\alpha, \beta)| = 0$  
6.3 Graph of $|I - (A + a(\beta/L)v^\prime(\beta))| = 0$  
6.4 Graph of $|I - (D_1A + (1/L)D_2fv^\prime)| = 0$  
6.5 Graph of $|I - (\alpha A + \gamma T + \beta B)| = 0$  
14.1 Russian GDP per capita in constant 2005 US dollars  
14.2 Russian GDP per capita growth annual per cent  
14.3 Increasing income inequality in Russia  
14.4 Russian market capitalization of listed companies, per cent of GDP  
14.5 Russian stocks traded; total value of GDP, per cent of GDP  
14.6 Russian stocks traded turnover ratio, per cent  
14.7 Russian inflation, consumer prices, annual per cent  
14.8 Privatization waves of the state-owned enterprises  
18.1 The world’s top 7 largest military budgets in 2010  
### Tables

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Technical features of production processes (extensive rent)</td>
<td>78</td>
</tr>
<tr>
<td>4.2 Technical features of production processes (intensive rent)</td>
<td>86</td>
</tr>
<tr>
<td>12.1 Conditions for the transition between resource bases</td>
<td>207</td>
</tr>
<tr>
<td>18.1 Share of global production by major regions, 1820–2006</td>
<td>326</td>
</tr>
<tr>
<td>18.2 Product per capita 1820–2006 by major regions</td>
<td>326</td>
</tr>
<tr>
<td>18.3 Trade flows’ intensities</td>
<td>329</td>
</tr>
<tr>
<td>18.4 South–south trade in world trade, 1955–2009</td>
<td>329</td>
</tr>
<tr>
<td>18.5 Annual growth rates of GDP and of per capita GDP at constant PPPs</td>
<td>330</td>
</tr>
<tr>
<td>18.6 Contributions to global GDP growth, 1970–2015 (per cent)</td>
<td>331</td>
</tr>
<tr>
<td>18.7 World carbon dioxide emissions by region</td>
<td>332</td>
</tr>
<tr>
<td>18.8 Population in 2010 and UN projections to 2050</td>
<td>336</td>
</tr>
<tr>
<td>19.1 Manufacturing production in the most important G-20 countries</td>
<td>350</td>
</tr>
<tr>
<td>19.4 Index of consumption of 11 industrial materials: average of the places held by each G-20 country in the 11 raw materials rankings, 1980–2010</td>
<td>358</td>
</tr>
<tr>
<td>21.1 BRICK companies in Fortune Global 500</td>
<td>390</td>
</tr>
<tr>
<td>21.2 Top 100 companies’ sales in the BRICKs, by ownership</td>
<td>391</td>
</tr>
<tr>
<td>21.3 Varieties of state capitalism in China</td>
<td>392</td>
</tr>
<tr>
<td>22.1 The resources-manufacturing matrix</td>
<td>412</td>
</tr>
<tr>
<td>23.1 Long-run capital share of the three classes</td>
<td>441</td>
</tr>
</tbody>
</table>
Contributors

ANTONIO ANDREONI, Lecturer in Economics, Department of Economics at SOAS, University of London, and Research Fellow at the Centre for Science, Technology and Innovation Policy (CSTI), Institute for Manufacturing, University of Cambridge.

MAURO L. BARANZINI, Professor of Economics, University of Lugano, Switzerland; Fellow of the National Lincei Academy, Rome.

HEINRICH BORTIS, Professor of Economics, University of Fribourg, Switzerland.

IVANO CARDINALE, Research Fellow and Lecturer in Economics, Emmanuel College, Cambridge.

D’MARIS DALTON COFFMAN, Senior Lecturer in Economics, The Bartlett School, University College London, and Fellow of the Cambridge Endowment for Research in Finance.

LILIA COSTABILE, Professor of Economics, University of Naples ‘Federico II’; Life Member of Clare Hall, Cambridge.

CARLO D’ADDA, Fellow of the National Lincei Academy, Rome; former Professor of Economics, University of Bologna.

CONSTANZELLE DOBLER, Executive Board Assistant, Hugo Brennenstuhl GmbH & Co. KG; former Research Assistant, Chair of Economic Theory, University of Hohenheim, Stuttgart.

FAYE DUCHIN, Professor of Economics, Rensselaer Polytechnic Institute, Troy, New York; former Director of the Institute for Economic Analysis, New York University.

MARCO FORTIS, Professor of Industrial Economics and Foreign Trade, Catholic University of Milan; Director of the Edison Foundation, Milan.

ANDREA GOLDSTEIN, Senior Economic Affairs Officer, ESCAP, Seoul.
List of Contributors

HARALD HAGEMANN, Professor Emeritus University Hohenheim, Stuttgart; Life Member of Clare Hall, Cambridge.

HEINZ D. KURZ, Professor of Economics, University of Graz.

MICHAEL A. LANDESMANN, Professor of Economics, University of Linz and Research Director, Vienna Institute for International Economic Studies; former Lecturer, Fellow of Jesus College, and Senior Research Officer, University of Cambridge.

KEUN LEE, Professor of Economics, Seoul National University.

PIER CARLO NICOLA, Fellow of the National Lincei Academy, Rome; former Professor of Mathematical Economics, State University of Milan.

LUIGI L. PASINETTI, Fellow of the National Lincei Academy, Rome; former Professor of Economics, Catholic University of Milan and Reader in Economics, University of Cambridge and Fellow of King’s College; Honorary Fellow of Gonville and Caius College, Cambridge.

PIER LUIGI PORTA, Professor of Economics, University of Milano Bicocca; Visiting Fellow, Wolfson College, Cambridge.

ALESSANDRO RONCAGLIA, Professor of Economics, University ‘La Sapienza’, Rome; Fellow of the National Lincei Academy, Rome.

CLAUDIA ROTONDI, Professor of Development Economics, Catholic University of Milan.

NERI SALVADORI, Professor of Economics, University of Pisa.

ROBERTO SCAZZIERI, Professor of Economic Analysis, University of Bologna and Fellow of the National Lincei Academy, Rome; Senior Member of Gonville and Caius College and Life Member of Clare Hall, Cambridge.

SUNANDA SEN, National Fellow of the Indian Council of Social Science Research and Visiting Professor, Institute for Studies in Industrial Development, Delhi; former Professor of Economics, Jawaharlal Nehru University, Delhi; Life Member of Clare Hall, Cambridge.

ALBERT E. STEENGE, Professor of Economics, University of Groningen, The Netherlands.

MOSHE SYROQUIN, Professor of Economics, University of Miami; Research Fellow, International Centre for Economic Research (ICER), Turin.

KUMARASWAMY VELA VEILUILLAI, Professor of Economics, New School of Social Research, New York; former Fellow in Economics, Girton
List of Contributors

College, Cambridge; Professor of Economics, University of Lund and Professor of Economics, University of Trento.

STEFANO ZAMAGNI, Professor of Economics, The Johns Hopkins University (Bologna Centre); former Professor of Economics, University of Bologna.
Preface

Non-produced natural resources and primary commodities (such as land and mines, agricultural products, minerals and energy sources) are structurally scarce within any given production system with given technology, and play a fundamental role in the structural dynamics of economic systems. At least since the first Industrial Revolution, a central feature in the evolution of modern economies has been the critical relevance of the linkage between technical progress and patterns of natural resources utilization, and the influence of that linkage upon the timing and character of growth processes. Technical progress has often reduced the structural scarcity of natural resources and primary commodities, in the sense of reducing their 'non-producibility' through switches from one natural resource base to another, thus bypassing bottlenecks and enhancing production opportunities. A classic example is the substitution of coal for wood as a resource for iron production in mid-eighteenth-century England. Instances like this call attention to the relationship between scarcity and producibility in the long-term dynamics of economic systems. As Alberto Quadrio Curzio has pointed out, the 'antagonism-coexistence' between the scarcity of natural resources and primary commodities on the one hand and the producibility of commodities and means of production on the other hand has perhaps been the most important feature of economic dynamics in the last few centuries. This antagonism-coexistence is often overlooked by analyses that exclusively focus on technical progress and sustained growth in the industrial economies.

This point of view stresses the central role of production interdependencies between different components of the economic system, their impact on the pattern of resource utilization, and their dependence on the resources that come to be dominant at any given time. This web of interconnections has far-reaching implications beyond the internal structure of the production system. For resource bottlenecks may have effects on income distribution as well as shift capital accumulation from one path to another. As productive interdependencies may be associated with a given social structure, changes in interdependence triggered by switches to different resource bases may in turn entail
significant variations in the relative position of social groups. This approach also suggests a major shift in the treatment of sustainability issues, since emphasis is placed on bottlenecks and opportunities arising from within the production system, and not primarily on the identification of trajectories of optimal paths of allocation of given resources among alternative uses.

This research programme, started in the mid-1960s by Alberto Quadrio Curzio, has provided a seminal analytical framework for the structural investigation of resource-based economic dynamics. His contribution has revived the analysis of production, resources and rents along the classical (mainly Ricardian) line of inquiry. The aim of this volume is to build on this research programme and to provide the foundations of a political economy of resource-based dynamics.

MAURO L. BARANZINI
CLAUDIA ROTONDI
ROBERTO SCAZZIERI
Acknowledgements

The preparation of this volume has been made possible by a number of institutions and scholars who have supported our research in manifold ways. First of all thanks are due to our present academic institutions, respectively the University of Lugano, Switzerland; the Catholic University of Milan; the University of Bologna; and Gonville and Caius College and Clare Hall, Cambridge. We also thank the following institutions for providing, at various stages, research facilities and an intellectual environment that has stimulated our work in a fundamental way. In Italy, we thank the National Lincei Academy, Rome, its Interdisciplinary Research Centre ‘Beniamino Segre’, and the Edison Foundation, Milan. In Cambridge, we thank the Research Seminar in Political Economy at Emmanuel College; the Centre for Financial History, Newnham College; the Cambridge Seminar in the History of Economic Analysis (CAMHIST), Clare Hall; and the Centre for Research in the Arts, Social Sciences and Humanities (CRASH). Furthermore we thank the Centre for Research on Economic Analysis and International Economic Development (CRANEC), Catholic University of Milan; the Centre for Banking Studies, Villa Negroni, Vezia, Switzerland; the Institute of Advanced Study, University of Bologna; and the Swiss National Science Foundation, Berne. We are also grateful to the colleagues and friends who accepted our invitation to take part in this project, and have contributed to the ‘invisible college’ of which this volume is a product.

MAURO L. BARANZINI
CLAUDIA ROTONDI
ROBERTO SCAZZIERI