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José M. Salazar-Xirinachs
Irmgard Nübler
Richard Kozul-Wright

International
Labour
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Geneva

TRANSFORMING ECONOMIES

Making industrial policy work for growth, jobs and development

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Salazar-Xirinachs, José Manuel; Nübler, Irmgard; Kozul-Wright, Richard

Transforming economies: Making industrial policy work for growth, jobs and development
José Manuel Salazar-Xirinachs, Irmgard Nübler and Richard Kozul-Wright (editors)
International Labour Office. – Geneva: ILO, 2014

ISBN 978-92-2-128565-6 (print)
ISBN 978-92-2-128566-3 (web pdf)

International Labour Office

industrial policy / industrial development / catching-up growth / structural transformation / capabilities/ learning strategies / employment / productive jobs / economic development / developed countries / developing countries /

08.01.2

ILO Cataloguing in Publication Data

ILO publications and electronic products can be obtained through major booksellers or ILO local offices in many countries, or direct from ILO Publications, International Labour Office, CH-1211 Geneva 22, Switzerland. Catalogues or lists of new publications are available free of charge from the above address, or by email: pubvente@ilo.org

Visit our web site: www.ilo.org/publns

This publication was produced by the Document and Publications Production, Printing and Distribution Branch (PRODOC) of the ILO.

Graphic and typographic design, manuscript preparation, copy editing, layout and composition, proofreading, printing, electronic publishing and distribution.

PRODOC endeavours to use paper sourced from forests managed in an environmentally sustainable and socially responsible manner.

Code: CPG-WEI-GEN

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Editors and Contributors

Editors

Richard Kozul-Wright is Director of the Globalization and Development Strategies Division at UNCTAD. He has worked at the United Nations in both New York and Geneva. He holds a PhD in Economics from the University of Cambridge, UK, and has published widely on economic issues in, inter alia, *The Economic Journal*, the *Cambridge Journal of Economics*, *The Journal of Development Studies* and the *Oxford Review of Economic Policy*. His latest book is *The Resistible Rise of Market Fundamentalism* (with Paul Rayment) and he has also edited volumes on Transnational Corporations and the Global Economy, Economic Insecurity and Development, Securing Peace, and Climate Protection and Development.

Irmgard Nübler has been a Senior Economist at the ILO in Geneva since 2004. She currently coordinates the work programme on productive transformation, jobs and industrial policies. Before joining the ILO, she held a position as Professor of Economics at the Free University of Berlin for 13 years. She conducted research at the Massachusetts Institute of Technology in Boston, the Institute for Development Studies at the University of Nairobi and the International Institute for Labour Studies, ILO, Geneva, and worked as a consultant for various national and international development agencies. She received her PhD in Economics from the Free University of Berlin. She has published in the areas of economic and industrial policy, globalization, technology, education, training, informal economy and human development. Her forthcoming book is titled *Capabilities, productive transformation and development: A new perspective on industrial policies*.

José Manuel Salazar-Xirinachs (PhD, Cambridge University, UK) has been Assistant-Director General for Policy at the ILO since March 2013. Prior to that, from August 2005 to February 2013, he was Executive Director for Employment. Before joining the ILO, he served as Director of the Office of Trade, Growth and Competitiveness at the Organization of American States (OAS), supporting the countries of the Americas in their negotiations of the Free Trade Area of the Americas (FTAA) (1998–2005); Minister of Foreign Trade of Costa Rica (1997–98); Chief Economist and later Executive Director of the Federation of Private Entities of Central America and Panama (1990–97); member of the Board of Directors of the Central Bank of Costa Rica (1995–97); and Executive President of the Costa Rican Development Corporation (1988–90). He is the author of numerous journal articles on development, trade and competitiveness policies and has written and edited several books, including: *Towards free trade in the Americas* (Brookings Institution, 2001), *Promoting sustainable enterprises* (ILO, 2008), and *Trade and employment: From myths to facts* (ILO, 2011).

Contributors

Tilman Altenburg is Head of the Competitiveness and Social Development Department at the German Development Institute (DIE), which is the government-funded think-tank for development policy in Germany. Before joining DIE in 1995, he was a research fellow of the Latin American Institute of the Free University Berlin and the Philipps University Marburg. He received his doctorate in Economic Geography from the University of Hamburg, Germany, in 1991. Since 1986, he has undertaken empirical research on issues of economic development in Latin America, Asia and Africa, with a focus on competitiveness, industrial and innovation policy, small and medium enterprises promotion and value chain development. Currently, he is coordinating several international research projects on low-carbon industrial policy in developing countries. He regularly publishes academic papers on these issues, and works as an advisor to the German Government and international development agencies.

Rodrigo Astorga has worked as a consultant in the Division of Production, Productivity and Management and currently in the Division of Social Development of the Economic Commission for Latin America and the Caribbean since 2011. He completed his undergraduate and graduate studies at the University of Chile, where he has worked as a research assistant since 2008. He is also co-author, with Jorge Katz, of a chapter in the book *National innovation systems, social inclusion and development: The Latin American experience* (LALICS).

M. Suresh Babu is Associate Professor at the Department of Humanities and Social Sciences, Indian Institute of Technology, Madras, India. His research is on India's industrial development, applied macroeconomics and trade and development. He is the co-author of *What and how do Indian firms innovate?* (Macmillan, 2010). He has published articles on various aspects of India's industrial development in leading national and international journals and popular media.

Byung You Cheon has been a Professor at Hanshin University, Republic of Korea, since 2009. He received his PhD in Economics from Seoul National University and has worked as a research fellow at the Korea Labour Institute for ten years. He has published books and articles in research areas of labour economics and social policies, including: *A study of incentive problems of welfare state* (2013), *Drivers of income inequality in Korea* (2012), and *Economic Crisis and Labour in Korea* (2010, co-author).

Mario Cimoli is Director of the Division of Production, Productivity and Management at the United Nations Economic Commission for Latin America and the Caribbean and Professor of Economics at the University of Venice (Ca' Foscari). In 2004 he was appointed Co-Director of two task forces: Industrial Policy, and Intellectual Property Rights Regimes for Development (Initiative for Policy Dialogue, Columbia University, New York). He was awarded the Philip Morris Chair of International Business (2004) at the Sant'Anna School of Advanced Studies, University of Pisa. He gives talks, writes and publishes books and articles on economic and industrial policy issues, science, technology and innovation.

João Carlos Ferraz is Executive Director of the Brazilian Development Bank (BNDES). His areas of responsibility include Economic Research, Corporate Planning and Risk Management. He is the BNDES representative at the Executive Secretariat of the Brazilian Industrial Policy. He is also Professor, on leave, at the Instituto de Economia, Universidade Federal do Rio de Janeiro, and Officer, on leave, at the United Nations Economic Commission for Latin America and the Caribbean. He holds a Doctorate in Philosophy from the University of Sussex. He has published more than 50 articles in books and academic journals.

Piergiuseppe Fortunato is currently an economist at the United Nations Conference for Trade and Development. Before joining UNCTAD, he was an economist with the Department of Economic and Social Affairs of the United Nations. Previously, he held the position of Assistant Professor in Economics at the University of Bologna and carried out research at the Université Paris-1 Panthéon–Sorbonne as a research fellow. His research interests include political economy and long-term growth, economic development and South–South integration. In these fields he has published in such journals as *The Economic Journal*, *The B.E. Journal of Theoretical Economics* and the *Global Policy*.

Gary Gereffi is Professor of Sociology and Director of the Center on Globalization, Governance and Competitiveness at Duke University. He has published numerous books and articles on globalization, industrial upgrading, and social and economic development in various parts of the world, including: *Global value chains in a post-crisis world: A development perspective* (World Bank, 2010) and *Shifting end markets and upgrading prospects in global value chains* (special issue of the *International Journal of Technological Learning, Innovation and Development*, 2011). He recently completed a three-year "Capturing the Gains" research project, and is currently working on global value chains in a post-Washington Consensus world and the role of industrial policies in emerging economies.

Xiao Jiang is currently an Assistant Professor of Economics at Denison University, Granville, Ohio, USA, and a consultant for the ILO. Previously, he was a junior research officer in the ILO's Policy Integration Department. He received his Doctorate degree in Economics from the New School for Social Research in New York. His research focuses on international trade and development, global value chains analysis, and classical political economy.

David Kupfer has a PhD in Economics from the Universidade Federal do Rio de Janeiro (1998). He is currently an Associate Professor of the Instituto de Economia da Universidade Federal do Rio de Janeiro (IE/UFRJ), Brazil, where he coordinates the Research Group on Industry and Competitiveness. Among other activities, he is editor of the *REC – Journal of Contemporary Economic of IE/UFRJ*, a member of the Economic Council of the Federação das Indústrias do Estado de São Paulo and columnist of the newspaper *Valor Econômico*. He is Advisor to the President's Office at the Brazilian Development Bank.

Dic Lo is a Reader in Economics at the School of Oriental and African Studies, University of London, UK. He is also Co-Director of the Center of Research in Political Economy at Renmin University of China. His recent publications include *Alternatives to neoliberal globalization: Studies in the political economy of institutions and late development* (Basingstoke and London, Palgrave Macmillan, 2011).

Elvis Melia is a PhD candidate at the University of Duisburg-Essen, Germany. His research focuses on institutional changes and industrial policy outcomes in sub-Saharan Africa. Currently, he is examining the industrial policy strategies of Kenya's newly created counties (field research funded by the Friedrich Ebert Foundation (FES)). He holds a Bachelor's degree in Political Science and a Master's degree in International Relations and Development Politics – both from the University of Duisburg-Essen.

William Milberg is Dean and Professor of Economics at the New School for Social Research. His research focuses on the relationship between globalization and income distribution and on the history and philosophy of economics. He has worked as a consultant to the UNDP, the ILO, UNCTAD and the World Bank. He is the author (with Deborah Winkler) of *Outsourcing economics: Global value chains in capitalist development* (Cambridge University Press).

Irmgard Nübler *(see above)*

José Antonio Ocampo is Director of the Economic and Political Development Concentration and a fellow of the Committee on Global Thought at Columbia University. In 2008–10 he also served as co-Director of the UNDP/OAS Project on "Agenda for a Citizens' Democracy in Latin America", and in 2009 as a member of the Commission of Experts of the UN General Assembly on Reforms of the International Monetary and Financial System. He previously served in a number of positions in the United Nations, most notably as Under-Secretary General for Economic and Social Affairs (New York) and Executive Secretary of ECLAC, and in the Government of Colombia as Minister of Finance and Public Credit, Chairman of the Board of the Central Bank of Colombia, Director of the National Planning Department, Minister of Agriculture and Rural Development, and Executive Director of FEDESARROLLO. He obtained his PhD from Yale University and has published extensively on macroeconomic theory and policy, international financial issues, economic and social development, international trade, and Colombian and Latin American economic history. In 2008 he was awarded the Leontief Prize for Advancing the Frontiers of Economic Thought.

Eva Paus is Professor of Economics and Carol Hoffmann Collins Director of the McCulloch Center for Global Initiatives at Mount Holyoke College, Massachusetts, USA. She is the author and editor of numerous books and articles on economic development and globalization. Her current research focuses on the middle-income trap, the implications of the rise of China for the prospects for growth-inducing structural change in other developing countries, and policy space for productive transformation under globalization. Her latest book is *Getting development right: Structural transformation, inclusion and sustainability in the post-crisis era* (Palgrave Macmillan, 2013).

Gabriel Porcile (PhD, LSE – University of London, 1995) is Economic Affairs Officer at the Economic Commission for Latin America and the Caribbean, Professor at Brazil's Federal University of Paraná (UFPR) and Researcher at the National Council for Scientific and Technological Development (CNPq). He has published extensively in the field of economic development, technology and growth. His latest papers are "Technology, structural change and BOP-constrained growth: A structuralist

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toolbox" (*Cambridge Journal of Economics*, 2014, with Mario Cimoli) and "Economic growth and income distribution with heterogeneous preferences on the real exchange rate" (*Journal of Post-Keynesian Economics*, 2013, with Gilberto Tadeu Lima).

Carlos Razo is an economist in the Office of the Director of the Division on Technology and Logistics of the United Nations Conference on Trade and Development (UNCTAD). He has published and contributed to papers, articles, book chapters and reports on issues related to industrial organization, international economics and development. He started his career at the United Nations with the Economic Commission for Latin America and the Caribbean (ECLAC), where he was one of the main authors of the Foreign Direct Investment Report of the region. Before joining the United Nations, he worked in London for a leading European consulting firm specialized in competition policy, as a lecturer at the Belarusian State Economics University in Minsk, and prior to that as an industrial engineer in the manufacturing sector in Mexico.

Felipe Silveira Marques has a PhD in Industrial and Technological Economics from the Economics Institute of the Federal University of Rio de Janeiro, Brazil (2009). He has been working within the Brazilian Development Bank for six years, where he is, as Advisor to the President's Office, working on industrial policy in the Planning and the Economic Research Divisions.

Volker Treichel is the World Bank's Sector Leader for Côte d'Ivoire, Benin, Burkina Faso and Togo and is responsible for economic policy dialogue and budget support operations with the four countries. He was a Lead Economist in the Office of the Chief Economist and Senior Vice President (2010–12). During this time he co-authored several Working Papers with Justin Lin, including papers on the global financial crisis, the Eurozone crisis and growth strategies for Latin America and Nigeria. From 2007 he was the World Bank's Lead Economist for Nigeria. From 1993 to 2007 he was an economist with the International Monetary Fund.

Manimegalai Vijayabaskar is Assistant Professor at the Madras Institute of Development Studies. His research centres on the political economy of labour and development, with an emphasis on how socio-political institutions mediate processes of economic development and labour market transformations. He is the co-editor of *Industrial dynamics in China and India: Firms, clusters and different growth paths* (Palgrave Macmillan, 2011), *ICTs and Indian social development: Diffusion, governance, poverty* (Sage, 2008) and co-author of *Labour in the new economy* (ILO, 2001). He has published in numerous scholarly journals and media outlets, including the *Economic Times* and the *Financial Express*. He is also a guest faculty at Department of Humanities and Social Sciences, Indian Institute of Technology, Madras, India.

Robert H. Wade is Professor of Political Economy at the London School of Economics. He worked earlier at the World Bank and taught at Brown University, Princeton University, and Massachusetts Institute of Technology. In 2008 he was awarded the Leontief Prize for Advancing the Frontiers of Economic Thought. His book *Governing the market* won the American Political Science Association's Best Book in Political Economy award. His recent writing has been about trends in global growth, poverty and inequality; the movement of global governance towards "multipolarity without multilateralism" (that is, the erosion of most international organizations); the causes of the current global economic slump; the debate about the role of the State; and economists' ethics.

Mei Wu is doctoral student of economics at the School of Oriental and African Studies, University of London, UK. Her research focuses on industrial policy, foreign direct investment and regional economic development in Guangdong Province, China.

Justin Yifu Lin is Professor and Honorary Dean of the National School of Development at Peking University (Beijing, China). He was the Senior Vice President and Chief Economist of the World Bank (2008–12). His recent publications include *Against the consensus: Reflections on the Great Recession*; *The quest for prosperity: How developing economies can take off*; *New structural economics: A framework for rethinking development and policy*; and *Demystifying the Chinese economy*.

Nimrod Zalk is an Industrial Development Policy and Strategy Advisor at the South African Department of Trade and Industry (DTI). Prior to this he was Deputy Director-General of the Industrial Development Division (IDD) of the DTI. He has been responsible for a range of processes related to South African and African industrialization, including the development and implementation of South Africa's National Industrial Policy Framework and annual Industrial Policy Action Plans and the design and implementation of key industrial policy initiatives including various sector strategies, industrial financing instruments, and leveraging procurement for industrial development.

Acknowledgements

This book originated from a workshop organized jointly by ILO and UNCTAD in February 2012 on "Growth, Productive Transformation and Employment: New Perspectives on the Industrial Policy Debate". We wish to thank Giovanna Centonze, who helped in the preparation of that workshop and in the early stages of the book. We would also like to extend our thanks to all the participants in the workshop, not all of whose papers could be included in this volume.

The workshop was motivated by the recognition that, after the financial crisis of 2007–08, a return to "business as usual" was neither desirable nor possible, as well as the need to accelerate and sustain inclusive, job-rich growth in developing countries. Some chapters of this book are the product of an ILO research project on "Capabilities for productive transformation". We would like to thank all the collaborators in this research project for their commitment.

We have received a great deal of support and encouragement from many colleagues during the preparation of this volume. In particular, we would like to thank Shaun Ferguson at UNCTAD and Alexia Deleligne and Martin Linden at the ILO, who kept close tabs on all the papers and reminded us about deadlines. We also would like to express our thanks to Sujaree Theingrodrai and Carole Coates of the ILO for valuable administrative assistance and to Charlotte Beauchamp for valuable advice and continuous support of this book project. Rolf van der Hoeven, Duncan Campbell, as well as three external reviewers read and commented on the chapters in this volume and provided helpful guidance on moving the book forward. Finally, we would like to thank the team of the Document and Publications Production Service (PRODOC) at the ILO, and in particular Ksenija Radojevic Bovet, for their rigorous and highly professional work throughout the editing and publication process.

List of abbreviations

AfDB	African Development Bank
ASEAN	Association of Southeast Asian Nations
BNDES	Brazilian National Development Bank
BOP	balance of payments
BRICS	Brazil, Russian Federation, India, China and South Africa
CACM	Central American Common Market
EAS	educational attainment structure
ECLAC	Economic Commission for Latin America and the Caribbean
EOI	export-oriented industrialization
E R&D	engineering research and development
EU	European Union
FDI	foreign direct investment
GDP	gross domestic product
GEAR	Growth, Employment and Redistribution (South Africa)
GNI	gross national income
GRIs	government-sponsored research institutes (Republic of Korea)
GPTS	global product and technology space
GVC	global value chain
HRD	human resources development
ICT	information and communication technologies
IDC	Industrial Development Corporation (South Africa)
ILO	International Labour Organization/Office
IMF	International Monetary Fund
IPAP	Industrial Policy Action Plan (South Africa)

IRP	index of relative participation
ISI	import-substituting industrialization
IT	information technology
ITP	industrial and technological policy
LDCs	least developed countries
MEC	minerals energy complex (South Africa)
Mercosur	Common Market of the Southern Cone
MNC	multinational corporation
MOE	Ministry of Education
MVA	manufacturing value added
NAFTA	North American Free Trade Agreement
NASSCOM	National Association of Software and Services Companies (India)
NEM	new economic model
NGOs	non-governmental organizations
NICs	newly industrialized countries
NIPF	National Industrial Policy Framework (South Africa)
OBM	own brand manufacturing
ODM	own design manufacturing
OECD	Organisation for Economic Co-operation and Development
OECD STAN	OECD Structural Analysis Database
OEM	original equipment manufacturer
OPT	outward-processing trade
PPP	purchasing power parity
PTAs	preferential trade agreements
RER	real exchange rate
R&D	research and development
SARB	South African Reserve Bank
SI	sophistication index
SMEs	small and medium-sized enterprises
SOEs	state-owned enterprises
TNC	transnational corporation
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
VS	vertical specialization
VSI	vertically specialized industrialization
WTO	World Trade Organization

Introduction

Industrial policy, productive transformation and jobs: Theory, history and practice

José M. Salazar-Xirinachs, Irmgard Nübler and Richard Kozul-Wright

1. The challenges of industrial policy and the objectives of this book

No country has made the arduous journey from widespread rural poverty to post-industrial wealth without employing targeted and selective government policies to modify its economic structure and boost its economic dynamism. Moreover, it is difficult to see how countries at all levels of development can respond constructively to contemporary challenges – from job creation and poverty reduction to participating in the technological revolution and global value chains, from promoting efficient and clean energy to mitigating climate change and greening the economy – without using some kind of targeted industrial policy.

The process of structural transformation remains particularly challenging for developing and emerging economies. Their efforts to upgrade and diversify take place in an interdependent world economy where earlier industrializers have already accumulated both enabling capabilities (individual and enterprise level know-how and skills, along with collective knowledge and sources of creativity) and productive capacities (embodied in production factors and physical and technological infrastructure) that give their producers significant cost and productivity advantages and equip them to push out the technological frontier through research and innovation. These advances offer developing countries many opportunities to catch up rapidly by learning to master technologies and products already available in more developed countries. The key question is: how can such learning be accelerated? Catching up encompasses two distinct but related processes: first, the strengthening of capabilities that enable developing economies to trigger, accelerate and manage structural and technological transformation; and, second, the accumulation of productive capacities through a sustained process of investment. In both aspects, success requires active policies that provide incentives, direction and coordination.

Many of the higher value added activities and sectors that characterize successful transformation today are likely to be more capital-intensive than their counterparts in the past, in part because of readier access to the technology and capital equipment produced in the more advanced economies, but also because of the pressures of intensified global competition, which can be met on a sustained basis only by rapid rises in productivity. Mobilizing the financial resources to undertake the investments in physical and human capital and in infrastructure required to meet these demands continues to be a major policy challenge in many countries.

Furthermore, such a transformation requires that workers, enterprises and the economy as a whole learn to adopt increasingly complex technologies, to invest in and produce new and more sophisticated goods and services, and also to govern, direct and accelerate processes of change. Learning builds up dynamic capabilities which are key drivers of catching up and economic development. These capabilities in turn shape patterns of productive transformation and job creation, as well as the speed and sustainability of the catching-up process. Therefore, a major challenge confronting any developmental state is to support and accelerate learning processes for the development of dynamic capabilities at all levels (Nelson and Winter, 1982; Lall, 1992; Greenwald and Stiglitz, 2014; Nübler, Chapter 4 in this volume).

The presence of surplus or underemployed labour in most developing economies poses the particular challenge of how to achieve productivity growth and net job creation simultaneously, in order that the chosen growth path be both inclusive and sustainable. Structural transformation and technological change affect productivity as well as the quantity and the quality of employment, and in many different ways. They generate as well as destroy jobs in enterprises, and transform the nature, quality and profile of jobs, thereby also transforming the occupational structure and employment patterns in the labour force. The policy challenge is to promote patterns of structural transformation and technological change that strike a good balance in achieving the two fundamental objectives of productivity growth and more and better jobs. One way in which late-industrializing countries have tried to achieve this balance is to produce large quantities of labour-intensive products for export. This can enable manufacturing employment to expand beyond the limits set by the domestic market. In the same vein, a mature economy, with a competitive edge in key industrial sectors

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and a surplus in manufacturing trade, can normally employ more labour in those activities and thus delay de-industrialization. However, there is a growing realization that export-led growth cannot be an option for all economies, particularly for systemically large economies, and that greater attention needs to be given to expanding domestic demand – all the more so since the financial crisis of 2007–08 (UNCTAD, 2013).

History shows that in all cases of successful catching up, the State has played a proactive role, be it in building markets, in nurturing enterprises, in encouraging technological upgrading, in supporting learning processes and the accumulation of capabilities, in removing infrastructural bottlenecks to growth, in reforming agriculture and/or in providing finance. However, this is not to say that such successes all follow a uniform model; on the contrary, they encompass a variety of different institutional arrangements and policies. Indeed, it is partly because of the wide variety of patterns of state intervention used to accelerate growth and development that industrial policy has been one of the most misunderstood areas of economic and development policy, supporters and detractors alike tending to adopt entrenched and often hostile positions. However, in recent years, and particularly since the recent financial crisis, there has been a degree of rapprochement between the two perspectives, based in part on a better understanding of the record of industrial policies – both successes and failures. It is now clear, for example, that protective tariffs can be overdone, with negative consequences, and that "hard industrial policy" measures can be distorting; but it is also clear, as recent studies recognize (Pagés, 2010; Devlin and Moguillansky, 2011), that there are many cases where industrial policies have been successful, with substantial development impact. Nor are the latter limited to the well-known East Asian examples. Ireland and Costa Rica were ambitious and successful in defining criteria for choosing sectors on which to place strategic bets and, in these particular cases, using foreign direct investment (FDI) as a tool of industrial policy; Brazil succeeded in creating competitive steel and aeronautics sectors, which are now generating significant exports – indeed, industrial policy is widely recognized across Latin America as having been of critical importance in launching new export activities in the region.[1] Robert Wade's contribution to this book (Chapter 14) shows that particularly but not exclusively in the high-technology sector, the United States has not only applied industrial policy extensively and successfully, but has been expanding and refining its reach.

[1] The Inter-American Development Bank (IADB) research project "The emergence of new successful export activities in LAC" reviews cases of the "discovery" of new competitive activities and concludes that industrial policy was important in solving coordination problems that led to discovery. See Pagés (2010), Ch. 11.

The recent rapprochement also owes something to the breach in the ideological dominance of neoclassical thinking and the contributions of different economic traditions. Growth, structural, institutional and evolutionary economics have produced a wealth of new research on productive transformation, catching up and industrial policies using different analytical frameworks, each one highlighting different dimensions of the catching-up challenge so that together they widen the scope for industrial policies. The failure of developing countries to translate economic growth into jobs, economic development, poverty reduction and enhanced living standards has also contributed to new thinking on the relevance of policies and strategies, including industrial policies, to the proactive promotion of multiple development objectives (ILO, 2011; UNIDO, 2013; ECA, 2013; World Bank, 2013; OECD, 2013).

A first objective of this book, therefore, is to recognize the relevance of the different traditions in development economics and the contributions of their various frameworks to the analysis and design of industrial policy. Each of those frameworks highlights different objectives of industrial policies, raises different policy issues, and therefore suggests different areas and scope for industrial policies. Over the past decade, the breadth of experience of developing and emerging economies in particular, places these countries, perhaps for the first time, in the vanguard of the discussion on industrial policy. The chapters in this book tap deeply into that experience. Moreover, the application of different analytical frameworks to current practice in industrial policy can contribute to a better understanding of what is needed to create and pursue successful productive transformation policies.

A second objective is to encourage a much more integrated approach to productive transformation policies. This is crucial to getting industrial policy right. Only a coherent set of macroeconomic, trade, investment, sectoral, labour market and financial policies can adequately respond to the myriad challenges of structural transformation and decent jobs faced by countries today. Strategies to enhance capabilities for high-performing catch-up growth require education, training, investment, trade and technology policies to promote learning at different levels and in different places – in schools, in enterprises, in social and organizational networks. Focusing systematically on coherence adds another dimension to the debates on industrial policy. Hitherto, policy coherence has generally not been a sufficiently explicit goal, either in research and analysis or in actual industrialization policies.

A third objective is to explore the links between productive transformation, job creation and employment growth. The new debate on productive transformation is weak in this area, and yet it is important to make these links explicit, especially in

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view of the rapid growth of labour supply in most emerging economies and developing countries. Industrial policies need to be designed with a view to fostering structural transformation patterns that have the potential to accelerate the generation of not just more jobs, but also more productive and better jobs. Productive jobs lead to higher levels of income, reduced poverty, an improved standard of living and stronger domestic demand, by providing decent wages, good working conditions, training, social protection and respect for workers' rights. Better jobs, in the sense of those of greater developmental and dynamic catching-up value, include those with high technology and skills content; these offer workers opportunities to acquire new knowledge and technological competences, thereby in turn enhancing the complexity and diversity of the knowledge base of the labour force, an essential ingredient for accelerating the catching-up process.

The next section presents a brief history of industrial policy. Section 3 moves on to discuss the various economic models and frameworks for productive transformation policies (based on Chapters 1–5). Section 4 distils lessons and principles from the various case studies presented in this volume (Chapters 6–14), focusing on practical issues, from design to implementation. Section 5 concludes.

2. The rise, fall and rise again of industrial policy

Economics, including development economics, is subject to fads and fashions. So, is the present renewed attention to industrial policy just a passing fashion, likely to fade away some time soon? Such is indeed the conclusion of a recent article in *The Economist* bemoaning the return to a misguided ideology of "picking winners".[2] In fact, a brief review of the history of industrial policy shows that it has never gone away, albeit persisting under different names and guises, and that it has been applied in both developed and developing countries, even when strong ideological currents appeared to be flowing in a contrary direction.

There is little doubt that the period after the Second World War was a "golden age" of industrial policy, in large part because governments in developed countries were in broad agreement that balanced and coordinated expansion, increased provision of public goods and services, accelerated technological progress and appropriately designed multilateral arrangements in trade and finance offered

[2] *The Economist* (2010). This article sees the renewed attention as a politically expedient response to short-term problems and warns: "The present round of industrial policy will no doubt produce some modest successes – and a crop of whopping failures."

the best way to secure rising living standards and prevent a return to the waste and destruction of the inter-war years. The overall consensus embraced a range of policy instruments to achieve these goals, so that active demand management coexisted with industrial policies and indicative planning, and steady multilateral trade liberalization with relatively strict capital controls. The outcome was a period of unprecedented growth in developed countries, driven by high rates of investment and rapid technological progress, often linked to strong export demand, and underpinned by full employment and rising wages.

This broad policy consensus also cultivated a favourable environment for growth and development in poorer countries, allowing them ample policy space, within the context of the multilateral trading system, to pursue "big push" strategies combining high rates of capital formation, strong industrial development and a shift of economic momentum from the rural to the urban economy. Together, these elements helped to accelerate growth across the developing world. Dedicated support measures were often employed to bolster agricultural output (and keep food prices in check), to advance technological capabilities and to strengthen financing arrangements, including through the creation of national development banks. In some cases (notably the East Asian "tiger" economies), these strategies had a strong export orientation, while in others (such as Latin America and South Asia) priority was given to growth in domestic or regionally integrated markets.

Across these experiences, the evidence shows that sustained periods of high growth rates derived from deliberate support for learning and the accumulation of collective capabilities as part of industrial development strategies. This was particularly marked in those East Asian countries that applied education and training policies to prepare the labour force for entry into targeted industries (see Chapter 7 by Cheon in this volume) and promoted technological capabilities in firms to enable them to diversify into dynamic sectors and to keep driving the process of "creative" imitation (Kim, 1997). Industrial, technology and trade policies were formulated as part of economic development strategies that provided a combination of incentives and compulsion ("reciprocal control mechanisms") to enable and accelerate learning by domestic enterprises and the translation of rents into productivity growth (Amsden, 2001). Examining the long history of uneven industrial development over the last 50 years, one can conclude that despite flaws and limitations, the achievements associated with these early strategies were significant.[3] As table 1 shows, the period from 1950 to 1973, which is usually identified as one dominated

[3] According to Ocampo and Parra (2006), in the 1960s and 1970s as many as 50 out of 106 developing countries experienced sustained expansion, defined as four consecutive five-year moving average periods with income per capita growth exceeding 2 per cent. See also Maddison (2001) for a useful comparative assessment of how the different developing regions performed during this "golden age".

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Table 1. Average per capita manufacturing growth rates, 1870–2007

	1870–90	1890–1913	1920–38	1950–73	1973–90	1990–2007
Leaders[1]	3.1	3.4	1.9	7.9	2.4	2.2
Asia[2]	1.5	4.2	4.2	8.3	5.9	4.3
Latin America	6.4	4.4	2.8	5.7	2.7	2.2
Middle East and North Africa	1.7	1.7	4.9	6.2	6.1	4.5
Sub-Saharan Africa	n.a.	n.a.	4.6	5.5	3.5	3.9

[1] Germany, United Kingdom and United States for the period up to 1938; includes Japan from 1950.
[2] Includes Japan before 1950 only.

Source: Bénétrix, O'Rourke and Williamson (2012).

by import-substituting industrialization (ISI), saw the fastest industrial growth rates in the developing world of any period since the late nineteenth century, and by some margin. However, this was not, strictly speaking, a period of catching up, as the leading advanced economies also posted historically unprecedented rates of industrial growth during these years; the dramatic slowdown in the latter countries following the oil shocks of the early 1970s meant that the period 1973–90 actually witnessed more pronounced convergence in industrial performance.

In a sobering assessment of post-war experience in Latin America, a region at the centre of much early debate on industrialization and development, Albert Hirschman (1995) complained that too much development thinking (by both dependency theorists and market fundamentalists) seriously misjudged the progress made in the three decades following the end of the Second World War and that the economic "growing pains" that became apparent at the end of the 1970s (whether in the form of rising inequality, balance of payments problems or rent-seeking behaviour) did not merit the wholesale policy changes that came to characterize much of the region following the debt crisis of the early 1980s.

Successful growth performance notwithstanding, from the early 1980s industrial policy was not only unceremoniously dropped from policy discussions but denigrated as a major source of economic distortions in rich and poor countries alike. Two compounding factors led to this abrupt fall from grace.

The first was the broad-ranging political and ideological assault on state intervention, beginning in the mid-1970s in the advanced economies, but accelerated by Margaret Thatcher in Britain and Ronald Reagan in the United States at the end of the decade, and spreading to developing countries during the debt crisis of the early 1980s. This attack was associated with specific evidence of excesses and abuses of industrial policy documented in influential research in developing countries (Little, Scitovsky and Scott, 1970; Bhagwati, 1978; Krueger, 1978). The result was a generalized consensus around the promotion of market-based strategies (liberalization, privatization, deregulation) in pursuit of more efficient ("get prices right") outcomes (Williamson, 1993; World Bank, 1987). In this intellectual environment, which came to be labelled the "Washington Consensus", industrial policy was criticized and shunned.

The second factor was the increase in capital mobility which began in the 1970s following the collapse of the Bretton Woods system, but picked up pace significantly only from the early 1980s, following the extensive deregulation of the financial sector in the advanced countries, and the dismantling of controls on cross-border financial activities. The ensuing surge in capital flows marked a radical break with the post-war international policy framework. While the theoreticians of efficient financial markets promised large-scale gains, particularly for capital-scarce countries in the South, the 1980s and 1990s were marked in most regions by a series of boom-and-bust cycles that did little to bolster productive capacity or generate broad-based growth, particularly in the developing world (UNCTAD, 2011). The exceptions to this pattern were in East Asia, where strong developmental states that had emerged in the 1960s and 1970s initially resisted financialization pressures and continued to use a range of policies to manage catch-up growth. Beginning in the early 1980s, China began to replicate this model of development, albeit with some unique characteristics specific to the history of that country (see Chapter 11 by Lo and Wu in this volume).

From the turn of the millennium, however, the external environment shifted in favour of developing countries. Not only did the volume of capital inflows increase, their cost fall, and trade conditions improve, but commodity prices began to rise sharply, while some countries also saw remittances increase. As a result, growth picked up across all developing regions; a number of countries saw a marked rise in their trade surpluses, while the debt profile of many others improved significantly.

Paradoxically, this shift opened up the space for developing countries to explore a much wider set of policies than that endorsed by the Washington Consensus to shape their growth and development prospects and to build closer economic and political ties with each other through renewed South–South cooperation. As the first decade of the new century unfolded, while advanced economies became more and more complacent about their apparently stable macroeconomic conditions and increasingly infatuated with the efficiency of financial markets and their product innovations, developing countries, particularly in Asia, were revisiting the potential of industrial policy as part of a renewed development discourse of "the rising South", and in Latin America left-leaning governments maintained conventional macroeconomic frameworks but enriched them with countercyclical policies and explored better ways to marry the goals of productive transformation and social inclusion (Devlin and Moguillansky, 2011; Ocampo and Ros, 2011).

In Africa, several countries experienced a welcome surge in growth in the years immediately after 2000. However, much of this growth was associated with a commodity boom and with extractive industries, and in consequence had little impact on labour markets and poverty reduction. Indeed, some countries underwent structural change that saw productivity fall, with some productive sectors shrinking and excess labour moving from higher to lower productivity sectors and to informality (McMillan and Rodrik, 2011). In fact, most sub-Saharan African countries have been experiencing premature de-industrialization: manufacturing value added as a percentage of GDP declined from 15 per cent in 1990 to 10 per cent in 2008 (ILO, 2011; UNIDO, 2011; UNCTAD, 2011). This is partly attributable to the pace and depth of trade liberalization, exacerbated by a neglect of investment in agriculture and especially in supporting small farmers. These policy mistakes have been widely recognized in the last few years and, as Altenburg and Melia argue in Chapter 13, there has been a renewed appreciation of the importance of industrial policy to achieving more economically sustainable and inclusive growth paths. This commitment to industrial policy has been particularly strong in countries such as Rwanda, Ethiopia and South Africa, the last of which is the subject of Nimrod Zalk's analysis in Chapter 12.

The resurgence of interest in industrial policy was strongly inspired by the better understanding, based on overwhelming evidence and increasingly accepted by the mainstream economic profession, that the developmental states of East Asia had successfully used industrial policies to help them rapidly absorb know-how, technology and knowledge from the rest of the world, to assimilate them at a tremendous pace and to diversify into new and more sophisticated products (Harrison and Rodriguez-Clare, 2009; Lin, 2009; Rodrik, 2007). The work of the World Bank's Commission on Growth and Development,[4] launched in 2006, was an important step towards a fresh appraisal of industrial policies. Its report concluded that economists lack understanding of the growth process, in particular of the link between education, training and technologies, on the one hand, and growth, on the other. The authors expressed the explicit concern that growth economists "may have the wrong model" and recognized that countries differ in respect of both institutions and capabilities, so that one policy will not necessarily fit all countries. Accordingly, countries should be allowed to experiment and make mistakes in order that, in a world of increasing returns, comparative advantage may be created. The report

[4] The Commission was composed of high-level growth economists from a range of institutions and policy-makers from developed and developing countries.

identified "the role of industrial policy and export promotion" as one important, albeit controversial,[5] ingredient in such a country-specific approach.[6] Subsequently, the World Bank's *World Development Report 2013: Jobs*, discussing what it calls a "targeted investment climate", has also provided a rationale for moving towards some selectivity in productive transformation strategies (World Bank, 2012).

More impetus to rejuvenate industrial policy came from the growing realization that the shift towards a more liberal policy regime had done little to bring about the diversification and upgrading of economic activity that the concept of "structural adjustment" had promised. Interest was further fuelled by the debate on the risk of a "middle-income trap", arising from the concern that some emerging economies, even after enjoying a period of strong growth, had failed to undertake the required changes in their productive structures needed to sustain future growth and job creation (Eichengreen, Park and Shin, 2011).

But perhaps the strongest boost to the reassertion of industrial policy came with the onset of the financial crisis in 2007–08. The crisis served as a reminder that unregulated markets and weak States provide a poor institutional environment for managing economies and societies. Just as importantly, it opened up an interest in more sustainable and more inclusive strategies in advanced countries, including a possible role for industrial policy, not only in areas such as infrastructure development and the green economy, but also in addressing what some saw as the undue hollowing out of the manufacturing and skill base.

In conclusion, while industrial policy fell into disrepute in the mainstream economic discourse in the 1980s and 1990s, many countries continued to make intensive use of it in practice under various names, even though some parts of the economics profession were in denial of this reality. Looking back at those decades now, it becomes apparent that the best economic performance was obtained by those countries that defied the conventional wisdom and put heterodox policy packages in place, while those that fully embraced the standard policy package experienced de-industrialization and macroeconomic volatility. On the basis of this and other related evidence, discussion among economists and policy-makers is now increasingly shifting away from whether or not to have industrial policy and towards a focus on the objectives and scope of industrial policies and "how to

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[5] The other three controversial ingredients are: deliberate undervaluation of the exchange rate; the extent and timing of opening the economy to capital flows; and the difficulties inherent in developing the financial sector. For an assessment of the report's contribution, see Salazar-Xirinachs (2008).

[6] To the sceptics who worry about the lack of government capabilities or capture by interest groups and prefer to do nothing, the Commission's report pointed out that inaction carries its own risks. It argued that, if an economy is failing to diversify its exports or generate productive jobs in new industries, it is the government's responsibility to jump-start the process.

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do it" in a way appropriate to each country's conditions. The next section accordingly reviews the various frameworks adopted in addressing issues of productive transformation, with the aim of informing the practical challenges of designing good policy and avoiding the mistakes of the past.

3. Economic models and frameworks for productive transformation policies

A number of different economic traditions have fed into the recent renewal and reshaping of discussions on productive transformation and industrial policy. This book recognizes the contributions from the most innovative approaches in development economics. Part I presents some of the most interesting conceptual approaches and frameworks developed recently, drawing on the neoclassical, structural, evolutionary and institutional traditions. Each one of them highlights different perspectives and objectives, and suggests different dimensions of structural transformation policies and strategies. Each one provides important insights and distinct policy principles that help to guide policy-makers in designing industrial policies.

While the distinct frameworks and perspectives presented in Part I differ in their analysis, including on the rationale and scope of industrial policies, they reflect convergence around the idea that governments should play a proactive role in facilitating as well as in shaping and orienting the development process, and that policies to promote structural and technological transformation and the catching-up process are relevant to the challenges facing contemporary economies.

These various frameworks can be seen as complementary tools and approaches in the design of country-specific productive transformation and catching-up strategies. Viewed together, they contribute to a deeper understanding of the dynamics of catching up, and of productive transformation policies, and thus can contribute to better policy formulation in developing (and developed) countries.

3.1 Managing productive transformation: A structuralist macroeconomic policy framework

Structuralist economics views changes in the composition of economic activity as among the prime movers of growth and employment, and the literature in this tradition therefore focuses on exploring that relationship, taking a holistic approach that considers the role of macroeconomic, trade, technology and sectoral policies.

The structuralist approach accords a central role in promoting growth, employment and poverty reduction to policies aimed at facilitating a dynamic restructuring of production and trade, arguing that "growth can only address poverty concerns if it generates new jobs to keep pace with a rising labour force" (Ocampo, Rada and Taylor, 2009, p. 1). From this perspective, diversification within and across sectors, rather than specialization, is a key driver of income growth in low-income countries (Imbs and Wacziarg, 2003; UNCTAD, 1964). A recent strand of literature provides evidence of the link between diversification patterns and growth rates (see especially Hausmann, Hwang and Rodrik, 2007; Ocampo, Rada and Taylor, 2009; Lederman and Maloney, 2012).

José Antonio Ocampo's contribution to this volume (Chapter 1) reviews the structuralist thinking developed in the tradition of the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) and its current relevance. He provides a brief overview of evidence on the link between patterns of production structures and growth rates. Within this context Ocampo suggests an updated structuralist framework for industrialization policies and presents an analysis of the relationship between economic growth and the production structure. The chapter argues that countries need to develop production development strategies and innovative activities with strong linkages to other economic activities.

Ocampo further argues that the strategy of industrialization and export promotion advocated by ECLAC "was also tied in with short-term macroeconomic policy because of the institution's obsession with maintaining competitive exchange rates, which were viewed as an essential ingredient of proactive policies to foster production sector diversification". He shows that ECLAC's "obsession" with maintaining competitive exchange rates has been vindicated by recent research showing that the real exchange rate is one of the determinants of economic growth. The experience of the Southern Cone countries in the 1970s showed that, if moves to liberalize trade are coupled with the opening of the capital account, not only might the expected real depreciation not occur, but the combination may have the exact opposite effect: a real appreciation, which acts as a disincentive for exports and industrialization. Wise management of the exchange rate throughout the business cycle is essential for productive transformation policies. On the basis of this analysis, Ocampo recommends a strategy of growth and development that combines countercyclical macroeconomic policies with a proactive strategy for diversification of the production structure, giving particular prominence to industrialization.

3.2 Following (latent) comparative advantages: A new growth-facilitating approach

Neoclassical economic models are limited in what they can say about growth and development and policies to help manage these processes (Commission on Growth and Development, 2008). Traditional growth and trade models developed in the neoclassical framework explain growth in terms of the accumulation of production factors, in particular physical and human capital, and technology (Solow, 1957; Lucas, 1988). These models suggest specialization in products in which a country has comparative advantages, and a significant part of the policy discussion centres on the large "residual" that derives from the accounting exercises generated by this approach (Aghion and Durlauf, 2007; Kenny and Williams, 2001). While, in principle, market failures provide a strong rationale for state intervention, the conventional wisdom in neoclassical economics has been to document cases of government failure and to argue that, because of factors such as myopic or incompetent bureaucracies, corruption and capture by the private sector, the likelihood of government failure is greater than that of market failure (Krueger, 1990; Schleifer, 1998). This approach is based on a stylized "perfectly competitive norm", and the resulting policy debate opposing "market failure" to "government failure" has been unnecessarily polarized, doing a great disservice to development policy by precluding sufficiently rich analysis of how a variety of institutions and learning processes can promote or stall structural transformation under a particular set of initial conditions and historical circumstances. In place of such nuanced enquiry, the mainstream policy view within this tradition has promoted unduly simplistic universal policy rules such as "get prices right", or "get the government out of the way".

New approaches in the neoclassical tradition recognize the role of institutions and governance. However, these variables are not yet well integrated into models and frameworks, which therefore have limited power in providing policy recommendations on strengthening the link between these variables and growth. Justin Lin and Volker Treichel (Chapter 2) propose to address this shortcoming through a "Growth Identification and Facilitation" (GIF) approach, suggesting a six-step methodology to identify and target sectors for investment and government support in a country-specific context. This approach recognizes a proactive role for the State in overcoming information, coordination and externality issues inherent in the development of new activities and sectors, but argues that past industrial policy efforts (the "old structuralist" paradigm) failed because they were based on a strategy that defied the concept of comparative advantage. It recommends instead that while industrial policies should indeed target economic activities and industries, they should follow a rule: namely, to focus on goods and services that have been growing dynamically for about 20 years in fast-growing countries with similar endowment structures that have a GDP per capita about twice as high (comparator countries), and among these give priority to those that some domestic private firms have already entered spontaneously. Attempts to reshape the production structure beyond the boundaries set by these "latent" comparative advantages are likely to fail and hamper economic performance.

This approach has clarity and is oriented to practical application. One can agree with Chang's assessment that this approach is right in arguing that the further you deviate from your comparative advantage, the riskier your industrial policy becomes. But the approach fails to recognize that many countries have in fact taken these risks, and their industrial policies have been much less "comparative advantage conforming" than this approach recognizes: "many success stories were based on moves that were far more daring than what their rule would suggest" (Chang, 2013, p. 41). This may be in part because by focusing on comparative advantage, this approach does not give due consideration to the dynamics of technological upgrading, learning and capabilities. For more thorough attention to these aspects, one needs to turn to evolutionary economics.

3.3 Technology, learning and innovation

Several strands of the literature deal with important questions around how to develop and accelerate learning and innovation, and the role of capabilities in shaping structural transformation. Evolutionary economics focuses on the dynamics of economic development, and analyses learning, technological change and the accumulation of domestic capabilities as central drivers of productive transformation, which is seen as a complex, incremental and non-linear process. Economists in this tradition argue that comparative advantages are not "given", but rather are made, and that it is the role of developmental states to design policies and institutions that support learning processes.[7] They emphasize that high-performing economies are those that have found ways to deliberately move their productive structures away from "low-quality activities", characterized by diminishing returns, flat learning, low productivity and low wages, and into "high-quality activities", characterized by economies of scale, steep learning curves, high growth of output, rapid technological progress, high productivity growth and

[7] For examples of work along these lines, see e.g. Reinert (2008) and Cimoli, Dosi and Stiglitz (2009). For a review of the latter, see Salazar-Xirinachs and Nübler (2010).

high wages (Cimoli, Dosi and Stiglitz, 2009). In this framework the role of the State is to create conditions conducive to learning.

Greenwald and Stiglitz (2013 and 2014) expand "infant industry" arguments to the case of an infant economy, discussing how well-designed government policies on trade, industry and intellectual property can help create a learning society, and arguing that "creating a learning society is more likely to increase standards of living than the small, one-time improvements in economic efficiency or those that derive from sacrifices of consumption today to deepen capital" (Greenwald and Stiglitz, 2013, p. 45). Their approach to knowledge, technology upgrading and learning is strongly rooted in the neoclassical tradition and builds on the analysis of failures in the markets for information and for the production and dissemination of knowledge, and of financial market failures to finance knowledge and innovation. They consider it of critical importance to understand the structure of learning within an economy, including how it spreads across sectors. When such understanding is achieved, important policy conclusions can be reached regarding how best to encourage manufacturing, exports, and other channels for fast learning and accelerated productivity growth.

A contrasting and powerful fresh look at the role of the State in promoting the development of technological capabilities for "innovation-led growth" in developed and middle-income countries has been recently presented by Mazzucato (2013). She provides evidence that the principal entrepreneurial drive, and corresponding risk-taking, behind the development of several important modern technologies (including solar and wind energy, the Internet, GPS, touch-screen displays and voice-recognition software) has been provided less than has been suggested by the private sector and the much-hyped venture capital, and more than has been acknowledged by the State. She shows that public policy in the United States and other countries played an active role in developing these innovations and the related capabilities during the period of highest risk.

In Chapter 3 of this volume, Astorga, Cimoli and Porcile use a growth model of structuralist–evolutionary inspiration to discuss technological upgrading, structural change, productivity and employment growth in four transitional economies – Argentina, Brazil, Chile and Mexico – over the period 1970–2008, benchmarked against the Republic of Korea. They argue that, when the real exchange rate appreciates and industrial and technological policies (ITPs) are weak or absent, productivity growth is driven by rationalization and defensive responses not related to the expansion of effective demand. In these conditions, sectors that are more technology-intensive lose competitiveness, and employment tends to concentrate in lower-productivity activities. Conversely, when the exchange rate is competitive and active ITPs favouring the diversification of production are

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introduced, there is a rise in employment and growth in productivity. The authors analyse structural change in manufacturing industry by means of a shift–share decomposition of the sources of aggregate productivity growth in the economy. They point to the importance of policy continuity, as opposed to abrupt changes of policy regime, in supporting an appropriate learning environment.

3.4 A theory of capabilities and learning strategies

The common thread running through much of the recent growth, development and technological change literature is the role of capabilities in shaping structural transformation. Authors of a more structuralist persuasion (Hausmann et al., 2011) focus on how capabilities influence the products and technologies that firms and economies can develop, and how a certain product and technology structure or portfolio is associated with certain capabilities for further diversification. Authors taking an evolutionary process perspective (among others, Nelson and Winter, 1982; Dosi, Winter and Nelson, 2000; Chang, 2010) emphasize how capabilities influence processes of learning and catching up. But no integrated theory of capabilities has yet been formulated to explain where capabilities reside, how they evolve, and how policies can support them and link them with the dynamics of learning and catching up.

Irmgard Nübler sets out to develop such a theory in Chapter 4 of this volume. The author presents a framework for catching up where capabilities are a key determinant of diversification of production structures and technological change. This framework introduces a distinction between *productive capacities*, which reside in the endowment of material production factors (physical and human capital and infrastructure), and *productive capabilities*, which exist in the immaterial knowledge sphere of the economy. Hence, countries with similar factor endowment structures and comparative advantages may differ substantially in their capabilities. The framework also integrates the *structural change* and *process* dimensions of productive transformation. Drawing from various disciplines that have developed explicit theories of knowledge and learning, Nübler develops a knowledge-based concept of capabilities, arguing that capabilities are embodied not only in individuals but also at various collective levels in enterprises, organizations, the labour force, value chains and entire societies. This conceptualization helps to shed light on where capabilities reside and how they are translated into productive transformation and growth. Finally, she elaborates a concept of collective learning to explain how capabilities evolve in distinct learning processes at different levels and places (formal education system, production system,

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social and organizational networks). On this basis Nübler provides recommendations for learning strategies aimed at creating capabilities for high-performing patterns and processes of productive transformation. The concept of a learning strategy is an integrated one and embraces education, training, technology, trade and investment policies as well as institutions promoting learning processes at all levels. From this perspective, industrial policies are also seen as the set of policies that promote such learning strategies to accelerate and sustain productive transformation.

3.5 Industrialization through global value chains

Parts of the global economy are increasingly structured around global value chains (GVCs), which account for an increasing share of international trade, output and employment.[8] The emergence of these chains has been facilitated by the "fragmentability" of production as a consequence of advances in technology, and by the liberalization of trade and investment in recent decades (Lall, Weiss and Oikawa, 2005). It has also been fostered by competitive strategies adopted by multinational enterprises, which have sought to locate labour-intensive and low value added tasks in low-wage countries while retaining high value added activities in high-wage countries. GVCs are seen as providing a stepping stone for firms and workers in developing countries, offering opportunities to integrate into the global economy and initiate the process of catching up.

From the perspective of productive transformation and industrial policy, value chains have the potential to become important learning networks and catalysts for the generation of capabilities, productive capacities and productive employment. Learning improves performance and productivity within the value chain, which promotes productive transformation, the generation of jobs and a dynamic catching-up process in the economy through spillover effects.

Despite the importance of GVCs for global production and trade, understanding of the link between increasing fragmentation of production and trade in tasks, on the one hand, and industrialization, structural transformation and catching up, on the other hand, is still limited. Even larger gaps exist in knowledge of how integration into GVCs and economic upgrading interacts with the generation of better and more jobs, learning opportunities and the development of capabilities. UNCTAD undertook early work on this issue, warning of the danger of countries "trading more but earning less" in the context of GVCs (UNCTAD, 2002).

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[8] See Park, Nayyar and Low (2013); Elms and Low (2013).

In Chapter 5, William Milberg, Xiao Jiang and Gary Gereffi suggest a framework of vertical specialization and upgrading in value chains, and discuss industrial policies in the context of value chains. They argue that since the early 1990s the expansion of GVCs has played an important role in shifting the pattern of international trade and has significantly affected the processes of industrialization and de-industrialization. Trade in intermediates rather than in final goods and services has grown rapidly and, as a consequence, the import content of exports has risen. They argue that economic development within the context of GVCs takes the form of "vertically specialized industrialization", that is, a process of upgrading into higher value added tasks and functions, either within a given chain or in new chains that generate more value added as a whole. However, they recognize that this is not an automatic process and that, even when it is deliberately and successfully pursued, the economic gains may not be matched by wider social gains.

The authors stress that industrial policy viewed through the lens of GVCs has different elements from traditional industrial policy. The GVC approach puts emphasis on firms rather than markets and States, with business strategies acting as the key drivers of upgrading for both foreign lead firms and domestic supplier firms. This requires the State to play a different role, promoting the capacity and activity of domestic firms and industrial upgrading, and capturing more value added in the value chain. Policies need to take into account the interests and power of lead firms in GVCs and influence the relationship between foreign lead firms and domestic low-value-adding firms in the light of international and regional networks of competing and cooperating suppliers.

3.6 Alternative economic frameworks and the scope of industrial policy

To conclude, the various economic models and frameworks discussed above have different implications for industrial policy in terms of objectives, dimensions, scope and instruments. For example, the GIF approach defines industrial policies in a narrow sense, with a limited role for the State, mainly identifying new economic activities and facilitating changes in factor endowment structures, without going beyond the boundaries of comparative advantage. In contrast, the capabilities approach defines a wide scope for industrial policy, tasking it with promoting productive capabilities and learning processes as well as enhancing productive capacities, and shaping patterns and processes of productive transformation aimed at higher productivity growth as well as enhancing the quantity and quality of jobs.

In their different ways, all these frameworks provide strong rationales and justifications for a proactive government role in accelerating the transformation of the economy's production structure and upgrading technologies. The focus on learning, capabilities and innovation means that industrial policy is not just about manufacturing, but also about agriculture and services, including infrastructure, health, education and skills, information technology and finance. In other words, modern industrial policy is about productive development policies more generally.

Within this perspective, the analysis and discussion of national and regional experiences, and of the types of interventions and institutional arrangements that can promote structural transformation, are essential elements of the policy economist's toolkit. Particular attention needs to be given to the practical problems posed by the implementation of industrial policies, and the institutional and incentive design issues required to solve them. There is now a wealth of experience on which to draw in addressing these questions. Parts II and III of the book contain chapters on these experiences in nine different contexts.

The next section turns to some of the key policy challenges involved in addressing these institutional and practical design problems, and to the key lessons offered by experience.

4. Making industrial policy work: Some lessons and principles

The broadening consensus about the role of government policy in influencing structural transformation provides a firmer intellectual foundation on which to design industrial policies for promoting learning, strengthening capabilities and achieving successful catch-up growth. This section discusses some practical lessons and principles for developing effective industrial policy that can be distilled from the country studies presented in Parts II and III of this volume, as well as the wider literature, grouped under five themes: targeting, macroeconomics, trade, learning and capabilities, and institutional and policy design.

4.1 Targeting

Whether to target policy measures on favoured firms or industries has been one of the most contested questions in discussions of industrial policy. However, as Chang (2010), Stiglitz, Lin and Monga (2013) and others have noted, the distinction between "horizontal" measures (presumed to be neutral across sectors) and "vertical" measures (supporting specific industries) is something of a false choice, as even the most "general" policy measures favour some sectors over others. Perhaps the closest to neutral interventions are certain business climate measures. But beyond that there is little that is genuinely neutral. There is nothing neutral about basic infrastructure, for instance. A road favours certain regions and not others, a bridge favours certain communities and not others, a port can be equipped with container facilities or specialized grain conveyor belts. Decisions about infrastructure always involve some choice of priorities, and have differential impacts on different sectors and communities. Education and training are also often presented as neutral, yet this is far from the case. Training programmes are normally targeted at solving specific skills bottlenecks or skills mismatches in particular sectors. The choices between investment in primary, secondary and tertiary education have major implications for the capabilities profile of the labour force and the nature and range of options available for structural transformation, as Nübler argues in Chapter 4 of this volume. And even a particular exchange rate policy favours some sectors, industries, social groups or regions more than others, depending on how much that policy benefits or penalizes exporters, for instance. So, as Hausmann and Rodrik (2006) have argued, governments – even those that believe they are advocating "neutral" policies – are "doomed to choose".

In addition, outside the stylized world of rapidly clearing competitive markets, rents are a normal feature of a dynamic economic landscape. In a purely static framework, rents signal a move away from competitive market efficiency as a result of some kind of restriction on entry or exit that prevents the emergence of market-clearing prices and imposes large welfare losses. But rents associated with entrepreneurial innovation have always played a dynamic role in a capitalist economy. Schumpeter famously linked these to the process of "creative destruction". More generally, Ocampo and Taylor (1998, p. 1531) have argued that when the assumptions of perfect competition fail to hold, and in the absence of uniform enterprise responses and fully utilized resources, rents can accelerate capital accumulation, raise productivity and contribute to a more dynamic economic climate. Scholars of the East Asian experience have also insisted that the management of rents helped to boost capital formation and to direct it towards more dynamic sectors (UNCTAD, 1996). A similar lesson emerges from other experiences of successful development (Rodrik, 2003).

There have, however, been changes in the approach to targeting. The use of top-down planning mechanisms and selective tariff measures in support of infant firms has, over the years, given way to a more decentralized approach, using an expanded range of support measures and instruments which aim to build clusters and linkages. In this context, the management of rents has become more nuanced and developmental. The focus now is on targeted interventions to provide public inputs via budgetary allocations, or market interventions that relax sectoral constraints; promoting learning and skill development; addressing coordination problems in sectors to stimulate more effective collective action among private and public actors; and creating incentives for the exploration of new possibilities to expand the sector or cluster, including through exporting (Fernández-Arias, Agosin and Sabel, 2010).

The case studies presented in this volume show that selective interventions of these types have indeed been commonly used in the recent revival of industrial policy. The right question to pose when drawing lessons from these experiences is not so much whether to target, but how to achieve the most effective targeting in the light of the specific goals adopted by policy-makers and government officials. In the case of China, for instance, Dic Lo and Mei Wu show (Chapter 11) that the State has played a prominent role both in creating an enabling environment through more general measures and in a wide variety of direct interventions, including selective and targeted ones. The balance of these measures appears to have shifted over time, with the latter taking on increasing importance as China shifted towards its more export-oriented growth strategy in the early 1990s, targeting favoured sectors such as automobiles, semiconductors, and high-speed railways.

In Chapter 12, drawing on the South African experience, Nimrod Zalk shows how a more general policy approach adopted soon after the first democratic elections in the early 1990s, and strongly influenced by the Washington Consensus, coexisted with ad hoc support measures for specific sectors and entrepreneurs but, in the absence of clear priorities, failed to transform a lopsided industrial structure inherited from the apartheid era. Only since the adoption of the National Industrial Policy Framework in 2007 and discussion of industrial policy at Cabinet level in government has there been a more concerted effort to target both transversal and sector-specific constraints in key industries or groups of sectors, and to develop and implement detailed sectoral strategies.

A similar conclusion can be drawn for Brazil. In Chapter 10, João Carlos Ferraz, David Kupfer and Felipe Silveira Marques describe how that country, having switched in recent years between general and targeted industrial policy measures, has since 2004, with the strong backing of a powerful development bank (BNDES), begun to establish a more coherent policy foundation for targeted measures.

For many countries in sub-Saharan Africa (discussed by Tilman Altenburg and Elvis Melia in Chapter 13), proactive and targeted industrial policies need to be substantially different from standard industrial policy packages, given these countries' predominantly rural structure, poorly functioning markets and weak public institutions. Moreover, the bulk of non-farm employment is generated in small or micro enterprises; inter-firm specialization and collaboration are still weak; economic transactions are strongly influenced by informal institutions that are not necessarily well aligned with the prevailing governance principles of market economies; and social norms and values in some countries are not conducive to developing entrepreneurship. To overcome these constraints and nurture competitive industry and agriculture, the State needs to take a particularly active role to simultaneously raise productivity in the rural economy and kick-start industrial transformation. At the same time, industrial policy needs to safeguard the poor, whose livelihoods would be jeopardized by unfettered competition. The policy mix and the sequence of reforms need to be carefully tailored to country conditions. Also, intraregional differences in terms of resource endowments, geography and level of development need to be considered.

4.2 Macroeconomics and industrial policies

Traditionally, with a few notable exceptions, macroeconomic analysis and industrial economics have remained separate. This separation has often translated into a disconnect at the level of policy discussions and implementation, with macroeconomics being a matter for ministries of finance and central banks while industrial policy is left to the "production ministries". An early notable exception to this was the Latin American structuralist thinking reviewed by Ocampo in Chapter 1 below. As Ocampo explains, ECLAC's structuralism was closely concerned with the nexus between productive transformation and macroeconomic policies, and even had an "obsession" with the importance of maintaining competitive exchange rates as an essential ingredient of productive transformation, growth and export diversification. It also emphasized the importance of high levels of aggregate demand and appropriate levels of interest rates to underpin industrial development strategies and promote investment. This structuralist tradition also insists on the importance of using macroeconomic policies to manage business cycles and economic shocks with countercyclical policies, and on the wisdom of keeping well-calibrated capital controls in the toolbox of instruments to manage volatile capital flows.

These policy stances were vindicated before the recent financial crisis by research and experience showing, for example, that the real exchange rate is indeed one of the key determinants of economic growth (Rodrik, 2008). They were also supported with particular force after the crisis by the superior performance and faster recoveries in countries that used countercyclical macroeconomic policies. Indeed, since the crisis a major reappraisal of macroeconomic policy and its links with growth, recovery and productive transformation has been under way. Some of it has been led by IMF staff, revisiting the conventional wisdom on one-size-fits-all thresholds for inflation targeting, debt-to-GDP ratios and fiscal deficits, and redefining the parameters of what a pro-growth and pro-employment macroeconomic framework should look like in countries at different levels of development (Blanchard, Dell'Ariccia and Mauro, 2010; Blanchard et al., 2012; Blanchard and Leigh, 2013). In November 2013 the Federal Reserve Bank of the United States surprised the economic world with the announcement that unemployment would have to drop to 6.5 per cent before it would begin to raise interest rates, thereby forging a close link between monetary policy and an employment target (English, Lopez-Salido and Tetlow, 2013).

ILO work on pro-employment macroeconomic frameworks has explored ways in which macroeconomic policies can be more closely connected to the agenda of structural transformation and inclusive development. This work argues that macroeconomic policies should go beyond traditional stability objectives to also support structural transformation as well as employment objectives. This would require, among other elements, more flexible debt-to-GDP and fiscal deficit thresholds (Islam and Kucera, 2014). In the context of the jobs challenge faced in recovery from the crisis, the ILO has also pointed out that the slow pace of job creation, coupled with falling real wages in some countries and a lag between productivity growth and wage growth in leading economies, has depressed consumption and exacerbated the global weakness in demand. The specific lesson here is that a stronger policy package for jobs recovery requires a well-calibrated mix of both demand-side and supply-side policies in order to avoid a slow growth trap (ILO, 2013 and 2014). The general point is that high and sustained levels of demand (both consumption and investment) are of critical importance to underpin growth and jobs, as well as productive transformation, in both the short and the longer term (UNCTAD, 2013).

Several of the chapters in this volume refer to the links between macroeconomic policies and productive transformation. Astorga, Cimoli and Porcile show in Chapter 3 how the wrong combination of macroeconomic and industrial policies can put an economy on a development path which imposes a socially unhealthy choice between rising employment and rising wages, and runs the persistent danger of falling into a vicious circle of weak demand, sluggish productivity growth and stalled structural change.

Lo and Wu in Chapter 11 explicitly connect the evolution of productive transformation policies in China with fiscal and social policies. They show that in the second half of the reform era, from the early 1990s onwards, public finance predominated in massive investment in infrastructure and industrial upgrading. This gave rise to the path of capital-deepening, investment-led industrialization, carried out mainly by state-owned enterprises in a number of basic industries and by transnational corporations in higher-technology industries. Combined with a ready supply of cheap labour, these investments propelled a strong export drive. Around 1998–2002 China's state leadership adopted a policy shift under the new policy line known as "constructing a harmonious society", which widened the previous narrow focus on market reform and growth to pay more attention to social and environmental outcomes, in particular growing inequality and worsening social polarization. This new policy line emphasized a better alignment of labour compensation with productivity growth, rather than pursuing growth based on "cheap labour". Specific policies adopted within this new perspective include measures to strengthen labour rights (including the promotion of trade unions), the enforcement of proper employment contracts and the implementation of minimum-wage legislation. These policies also fit the more recent drive to rebalance growth in China by paying more attention to the role of the domestic market, and not just the export sector, as a driver of growth.

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4.3 Trade and industrial policies

One of the most difficult policy areas in economic debate on effective and balanced productive transformation is international trade. The literature on the links between trade openness, structural transformation and economic growth is vast. Very broadly, the evidence shows that most successful economies have used smart combinations of trade opening, export promotion, and support and protection for infant industries as part of a wider set of policies to stimulate structural transformation. Consequently, trade reforms should not be pursued as stand-alone goals and need to be accompanied by other policies: infrastructure, education and training, enterprise development, entrepreneurship, innovation, finance and indeed social policies (Jansen, Peters and Salazar-Xirinachs, 2011).

In a world where trading advantages are created rather than given, and both economies of scale and learning are key to sustained growth and structural transformation, gaining market entry is a challenging exercise that depends not only, or even principally, on flows of FDI but mostly on local firms emerging successfully from an expanding domestic market and connecting with regional and global value chains. Historical legacies (and accidents) can have long-run economic consequences, and "market forces do not select a single, predetermined outcome, instead they tend to preserve the established pattern, whatever that pattern may be" (Gomory and Baumol, 2000, p. 7). This would suggest that a "win–win" outcome is just one among a range of possibilities in a more open trading system and that international market forces, in conjunction with varying national capabilities, can produce results that are beneficial for some but detrimental to others. Certainly, posing the policy issue as a contest between import substitution and export-led industrialization models is misleading. .

The disparate experiences described in this book reinforce the need for a strategic approach to trade policy and a close link between trade and competitiveness policies. In a number of the cases discussed, countries have followed the kind of shock therapy that was part of the Washington Consensus without concomitant attention to their dynamic competitiveness and have, as a result, discovered that the combination of rapid trade liberalization with limited public investment leads to serious bottlenecks in infrastructure and human capital and a deficient investment climate, and that, even when this policy approach generates static gains, it can also destroy existing industrial capacity and undermine prospects for future industrial development. The lesson seems to be that policy-makers need to develop balanced packages of trade and competitiveness measures, and that sequencing and timing issues are fundamental to successful outcomes, as are relationships with complementary structural policies, the development of education and skills, and the maintenance of competitive exchange rates. The individual chapters in this book provide plenty of food for thought about appropriate trade policy mixes to accompany processes of structural transformation and catching up.

Successful exporting is itself contingent on a favourable investment dynamic. As incomes increase, rising labour costs and the entry of lower-cost producers can rapidly erode the competitiveness of labour-intensive manufactures, creating a need for new investments to maintain productivity growth and to enable upgrading to higher value added activities. These familiar challenges have taken on a new guise with the growing prominence of GVCs and production networks. According to some (see Baldwin, 2012), the spread of GVCs heralds a "great economic transformation" from a world in which trade took the form, primarily, of finished goods moving between countries, to a new "21st century world" involving continuous "two-way flows of things, people, training, investment, and information" within GVCs organized by transnational corporations. With the Doha Round of international trade talks in limbo, this agenda has been promoted as a way to breathe new life into trade liberalization at the multilateral level (Lamy, 2012). The GVC approach could also, however, help in a different direction by generating new insights into what kinds of public policies can strengthen local industrialization efforts, build productive capacities and create jobs.

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Milberg, Jiang and Gereffi (Chapter 5) are optimistic about the opportunities that GVCs offer, but, as also recognized by Ocampo in Chapter 1, the economic fragmentation that accompanies participation in these chains may also pose new obstacles to diversification and technological upgrading, especially in middle-income countries. In particular, the link between the technological content of export products and production activities may be broken. Thus, the specific task that is undertaken in a given place may be characterized by low technological content even if the final output of the value chain is a high-technology good. Alternatively, the task (e.g. garment design) may have high technological or human capital content even if the output (in this case, apparel) is classified as a low-technology good. The authors, accordingly, see the "upgrading" challenge within value chains as a multifaceted one for policy-makers in developing countries, requiring a policy approach that will not only better accommodate the demands and strategies of "lead" firms but also promote innovative economic and social measures locally, such as those to support domestic enterprises in linking up with lead firms in the value chain. They suggest that the regional setting could be the right level for expanding industrial policy options in an era of vertical specialization.

4.4 Learning and capabilities

High-performance growth and productive transformation relate to two distinct, yet closely interrelated, processes: building *capabilities* through learning; and accumulating productive *capacities* by investing in physical and human capital. Countries can only catch up when they acquire the capabilities required to adopt advanced technologies and shift into new industries. A critical question for policy-makers is therefore how to build up collective capabilities that allow countries to trigger a process of structural change, and then how to continuously enhance such capabilities to sustain productive transformation.

In Chapter 4 below, Nübler develops a concept of collective learning as one component of her theory of capabilities with a discussion around the question of how to design and implement learning strategies, and provides a framework within which such learning strategies can be explored. She argues that learning to create capabilities for productive transformation is a complex process and needs to occur at different levels and in multiple places: enterprises, education and training systems; social networks such as professional communities; organizational networks such as public–private partnerships and value chains; and public policy institutions. Key points for learning strategies include the following:

(1) formal educational attainment structures are important determinants of the feasible options for productive transformation; (2) manufacturing is a type of economic activity with a particularly large potential for technological learning, and industrial policies that promote manufacturing are accordingly a key element of national learning strategies; (3) belief systems play an important role in technological and economic development as they determine choices and behaviour; (4) exporting and value chains can become major channels and networks for learning; and (5) learning to learn, through the evolution of high-performing learning procedures and institutions, is essential to accelerate and sustain learning processes at the levels of individuals, organizations and societies. Governments can play a role in catalysing or accelerating learning processes through policy formulation and supporting the development of an institutional environment which provides incentives and pressures to firms and societies to learn, as well as by providing direct support for learning along these different channels. The concept leads to the argument that governments need to promote high-performing collective learning processes as an integral part of industrial and economic development strategies.

The chapters by Paus, Cheon, and Vijayabaskar and Babu respectively analyse the strengths and weaknesses of specific strategies and institutions designed to promote learning for rapid catching up in three different countries. In Chapter 6, Eva Paus analyses the case of capability building in Costa Rica during the period of ISI (from the early 1960s to the early 1980s) and during the transition towards the new economic model (NEM). She concludes that substantial social capabilities were developed under ISI, but that this ceased under the NEM, while under both models the development of local firm capabilities has been limited. She argues that Costa Rica's export success does not translate into unequivocal development success, because the country's export growth and transformation have been driven by foreign producers, while the domestic production sector has become increasingly dualized, with a limited number of companies becoming internationally competitive and a huge number of small and medium-sized enterprises (SMEs) producing for the domestic market with low productivity. This is the result of a stark contrast between the government's consistently proactive policies to attract foreign investment and a lack of coherent and equally proactive policies in support of the development of local firm capabilities, combined with underinvestment in education, infrastructure and R&D under the NEM. The country's institutions have been much less "smart" in creating and sustaining high-performing learning processes at the domestic enterprise level than in attracting FDI in medium- and high-technology activities. Paus concludes that Costa Rica needs to address three major challenges: (1) tackling the dual nature of the production sector by improving the capabilities of SMEs and supporting a more aggressive national innovation strategy; (2) improving policy coordination and articulation to redress the marked fragmentation of efforts and competences in the public sector relating to productive transformation and competitiveness policies; and (3) mobilizing taxation to finance the required level of capability accumulation, as the tax ratio is below that of countries with similar income per capita, and there is underinvestment in infrastructure, innovation and capabilities.

In Chapter 7, Byung You Cheon examines the successful catching up of the Republic of Korea from the mid-1960s through to the 1990s, with particular emphasis on how education and training policies and institutions were coordinated with industrial policies and adapted over time to new conditions. The author argues that the economic "miracle" was accompanied by an education "miracle" in the sense that the education and training system was organized specifically to serve the need of the economy for a highly skilled workforce. Thus the knowledge structure in the labour force, characterized by a "strong middle educational attainment structure" (Nübler, forthcoming), was of critical importance to enlarging the options for industrialization and avoiding skills mismatches in the targeted industries despite their unprecedented growth. Furthermore, education and training policies, combined with social policies and increasing wage levels, created a more equal income distribution, which in turn provided strong incentives for further investment in skills development. Education and training policies were successful in developing the skills required for rapid catching up as well as in matching the demand for and supply of skills necessary for industrial upgrading. The chapter also analyses the country's policies towards R&D and innovation. Investment in these collective capabilities ensured a rapid and sustained process of industrial and technological development, the generation of jobs, and the transformation of the employment and occupational structure. Finally, the author argues that the country's education and skills development system faces serious challenges in developing the new capabilities required for shifting into the knowledge economy and developing advanced technologies. Cheon identifies in particular the need to develop institutions that can effectively align industrial development with education, training and R&D policies, to design sophisticated incentive systems and to emphasize private sector participation and social partnership between stakeholders.

Chapter 8, by Vijayabaskar and Babu, explores the process of capability formation behind the success story of the Indian software industry. It analyses how various institutional mechanisms and policies fostered the necessary accumulation of capabilities to grow and upgrade the industry at the national, value chain

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and firm levels. A key element was the development of a labour force endowed with a specific mix of knowledge, skills and competences. This particular knowledge structure enabled India to take advantage of the window of opportunity opened up by the high demand for software services arising from the Year 2000 problem. The study shows that a large part of learning, in particular the acquisition of tacit knowledge and the development of enterprise routines, took place in organizational networks such as joint ventures and value chains, as well as in social networks embracing the information technology diaspora, in particular in Silicon Valley in the United States. National, sectoral and international institutions are shown to have played a key role in promoting rapid learning by setting and enforcing standards. The authors also stress the important role of standard setting in providing incentives to individuals, firms and organizations to learn and to develop the capabilities that have continuously opened up options and competences to diversify and to upgrade technologies within the software industry.

In Chapter 9, Fortunato and Razo also highlight the importance of capabilities development in industrial development strategies. They undertake regression studies to analyse the potential of developing countries to make the transition to middle- and high-income levels. Starting from the finding that a country's relative level of export sophistication has significant consequences for subsequent growth, the authors undertake a regression study of dynamic variations in export structures and the likelihood of a country remaining trapped at intermediate levels of income.

Fortunato and Razo group countries on the basis of their export sophistication and calculate the transition probability of each country, that is, the probability that it will move up into a group with greater export sophistication; they then estimate how the probabilities of transition between different groups change through time. Their results reveal several significant trends. One is that a substantial number of countries will rise from the lowest to the middle export sophistication groups, while only a few will make it into the highest sophistication group. This implies that many developing countries are at risk of falling into the middle-income trap and being unable to shift their production to highly sophisticated products over the next 30 years.

The authors apply the framework of capabilities provided by Nübler in Chapter 4 in this volume to interpret these findings. They conclude that continuous investment in new activities is crucial to climbing the ladder of sophistication and to fostering development, and that this requires the continuous transformation and building of collective capabilities. Capabilities, however, are not created automatically; deliberate policies and learning strategies are required to continuously generate capabilities as part of an industrial development strategy.

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4.5 Institutional and policy design

Structural transformation advances by means of both creative and destructive forces that inevitably produce surprises, create tensions, trigger conflicts and generate trade-offs, all of which pose challenges for policy-makers. Managing this process effectively requires countries to engage in a certain amount of experimentation in seeking the configuration of institutions and policies that will work best in their national conditions and accommodate the necessary transitions and adaptations. A readiness to embark on such experimentation and flexibility are essential to successful operation in an uncertain and rapidly changing world. Equally essential, to maximize the chances of success, are strong social dialogue institutions to discuss and manage difficult transitions.

This experimental and adaptive approach is often associated with the developmental states of East Asia. But even in Latin America, where a narrower ISI-based approach predominated, industrial policies were modified over time to correct excesses and to take advantage of new export opportunities. As Ocampo points out in Chapter 1, from the 1960s onwards thinking in ECLAC began to evolve away from ISI, becoming critical of the excesses associated with those strategies, towards a "mixed" model that combined import substitution with export diversification and regional integration. This eventually led to the region's widespread adoption of export promotion policies.

Like all policy-making, industrial policy has both a technocratic and a political economy dimension. *Technocratic knowledge* of the issues at hand, and the corresponding capabilities, are certainly needed and should be institutionally embedded to ensure effectiveness and the requisite degree of continuity beyond immediate political expediencies and cycles. Building a qualified and dedicated bureaucracy with sound knowledge of the portfolio of policy instruments at its disposal, including carrots and sticks, is part and parcel of the structural transformation challenge. The *political economy dimension* stems from the fact that specific governments, agencies and bureaucrats are embedded in evolving economic, political and social arrangements; as a result, what works in one period may fail in another. Successful economies are those that have or develop the capacity to adapt their institutions and behavioural conventions to changing economic circumstances and evolving political and social preferences (North, 1993). This means that, beyond a few core elements, there is no single homogeneous model of State–market relations that underpins the "right" industrial policy approach in any particular context.

Selective industrial policies require strong counterparties, including private sector organizations able to articulate and prioritize needs at the sector/cluster level and, on the public side, strong coordinating agencies, as well as knowledge

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and service agencies to support the policies with the right thematic expertise. Public institutions have the advantage of being less subject to short-term market pressures or the demands of shareholders than private sector bodies, and thus better able to take a more expansive view, in terms of both a longer time horizon and a wider public interest perspective. However, these institutions face their own problems, not least the dispersal of responsibilities among several agencies and ministries, when coherence across the system is essential to ensure effective policy-making. They are also vulnerable to capture by the very agents (whether firms or industries) they are trying to encourage and support.

Avoiding or at least minimizing these risks requires effective mechanisms of voice and collaboration, both across the relevant public institutions and between these institutions and the private sector. Such mechanisms are key to creating an entrepreneurial ecosystem in which familiarity and trust encourage investment in the capabilities needed to generate new competitive activities, while dialogue and feedback help to correct mistakes and minimize their costs, reducing the likelihood of abuse and capture. Much has already been learned about how to design incentives and institutions to avoid abuse and capture (Rodrik, 2007). If these lessons are to be put into practice, industrial policy has to be coupled with a good deal of discipline and accountability, applied to both private actors and the State. Amsden (2001) has referred to the need for "reciprocal control mechanisms", a set of institutions that discipline economic behaviour on the basis of feedback information that has been collected and assessed. The most successful industrializers were able to abandon projects that were not performing adequately, whereas in less effective systems failing projects persisted because bureaucrats had been hijacked by business interests that became dependent on the state. Desirable features of good incentive programmes include standard setting, automatic sunset clauses, built-in programme reviews, monitoring, the establishment of clear benchmarks for success or failure, and periodic evaluation exercises. These and other instruments can be used to limit the likelihood of abuse in implementing proactive policies based on strong public–private cooperation. Their application, of course, requires competent public agencies and effective coordination. Here the technocratic and political economy dimensions interact closely.

Much of recent industrial policy has been concerned with mobilizing the participation of a wider set of relevant actors beyond business leaders and national policy-makers, to include academics, trade unions and civil society groups, not only at national but also at regional and even municipal level. In the case of China, for example, the importance of local and regional decision-making is emphasized by Lo and Wu (Chapter 11). What is needed is a level of agency that can adopt a public policy, systemic and long-term point of view, rather than just

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a firm-level, sectoral or short-term perspective. All these actors have a legitimate role to play in policy-making for productive transformation, and the consistent exercise of this role requires effective coordination mechanisms, such as national competitiveness councils, sectoral councils or committees, informal networks of communities of practice, and public–private partnerships. Disciplines and rules to govern the interaction between the different players are also essential. Recent experience in Latin America, as documented by Devlin and Moguillansky (2011), further suggests that efforts to move in the direction of stronger public–private partnerships mark an important step forward in industrial policy design in the region.

The importance of strong coordinating institutions is clearly demonstrated in Robert Wade's discussion of the hidden developmental state in the United States (Chapter 14). Wade argues that industrial policy should not be taken to mean only the formulation by centralized coordination agencies of national "visions" and national programmes to develop specified industries (though at times the US development model has followed such lines), and that the absence of these features does not necessarily mean that there is no industrial policy. As an alternative, he refers to the role of "network-building" industrial policy, whereby state and city governments as well as federal institutions have, in collaboration with scientific, financial and business interests, forged a more effective platform for developing and commercializing new products and processes. Wade calls this "the developmental state in disguise" and argues that, by hiding its support programmes, it has paradoxically helped to perpetuate the myth that the United States has no industrial policy. Wade gives several examples of US-style industrial policy in action, including high-tech public venture capital funds linked to military use, and discusses the causes and effects of these programmes. He backs the claim that US governments – including state and city governments as well as the federal government – have undertaken much more industrial policy than the standard narrative concedes, with generally net positive effects according to a national interest test.

Any policy regime requires some metric of performance. This is particularly true in the case of industrial policy. Critics have argued that even a strong and capable State will have difficulty imposing discipline on the beneficiaries of state support because measuring performance, in order to reward good performance and punish bad, is complex and difficult. But while it may be difficult, it is not impossible. Countries that want to engage in ambitious industrial policy programmes should create a culture of systematic and rigorous evaluation of impacts. In fact, a structured system for monitoring and assessing programmes is a key ingredient for good policy in general, not just for industrial policy.

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Structural transformation is a demanding and difficult process that requires a degree of social consensus and popular assent. Institutions for consultation, discussion, participation and social dialogue at all levels should be engaged in the process of structural change.

5. Final remarks

This volume seeks to restate the case for industrial policy by: (1) presenting the relevance of different economic traditions, all of which can contribute to the analysis and design of industrial policy, and recognizing that in recent years there has been some degree of rapprochement between them, based partly on a better understanding of the record of success and failure of industrial policy; (2) making the case for the importance of a number of key lessons and principles that have proved valuable in promoting productive transformation (the need for coherent, integrated, multisectoral frameworks, setting about targeting in the right way, pursuing a better marriage between trade, macroeconomic and industrial policies, and promoting learning and productive transformation as interrelated processes); and (3) exploring the link between productive transformation, job creation and employment growth, a link which tends to be weak in the current literature.

In addition to providing an overview of the main frameworks and issues that arise from the case studies presented in the book, this introductory chapter has made an effort to distil some general lessons and principles on *how to get the policy process right*. We have argued that this requires taking institutional design seriously; measuring performance in order to learn from experience and ensure discipline; being pragmatic and flexible over time; and taking voice seriously by promoting consultation, participation and social dialogue at all levels, as well as keeping industrial policy honest. But then, these are good principles in all policy areas, not just for industrial policy.

As Rodrik (2007), Chang (2003), Bairoch (1972) and others have argued, if countries that have been successful in catching up had actually applied the prevailing market orthodoxy, they would not be success stories today. They were successful because their governments were both unorthodox and pragmatic in their approaches. They experimented with different forms of sectoral, trade, education, technology and macroeconomic policies that allowed them to launch and manage a sustained process of structural transformation and capability building, and they learned from their mistakes and adapted policies accordingly. They applied the principle that "the market is a good servant but a bad master" and, to paraphrase

Robert Wade (1990), they adopted institutional mechanisms and policies to "govern the market" in transforming their economies without losing sight of the wider policy challenges that contribute to building prosperous, stable and inclusive societies.

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Part I

Productive transformation: Models and policies

Latin American structuralism and production development strategies

1

José Antonio Ocampo

Contents

1.1 Introduction

The recent international financial crisis has put macroeconomic analysis to a test. As in the Great Depression of the 1930s, the orthodox economic ideas about self-regulating markets that had prevailed in the years leading up to the crisis have been severely questioned. As a result, Keynesian thought, which had been born in the 1930s, has experienced an important revival – even if it has not always been followed in practice by policy-makers. In particular, Keynes' emphasis on the inherent instability of financial systems and the role played by aggregate demand in determining the levels of economic activity and employment have come back with significant force.

For the developing world and for Latin America in particular, crises have also spurred the development of new economic ideas and policies. The Great Depression of the 1930s planted the seed for the school of economic thought that was later developed at the United Nations Economic Commission for Latin America and the Caribbean (ECLAC) under the intellectual leadership of Raúl Prebisch and that would eventually come to be known as Latin American structuralism.

Macroeconomic analysis arose out of the need to understand short-run macroeconomic dynamics, but later came to encompass the analysis of economic growth. The core ideas in this respect emerged in the 1940s and 1950s and were elaborated upon in the following decades. The idea that took centre stage had to do with the role of technological change, although also with the importance of physical and human capital formation. For developing countries, this analysis was mixed from the start with three other concepts: (i) the role of surplus labour and the dualism in labour markets that it engenders; (ii) balance of payments constraints in both the short- and long-term macroeconomic dynamics; and (iii) the crucial role of industrialization as a mechanism for the transmission of technological progress. This last mechanism operates, in part, via investment in machinery and equipment, but also via production linkages and dynamic economies of scale generated by the learning processes associated with industrialization.

ECLAC and structuralist economic thinking have been in the past, and remain today, at the centre of this debate. This chapter deals with one particular aspect of Latin American structuralist thinking: the relation between economic growth and production structures. Section 1.2 summarizes the main contributions made by ECLAC and its main intellectual father, Raúl Prebisch, to this debate. Section 1.3 presents a detailed analysis of the relationship between economic growth and the production structure. Both sections make brief references to Latin America's experiences. Section 1.4 draws some brief conclusions.

1.2 ECLAC, macroeconomic analysis and structural change

At the risk of oversimplification, ECLAC's major contributions to macroeconomic thought revolve around two concepts. The first has to do with the crucial role of the balance of payments in shaping the business cycle in developing countries and, hence, the role that policies affecting the balance of payments have in managing the business cycle. The second is the link between long-term growth and the transformation of production structures, with industrialization as the most prominent feature of such transformation. Both of these ideas have implications for state intervention. They are also linked to a conceptualization of the international economic order as a system composed of a centre and a periphery, in which business cycles and technical progress originate in the centre and are then propagated to the periphery. At least two more ideas could be added: the need to develop appropriate financing mechanisms to facilitate the structural transformation, and what has come to be known as the structuralist theory of inflation. For the sake of brevity, however, this chapter will not deal with these issues.

Traditional macroeconomic analysis has developed the concept of "fiscal dominance" to refer to situations in which monetary policy and macroeconomic dynamics as a whole are determined by public finances. The concept developed by ECLAC might, by analogy, be referred to as "balance of payments dominance" in short-run macroeconomic dynamics (Ocampo, 2013). This implies that the basic task of macroeconomic policy in developing countries is to devise ways of moderating external aggregate supply shocks generated through the balance of payments rather than managing aggregate demand. The former is determined largely by export earnings, the supply and cost of external finance and their impact on domestic interest rates, and the effects of both exports and external financing on the exchange rate.

It is not surprising that the management of balance of payments shocks became the focus of macroeconomic policy in Latin America. The types of measures used for this purpose in the past came to include, with some differences from country to country: foreign exchange and capital account management; import duties and quantitative import restrictions; taxes on traditional exports combined with incentives for non-traditional ones; multiple exchange rates; and, from the mid-1960s on, gradual devaluations (crawling exchange rate pegs). Starting in the 1970s, most of these policies were dismantled during the liberalization process, leaving a single tool – the exchange rate – to manage balance of payments. In several cases, this policy instrument was diverted to support anti-inflationary programmes, leading to situations in which no policy instrument was effectively assigned to manage external shocks.

As can be seen from the types of measures used, they were closely linked to the second component of macroeconomic policy, for which the focus was long-term growth: the industrialization strategy. The basic idea underlying this policy was that growth is a process of structural change in which primary sectors give way to modern industries and services and in which industrial activity is the main channel for the transmission of technical progress from the centre to the periphery – a process that Prebisch characterized as "slow and irregular".

The complexities associated with this process were related to the management of economies whose static comparative advantages clearly lay in the production of primary commodities. In the classic ECLAC approach to the subject, industrialization strategies were also tied to the assumption that there was a secular downward trend of commodity prices. However, at least in the way it was framed at the time, this postulate has not been borne out by the facts. Indeed, the empirical evidence shows that, while real commodity prices fell through the twentieth century (but not in the nineteenth century), it was not a steady trend but rather the result of two sharp declines during the early 1920s and the 1980s (Ocampo and Parra, 2010). A much more solid line of reasoning is based on the fact that different sectors of the economy have very different capacities for transmitting technical progress and for generating new knowledge. Indeed, this classical justification for industrialization did not rely on the existence of a downward trend in commodity prices. Moreover, in the 1930s or immediately after the Second World

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War, there was little need to champion domestic-based industrialization versus production for the international market since, in the wake of the collapse of the world economy, the only opportunities available were, by and large, those offered by domestic markets.

According to this approach, which was best expressed in the "Latin American manifest", as Albert Hirschman dubbed the report issued by the Economic Commission in 1949 (Prebisch, 1973), the solution was not to isolate the region's economies from the international economy, but rather to *redefine* the international division of labour so that Latin American countries could also reap the benefits of technological change, which they rightly saw as being closely associated with industrialization. In other words, this strategy sought to *create* new comparative advantages. Industrialization policies were modified as time passed in order to correct their own excesses and to take advantage of the new export opportunities that began to open up in the world economy in the 1960s. From that point on, ECLAC thinking began to evolve from an import-substitution strategy (with the institution becoming critical of the excesses associated with it) to a "mixed" model that combined import substitution with export diversification and regional integration.[1] This eventually led to the region's widespread adoption of export promotion policies, a simplification of the complex system of tariffs and quantitative import restrictions, the streamlining or elimination of multiple exchange rate systems, and the introduction of crawling pegs in economies with a long history of inflation.[2]

An inherent problem in dealing with the intersection between factors influencing business cycles and long-term growth was that the changes in relative prices generated during the upward phase of external cycles make it difficult to hold to the industrialization strategy. Commodity price booms tend to generate incentives to return to a heavier reliance on primary production, both via rising international prices and through the effects that commodity price booms have on exchange rates.[3] Both of these factors tend to exert downward pressure on the relative prices of manufactures. Capital account booms often coincide with upswings in commodity prices and have similar effects on the exchange rate. In the past, the policy tools devised to manage commodity price booms included

[1] For histories of the development of ECLAC thought, see Bielschowsky (1998), Rodríguez (2006) and Rosenthal (2004). In relation to the ideas on regional integration, see also Salazar-Xirinachs (1993). For a review of the first half-century of the *Economic Survey of Latin America and the Caribbean*, see ECLAC (1998b).

[2] See Ffrench-Davis, Muñoz and Palma (1998); Ocampo (2004); and Bértola and Ocampo (2012).

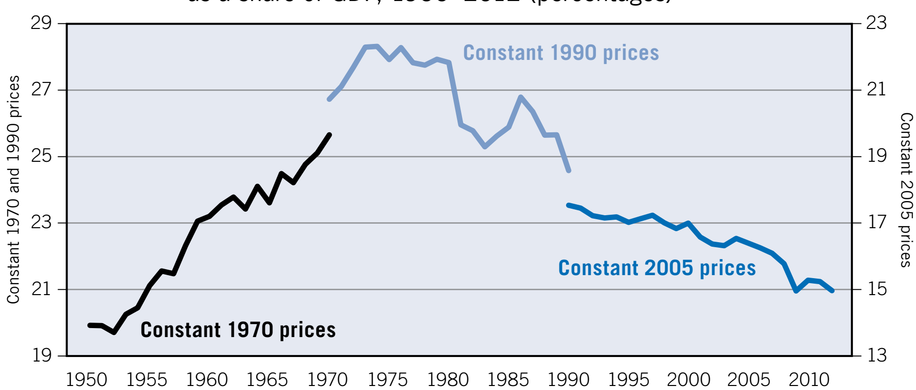
[3] See analysis on Dutch disease effects in Altenburg and Melia, in this volume.

taxes on commodity exports, multiple exchange rate regimes that discriminated against those exports, and incentives for non-traditional exports, while capital controls were designed to deal with shifts in financing cycles. The dismantling of most of these policy instruments led to a situation in which, too often, governments came to reinforce the effects of external shocks with procyclical macroeconomic policies.

The industrialization strategy entailed a range of other elements, including the need to raise the rate of investment in manufacturing and physical infrastructure. This gave rise to a demand for multilateral external financing and to the development of domestic mechanisms, notably development banking and direct investment by the State in infrastructure and some industrial activities. In any case, the level of investment varied sharply across the region. For the sake of brevity, however, these topics will not be explored here.

Despite inefficiencies associated with high levels of protection, state-led industrialization was in many ways a very successful story. It led to the fastest rate of growth in Latin American history between 1945 and 1980, which was accompanied by rapid rates of human development and reduction in poverty levels (Bértola and Ocampo, 2012, Ch. 4). However, this process reached a plateau in the second half of the 1970s (figure 1.1), and was followed by a premature deindustrialization, in the sense that the share of manufacturing in GDP started to fall at lower levels of per capita income than had been typical of patterns in advanced countries. This process was set off by the joint effects of the debt crisis of the 1980s and the liberalization process that started in the mid-1970s in a few economies and spread throughout the region from the mid-1980s.

Figure 1.1 Latin America: Manufacturing value added as a share of GDP, 1950–2012 (percentages)



Source: Author's estimates, based on ECLAC data.

In the midst of the liberalization process, ECLAC produced its groundbreaking study *Changing production patterns with social equity* (ECLAC, 1990), which marked the beginning of a complete reworking of ECLAC thinking that has exhibited a remarkable degree of continuity over the past quarter century. In line with the proposals concerning economic growth that it put forward in its seminal 1990 study, ECLAC (1998a, 2000, 2007, 2008 and 2012) developed an agenda for production sector strategies in open economies. The point of departure for this agenda, as well as for the Commission's more classic contributions, was the idea that development is a process of structural change in which progress hinges on the economy's ability to develop technologically advanced production sectors. Accordingly, together with the promotion of more competitive production structures and "horizontal" policies to correct market failures in factor markets,[4] ECLAC proposed a series of policies for developing more dynamic production structures by fostering innovative activities with higher technological contents (national innovation systems) and promoting exports (diversification of export products, domestic export linkages and the conquest of new markets). It also suggested ways of developing inter-sectoral synergies and complementarities in order to achieve "system-wide competitiveness", which was the seminal concept put forward in *Changing production patterns with social equity*.

The major constraint on the adoption of this policy was the institutional void created by the elimination of the mechanisms for supporting production sectors as the result of liberalization policies. ECLAC advocated the idea of forming public private partnerships (which each country should establish in line with its own characteristics and development history) to rebuild these institutional frameworks. The destruction of earlier institutions and the failure to build others to replace them were seen as the root causes of the fragility of the region's production structures. This strategy was also tied in with short-term macroeconomic policy because of the institution's obsession with maintaining competitive exchange rates, which were viewed as an essential ingredient of proactive policies to foster production sector diversification.

The recent return of attention in the region to industrial policies has validated ECLAC's approach. In particular, the widespread acceptance in the past few years of innovation strategies reaffirmed the validity of the approach that ECLAC advocated during Latin America's industrialization stages and which it continued to endorse and to adapt to changing circumstances generated by deeper integration into global markets.

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[4] These policies focused on providing credit to small and medium-sized enterprises (SMEs), long-term financing as well as technology, skilled human resources and land.

1.3 Economic growth and structural change

1.3.1 Patterns of specialization and economic growth

Economic growth is invariably accompanied by changes in production structures: changes in the composition of GDP and employment and in international specialization patterns. In addition, in developing countries, gains in productivity through the development process are linked to shifts in labour from low- to high-productivity sectors, as noted in classic development theory and discussed by Ros (2000). Most traditional studies portray changes in structures as simply a by-product of growth. In the structuralist view, on the other hand, these changes are neither mere by-products nor neutral in terms of their effects; quite to the contrary, they are the actual *engines* of economic growth. Seen from this perspective, development can be equated with an economy's capacity to generate new dynamic production activities (Ocampo, 2005). By the same token, the absence of growth is linked to an interruption of the process of structural change.

In industrialized countries the process of economic growth is driven by technological change. Since the generation of technology continues to be highly concentrated at the world level, it creates a world centre–periphery system. In developing countries, growth is driven by the capacity to absorb, with a lag, these technological changes and economic activities as they become mature and are gradually transferred to the periphery, or by the capacity to respond to the demand for commodities created by economic expansion at the centre. The transfer of technology and production activities is not a passive process: it entails an effort to develop new industries, including those attracted from industrial countries, as well as an active technological learning process (Katz, 1987). If efforts to narrow the technological gap succeed, these lags will be reduced and developing countries may become secondary sources of technology.

This emphasis on changing production structures is closely tied with the need to increase investment. Rapidly growing economies also have high investment rates, but this link is much less systematic than the one that exists between economic growth and structural change (Ocampo, Rada and Taylor, 2009, Ch. 3). This is because high investment rates are actually more of an effect than a cause of dynamic economic growth and associated structural change. This is why more attention will be devoted here to structural change than to investment. There can be, of course, other determinants of capital formation, in particular factors related to appropriate financing mechanisms.

There are a number of reasons why economic growth and changes in production structures are interrelated. The first explanation, which has the longest history in development thought, is that different branches of production create very different opportunities for generating and transmitting technical progress and, hence, for boosting the economy's productivity. The classic defence of industrialization made the argument that industrial activities were the best channel for transferring technology and spurring other innovations. Some primary-sector activities, such as agriculture and mining, may also experience steep increases in productivity, but they have been less effective in transmitting those increases to other sectors of production.

This leads us to the second explanation, which has to do with different sectors' production linkages. The more traditional sorts of linkages, which are the type focused on by Hirschman (1958), are created by the demand that a new activity generates for others (backward linkages) and the opportunities that it offers for the development of other activities (forward linkages). The key feature to notice in this connection, as well as in the case of the transmission of technical progress, is that these effects are confined to a single geographical area (a country or a region within a country) and do not radiate out to the rest of the world, as tends to occur in an increasingly integrated world economy.

A type of linkage identified more recently has to do with what Hidalgo et al. (2007) call the "product space". In these authors' view, the factors and inputs used in a given branch of production are invariably specific in nature, such as particular kinds of production plants or facilities, workers with certain types of skills and specific intermediate inputs. Consequently, they cannot be directly shifted over to other economic activities except at the cost of lower levels of productivity. They can, however, be used or adapted for use in activities that are in the nearby "product space". In this view, a production activity's capacity to innovate and diversify will depend on what activities are "nearby". Thus, depending on the "density" of nearby production activities (the authors use the metaphor of a forest which is more dense in some areas and sparser in others), they will generate very different opportunities for the diversification of production.

These two phenomena, which, in a broad sense, can be referred to as *innovations* and *complementarities*, should be the essential focus of any production development strategy. In this context, the term "innovation" should not be understood as being restricted to technological innovation, but should instead be interpreted in a broad sense, as referring to new types of activities. It thus includes not only technology (new production processes, new products and higher quality of existing products), but also new ways of marketing and the conquest of new markets, new ways of managing or structuring firms or industries, and the development of new sources of raw materials. This approach, advocated in an earlier paper (Ocampo, 2005), is also the one used by Australia and New Zealand in their innovation policies (ECLAC, 2006, Ch. V).

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The interrelationship between innovations and complementarities is the source of most externalities and, hence, of market failures (coordination failures and information leakages, including technological diffusion). A key problem lies in the interrelationship among the investment decisions of different economic agents, since, in the absence of coordination among those agents (which the market does not guarantee), investments may not be made in new activities if the benefits cannot be fully appropriated by the innovator, or may be made at suboptimal levels. The "new information" (technological but also information about potential markets) may be costly for the agent who needs to acquire it, while the benefits may largely be appropriated by other agents. As a result, the investment made in acquiring that information may be suboptimal.

There is plentiful evidence of a link between specialization patterns and growth rates. In the recent literature, Hausmann, Hwang and Rodrik (2007) have made what is perhaps the most ambitious effort to demonstrate that the technological content or "quality" of countries' exports is a fundamental determinant of their growth. These authors estimate that content as the "income level" that is incorporated into a country's exports (the value of exports, weighted by the income level of the countries that typically export those same products). Lederman and Maloney (2012) present some caveats on these results and emphasize that *tasks*[5] incorporated into a country's exports rather than goods is what matters, and that there are particular benefits to those that incorporate a higher content of human capital as well as goods that have the possibility of quality upgrading.

Ocampo, Rada and Taylor (2009, Ch. 4) engage in a simpler exercise in which they estimate the relationship between economic growth and the dominant pattern of export development in terms of technological content using the categories proposed by Sanjaya Lall (2000). This exercise indicates that countries specializing in high-technology exports tend to grow the fastest, followed by those that mainly export intermediate- and low-technology exports, while countries whose export structures are based on natural resources tend to grow more slowly. This tendency is not as obvious during periods when commodity prices are high, which indicates that one of the reasons why, over the long term, growth based on high- and even low-technology industries is preferable, is that it relies less on price spikes or windfall profits and thus engenders a more stable development process. Interestingly enough, mid-level technology exports (which are partly composed of industrial commodities such as standardized iron and steel products and chemicals) do not enjoy those advantages.

[5] The phenomenon of "trade in tasks" is analysed in detail in UNIDO (2009).

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When value chains disintegrate, the link between the technological content of export products and production activities may be broken, especially in the case of maquila activities. So, the particular task that is undertaken in a particular place may be characterized by low technological content (e.g. pure assembly of imported parts) even if the final output of the value chain is a high-technology good. Alternatively, the task may have high technological or human capital content even if the output is classified as a low-technology good (e.g. design of apparel). Furthermore, in maquila activities, and more generally in export industries that use large volumes of imported inputs, the complementarities may also be very limited. Many activities that export manufactured goods may therefore lack the virtues that they are portrayed as having in the economic literature.

Various disadvantages that are associated with a specialization in natural resources have been explored in the course of the controversy about the "natural resource curse".[6] Two main problems with this type of specialization have been identified by Agosín (2007): the structural effects of this pattern of specialization as such (i.e. production/technological contents and linkages) and macroeconomic vulnerability (which he terms the "portfolio effects"). According to Hidalgo et al. (2007), the first problem has to do with the fact that countries with abundant endowments of natural resources (including oil) are situated in sparsely populated areas of the product space, which limits their opportunities for diversifying their production activities. The second is that countries that specialize in natural resources are more prone to crises emanating from the export sector owing to their less-diversified export structures and their vulnerability to sharp fluctuations in the exchange rate. One of the consequences of this is a strong propensity to use procyclical policies and vulnerability to the severe crises that they can trigger.[7] The "Dutch disease" links the two problems: in this case, the crucial problem is that commodity price booms can spark exchange rate appreciations that can have lasting effects on the production structure – effects that can turn out to be very costly when price levels subside.[8] The issues involved in exchange rate management will be discussed in a later section.

[6] The paper by Sachs and Warner (1995) is the best-known attempt to devise an econometric corroboration of the adverse growth effects of a natural resource-based pattern of specialization. Lederman and Maloney (2007) claim that there is no negative technological factor of any sort associated with natural resources, but there may be adverse effects associated with high concentration of exports in a few commodities (i.e. macroeconomic vulnerability) as well as adverse political economy characteristics associated with such specialization pattern.

[7] See also Manzano and Rigobón (2007).

[8] There are many analyses of this problem, but the most insightful is that by Krugman (1987).

There is also, however, an opposing body of literature that postulates that the forward and backward linkages of primary production activities can be used to leverage the diversification of production. Sweden and Finland boast two of the best success stories of this type of diversification (Blomström and Kokko, 2007), along with Australia and New Zealand (ECLAC, 2006, Ch. V). There are also certain technologically demanding niches for commodities in terms of quality, processing, storage or transport, some of which also afford access to dynamic markets (Akyüz, 2003, Ch. 1; ECLAC, 2008, Chapters III and V).

In view of these effects, and looking beyond the specific issues involved in natural-resource specialization, the critical issue for Latin America is the low technological content of its production activities and exports and its scant levels of research and development, not only in comparison to the more successful East Asian economies, but also to industrialized countries that specialize in natural resource-intensive exports. The data shown in table 1.1, drawn from Cimoli and Porcile (2011) and from a broader ECLAC study (2007), corroborate these findings.

Numerous studies have shown that one of the major differences between the success stories of East Asia and the experiences of Latin America has been that East Asian economies have made the transition to knowledge generation, whereas Latin America is still lagging behind in this respect – and, indeed, substantially so (Cimoli and Porcile, 2011; ECLAC, 2008, Ch. III; Palma, 2009 and 2011). This is highly associated to three decades in which the production sector strategy was ignored as a crucial element of development policy. Hausmann (2011) has

Table 1.1 Specialization, productive structure and technological content

	Share of engineering industries relative to United States, 2002–07[a]	**Spending on R&D as share of GDP, 1996–2007**	**Patents per million inhabitants, 1995–2008**
Latin America	0.23	0.40	0.5
Natural resource-intensive developed economies	0.72	1.89	65.4
Developing Asia	0.99	1.21	30.5
Mature economies	0.97	2.43	132.6

[a] Share of engineering industries in manufacturer value added (ratio with respect to share in the United States).
Latin America: Argentina, Bolivia, Brazil, Chile, Colombia, Mexico and Uruguay.
Natural resource-intensive economies: Developed economies where more than 40% of total exports are based on natural resources: Australia, Canada, Denmark, Finland, Iceland, Norway and New Zealand.
Developing Asia: Republic of Korea, Philippines, India, Malaysia, Singapore and Taiwan (China).
Mature economies: France, Italy, Japan, Sweden, United Kingdom and United States.

Source: Cimoli and Porcile (2011); ECLAC (2007).

demonstrated that the region's lower long-term growth rate is correlated with a poorer-quality export basket and with the fact that it is, in general, located in less dense portions of the product space. In contrast, industrialized countries are for the most part situated in high-density portions of that space, and the rapidly growing economies of East Asia have been moving in that direction.

The main lesson to be drawn is that, above and beyond the fact that different branches of production have differing capacities for leading the way to gains in productivity, in today's developing countries the key to robust growth is the synchronization of export development, production linkages and technological capacity building.

1.3.2 Production development strategies in open economies

The strong relationship between production structures and economic growth obviously has major policy implications. As development is closely linked with changes in production structures, ensuring that the economy has the capacity to bring about dynamic changes in its production patterns by putting into place proactive production development strategies is a crucial element of economic policy. A reference to the "production sector" as the focus of these policies is perhaps better than the term "industrial policies" because it does not necessarily assume that these measures are specific to manufacturing industries but instead recognizes that they can be implemented in natural resource or service-intensive sectors as well, and indeed that some mature manufacturing activities may not significantly contribute to technological upgrading.

In open economies, such as those of Latin America today, progress in this area is closely intertwined with the capacity to develop increasingly high-technology export structures. The domestic market should not be overlooked, however, because it plays a critical role in economic growth. For most countries in the region, economic integration should serve the same purpose as a larger domestic market would, but for this to be possible, the political obstacles that are blocking stronger integration would have to be overcome. Particular attention also needs to be devoted to the production linkages generated by export activities, which may also be seen as the "domestic market" generated by export activity. These linkages are some of the complementarities created by this type of activity. It can also be argued that the competitiveness of a given export sector, which makes it less prone to relocation, lies precisely in the complementary production activities that supply it with inputs or services at the local level, especially non-tradable (or imperfectly tradable) goods and services. These complementarities are, to use the term employed by ECLAC (1990), sources of systemic competitiveness.

The debate surrounding types of production development strategies has raised a number of questions. The first is what the focus of such policies should be. Most of the literature places its emphasis on innovative activities that generate externalities (Cimoli, Dosi and Stiglitz, 2009; Ocampo, 2005; Rodrik, 2007). The presence of externalities – which, as indicated, may be technological, commercial or both – is crucial, since their presence implies that the benefits of innovation will not be appropriated exclusively by the innovating firm.[9]

In the long run the main objective of any production development strategy should be, in any case, to build technological capacity. This raises a second set of questions. Some of them refer to the coexistence of high- and low-productivity sectors and firms and thus to the need to accelerate the diffusion of technology. Others have to do with the relationship between building production capacities and building technological capacities. Acquiring new production capacities inevitably involves learning how to use a given technology but the focus is on production sector activities, whereas the acquisition of new technological capacities encompasses everything from adapting technologies, introducing small innovations or modifying a product design to developing the capacity to generate new technologies, new designs of existing products and new products.

In the early stages of development and, in some industries, even today, technological learning is a by-product of the development of a new production sector. In this case, technology plays an important but passive role and the policy focus should be on promoting the sector, rather than technological development as such. This was, to some extent, done during the stage of state-led industrialization. During that stage, technological development was a by-product of the production development strategy. There was limited technological policy, a few notable exceptions aside (including agriculture). Trade liberalization tended to create incentives for the adoption of the best available technology so that producers could compete – and, in particular, obliged them to streamline their production processes. However, this strategy placed more emphasis on importing technology than on adapting and developing it. In some cases, this even led to the dismantling of technologies or indeed production sectors that had been developed in the past. Thus, in terms of their effectiveness in inducing economic growth, in Latin America these processes of promoting sectors and trade liberalization proved to be less satisfactory than the preceding strategy.

[9] Commercial externalities are associated with the fact that when a country or region comes to be recognized as a reliable supplier of a given product, this generates benefits that accrue to other producers.

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It is therefore of crucial importance to determine whether the focus should be on production activities or on the development of an innovation system. There is no single answer to this question. In some cases, local technological innovation is essential for competitiveness. This occurs in high-technology sectors in the region (Brazil's aeronautics industry, for example) as well as in natural resource-intensive sectors (e.g. the role of national research institutes in the development of agri-food complexes). In any event, the adaptation and creation of knowledge are always "infant industries" and should therefore be given preferential treatment in any production development strategy.

At times it may not be clear, however, which "innovative activity" should be promoted or whether it is possible to promote it as such. In such cases, fostering innovation may be indistinguishable from the promotion of a given sector's development. In this type of situation, saying that promoting a given sector is misguided because it entails "picking winners" is to ignore the intrinsic characteristics of production development strategies. The first point that is being overlooked is that a learning process is involved in determining what elements should be promoted and, even more importantly, how to go about doing so. Many things have to be learned along the way, and mistakes will be made. Seen from this angle, the types of choices to be made are not very different from those that any private company makes when it decides to expand into new product lines and has to make a strategic gamble based on the capacities that it has built up over time. Firms in this position are liable to make mistakes, too. The second point that is often overlooked is that policies of this type are designed to create conditions that will be conducive to the initiative's success, so, rather than "picking winners", they are actually aimed at "creating winners". Yet another consideration is the fact that, in line with one of the basic conclusions of modern international trade theory, when economies of scale (including learning processes) are present, comparative advantages are, in large measure, created.

Regardless of whether a technological or sectoral approach is being taken, incentives may be either horizontal or selective. There are some crucial horizontal components that should be a part of any production development strategy, such as measures for fostering innovation and the diffusion of technology, improving long-term financing mechanisms, and supporting micro, small and medium-sized enterprises. Compelling arguments can be made, however, for selective strategies, since opportunities for innovation do not arise across the entire range of the production structure. What is more, advocates of the general preference for horizontal schemes overlook the fact that, when such schemes rely on scarce fiscal resources, it is necessary to specify where those resources should be used, and this necessarily entails selectivity of some sort. No matter what policy tools are used, these kinds of choices should be made within the framework of a production

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development strategy. And in the interests of transparency, it is better for these choices to be explicit rather than implicit.

Another set of questions concerns public–private partnerships, which are an inherent part of any production development strategy. Such partnerships are necessary because the various agents are faced with problems relating to lack of information about production processes and markets on the part of the business community, about the economy as a whole, or about international negotiations. It is important, however, to make sure that the incentives provided by the State actually serve a collective purpose rather than simply being transformed into economic rents. The crucial issue is how to go about developing a close partnership that will ensure policy relevance while avoiding policy capture by the private agents involved. There are many different solutions to this problem, as is illustrated by the range of experiences in this field that can be identified the world over (ECLAC, 2008, Ch. VI; Devlin and Moguillansky, 2011). The interaction between the public and private sectors should be viewed, like in any production development strategy, as a mutual learning process.

A final question relates to the timing of incentives. The fact that mistakes may be made implies, first of all, that the system must include clear-cut mechanisms for detecting errors and correcting them. The quid pro quo for any incentive should be a performance requirement, or a "reciprocal control mechanism," to use the term coined by Amsden (2001). In addition, by their very nature, incentives should last only for as long as they continue to meet certain basic requirements: that they are necessary for innovation to take place and for it to be diffused to other agents. Because of information failures, however, it may not be feasible to set strict time frames at the outset of a process about which full information is not available. In fact, setting definite time frames may undermine the policy effectiveness, and the associated incentives may end up being wasted. Indeed, this may increase the probability of creating "losers" instead of "winners" or may make it necessary to extend an incentive whose initial cut-off date had been set, at the expense of government credibility. Again, what is needed is a way of designing a process that allows the agents involved to see when it is going off track so that they can correct it and to determine when the innovation has become consolidated.

This means that governments need to invest in the development of the institutions responsible for policy implementation. If anything can be said with certainty in this respect, it is that during the market reform period in Latin America, the destruction of institutions was widespread. Fortunately, some institutions survived and have adapted to the changed circumstances. More recently, a new wave of institutional reconstruction has begun, Brazil's production development strategy being the most outstanding example of this.

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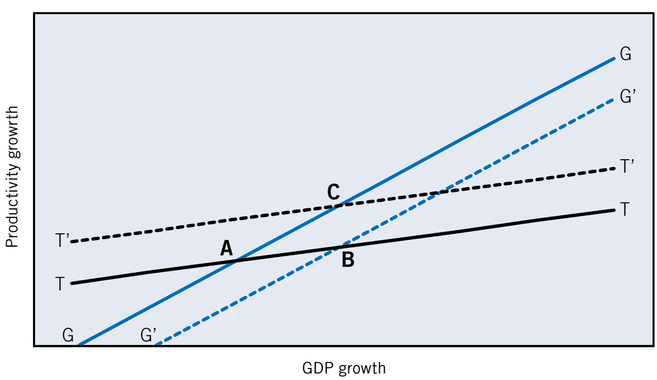
1.3.3 Interaction between the macroeconomy and production development and the crucial role of the exchange rate

A simple way of visualizing the link between the development of the production sector and macroeconomic conditions is by looking at the double relationship that exists between economic growth and productivity gains, as shown in figure 1.2 (see Ocampo, 2005). The function of technical progress, TT, is determined by structural conditions. The direction of causality in this case runs from the growth of production to increases in productivity: the expansion of the production sector boosts productivity by spurring investment (if better technology is incorporated into production equipment), learning processes and the reallocation of labour from low- to high-productivity sectors.

A state of macroeconomic equilibrium, GG, indicates either that aggregate demand is in equilibrium or, if there is an external gap, that the balance of payments is tenable. The relationship is positive in both cases, with the direction of causality running from productivity gains to growth, but it runs through different channels in each case. If it is demand that is in equilibrium, then increases in productivity will boost investment and labour income (and consumption) and will also improve the external balance. In the second case, productivity gains will drive up exports or reduce imports and, either way, will narrow the external gap.

Equilibrium is reached at point A. If macroeconomic conditions improve, then GG shifts to the right and results in a new equilibrium point (B) at which there is both more growth and faster productivity gains. This effect can operate through an expansionary macroeconomic policy that is sustainable because it induces higher investment and does not generate inflationary barriers or untenable balance of payments disequilibria. A successful production development

Figure 1.2 Relation between GDP and productivity growth



strategy will shift the TT function upward, as it leads both to more economic growth and higher productivity (point C).

As pointed out by Ocampo (2005) and Ocampo, Rada and Taylor (2009), this implies that the relationship between increases in productivity and in growth is the result of a two-way link, rather than, as in the traditional view, productivity being the cause and economic growth the effect.[10] The reverse link implies that a poor growth performance tends to undercut the rate of productivity growth. There can be various reasons for this, including a balance-of-payments crisis or a destructive restructuring process in the production sector. Declines in productivity will operate through the pathways mentioned earlier: lower investment, less learning and a perverse reallocation of labour to informal sectors. A strong macroeconomic performance will have the opposite effect.

Although this conceptual scheme can be used to analyse many different types of problems, here we will focus on the real exchange rate, which is perhaps the most critical macroeconomic variable in open economies.

The exchange rate has a number of complex features. One is that, because it is a macroeconomic variable, it cannot generate the selective incentives that a trade regime can, and it can therefore serve only as a partial substitute for a production development strategy. Another is that it is at the same time the price of a set of financial assets and one of the determinants of the relative price of internationally tradable goods and services.

This latter feature gives rise to a number of well-known effects. For example, one of the main ideas underlying the concept of an "anti-export bias" was that protection led to an overvaluation of the exchange rate, which undermined export incentives. In orthodox theory, the expectation was therefore that any reduction in protection would trigger a real depreciation that would spur the development of the export sector. However, the experiences of the countries of the Southern Cone in the second half of the 1970s already showed us that, if the move to liberalize trade is coupled with the opening of the capital account, not only does the expected real depreciation not occur, but it may have the exact opposite effect: a real appreciation. This blocks the pathway through which liberalization would correct the "anti-export bias" and can even give rise to a paradoxical situation in which economic growth is driven by domestic demand rather than by exports. This has, in fact, often occurred in Latin America (see, among many others, Vos et al., 2006, Ch. 3).

[10] The fundamental problem has to do with the assumption of full employment of resources used in traditional growth models, in which the direction of causality runs only from productivity to growth.

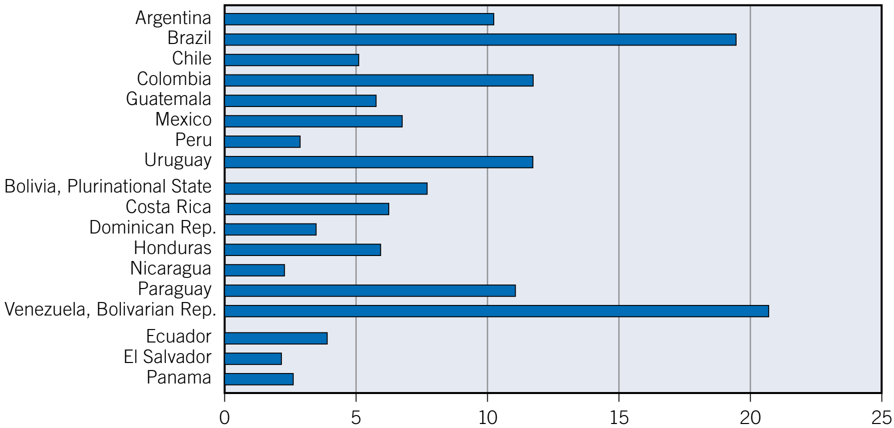
The empirical evidence shows that the real exchange rate is one of the determinants of economic growth. According to Rodrik's (2008) estimates for developing countries in the period from 1950 to 2004, a 10 per cent undervaluation of the exchange rate was associated with 0.27 per cent additional growth per year. One of the explanations that he offers has to do with the externalities generated by producers of tradables and indicates that an undervaluation of the exchange rate functions as a partial substitute for a production development policy. Hausmann, Pritchet and Rodrik (2005) show that one of the factors behind an acceleration in growth rates in developing countries is a competitive exchange rate. This evidence is also in line with the findings of Prasad, Rajan and Subramanian (2007) and the results of Frenkel and Rapetti's review of the literature, which indicate that higher growth rates are associated with an improved current account balance (Frenkel and Rapetti, 2010).

Frenkel and Taylor (2007) call this effect of the real exchange rate on growth the "development effect" and draw a distinction between this and other effects of this variable, such as its short-run macroeconomic effect, which is ambiguous (as there may be short-term contractionary effects of an exchange rate depreciation), and its impact on employment. The development effect is linked, first of all, with the externalities generated by the dynamic development of tradables sectors, which include the repercussions that this has on the diversification of the export structure. Second, it is associated with the fact that economies with a robust current account are less sensitive to sharp turnarounds in the capital account. One way of understanding these effects is to see that a stable, competitive exchange rate shifts TT upward (i.e. serves as a partial substitute for a production development policy) and shifts GG to the right (i.e. generates an expansionary macroeconomic effect) (see figure 1.2).

Apart from these development effects, the exchange rate has, as noted by Frenkel and Taylor (2007), additional implications for employment that have to do with its effect on the labour output elasticity. A real appreciation tends to reduce this elasticity in two different ways: first, it lowers the price of production equipment in economies that import a large share of their machinery, which leads to a substitution of capital for labour; second, it tends to bias the selection of inputs in production processes toward imported inputs, which weakens domestic production linkages.

Instability in the real exchange rate also heightens risk and thereby depresses investment in the production of tradable goods and services that can be exported or used as import substitutes. This problem is compounded by the greater vulnerability to international price shocks displayed by countries that are dependent on commodity exports. The greater volatility of the real exchange rate in the

Figure 1.3 Coefficient of variation of the real exchange rate, 2004–11 (percentages)



Source: Author's estimates based on ECLAC data.

countries of Latin America, as illustrated in figure 1.3, is indeed associated with this subregion's greater reliance on commodities.

This underscores the fact that the macroeconomic challenges posed by this situation are especially formidable in economies where a considerable portion of the export basket is composed of natural resource-based goods. In order to deal with this situation, mechanisms need to be developed that can smooth out the macroeconomic effects of fluctuations in commodity prices.

It should be underscored, however, that even in economies in which commodities make up a large share of exports, the real exchange rate is not determined solely by export prices. Figure 1.3 shows, for example, that Peru has been much more successful in avoiding exchange rate volatility than other Latin American countries, thanks to its central bank's active intervention in foreign exchange markets. The other side of the coin is that the introduction of more flexible exchange rates heightens the volatility of the real exchange rate, especially in economies dependent upon natural resource-based exports. This points in the direction of using managed flexible exchange rates as part of broader countercyclical macroeconomic policies.

1.4 Conclusions

The essential message of this chapter is that a sound macroeconomic policy for development should combine well-designed countercyclical macroeconomic policies with a proactive strategy for the diversification of the production structure. The need for a production development strategy stems from the close relationship that exists between economic growth and the diversification of production structures. The central policy objective is to promote innovative production activities that generate strong production linkages with other domestic economic activities and, through them, systemic competitiveness. The concept of "innovation" should be understood in the broad sense of the term – i.e. not as being confined to technological innovation, but also encompassing new production activities, new marketing methods, the conquest of new markets and new ways of organizing a company or an industry. The litmus test, however, is the extent to which an economy is capable of building up technological capacities. The challenge is particularly formidable in economies that, like most of those of Latin America, have static, natural resource-based comparative advantages. The exploitation of those advantages should not, however, be a barrier to the diversification of the production structure. Wise management of the exchange rate throughout the business cycle is essential if this is to be accomplished.

Countercyclical macroeconomic policy and the diversification of production structures are crucial elements in the contributions to economic thought made by Latin American structuralism. They, in turn, are based on two other fundamental concepts: the key importance of managing the external vulnerabilities of economies whose macroeconomic dynamics are subject to "balance of payments dominance", and the close relationship that exists between economic growth and changing production patterns. These two pivotal ideas are as valid today as they were in the past and demonstrate the cogency of the concepts that Latin American structuralism has espoused throughout its history.

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Making industrial policy work for development

2

Justin Yifu Lin and Volker Treichel

Economic development is a process of continuous technological innovation, industrial upgrading, and structural transformation – which makes it inherently beset with market failures. Before the 2009 crisis, industrial policy as an instrument to promote industrial upgrading was widely dismissed by economists who were not convinced of its analytical foundations and cited its poor track record. Even those who recognized the presence of market failures and the associated case for state intervention generally rejected industrial policy, as they were concerned that the attempt to pick winners was more likely to fail – and fail at high cost – than to correct perceived market failures effectively. Most economists believed that the State should focus on maintaining macroeconomic (fiscal and financial) stability and on creating a business environment characterized by the absence of distortions, thereby establishing a level playing field for all economic agents.

The view post-crisis has shifted considerably. To a significant extent, both economists and policy-makers have perceived the crisis to be the result of unregulated free markets, causing many economists to take a fresh look at the role of the State in economic management. An idea gaining traction among economists is that broad-based interventions to support industrial upgrading and diversification are crucial to facilitate structural transformation and spur sustainable growth. This chapter discusses the evolution of the understanding of the process of fostering economic growth and, based on a review of economic history, the role that industrial policy has played in facilitating growth in the past. It then derives principles that industrial policy will have to follow in order to be able to effectively support growth and development.

2.1 Fostering economic growth in developing countries: The evolution of development thinking

The development of viable theoretical and practical approaches to facilitate growth in developing countries has been one of the top concerns of policy-makers and economists for some time.

Inspired by the desire to align their countries' economic performance with that of the advanced countries, and given the apparent success of the Soviet Union's industrialization at the time, many developing country leaders in the 1950s and 1960s instituted development strategies built on structuralism. At that time, structuralism was the prevailing economic development framework. Essentially, it contended that developing countries could overcome their underdevelopment or "backwardness" most rapidly by developing the same advanced industries as those in the high-income industrialized countries. The rationale behind this strategy was often noble, as leaders of developing countries wanted the economies of their countries to compete on the global technological frontier as quickly as possible.

However, this turned out to be a fatal mistake. Rather than facilitating economic growth, the structuralist paradigm actually hindered development because it was a strategy that defied the concept of comparative advantage and advised countries to give priority to capital-intensive heavy industries, even though capital was scarce in those economies (Lin, 2009). The strategy implied very high production costs compared with those in countries that developed similar industries but in keeping with their comparative advantage. The firms in the capital-intensive industries that faced such high production costs could not survive in an open, competitive market – unless the government was willing and able to grant them strong protection through large-scale subsidies or other forms of protectionism. The common denominator of these strategies was that the government targeted industries that were flourishing in countries whose per capita income was far higher than its own. Consequently, the developing country was unable to produce the goods at a cost advantage and therefore unable to compete in these industries.

Examples of these comparative advantage-defying strategies include Indonesia launching a ship construction industry in the 1960s, when its GDP per capita was only 10 per cent of that of its main competitor at the time, the Netherlands. Another example is the attempt to build an auto industry in Zaire (now the Democratic Republic of the Congo, DRC) in the 1970s, when the country's GDP per capita was only 5 per cent of the level in the industry leader (table 2.1).

To implement this comparative advantage-defying strategy, developing country governments had to protect numerous non-viable enterprises in the priority sectors. The measures to which they resorted to reduce the investment and

Table 2.1 The economics of unrealistic ambitions

Latecomer country	Industry, decade	Leading producer at time	Real GDP per capita		Income ratio of follower versus leader (%)
			Latecomer country	Leading country	
China	Automobile, 1950s	United States	577	10 897	5
DRC	Automobile, 1970s	United States	761	16 284	5
Egypt	Iron, steel, chemicals, 1950s	United States	885	10 897	8
India	Automobile, 1950s	United States	676	10 897	6
Indonesia	Ship building, 1960s	Netherlands	983	9 798	10
Senegal	Trucks, 1960s	United States	1 511	13 419	11
Turkey	Automobile, 1950s	United States	2 093	10 897	19
Zambia	Automobile, 1970s	United States	1 041	16 284	6

Source: Authors' calculations based on data from Maddison (1995).

operational costs of non-viable enterprises included granting those enterprises a market monopoly, suppressing interest rates, overvaluing domestic currency, controlling prices of raw materials, and imposing high tariffs on imports. Such interventions caused widespread shortages in credit, foreign exchange, and raw materials. Consequently, governments also had to allocate resources directly to those enterprises through administrative channels, including through national planning in the Socialist countries and credit rationing and investment and entry licensing in non-Socialist developing countries. For ease of implementation, many countries also relied on state-owned enterprises to develop the targeted industries.

The protectionist measures that many governments implemented incurred various types of costs. As the prices of imports and of import-substituting goods increased relative to the world price, this discrepancy pushed these economies to consume a mix of goods that was inappropriate in terms of economic efficiency. Markets fragmented as the economies produced goods at too small a scale, again resulting in loss of efficiency. Also, protectionism lessened competition from foreign firms and encouraged monopoly power among domestic firms whose owners were politically well-connected. Moreover, protectionism created opportunities for rent-seeking and corruption, which raised input and transaction costs. Rent-seeking connected with the establishment of non-viable enterprises also made it difficult to end state interventions in support of these industries, including subsidies.

In some cases (mainly in Eastern Europe and the Soviet Union), the industrial development brought about by the comparative advantage-defying strategy appeared to be successful initially because large-scale investment through massive state mobilization of resources increased the growth rate and improved productivity indicators. But firms in the capital-intensive sectors depended on the government's subsidies and protection for their survival; when the State could no longer mobilize resources for further investment, the economy stagnated. Moreover, investment in the capital-intensive sectors generated little employment, and the labour force remained mostly in the rural sector.

Critics interpreted the failure of the old structuralist policies to deliver structural transformation, economic growth and prosperity as an indication that government interventions in the economy were bound to fail because of the inevitable distortions of prices and incentives and the resulting misallocation of resources. These views, in turn, prompted a shift in development thinking toward the free market approach that became known as the Washington Consensus, which promoted economic liberalization, privatization, and the implementation of rigorous stabilization programmes. In terms of growth and employment generation, however, the results of the policies presented as alternatives to the failed old structuralism were controversial at best (Easterly, 2001 and 2005). Many economists and the public in many countries quickly perceived the Washington Consensus as a set of neoliberal policies that were imposed on hapless countries by the Washington-based international financial institutions. These policies ended up leading many countries to crisis.

Why did the Washington Consensus, which attempted to correct the mistakes of the old structuralist approach, fail to foster structural transformation and sustained growth in low-income countries in Africa and elsewhere? What have been the primary features of processes that *do* help generate successful and sustained growth? How can developing countries create the conditions to facilitate the flow of technology and unleash growth, even in the context of suboptimal microeconomic policies, weak institutions, and sometimes uncertain private property rights? Why do some countries catch up with developed countries and others do not?

The report of the Commission on Growth and Development offers important insights into these questions. Launched in April 2006, the Commission brought together 22 leading development practitioners from government, business and the policy-making arenas, mostly from the developing world. It was chaired by Nobel Laureate Michael Spence and Danny Leipziger, a former World Bank vice president. The Growth Commission's report (2008) concludes that "[f]ast, sustained growth does not happen spontaneously. It requires long-term commitment by a country's political leaders, a commitment pursued with patience, perseverance and pragmatism." According to the report, the key principles of growth are: (i) full engagement with the global economy; (ii) macroeconomic stability; (iii) high saving and investment rates; (iv) market allocation; and (v) leadership and governance. The report represents an important step forward as it provides new insights that have helped policy-makers to better understand the economic dynamics of catching up and to avoid some of the pitfalls that plague economic development. One of the most important conclusions of the Growth Commission's report is that there is no universal set of rules to guide policy-makers. The Commission recommends less reliance on simple formulas and the search for elusive "best practices" and instead champions greater reliance on deeper economic analysis to identify the binding constraints to growth in each country.

The key recommendation of the Growth Commission, therefore, was for each country to identify and focus on one area that presents the biggest obstacle to growth, much in line with research by Hausmann, Rodrik and Velasco (2008). The approach proposed by Hausmann and colleagues offers a decision-tree methodology to help identify the binding constraints to growth relevant for individual countries. The implication is that different countries require different policy choices to facilitate growth, identified on the basis of country-specific Growth Diagnostics. Furthermore, the overarching principles that support growth (for example, sound monetary policy, property rights, openness, and free markets) need to be calibrated to the country-specific context, including the right institutional framework and policy mix.

While the Growth Diagnostics approach is an important advance, one of its major weaknesses is that it depends on surveys of firms in the existing industries. It is possible, however, that some of these industries in their current form exist only because of the old structuralist policies and are not really consistent with the country's comparative advantage. At the same time, other industries that *are* consistent with the country's comparative advantage may not have developed because the government failed to provide proper facilitation. Consequently, the binding constraints identified in a survey of the existing industries may actually not be relevant as they may reflect a suboptimal structure of the economy. More fundamentally, as discussed in greater detail below, one of the most important roles for industrial policy is to facilitate "first movers", companies that are willing to enter new sectors in line with the country's comparative advantage and that offer significant potential for growth and employment creation. Addressing the binding constraints of growth identified through a survey of existing industries will not include measures to facilitate the emergence of first movers that are new to the economy.

New Structural Economics (Lin, 2012) integrates the insights of structuralism and neoclassic economic analysis concerning the growth process. It starts with the observation that the main feature of modern economic development is continuous technological innovation and structural change. The optimal industrial structure in an economy – that is, the industrial structure that will make the economy most competitive domestically and internationally at any specific time – is endogenous to its comparative advantage, which in turn is determined by the given endowment structure of the economy at that time. Economies that try to grow simply by adding more and more physical capital or labour to the existing industries eventually run into diminishing returns, and economies that try to deviate from their comparative advantage are likely to perform poorly.

The main goal in the formulation of economic policy is to ensure that the economy grows in a manner that is in keeping with its comparative advantage. In this way the economy will be competitive, profits will be optimized, and capital accumulation will be maximized. As capital accumulates, however, the economy's factor endowment structure evolves, resulting in a gap between the current and the optimal industrial structure. Firms then need to upgrade their industries and technologies accordingly in order to maintain market competitiveness.

Obviously, for firms to make the right decisions regarding investment in industries that are consistent with the economy's comparative advantages, relative prices need to be correct. This requires a competitive market system. In developing countries, where this is usually not the case, it is necessary that governments act to create or improve various market institutions so as to create and protect effective competition in the product and factor markets.

As a case in point, in the process of industrial upgrading, firms need to have information about production technologies and product markets. Often, first movers can be pioneers and provide this type of information, but they may face a set of specific challenges. On the one hand, first movers may fail, but in that process they can provide valuable information to other prospective entrants. On the other hand, first movers may succeed, encourage other firms to enter, and gradually reduce the rent accruable to them. They may also incur significant costs to train workers in new business processes and techniques, and these workers may then be hired by competitors. So, first movers may create external benefits for which they will not be compensated, a result that reduces the incentives for firms to be first movers.

Also, technological innovation, industrial diversification, and industrial upgrading are typically accompanied by changes in capital and skills requirements for firms, as well as by changes in their market scope and infrastructure needs due to the evolving nature of production that is embodied in the process of innovation. In other words, industrial upgrading and diversification are typically accompanied by changes in hard and soft infrastructure requirements. For example, with the change from agrarian production to manufacturing and from simple manufacturing to advanced manufacturing in the development process, the scale of production and market scope increase. The demand for transportation, roads, and power increases accordingly. Individual firms are not capable of internalizing their provision or deploying the kind of coordination efforts among firms in different sectors needed to meet those increasing demands. Even if some large companies were willing to finance a national road or a power network, coordination through the public sector would be necessary to ensure consistency, efficiency, and prevention of natural monopolies when the economy grows.

In order to operate, low-income country firms in small-scale, labour-intensive agriculture and manufacturing industries need only an unskilled labour force, an unsophisticated informal financial and manufacturing system, and hard infrastructure. But when the economy expands into modern manufacturing industries, firms need highly skilled labour, large funds for lump-sum investments in equipment, working capital and/or export financing, and new marketing arrangements. However, individual firms usually are not capable of internalizing the required changes in soft infrastructure. Here again, there is a need for the State to provide or coordinate some of these changes in different sectors of the economy so as to facilitate upgrading and diversification by individual firms.

Economic development is, therefore, a dynamic process marked by externalities and coordination requirements. While the market is the necessary basic mechanism for effective resource allocation at each stage of development, governments must play a proactive, facilitating role for an economy to move from one stage to another and to overcome the type of information, coordination, and externality issues that are inherent to the development of new activities and sectors. Governments must intervene to allow markets to function properly by:

1. Providing information about new industries that are consistent with the country's comparative advantage as determined by changes in its economy's endowment structure;

2. Coordinating investments in related industries and facilitating the required improvements in infrastructure;

3. Subsidizing activities with externalities in the process of industrial upgrading and structural change; and

4. Catalysing the development of new industries by incubating them or by attracting foreign direct investment to overcome the deficits in social capital and other intangible constraints.

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2.2 What are the principal tenets of successful industrial policy?

To derive the principal tenets of successful industrial policy, a review of successes in implementing industrial policy is necessary. There is considerable historical evidence that today's most advanced economies have relied heavily on government intervention to ignite and facilitate their economic take-off, which allowed them to build strong industrial bases and sustain the momentum of growth over long periods.

Chang (2003) reviewed economic developments during the period when most of the present-day advanced economies went through their industrial revolutions (between the end of the Napoleonic wars in 1815 and the beginning of the First World War in 1914). Contrary to conventional wisdom, which often attributes the industrial successes of Western economies to laissez-faire and free market policies, the historical evidence shows that the use of industrial, trade, and technology policies was critical to their successful structural transformation. The interventions ranged from the frequent use of import duties or even import bans to protect infant industries, to industrial promotion through monopoly grants and cheap supplies from government factories, to public–private partnerships and direct state investment, especially in Britain and the United States, in addition to various other subsidies (Trebilcok, 1981).

The US government has continuously offered strong incentives to private businesses and academic institutions to discover new ideas that are valuable for sustaining growth and has encouraged making such ideas non-rival. In addition, it has built infrastructure in key economic sectors such as transportation and provided financing to education and training in order to build the country's skills base in many industries. Chang (2003) observes that interventions by the US government have included support to industries such as computers and aerospace and to technologies such as the Internet, where the United States still maintains an international edge despite the decline in its overall technological leadership. He notes that these industries would not have existed without defence-related research and development funding by the US government.

In Europe, active industrial policy has continued to be applied since the end of the Second World War. Examples of the implementation of these policies include the rise of the French space programme Ariane and European collaboration in the aircraft manufacturer Airbus, which have been remarkable industrial successes. Finland is an example of a country that experienced late but successful state-led industrialization. According to Jäntti and Vartiainen (2009), the economic policy that achieved that objective was a mix of heavy government intervention and incentives for the private sector. The main features of the country's growth regime were a high rate of capital accumulation that often required the use of directed credit provided at government-controlled interest rates, a policy of selective loan approvals for capital equipment investment, and a high rate of investment in targeted areas of manufacturing, particularly the paper, pulp and metalworking industries. State enterprises were established in the basic metal and chemical-fertilizer industries and in the energy sector. As late as the 1980s, state-owned enterprises accounted for 18 per cent of the country's total industry value added.

What have been the key ingredients in the successful implementation of industrial policy?

Modern economic growth is a process of continuous industrial upgrading and structural change. To achieve dynamic growth, a developing country should develop industries according to its comparative advantage, which is determined by the country's endowment structure, and tap into the potential advantages of backwardness in industrial upgrading. The process of upgrading the industrial structure to a higher level consistent with national factor endowments cannot rely solely on the market mechanism. For example, starting a new industry may be difficult because of the lack of complementary intermediate inputs or adequate infrastructure for the new industry, even if the targeted industry is consistent with the economy's comparative advantage as determined by its factor endowment. In their upgrading or diversification decisions, private firms may not be able to internalize the investments for production of those intermediate inputs or for the provision of infrastructure. Thus, the government has an important role to play in providing or coordinating investments in the necessary infrastructure and complementary inputs. In addition, innovation, which underlies industrial upgrading and diversification, is a risky process because it entails a first-mover problem (see page 70).

It is therefore useful to draw on the theories of comparative advantage and of the advantage of backwardness,[1] as well as on the successful and failed experiences of industrial policies discussed above, to codify some principles and policy recommendations that can guide the formation of successful industrial policy. Essentially, the most promising approach for developing countries in designing successful industrial policy is to exploit the latecomer advantage by building up industries that are growing dynamically in more advanced countries with endowment structures similar to theirs. When Britain applied industrial policies to catch up with the Netherlands in the sixteenth and seventeenth centuries, its per

[1] The advantage of backwardness refers to the fact that a developing country can benefit from the technological/industrial gap with the advanced countries by adopting a new technology or entering an industry that is new to its economy but mature in the advanced countries. In this situation, the cost of innovation in the developing country will be substantially lower than in the advanced countries that needed to invent or innovate.

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capita income was about 70 per cent that of the Netherlands. When Germany, France and the United States used industrial policy to catch up with Britain in the nineteenth century, their per capita incomes were about 60 to 75 per cent that of Britain. Similarly, when Japan's industrial policy targeted the US automobile industry in the 1960s, the country's per capita income was about 40 per cent that of the United States. When the Republic of Korea and Taiwan (China) adopted industrial policies to facilitate their industrial upgrading in the 1960s and 1970s, they targeted industries in Japan instead of the United States, and for a good reason: their per capita incomes were about 35 per cent that of Japan and only about 10 per cent that of the United States at the time.[2]

Also, looking closely at the elements of successful catch-up strategies, it appears that the specifics of policy interventions depended on the particular binding constraints for these new industries and on country circumstances. But while the interventions were often different, the patterns of industrial development were similar across countries. They all started from labour-intensive industries, such as garments, textiles, toys and electronics, in the early stage of development and proceeded to move up the industrial ladder step by step to more capital-intensive industries. The newly industrialized economies of East Asia, for instance, exploited the fact that their endowment structures were similar to Japan's to follow its development in a flying geese pattern (Akamatsu, 1962; Kim, 1988). This was possible because the per capita income gaps with their target country were not large (Ito, 1980).

By following carefully selected lead countries, latecomers were able to emulate the leader–follower, flying geese pattern that has served well all successful catching-up economies since the eighteenth century. In the process, governments – through support in information, coordination, and sometimes limited subsidies – facilitated the development of new industries that are consistent with the country's latent comparative advantage as determined by its endowment structure, and hence helped the establishment of firms that turned out to be competitive.

Based on a review of this historical experience, the first step is to identify new industries in which a country may have a latent comparative advantage,[3] and the second is to remove the constraints that impede the emergence of industries with latent comparative advantage and create the conditions that allow them to become the country's actual comparative advantage.

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[2] For a discussion of industrial policies in these countries, see Chang (2003); for the estimations of per capita income for the countries mentioned, see Maddison (2006).

[3] A country will have a latent comparative advantage in an industry in which it would in principle be competitive based on the factor cost of production, but is currently not competitive due to transaction costs arising from lack of infrastructure and of a conducive business environment.

The Growth Identification and Facilitation Framework, based on New Structural Economics, proposes a six-step process (Lin, 2012, Chapter 3):

The first step consists in identifying tradable goods and services that have been growing dynamically for about 20 years in fast-growing countries with similar endowment structures and a GDP per capita about twice as high as that of the developing country. In many cases, given that wages tend to rise in the growth process, a fast-growing country that has produced certain goods and services for about 20 years may begin to lose its comparative advantage in those sectors, leaving the space for countries with lower wages to enter and compete in those industries. For example, a developing country could produce simple manufactured goods domestically, particularly those that are labour-intensive, have limited economies of scale, require only small investments, and are currently imported. This would not only allow it to identify potential new industries, but may also present promising business opportunities for its private sector.

Second, among the industries identified, the government may give priority to those that some domestic private firms have already entered spontaneously. The government may then try to identify: (i) the obstacles that are preventing these firms from upgrading the quality of their products, or (ii) the barriers that limit entry to those industries by other private firms. This could be done through the combination of methods such as value chain analysis or the Growth Diagnostic Framework suggested by Hausmann, Rodrik and Velasco (2008). The government can then implement policies to remove those binding constraints and rigorously assess the impact of its action so as to ensure effective scaling up of those policies at the national level.

Third, some of the industries identified may be completely new to domestic firms. In such cases the government could adopt specific measures to encourage firms in the higher-income countries identified in the first step to invest in these industries. Firms in these higher-income countries will have incentives to reallocate their production to the lower-income country so as to take advantage of the lower labour costs. The government may also set up incubation programmes to catalyse the entry of domestic private firms into these industries.

Fourth, in addition to the industries identified on the list of opportunities for tradable goods and services in step one, governments of developing countries should pay close attention to successful innovations by domestic private enterprises and provide support to scale up those industries. Due to rapid technological changes, many new opportunities may arise – opportunities that would not have existed a decade or two ago, as those industries did not exist in the rapidly growing comparator countries.

Fifth, in developing countries with poor infrastructure and unfriendly business environments, the government can invest in industrial parks or export processing zones and make the necessary improvements to attract domestic private firms and/or foreign firms that may be willing to invest in the targeted industries. Improvements in infrastructure and the business environment can reduce transaction costs and facilitate industrial development. However, because of budget and capacity constraints, most governments will not be able to make these desirable improvements for the whole economy in a reasonable time. Focusing on improving the infrastructure and business environment in an industrial park or an export processing zone is a more manageable alternative. Industrial parks and export processing zones also have the benefits of encouraging industrial clustering. The industrial parks would need to be tailored to the specific requirements of the targeted industry.

Sixth, the government may also provide limited incentives to domestic pioneer firms or foreign investors that work within the list of industries identified in step one in order to compensate for the non-rival public knowledge created by their investments. Incentives should not, and need not, be in the form of monopoly rent, high tariffs, or other distortions.

2.3 Concluding remarks

The basic feature of modern economic growth is continuous industrial upgrading and structural change. To achieve dynamic growth, a developing country should develop industries according to its comparative advantage, which is determined by the country's endowment structure, and tap into the potential advantages of backwardness in industrial upgrading.

Industrial upgrading and diversification are essential to allow a developing country's endowment structure to gradually align with that of more developed countries and in that way create the preconditions for better jobs, poverty reduction and higher living standards. To facilitate upgrading in these sectors, developing countries should use industrial policy targeted to alleviate binding constraints to growth in the most promising sectors. New Structural Economics and the Growth Identification and Facilitation Framework offer a practical approach to identifying sectors in line with the latent comparative advantage of a country and guidance on how to remove constraints to growth in these sectors by addressing coordination and market failures.

In recent years a number of countries have embarked on efforts to identify strategic sectors and calibrate industrial policy measures accordingly. In its Vision 2020, Nigeria has identified a number of priority sectors, and – with support from

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the World Bank – has launched programmes to promote growth in these areas, including in specific regions. Also, Côte d'Ivoire's National Development Plan highlights the need to identify strategic sectors in both the agro-processing and manufacturing areas. The country is working with both the World Bank and the United Nations Industrial Development Organization to develop and implement a growth strategy built on its latent comparative advantage. Similar efforts are under way in Rwanda, Ethiopia, the United Republic of Tanzania and Zambia.

In addition, several countries in Latin America, such as Colombia, with its Productive Transformation Program, and Brazil, through its national development bank (BNDES), are in the process of developing and implementing industrial policies intended to make full use of their respective comparative advantages in the global marketplace. Different from the experience under the old structuralism, industrial policy measures inspired by New Structural Economics will be consistent with the principles of free and fair competition, as the sectors are in line with a country's latent comparative advantage, and will therefore be sustainable.

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The role of industrial and exchange rate policies in promoting structural change, productivity and employment

3

Rodrigo Astorga, Mario Cimoli and Gabriel Porcile

3.1 Introduction

In mainstream economic theory the issue of employment is usually discussed in terms of a natural rate of unemployment and "distortions" in the labour market through institutions such as minimum wages, unemployment benefits and strong labour unions. However, developing economies whose labour market institutions are often weak or are ineffective outside the formal economy have experienced long periods of high unemployment. Furthermore, countries where labour unions greatly lost influence – as in Latin America in the 1970s and 1990s – nevertheless experienced rising unemployment (Stalling and Peres, 2000). Therefore, it is necessary to look at other variables when exploring the issue of employment.

In addition, most developing economies have a large surplus of labour in the subsistence sector or in sectors with extremely low levels of productivity (underemployment).[1] They are "dual" economies in Lewis' sense, or at least they comprise labour market segments with productivity levels close to subsistence level. These models view economic development as a process of moving labour from low- to high-productivity segments. The engine that draws labour out of the subsistence sector is structural change (Cimoli, 1988; Cimoli and Porcile, 2011; ECLAC, 2007; McMillan and Rodrik, 2011). Countries need to transform the production structure, that is, create new sectors and technologies that generate more productive and better jobs.

[1] This is the starting point of ECLAC's structuralist theory (Prebisch, 1950).

This chapter argues that job creation and the reduction of underemployment critically depend on the diversification of the production and export structures. Here, diversification is taken to mean developing and expanding sectors that are more dynamic in a Keynesian and Schumpeterian sense (KS dynamic), i.e. they show higher rates of demand growth and more opportunities for technical change.[2] Two variables that determine the diversification process will be highlighted: the real exchange rate (RER) and industrial and technological policies (ITPs). The RER is defined as the price of foreign goods in terms of domestic goods. Therefore, a high RER, reflecting a depreciated domestic currency, implies more competitiveness. In recent years the literature has clearly established the importance of the RER in structural change and growth.[3] As for ITPs, this chapter defines them in a very broad sense, including all measures that create incentives in favour of certain sectors and in favour of technological change. Although the idea that successful catching up requires active ITPs has only gradually reached mainstream economics, this is an old, well-established point in the tradition of economic history and heterodox growth theory.[4]

This chapter discusses the trajectories of four Latin American economies – Argentina, Brazil, Chile and Mexico – between 1970 and 2008 and compares them with that of a successful catching-up economy, the Republic of Korea. These four economies have been chosen because they represent a significant share of Latin America's total gross domestic product (GDP) (81.6 per cent in 2008[5]); they also illustrate the diversity of experiences in economic policy in the region. First, trends in production, employment, productivity and structural change are discussed for the manufacturing sector. Then, the evolution of these variables is studied for the whole economy.

A caveat is necessary. Manufacturing is the starting point because it has been, as is generally acknowledged, a privileged locus of learning, accumulation of

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[2] Dosi, Pavitt and Soete (1990) define sectors with Keynesian or growth efficiency and Schumpeterian efficiency in terms of the dynamism of demand and of technology, respectively. Usually, there is a large overlap between these two categories. Of course, some countries may just have good luck in the "commodity lottery" (Díaz-Alejandro, 1983) and perform well (for some time) in the international economy without building technological capabilities, but this is not the rule in economic history. Evidence of a positive relation between export diversification and growth can be found in Saviotti and Frenken (2008); Hausmann, Hwang and Rodrik (2007); and Agosín, Alvarez and Bravo-Ortega (2012).

[3] The literature is extensive; see, for instance, Frenkel (2004); Pacheco-Lopez and Thirlwall (2006); Bresser-Pereira (2008); Eichengreen (2008); Freund and Pinerola (2008); Rodrik (2008); Razmi, Rapetti and Skott (2009); and Rapetti (2011). Early contributions are Baldwin (1988), and Baldwin and Krugman (1989).

[4] See Amsden (1989); Reinert (1995); Bell (2006); Cimoli and Porcile (2009 and 2013); and Ocampo (2011).

[5] Based on ECLACSTAT, Latin America and the Caribbean, by economic activity.

technological capabilities and diffusion of technology to the whole economic system – at least for most of the period addressed in this chapter. In the post-war years, to catch up and to promote structural change in developing economies has largely meant to industrialize. While other sectors play an important role in development and production of externalities, it will be argued here that a rising share of technology-intensive activities in manufacturing is a good proxy for the process of learning in the whole economy. Manufacturing does not monopolize learning, but it tracks well the learning process in a developing economy. In addition, along with construction and services, manufacturing is responsible for a substantial share of total employment. What happens to employment in manufacturing has significant repercussions for employment and productivity in the rest of the economy.

The remainder of the chapter is organized into three sections. Section 3.2 briefly presents a theoretical framework for discussing the interactions between technology, structural change, demand growth and employment growth in developing economies. This framework provides the basis for a typology of patterns of growth. Section 3.3 offers empirical evidence of different trajectories of growth, productivity and employment in manufacturing under different scenarios defined by macro policies, ITPs and external shocks. Section 3.4 identifies growth patterns for the whole economy. Section 3.5 offers concluding remarks.

3.2 Employment, structural change and growth in developing economies

3.2.1 Demand, productivity and structural change regimes

This section discusses the interactions between employment, patterns of specialization and the growth of effective demand (a formal discussion can be found in the Appendix). At one level the evolution of unemployment depends on the difference between the growth rates of GDP and of labour productivity. At another level, GDP growth is frequently constrained by external disequilibrium or balance of payments (BOP) constraints, particularly for countries specialized in low-tech commodities. These countries have a low income elasticity of demand for exports and a high income elasticity of demand for imports. As a result, the deficit in the current account as a percentage of GDP tends to rise when economic growth accelerates. Such a situation is not sustainable in the long run, and hence the country is forced to reduce its rate of growth in order to curb external disequilibrium.

Productivity growth is determined by changes in the RER, economic growth and structural change. The RER influences productivity growth for two reasons. First, in developing economies a significant share of total investment in capital goods is imported. Therefore, a fall in the RER reduces the price of these goods and accelerates the replacement of earlier vintages of equipment. Second, a lower RER heightens competitive pressures in domestic and external markets.[6] Foreign goods will be cheaper, and domestic firms will have to invest more in technology than when they are "protected" by a high RER. In the analysis below, increases in productivity also come from learning-by-doing and depend positively on the rate of economic growth, a relationship referred to as the Kaldor–Verdoorn law.

Structural change, a key factor determining productivity growth, is closely associated with the diversification of production, increasing returns, new skills and capabilities and various knowledge spillovers that a more complex economic structure makes possible.[7] Structural change also depends on the RER and productivity growth in various other ways. The RER and productivity determine unit labour costs of production in each sector. An increase in the RER and/or productivity growth allows domestic firms to break in and compete in new sectors, and it promotes both export diversification and import substitution.

Together, effective demand, productivity and structural change define the parameters that describe different growth typologies and how changes in policies and external conditions affect growth prospects and employment. The RER is influenced by the combination of macroeconomic policies, external shocks in lending and the terms of trade. Although the RER is not fully controlled by the government, it is assumed that macro policies do have an influence on this variable.

3.2.2 The three regimes and emerging patterns of growth

There are various possible combinations of the demand, productivity and structural change regimes in equilibrium. These combinations define different scenarios, which are in turn directly related to macro and industrial policies. Four scenarios will be highlighted that represent different growth and employment paths found in developing economies (table 3.1), although other combinations are possible. These scenarios correspond to the four scenarios suggested by Ocampo (2005) in terms of structural dynamics and may be seen as a complement to his typology.

[6] See Blecker (1999).

[7] See, for instance, ECLAC (2008) and Dosi, Lechevalier and Secchi (2010).

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Table 3.1 Growth in productivity, employment and structural change: alternative scenarios

Employment growth (z)	**Productivity growth (a)**	
	Fast productivity growth	**Slow productivity growth**
Fast employment growth	**I** *Virtuous circle* – Strong demand regime – Strong productivity regime – Strong structural change regime	**II** *Labour absorption* – Strong demand regime – Weak productivity regime – Weak structural change regime
Slow employment growth	**III** *Defensive rationalization* – Weak demand regime – Strong productivity regime – Weak structural change regime	**IV** *Vicious circle* – Weak demand regime – Weak productivity regime – Weak structural change regime

- The first scenario is the **virtuous circle**, represented in panel I of table 3.1. This scenario emerges from macro policies that focus on competitiveness and strong ITPs, generally in a context of expansion of the world economy. A competitive RER and structural change spur economic growth. The positive effect of structural change on the growth of exports (or on reducing the growth rate of imports) boosts the rate of growth of labour demand compatible with external equilibrium. For this positive effect on labour demand to occur, the impact of structural change on demand growth must exceed its impact on productivity growth.[8] At the same time, productivity growth is positive and rapid because spillovers and externalities produced by structural change largely overcome the drag on technical change arising from a depreciated RER.
- The second scenario is driven by **labour absorption**, represented in panel II of table 3.1. This scenario is produced by a macro policy that stresses competitiveness, while ITPs are absent or weak. Structural change is very slow, but a depreciated RER sustains demand growth. As a result, employment grows. However, productivity growth slows as a high RER raises the costs of capital goods and increases monopoly power of domestic firms. The difference between this scenario and the previous one lies mainly in the specific role of ITPs. In the first scenario active ITPs closely link the diversification

[8] Formally, $y'(z) > a'(z)$ (see Appendix).

of production to productivity growth and thereby compensate for the negative impact of the RER. In the second scenario the RER effect prevails due to weak spillovers and limited learning. A weak industrial policy is a policy that does not provide incentives to shift into economic activities that generate externalities, increasing returns and the absorption of new technologies. This lack of support may be the result of negligible transfers of resources to dynamic activities; weak differential incentives that are unable to counteract path dependence that reinforces static comparative advantages; the transfer of rents to industries or firms that lack clear targets and objectives; and the failure to build up infrastructure and human capital and other requirements for catching up with the technological frontier (Cimoli, Porcile and Rovira, 2010).

- The third scenario is related to macro policies or external shocks that increase the RER. In the case of external shocks, such increases may stem from easy lending in international capital markets or from rising terms of trade. The appreciation of the RER leads to **defensive rationalization** as the main competitive strategy and to losses of capabilities, as some sectors cannot survive. This is shown in panel III of table 3.1. A paradox may emerge in this situation, in which productivity growth accelerates while the specialization pattern moves towards low-tech commodities. The process of job destruction advances faster than job creation, and unemployment increases. The corollary of this is that productivity may significantly increase in some sectors in a context of slow growth of aggregate demand and growing unemployment in the aggregate. Labour is reallocated towards non-tradables, largely to service activities with low labour productivity.

  Some policy-makers may see this scenario as a healthy process of moving back to comparative advantages and to what the economy does best. They may welcome such a combination of slower employment growth and faster productivity growth, particularly if they are concerned primarily with inflation.[9] However, there is a significant risk of trading long-run productivity growth for short-run productivity growth. In the long run the loss of technology-intensive sectors would harm productivity growth. In other words, the adverse impact of RER on learning may be important in the short run, while adverse *structural* effects become increasingly important in the long run (see Lima and Porcile, 2013).

[9] It is necessary also to distinguish between appreciation of the RER arising from better terms of trade and appreciation arising from easy lending. The former may be associated with high rates of demand growth, pushed by booming exports; the latter is more likely to produce slow economic growth.

- The fourth scenario is a **vicious circle** of falling productivity and employment, shown in panel IV of table 3.1. Aggregate demand stagnates or falls even with a competitive RER, either because the country is heavily indebted and has to use most of its foreign exchange to service the debt (it becomes a net exporter of foreign exchange) or because there is a large negative shock in the terms of trade that heightens the external constraint on growth. Decline in the role of structural change and loss of productivity growth reinforce each other and stifle the efforts of the country to escape from the vicious circle using the RER. Only some exogenous intervention alleviating the burden of the external constraint (through either a default on the debt or a favourable renegotiation of its terms) would be effective in this scenario.

The next section presents these scenarios in the productivity–value added plane to discuss how they relate to employment growth.

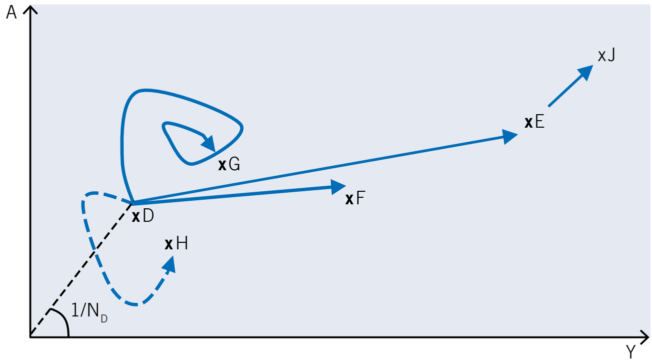
3.2.3 Combining demand side and supply side variables

The scenarios described above can be seen in terms of the co-evolution of labour productivity (A) and aggregate demand/production (Y) (figure 3.1; see also Cimoli and Porcile, 2009). In the AY space point D indicates the prevailing levels of productivity and income at t = 0; ND indicates the level of employment; and the ratio 1/ND corresponds to the slope of the line drawn from the origin to point D.[10] Different trajectories in productivity versus aggregate demand (and hence employment) from $t = 0$ to $t = T$ are described by the curves from D to E, F, G and H. These trajectories are related to how the country combines demand-side and supply-side interactions – which, as mentioned, depend on specific combinations of macro policies and ITPs as well as on external shocks.

Consider, for instance, the virtuous circle scenario, in which ITPs aim at strengthening technological capabilities and changing the pattern of specialization towards high-growth sectors, while the macroeconomic policy sustains both a high and stable RER and the expansion of autonomous expenditure consistent with external equilibrium. This virtuous circle will take the economy – after time T – from point D to point E. The labour market will increasingly enhance the bargaining power of workers, as the rate of employment rises and real wages tend to move upwards as well.

[10] This ratio multiplied by the productivity level gives total product and total aggregate demand.

Figure 3.1 Alternative patterns of productivity and income growth



In the labour absorption scenario, the RER and the expansion of world trade sustain effective demand, but structural change and learning advance at a much slower pace. After the same period *T*, the economy will be at point *F* rather than at point *E,* as in the virtuous circle scenario. This pattern of growth is reflected in horizontal shifts in figure 3.1, with labour productivity contributing slightly to growth (labour absorption only). The management of the demand side favours growth, but there is not enough learning to reduce the gap with the international technological frontier (weak ITPs). Employment grows, but jobs will be of lesser quality in this scenario. This also means that the demand for qualified labour will be feeble, which in turn implies almost no incentives to train and educate the workforce.

The scenario of defensive rationalization reflects a context of RER appreciation and lack of ITPs. Such a trajectory is represented by the curve from point *D* to point *G*, driven by RER effects on productivity and falling employment. In this case there is a strong initial jump in productivity – due to a short-lived investment spike based on imports of capital and intermediate goods – but it soon recedes. Moreover, if the appreciation of the RER leads to deficits in the current account, a recessive period may follow the initial expansionary shock of higher productivity. The economy may then show cyclical swings around a lower equilibrium rate of growth. The effects on the labour market may be highly negative for two reasons. The first is the direct impact of a low RER on competitiveness, effective demand and, hence, employment. The second is that the regime of defensive rationalization is associated with strong fluctuations in the RER, inflation and GDP. This regime entails the accumulation of disequilibria (external and internal) that at the end of the day are followed by deep recessions, which may hurt in a lasting way the production structure and the labour market.

The vicious circle scenario, represented in figure 3.1 by the dashed line from *D* to *H,* emerges when there is a severe external shock and large exports of capital. Such a curve depicts the case in which GDP falls or else grows at a very slow rate, while levels of labour productivity fall. The vicious circle is associated with sluggish labour markets and falling real wages. A fall in total investment accompanies this scenario and makes catching-up in technology still more difficult.

The different scenarios can be sequential. For instance, a phase of the virtuous circle of growth in productivity and employment, if it exhausts the reserve of labour in the developing economy, may lead to a period of growth led by productivity growth. The accumulation of technological capabilities after a long period of learning allows the country to depend less on a depreciated RER and more on rising productivity to compete in the international market. Labour markets change in favour of workers, and real wages rise. This case is represented by the arrow connecting the points *E* and *J* in figure 3.1. Inversely, a period of easy lending associated with defensive rationalization may produce a large external debt that has to be paid in the following phase. A negative shock in external conditions triggers the crisis and moves the economy towards a vicious circle (from *G* to a lower point close to *H*, not shown in figure 3.1).

Historically, in developed economies the expansion of employment along with labour productivity is related to the diversification of the economy, the expansion of high-tech activities and exports and the consequent dynamism of domestic and international demand. In developing economies, on the other hand, technical change is highly localized in a few export activities (in both the agricultural and industrial sectors), with feeble effects on total demand and structural change. As a result productivity tends to grow at higher rates than demand, implying that unemployment and underemployment persist. Countries that succeeded in catching up, such as the Republic of Korea and, more recently, China, have had a macro policy committed to competitiveness and comprehensive ITPs. While industry in China seems to follow the path described by the arrow from *D* to *F*, as in the labour absorption scenario, the Republic of Korea is already on the path described by the arrow from *E* to *J*.

In the next section (section 3.3) different patterns of growth, employment and structural change in the manufacturing sector will be discussed for four Latin American countries and the Republic of Korea. These patterns are related to the exogenous variables of the model – macro and industrial policies and shocks in capital lending and terms of trade. In section 3.4 the same variables are analysed for the aggregate economy.

3.3 Patterns of structural change, growth and employment in the manufacturing sector

This section discusses different paths followed by the manufacturing sectors of four Latin American economies (Argentina, Brazil, Chile and Mexico) and the Republic of Korea. The latter provides an example of a successful catching-up economy. For each country the different phases described in the text are identified in table 3.2 at the end of the section (see also figures A3.1–A3.5 in the Appendix). Growth in value added and employment growth is measured based on data obtained from the PADIWIN for Latin America and from the STAN Database for Structural Analysis (OECD) for the Republic of Korea. The RER was obtained from the Penn World Table.

Structural change is measured through a proxy that aims to capture the technological intensity of manufacturing, the Index of Relative Participation (IRP). The IRP is the ratio between the share of engineering industries[11] in the total manufacturing value added in a certain country (Argentina, Brazil, Chile or Mexico) and that share in a benchmark country. This chapter uses the United States as the benchmark country. Therefore, an IRP = 0.5 in country i means that the share of the engineering industries in manufacturing in country i is half of its share in the United States. A higher IRP indicates a higher KS dynamism in the production of manufactured goods. The change of IRP over time represents progressive structural change ($z > 0$; see Appendix).

To make the typology operational, the different patterns of growth are identified by applying quantitative thresholds. We consider two variables: employment growth and productivity growth. We adopt the following criteria: (i) employment growth is positive or zero/negative and (ii) productivity growth is higher or lower than 2 per cent.[12] Combining these two criteria produces the following matrix.

Patterns of growth in manufacturing

Employment growth	**Productivity growth**	
	≥ 2 per cent	**< 2 per cent**
Positive	*Virtuous circle*	*Labour absorption*
Zero or negative	*Defensive rationalization*	*Vicious circle*

[11] Engineering industries comprise, in the Standard International Trade Classification (SITC), Fabricated metal products except machinery and equipment; Machinery and equipment; Transport equipment.

[12] Choosing the thresholds is to some extent arbitrary. The choice of the cut-point of 2 per cent productivity growth and positive employment growth is intended to ensure that the economy grows above 2 per cent annually.

In the remainder of this section, the different phases of growth of Argentina, Brazil, Chile, Mexico and the Republic of Korea will be classified according to this matrix.

3.3.1 Argentina

In Argentina since 1970 three different scenarios can be identified (see table 3.2 and figure A3.1 in the Appendix). Defensive rationalization was the prevailing scenario in two periods (1976–81 and 1990–2001), characterized by low RER, regressive or slow structural change and falling or stagnant industrial employment. These periods correspond to two major experiments in economic policy. The first was implemented by the military government that came to power in 1976. That government adopted a bold plan of trade and financial liberalization. The nominal exchange rate was used as an anchor to curb expectations of inflation, leading to strong real appreciation, and trade barriers were unilaterally reduced. This period ended with the debt crisis of 1982. The second period of defensive rationalization was related to the "Convertibility Plan" and the adoption of a fixed exchange rate regime (Cavallo Plan) under democracy. In both cases the low RER was used as the main anti-inflationary weapon as Argentina emerged from a period of super- or hyper-inflation in the early 1970s and the late 1980s. In both cases there was an attempt to return to static comparative advantages and to minimize government intervention, which was seen as the main cause of economic stagnation in Argentina. As with the previous experiment at rapid trade and financial liberalization, the "Convertibility Plan" led to a major external crisis and recession.[13]

The labour absorption scenario – high RER, slow structural change and increases in industrial employment – is found in Argentina in two quite different periods: in the first half of the 1970s and after the major devaluation of 2002. In the first period (1970–75) the RER was as appreciated as in the 1990s, but at the same time a vast array of protectionist measures kept the manufacturing sector relatively sheltered from external competition. In the second period (from 2004) the government sought to keep the exchange rate at a competitive level while encouraging a more equitable income distribution, with positive effects on aggregate effective demand. Manufacturing GDP grew twice as fast as in the first half of the 1970s, accompanied by a moderate increase in labour productivity.

[13] See Frenkel (2004), and Damill and Frenkel (2009).

The last scenario seen in Argentina is that of the 1980s in which value added and employment fell due to the costs of the debt service, which sharply compromised growth and investment. Productivity grew moderately in this period, but this was due to the fact that output collapsed even faster than employment. Such a scenario reflects a vicious circle of technological backwardness and declining competitiveness.

Structural change responds more slowly to changes in policy than do productivity and employment. The evidence shows that the IRP (whose change captures structural change) tended to remain more or less stable until the outbreak of a crisis and then to drop sharply. This does not mean, however, that the structure is insensitive to macro prices. During the period of currency appreciation, firms are harmed by falling competitiveness and demand, while capabilities and skills are gradually eroded. During the crisis firms, production and human capabilities are destroyed on a large scale as a result of accumulated disequilibria of the previous period. The adverse impact of the crisis on the engineering sector is heightened by the fact that in time of crisis investment contracts more than other components of aggregate demand.

Hysteresis phenomena are important in structural change. Slow growth and low investment imply falling behind the rest of the world in terms of technological capabilities. In a world of fast-moving international technological frontiers, it is extremely difficult for an economy to recover its technology-intensive sectors once it has lost them. This is why periods of currency appreciation based on defensive rationalization are followed by a vicious circle of slow growth in employment and value added.

Argentina dismounted most of the instruments it had as ITPs after 1976, but some protectionist measures remained in place for sectors such as automobiles, steel and petroleum.[14] In recent years the Argentine government has sought to rebuild its instruments for industrial ITPs, largely as a defensive response to the global recession of 2008 and subsequent appreciation of the RER. Appreciation since 2007 is due not only to higher commodity prices but also to rising inflation, which exceeded 20 per cent in the last few years. In parallel, there was a significant move towards the adoption of protectionist measures that are not clearly related to learning and catching up. All in all, the Argentine experience in industrial policy has been weaker and more discontinuous than that of Brazil.

[14] See Katz (1997).

3.3.2 Brazil

Two critical differences between Argentina and Brazil should be emphasized. The first is that, throughout its post-1930 history, Brazil has been more committed to industrial development than Argentina. In contrast to manufacturing in Argentina, manufacturing in Brazil grew in all the periods considered (table 3.2 and Appendix figure A3.2). In particular, while Argentina made an early attempt at financial and trade liberalization in the late 1970s and abandoned most of its instruments for industrial policy in the same period, Brazil adopted the Second National Plan of Development (II PND), which gave a significant push to industrial diversification. Import-substituting industrialization and subsidies to industrial exports were extensively used in the 1970s. The continuous use of industrial policy in Brazil led to higher levels of IRP than in any other Latin American country. The IRP in Brazil in the 1970s was almost 0.7, while in Argentina it was 0.3.

The second difference lies in the RER policy after 1990.[15] Like Argentina, Brazil used the RER as an anchor for inflation in the 1990s, but without adopting a full-fledged fixed exchange rate regime like Argentina's. Brazil's "Real Plan" adopted instead a band of fluctuation for the nominal exchange rate. This band was used for anti-inflationary purposes but still gave the Brazilian government more freedom to devalue and react to external disequilibrium. For this reason the appreciation of the Brazilian currency, the real, was not as critical as that of the Argentine peso. Positions reversed after 2002. Argentina then sought to keep the RER at a competitive level (and was successful until inflation began to bite the RER), while in Brazil, by the end of the first decade of the 2000s, the RER had fallen to the levels of the 1990s.

Analysis of industrial transformation in Brazil suggests four different phases. One comprises the period 1970–81, in which ITPs secured high manufacturing and employment growth, albeit in a context of low competitiveness. The IRP increased steadily, driven by ITPs, giving rise to a virtuous circle. However, the RER appreciated in the late 1970s. This was associated with rising external debt and falling rates of growth. In the 1980s the debt crisis inaugurated a vicious circle phase that lasted until the early 1990s. Defensive rationalization prevailed as a consequence of the stabilization programmes of the 1990s (which used the RER as an anchor). A labour absorption phase started after the devaluation of 1999. In recent years the RER has tended to appreciate again in Brazil. This has moved Brazilian employment and structural change towards a path more like that of the 1990s, although it is too early to assess impacts on industrial structure.

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[15] An account of policies in the 1990s in Latin America can be found in ECLAC (2003).

3.3.3 Chile

The analysis of economic evolution in Chile delineates several phases since 1970 (table 3.2 and Appendix figure A3.3). In the second half of the 1970s, Chilean performance in terms of growth, particularly for the manufacturing sector, was dismal. Chile adopted a policy of rapid trade and financial liberalization that brought about the appreciation of the RER in 1976–81. This hampered competitiveness, particularly in the manufacturing sector. Under a policy of reducing the presence of the State and deregulating the markets, sector policies were abandoned, while – as in Uruguay and Argentina – macro policies were based on the "monetary approach to the balance of payments". The consequences were a sharp drop in the IRP and a mounting external debt that created the conditions for the vicious circle observed during the first half of the 1980s.

The country entered a dynamic path of growth only in the mid-1980s, *pari passu* with the adoption of a competitive RER and policy efforts at export diversification.[16] While the IRP rose during the virtuous circle phase of 1986–97, the gradual appreciation of the RER hindered the momentum of growth and so led to a new fall in the IRP. Capital controls (administrative controls and an "unremunerated reserve requirement" between 1991 and 1998) allowed for a higher degree of autonomy in monetary policy. However, these controls were abandoned after the Asian financial crisis, making more room for subsequent currency appreciation. Since 1997 manufacturing has moved towards defensive rationalization. Employment in manufacturing ceased to rise, reflecting the slowing of diversification and growth.

Chile shares with Argentina the radical move towards trade and financial liberalization along with currency appreciation in the 1970s and the collapse of the 1980s. The difference between the two countries in the 1990s seems to lie in Chile's commitment to a policy of export diversification and to a more competitive RER, which – in contrast to the "Convertibility Plan" in Argentina and (to a lesser extent) the "Real Plan" in Brazil – was intended to spur diversification. The difference in the development of the IPR in the two countries reflects this difference in policies.

After 1998 the momentum of export diversification receded in Chile, leading to both a fall of the IRP and a marked fall in the growth of productivity. There is still considerable debate as to which factors lie behind lower productivity growth.

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[16] On the institutional and productive changes that encouraged the emergence of new export activities in Chile in the 1990s, see Katz (2008).

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The initial wave of diversification succeeded in exploring technological trajectories based on natural resources. Such technological trajectories were gradually exhausted, however. To overcome decreasing returns, more active industrial policy would be required, aimed at developing capabilities with technological bases beyond the primary sector. Although Chile has a few instruments devised to promote innovation and diversification, these instruments are fragmented and poorly funded. The effects of such programmes were limited, and Chile remains dependent on natural resources, particularly on copper exports. Also, the appreciation of the exchange rate through 1997 has compromised the continuity of export diversification (Ffrench–Davis, 2000 and 2002).

3.3.4 Mexico

Like Brazil, Mexico continued to promote industrialization in the 1970s and did not renounce industrial policy until the mid-1980s. During most of the 1970s, Mexico followed a virtuous path of growth (table 3.2 and Appendix figure A3.4), although import substitution lost momentum late in the decade, except for some intermediate and capital goods sectors (Ros, 2000). In the late 1970s the RER appreciated in the context of increasing oil exports, while disequilibria in the current account accumulated, leading to the 1982 default on the external debt.

In the 1990s Mexico moved sharply towards a more liberal stance in trade and finance, abandoning ITPs. In 1994 the country joined the North American Free Trade Association (NAFTA). This had two major consequences for manufacturing growth. On the one hand, manufacturing gained easy and stable access to the large US market, an advantage that promoted exports. On the other, Mexico had to compete with US industry on an equal footing. As a result, the use of foreign inputs and imported technology increased. The export drive sustained industrial growth but diluted the domestic technological content of growth. Significant parts of manufacturing classified formally under the heading of engineering were indeed labour-intensive activities (maquila). In this sense, although the Mexican IRP was close to the IRP in Brazil, the IRP in Mexico cannot be taken as an accurate indication of technological intensity.

Mexico sharply devaluated its currency in 1995, giving rise to a phase of labour absorption. Exports grew rapidly but produced little endogenous technology and domestic value added. The export surge failed to create linkages with the rest of the economy, which led the government to revisit the previous rejection of ITPs. More recently, both horizontal and vertical industrial policies have found a place on the agenda of the newly elected (in 2012) Mexican government.

Table 3.2 Patterns of growth in the manufacturing sector, 1970–2008

Argentina: manufacturing sector, 1970–2008

Period	IRP (%)	RER	VA (%)	Employment (%)	Productivity (%)
1970–75 (LA)	−0.45	0.99	3.49	3.58	−0.08
1976–81 (DR)	0.23	1.12	−1.90	−6.93	5.29
1982–190 (VC)	−4.07	1.41	−0.67	−2.18	1.58
1991–2001 (DR)	−0.74	0.99	2.01	−2.29	4.35
2002–08 (LA)	−0.66	2.17	6.50	5.53	0.90

Brazil: manufacturing sector, 1970–2008

Period	IRP (%)	RER	VA (%)	Employment (%)	Productivity (%)
1970–81 (VirtC/LA)	3.25	1.07	7.28	5.38	2.00
1982–92 (VC)	0.07	2.00	0.62	−0.67	1.45
1993–98 (DR)	−0.31	1.31	2.59	−3.28	6.16
1999–2008 (LA)	−0.56	1.75	2.76	3.96	−1.10

Chile: manufacturing sector, 1970–2008

Period	IRP (%)	RER	VA (%)	Employment (%)	Productivity (%)
1970–73 (LA)	7.26	0.88	2.70	2.69	0.07
1974–81 (DR)	−4.83	0.93	1.55	−3.79	5.50
1982–85 (VC)	−12.99	1.14	−1.57	−0.63	−1.03
1986–97 (VirtC)	5.61	1.21	6.43	4.08	2.40
1998–2008 (DR)	−3.49	1.32	2.53	0.66	2.01

Mexico: manufacturing sector, 1970–2008

Period	IRP (%)	RER	VA (%)	Employment (%)	Productivity (%)
1970–81 (VirtC)	2.93	0.89	7.02	3.67	3.24
1982–94 (VC)	0.43	1.11	2.03	0.16	1.83
1995–2000 (LA)	−0.09	0.96	5.72	4.12	1.51
2001–08 (DR)	−2.45	0.77	1.10	−2.55	3.74

Republic of Korea: manufacturing sector, 1970–2009

Period	IRP (%)	RER	VA (%)	Employment (%)	Productivity (%)
1970–80 (VirtC)	7.29	0.82	16.16	8.87	6.75
1981–90 (VirtC)	6.66	0.69	12.50	5.09	7.15
1991–2000 (DR)	3.52	0.57	8.91	−1.47	10.46
2001–09 (DR)	1.08	0.57	5.38	−1.22	6.67

Key: *Variables:* RER=average real exchange rate of the period; IRP=rate of growth of the Index of Relative Participation; VA=rate of growth of manufacturing value added; Employment=rate of growth of employment in the manufacturing sector; Productivity=rate of growth of labour productivity in the manufacturing sector.

Growth regimes: LA=labour absorption; DR=defensive rationalization; VirtC=virtuous circle; VC=vicious circle.

Source: PADIWIN (CEPAL), STAN Database for Structural Analysis (OECD) and Penn World Table (University of Pennsylvania).

In the second half of the 1990s, the RER began to appreciate again in Mexico, first in a context of high instability and subsequently in a more stable environment (following the adoption of an inflation target regime in 1999). The country ended the first decade of the new century with a RER much more appreciated than in the 1990s, which helps to explain the emerging pattern of defensive rationalization of the 2000s (Gallagher and Moreno-Brid, 2008).

3.3.5 Republic of Korea

It is interesting to compare the trajectories of the Latin American economies with a successful catching-up economy such as that of the Republic of Korea. Table 3.2 and Appendix figure A3.5 clearly show four main contrasts.

First, in the Republic of Korea productivity growth in manufacturing did not experience the reversals seen in the Latin American economies. Second, very high rates of productivity growth went hand in hand with very high rates of employment growth until the 1990s. Thereafter, employment in manufacturing fell, but at the same time manufacturing value added grew rapidly – a pattern that suggests this was not a defensive strategy (i.e. an effort to avoid losing market shares due to declining competitiveness). Third, the RER shows a slow and steady path of appreciation over time, without the volatility that plagued the Latin American experience. Such appreciation mirrors the increase in productivity that allowed the Republic of Korea to become less dependent on the RER to compete. Last but not least, the IPR moved up throughout the period, reflecting a very strong process of structural change in favour of KS dynamic sectors in production and exports. The central role of structural change in the Republic of Korea, which avoided any discontinuity in virtuous growth, is apparent in the table.

3.4 Where do workers go? Aggregate productivity and employment

The preceding analysis focused on the co-evolution of productivity and employment to describe different patterns of growth in the manufacturing sector. However, this sectoral analysis does not allow conclusions for the whole economy. Rapid losses of employment in manufacturing are not necessarily harmful if new, good-quality jobs (i.e. jobs with similar or higher productivity) are created elsewhere. In this section, therefore, we extend the analysis to the whole economy and contrast the patterns of overall growth with those in manufacturing.

If productivity growth in manufacturing goes hand in hand with productivity growth and employment creation in the whole system, then the process of economic development – at least from the perspective of structural change – is on the right track. However, this has not always been the case in the four Latin American countries considered. Peaks of productivity growth in manufacturing under defensive rationalization may not be productivity-enhancing for the rest of the economy. During phases of defensive rationalization, manufacturing does not diffuse technology, but rather defensive rationalization cuts off some of manufacturing's linkages with the rest of the economy.

Three indicators demonstrate this. The first is trends in value added and productivity in the whole economy. The movement of employment and productivity in opposite directions at the aggregate level suggests that workers dismissed in the manufacturing sector could not find jobs of similar productivity in other sectors of the economy. The second indicator is the evolution of unemployment. Even when productivity per employee rises, if at the same time open unemployment or informality increases, then the productivity of the total labour stock may fall. The third indicator is a shift–share exercise that decomposes total productivity growth into two sources: productivity growth in each sector, on one hand, and, on the other, the reallocation of workers from lower to higher productivity sectors. If the signal of both sources is positive and strong, then a virtuous process of growth is taking place.

Table 3.3 and Appendix figures A3.6 through A3.10 show patterns of aggregate growth in productivity and value added. It can be seen that virtuous circle periods show a similar pattern in the aggregate. In contrast, defensive rationalization in industry is associated with stagnant employment or declines in productivity growth. The available information allows for extending the analysis to 2010.

In effect, employment stagnated in Chile during the liberalization – cum – appreciation phase of the second half of the 1970s, while in Argentina in the same period value added stagnated and productivity fell (figures A3.6 and A3.8). A similar stagnation in productivity and employment can be seen in Brazil and Argentina during the years of currency appreciation in the 1990s ("Real Plan" and "Convertibility Plan") and in Mexico in the 2000s (Appendix figures A3.6, A3.7 and A3.11). After 1998 Chile experienced slow productivity growth at the aggregate level despite rapid productivity growth in the manufacturing sector. In Mexico defensive rationalization in manufacturing resulted in a decline in employment of 2.5 per cent per year on average between 2001 and 2005, which was accompanied by a fall in aggregated employment by 0.5 per cent on average in the same period.

The Republic of Korea displays a different pattern. Its sustained economic growth characterized by growing productivity and employment in the aggregate is

Table 3.3 Patterns of growths for the economy, 1970–2010

Argentina, 1970–2010

Period	VA (%)	Productivity (%)	Employment (%)
1970–75	3.1	3.2	−0.1
1976–81	2.0	1.0	1.0
1982–90	−0.5	−2.9	2.4
1991–2001	2.8	1.8	1.0
2002–10	7.6	3.6	3.9

Brazil, 1970–2010

Period	VA (%)	Productivity (%)	Employment (%)
1970–81	7.22	3.11	3.99
1982–92	2.05	−1.50	3.60
1993–98	3.05	1.47	1.55
1999–2010	3.64	1.84	1.77

Chile, 1970–2010

Period	VA (%)	Productivity (%)	Employment (%)
1970–73	0.9	−0.3	1.2
1974–81	4.0	3.5	0.5
1982–85	3.6	−2.0	5.8
1986–97	7.8	4.4	3.2
1998–2010	3.4	2.3	1.1

Mexico, 1970–2010

Period	VA (%)	Productivity (%)	Employment (%)
1970–81	6.87	1.31	5.49
1982–94	2.03	−1.37	3.45
1995–2000	5.45	2.16	3.23
2001–10	1.98	0.72	1.25

Republic of Korea, 1970–2010

Period	VA (%)	Productivity (%)	Employment (%)
1970–80	7.2	3.7	3.5
1981–90	9.0	6.0	2.9
1991–2000	5.7	4.3	1.4
2001–09	3.9	2.6	1.3

Key: VA = rate of growth of the value added; Productivity = rate of growth of labour productivity; Employment = rate of growth of employment;

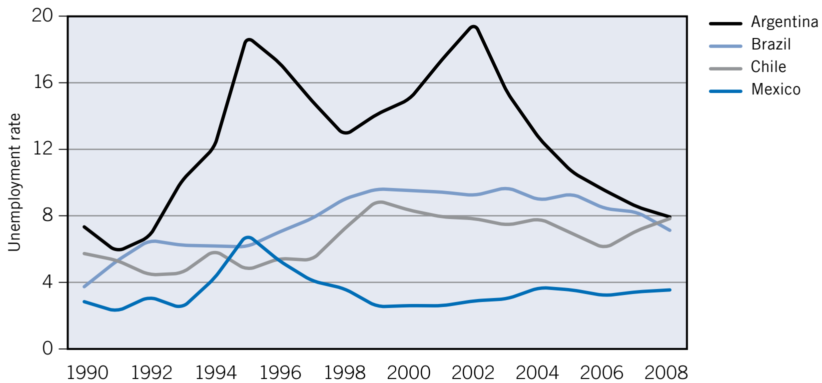
Source: Computed by the authors based on the Groningen Growth and Development Centre database.

remarkable. Although employment growth slowed in the 1990s, rates of economic and productivity growth were still high. In the 2000s the performance of the Republic of Korea was less impressive, although still positive. However, growth rates became negative after the 2008 Great Depression. In contrast to many Latin American countries, the Republic of Korea did not benefit from the rising global demand for natural resources since 2004.

Argentina performed particularly well in terms of aggregate GDP growth after 2002. Several factors coincided to produce this outcome. The year 2002 marked the lowest point in the Argentine business cycles; external conditions for Argentine exports significantly improved after 2004. In addition, the country followed more heterodox policies that favoured growth. Default on the external debt freed Argentina (at least temporarily) of the heavy constraints imposed by the transfer of resources to creditor countries – the type of constraint that hampered growth and investment in the 1980s. Maintaining the RER at a competitive level has been crucial as well. There are still clouds of uncertainty concerning the sustainability of growth, which, notably, receded in recent years, while inflation remains high. The need for more vigorous policies aimed at spurring productivity growth and structural change will probably be at the top of the agenda of the policy debate in Argentina in the coming years.

In the four Latin American countries examined, trends in unemployment are consistent with the patterns seen in figure 3.2. In Argentina unemployment increased throughout the 1990s and then rapidly fell after the 2002 devaluation. In Brazil it rose sharply in the Real Plan years (1994–99), remained at high levels, and then began to fall slowly after the devaluations of 2002. Chile showed low

Figure 3.2 Unemployment rates in four Latin American countries, 1990–2008 (percentages)



Source: ECLAC, Economic Development Division.

and stable levels of unemployment until the late 1990s. The rates then jumped to around 9 per cent and then fell again. Among these four countries, Mexico had the lowest levels of unemployment. Unemployment levels peaked during the tequila crisis in 1994. In the second half of the 1990s, they returned to pre-crisis levels and then slightly increased again in the 2000s.

The shift–share analysis aims at identifying two different sources of productivity growth: the "within" component, which represents productivity increases within each sector, and the "between" component, which represents the effect of workers moving from lower- to higher-productivity sectors. It should be borne in mind that the between-sectors component captures just a small part of the role that structural change plays in development. In the model set forth in section 3.2, structural change affects the behaviour of (domestic and external) effective demand and the balance of payments (BOP)-constrained rate of growth, as well as productivity and the quality of jobs created.

The shift–share analysis covers the period 1990–2008, using data from the ECLACSTAT database; there are no comparable data for the shares of total employment in the different sectors before the 1990s. Table 3.4 shows the results of this analysis.

In the case of Argentina, it is remarkable that aggregate productivity growth in the 11 years of the "Convertibility Plan" did not exceed that of 2002–08, in spite of much higher productivity growth in manufacturing in the earlier period.[17] It seems that, while manufacturing expelled labour to lower-productivity sectors in the 1990s, it attracted labour from lower-productivity sectors in the 2000s. Accordingly, the between-sectors component was more significant in Argentina in the 2000s than in the 1990s. The same is true for Brazil. Despite all the productivity growth in manufacturing in the 1990s, aggregate productivity growth was much lower than in the 2000s. Moreover, the between component was negative in Brazil in the first period.

A somewhat puzzling case is Argentina in 1970–75: manufacturing was labour-absorbing, while the economy showed a pattern of defensive rationalization. In this case protection assured increases in manufacturing employment at very low productivity levels, while rising economic instability led to slow growth and a drop in aggregate employment.

In the case of Chile, the shift–share analysis shows that economic growth between 1990 and 1998 was associated with higher productivity growth and a higher between-sectors component than in the subsequent period. This confirms

[17] The rate of growth of the second period may be exaggerated because it began at the bottom of the crisis in 2002, but it is nevertheless impressive.

Table 3.4 Shift–share analysis

Argentina, 1990–2008

Period	Labour productivity growth (%)	Effect	
		Within (%)	Between (%)
1990–2001	21.49	19.06	2.43
2002–08	21.47	17.06	4.42

Brazil, 1992–2008

Period	Labour productivity growth (%)	Effect	
		Within (%)	Between (%)
1992–98	6.01	8.07	−2.06
1999–2008	18.11	17.90	0.21

Chile, 1990–2008

Period	Labour productivity growth (%)	Effect	
		Within (%)	Between (%)
1990–97	33.66	24.20	9.46
1998–2008	29.43	26.62	2.81

Mexico, 1990–2008

Period	Labour productivity growth (%)	Effect	
		Within (%)	Between (%)
1990–94	1.40	13.34	−11.94
1995–2000	10.49	6.41	4.08
2001–08	9.21	1.45	7.77

Source: CEPALSTAT, Latin America and the Caribbean, by economic activity.

the presence of a virtuous pattern in the 1990s. In Mexico, in contrast, there was regressive structural change early in the decade. Productivity growth accelerated after the 1995 crisis and continued in the 2000s, albeit in a context of slower aggregate growth. As a result, productivity in the 2000s was less dynamic in Mexico than in Argentina, Brazil and Chile.

What emerges from the analysis of the aggregate behaviour of the economy? Periods of high productivity growth in manufacturing may not foster productivity growth in the rest of the economy. Rising unemployment and slower economic growth associated with external constraints compromise the performance of the economy in a context of appreciation of the RER – particularly if ITPs are absent or in some cases reinforce the adverse effects of the RER on competitiveness.

3.5 Concluding remarks

We have discussed technological upgrading, structural change and productivity and employment growth in four Latin American economies (Argentina, Brazil, Chile and Mexico) and in the Republic of Korea (used as a benchmark for successful catching up) in the period 1970–2008. The structuralist-evolutionary framework is giving rise to different growth scenarios based on the combination of three regimes: demand regime, productivity regime and structural change regime. Different income growth, employment growth, productivity growth and structural change trajectories emerge under different parameter values, defined by the combination of macro policies, ITPs and shocks in the international economy.

We contend that, when the RER is appreciated and ITPs are weak or absent, productivity growth is driven by rationalization and defensive responses not related to the expansion of effective demand. In this case sectors that are more technology-intensive lose competitiveness, and employment moves to activities of lower productivity. Inversely, when the exchange rate is competitive and active IT policies favour the diversification of production, higher-quality employment increases, as does productivity. The combination of the RER policy and ITP is critical: without ITP, the RER can sustain only a labour absorption pattern that is unable to close the technology gap. At the same time, without a competitive RER, the ITP cannot promote rapid demand growth and fully exploit increasing returns. Our analysis also highlights the risks of long periods of RER appreciation, which adversely affect structural change and hence long-run growth.

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Contents

Appendix

Theoretical framework: Demand, productivity and structural change regimes

Understanding the evolution of unemployment requires discussing the determinants of the demand for labour. Growth of total employment (n) equals GDP growth (y) minus the rate of growth of labour productivity (a):

$$(1) \quad n = y - a$$

Lowercase letters represent proportional rates of growth (e.g. income growth is $y \equiv \left(dY/dt\right)/Y$). We focus first on economic growth and subsequently on the determinants of productivity growth.

Keynesians point out that, to curb unemployment, one should look mainly to the growth of effective demand rather than to changes in the institutions of the labour market (such as changes in the strength of labour unions, the flexibility of labour contracts and nominal and real rigidity of wages and prices). In this appendix we present a simple North (developed economy) – South (catching-up economy) heuristic model that illustrates the interaction among employment, the pattern of specialization and the growth of effective demand.

The point of departure is the literature on the external constraint on growth. This literature argues that, in countries specialized in a few sets of (usually low-tech) commodities, rates of growth are constrained by the recurrent emergence of external disequilibrium, which frequently takes the form of balance of payments (BOP) crises. Countries cannot grow for long periods with a rising deficit in the current account as a percentage of gross domestic product (GDP); therefore, rates of growth should adjust to restore equilibrium.[18] Supply-side variables (technological asymmetries with the North) and demand-side variables (patterns and shifts in the international demand for consumer and capital goods; rate of growth of the global economy) combine to define the rate of growth compatible with long-run equilibrium in the current account.

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[18] Several developing countries have experienced discontinuous, stop-and-go patterns of growth punctuated by external crisis – some of them with effects that persist for long periods. For a discussion of the external constraint on growth from the perspective of Latin American structuralism, see Rodríguez (2007). Recent revisions and extensions are Blecker (2009), Cimoli and Porcile (2011), Setterfield (2009) and Thirlwall (2011). For a discussion of the external constraint and its links with macro policies, see Ocampo, Rada and Taylor (2009, Chapter 7).

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Equations (2) and (3) express the rate of growth of exports (x) and imports (m) as a function of the real exchange rate (r), the growth of domestic income (in the imports equation), international income (in the exports equation) and structural change:

$$(2)\quad x = x(\rho, z, y^*),\ x'(\rho) > 0, x'(z) > 0, x'(y^*) > 0$$
$$(3)\quad m = m(\rho, z, y),\ m'(\rho) < 0, m'(z) < 0, m'(y) > 0$$

In equations (2) and (3) y is growth of real GDP in the South; y^* is the growth of real GDP in the North; z represents the diversification of the economic structure (structural change towards sectors with higher Keynesian and Schumpeterian efficiency); and $r = P^*E/P$ is the real exchange rate (P^* and P are foreign and domestic prices, respectively, and E is the nominal exchange rate defined as units of domestic currency per unit of foreign currency). Equilibrium in the trade balance, where M and X are the volume of imports and exports, implies:

$$(4)\quad P^*EM = PX$$

The dynamic condition for equilibrium in the current account (assuming a balanced current account initially) is:

$$(5)\quad p^* + e + m = p + x$$

Using (2) and (3) in (5) gives:

$$(6)\quad y = y(\rho, z, y^*),\ y'(\rho) > 0, y'(z) > 0, y'(y^*) > 0$$

In Kaldorian terms equation (6) represents *the demand regime* of the economy, which gives the rate of economic growth compatible with equilibrium in the current account. The elasticity of growth with respect to r is positive, which implies that the Marshall–Lerner condition holds. In turn, the elasticity of growth relative to diversification is represented by the positive (negative) derivative of the rate of growth of exports (imports) relative to structural change (z). The Kaldorian demand regime is usually associated with export-led growth. However, as Blecker (2009) shows, such a rate of growth may be incompatible with current account equilibrium and, hence, not sustainable in the long run. It is necessary to consider the response of imports to faster growth, and not only the response of growth to more exports. For this reason the demand regime is defined in accordance with the BOP-constrained growth model.

Productivity growth (*a*) depends on the RER, economic growth and structural change. Formally:

$$(7) \quad a = a(\rho, y, z), \; a'(\rho) < 0, \; a'(y) > 0, \; a'(z) > 0$$

Equation (7) defines Kaldor's *productivity regime*. The argument in equation (7) has three variables. The first is the RER, which is assumed to affect productivity growth for two reasons:[19] it fosters imports of capital goods and increases the pressure of foreign competition on domestic firms (see subsection 3.2.1).[20] The second variable in the argument of equation (7) represents learning-by-doing, which depends on the rate of economic growth (y), as stated in the Kaldor–Verdoorn Law.

Finally, structural change (z) depends on the RER and productivity growth:

$$(8) \quad z = z(\rho, a), \; z'(\rho) > 0, \; z'(a) > 0$$

A higher RER and a higher *a* favour competitiveness and diversification, and this is why the derivatives of z with respect to *r* and *a* are positive.

Equations (1), (6), (7) and (8) form a system of four equations with four unknowns: economic growth (*y*), productivity growth (*a*), employment growth (*n*) and structural change (*z*). The exogenous parameters are the RER (*r*), the rate of growth of the global economy (*y**) and the Kaldorian coefficients that link productivity growth to economic growth and structural change. The values of the parameters respond to changes in policies and external conditions. The RER is defined by the mix of macroeconomic policies and by external shocks in lending and terms of trade. Technological coefficients are affected by industrial and technological policies (ITPs). Note that, although government does not fully control the RER, it is assumed that macro policies do have an influence on this variable. The experience of countries such as Brazil, Germany and the Republic of Korea in the 1960s and part of the 1970s, and more recently China, support this hypothesis.

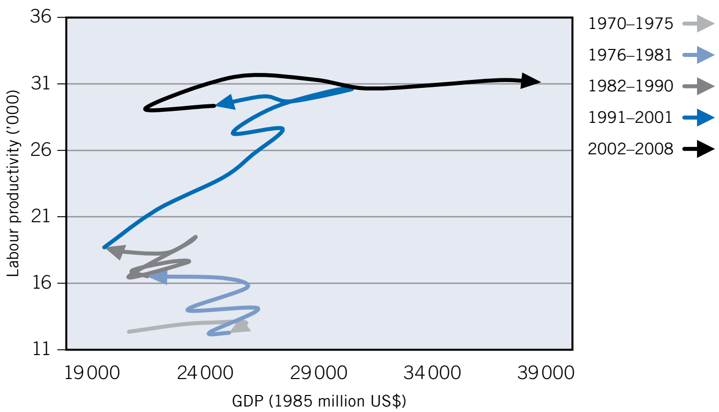
[19] This is a point of debate in the literature. See Lima and Porcile (2013).

[20] See Blecker (1999).

Contents

Evolution of productivity and value added in the manufacturing sector, 1970–2008

Figure A3.1 Argentina: manufacturing sector, 1970–2008



Note: The reciprocal of the employment level is given by $\frac{\partial(Q/L)}{\partial Q}=1/L$, the slope of the curve in the graph above.

Figure A3.2 Brazil: manufacturing sector, 1970–2008

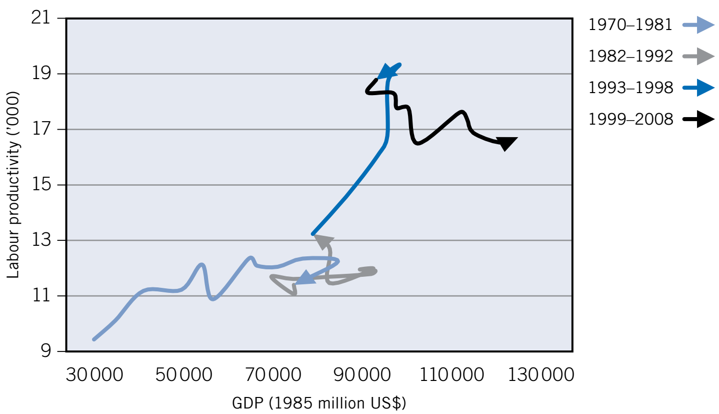


Figure A3.3 Chile: manufacturing sector, 1970–2008

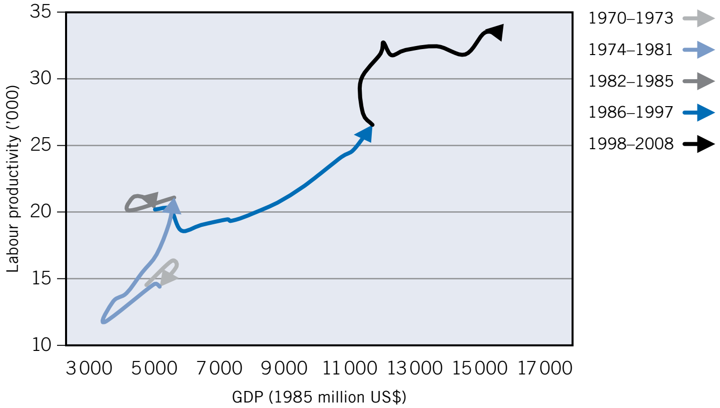


Figure A3.4 Mexico: manufacturing sector, 1970–2008

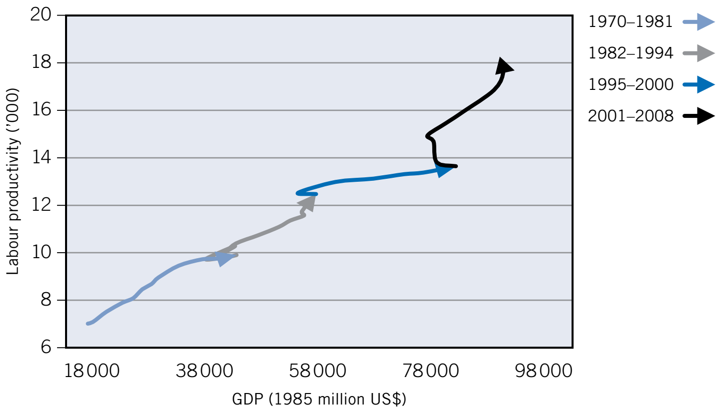
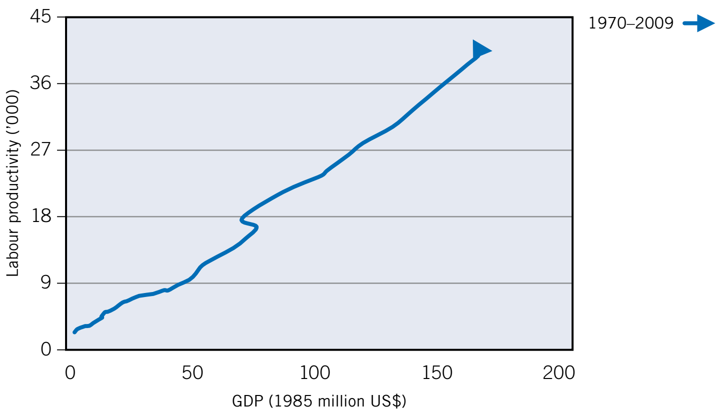


Figure A3.5 Republic of Korea: manufacturing sector, 1970–2009



Evolution of productivity and value added in the economy, 1970–2010

Figure A3.6 Evolution of productivity and value added in the economy, 1970–2010: Argentina

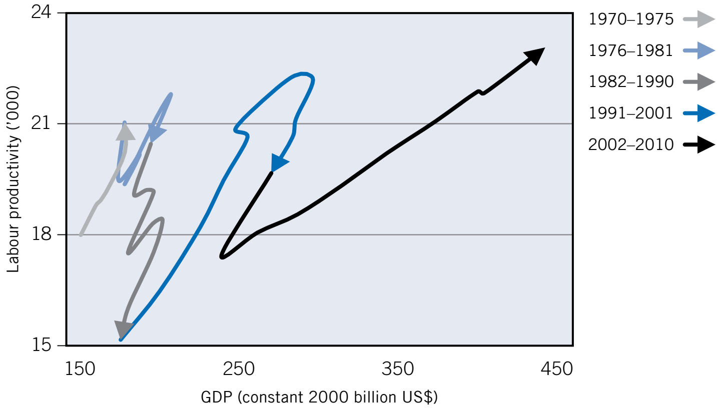


Figure A3.7 Evolution of productivity and value added in the economy, 1970–2010: Brazil

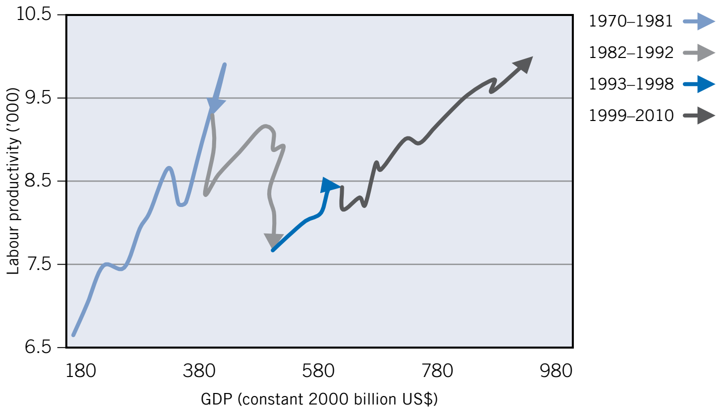


Figure A3.8 Evolution of productivity and value added in the economy, 1970–2010: Chile

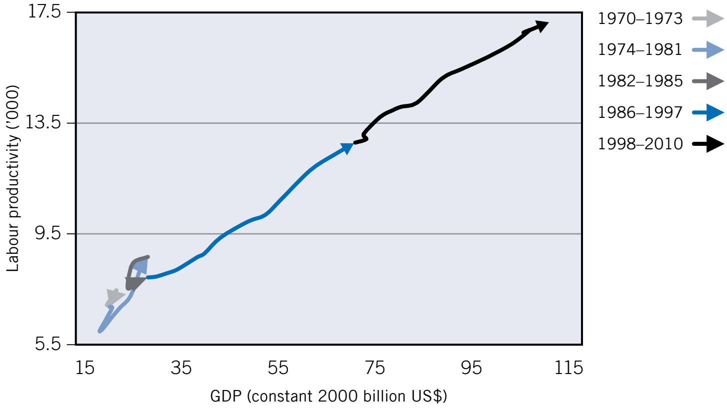


Figure A3.9 Evolution of productivity and value added in the economy, 1970–2010: Mexico

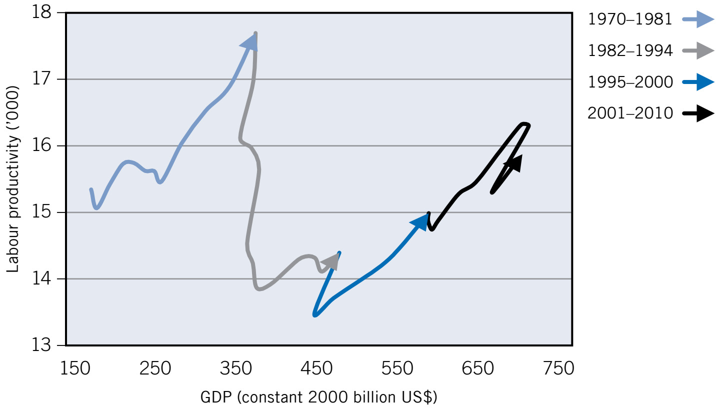
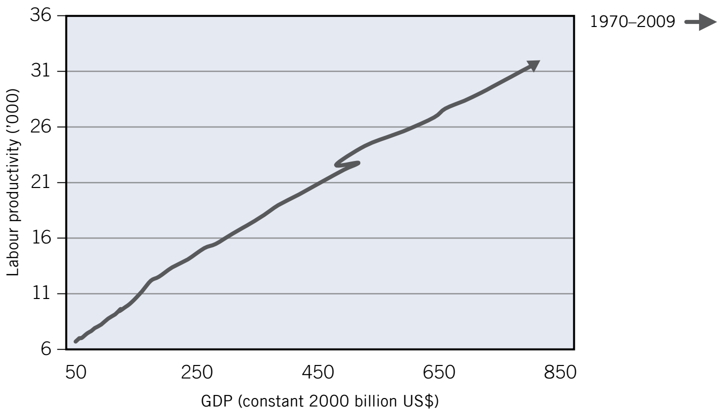


Figure A3.10 Evolution of productivity and value added in the economy, 1970–2009: Republic of Korea



A theory of capabilities for productive transformation: Learning to catch up

4

Irmgard Nübler

4.1 Introduction

Patterns and processes of productive transformation have varied greatly across countries. Some countries have shown high performance, sustaining rapid growth over long periods. These high-performing countries have managed to achieve a pattern of growth and structural transformation that has led to fast and sustained technological change and productivity growth, the generation of more and better jobs, more sophisticated occupational structures, and employment patterns that result in rising incomes and in poverty reduction. In short, they achieved high-performing catching-up growth and economic development. Others have gone through a more fitful and uneven transformation process with growth spurts followed by slowdowns. Yet others have failed to trigger much in the way of transformation, continuing to rely heavily on traditional activities in the rural economy and informal activities in the urban economy.

This differentiated performance among countries and regions in their patterns and processes of catching up raises significant policy issues and challenges. One of them is the role of capabilities in productive transformation. Economists take different perspectives on how capabilities enable and shape productive transformation. One strand of the literature, the structural change perspective, argues that capabilities determine the products and technologies that firms and economies can easily develop (Hausmann et al., 2011; Richardson, 1972). A second strand, the process perspective, discusses capabilities as the determinant of the behaviour of firms and economies and their competences to perform such tasks as coordinating, investing, innovating, identifying and solving problems, and learning

(Chang, 2010; Dosi, Winter and Nelson, 2000; Lall, 1992 and 2000; Nelson, 2008; Nelson and Winter, 1982; Sutton, 2012; Teece, Pisano and Shuen, 1997). Thus, these two separate strands of the literature discuss capabilities as the determinants of two dimensions of productive transformation: the *patterns* as well as the *process* of structural transformation. Development economics, however, so far has failed to integrate these two perspectives into a growth and productive transformation model.[1]

Mainstream growth models have largely neglected capabilities. These models view economic development as a process of production factor and technology accumulation, assuming a mechanistic relationship between investment in productive capacities and growth, with market forces driving the accumulation and growth process. Robert Lucas (1988) summarizes this perspective in his article "On the mechanics of economic development". He distinguishes three accumulation models: "[A] model emphasizing physical capital accumulation and technological change, a model emphasizing human capital accumulation through schooling, and a model emphasizing specialized human capital accumulation through learning-by-doing. Two decades after Lucas published his article, the Commission on Growth and Development (2008, p. 37) concluded that economists still lack a good understanding of the link between technology, human capital, education and training on the one hand, and economic growth on the other one, that therefore "[researchers] may have the wrong model of growth" and that, due to country-specific capabilities, there is no "one size fits all" set of rules to guide policy-makers seeking to promote growth.

This chapter shifts focus from the *mechanics* to the *dynamics* of economic development by elaborating an analytical framework to better understand the process of catching up and the forces driving its dynamics. The framework introduces capabilities as a key determinant of catching up and economic development.

To date, however, despite the centrality of capabilities in the literature on productive transformation, the concept has remained a black box. Dosi, Winter and Nelson (2000, p. 1) note that "[t]he term 'capabilities' floats like an iceberg in a foggy Arctic sea, one iceberg among many, not easily recognized as different from several icebergs nearby". This chapter therefore develops a theory of capabilities to explain how capabilities shape the dynamics of catching up, where the different types of capabilities reside, how they are created and transformed, and the role of policies in promoting and shaping them.

[1] It is important to distinguish this "productionist" view of capabilities from the "humanistic" view developed by Amartya Sen (Chang, 2010). Sen developed a concept of human capabilities to provide a new measure for development. In contrast, the "productionist" view explains how collective capabilities at the level of firms and economies shape structural and technological change in the economy.

The theory consists of three components. First, a concept of catching up is elaborated which defines the phenomenon as a process of productive transformation reflected in diversification into new products and higher value added activities as well as in technological upgrading, the creation of more productive and better jobs and employment patterns that result in rising wages and poverty reduction. The catching-up concept views productive capabilities and productive capacities as two fundamentally different but interrelated concepts, integrates the structural change and process dimension of productive transformation discussed by distinct economic traditions, and elaborates the channels through which capabilities shape both dimensions of productive transformation and thereby determine growth.

With this in mind, the chapter develops a knowledge-based concept of capabilities, the second component of the theory of capabilities for productive transformation. The concept argues that the capabilities to drive and govern productive change are embodied in various collective, shared or aggregate forms of knowledge at the levels of enterprises, the labour force, economies and societies. Hence, while productive capacities reside in the "material" sphere of the economy (in tangible production factors and infrastructure), productive capabilities exist in the "non-material" or in the intangible sphere of knowledge.[2] Figure 4.2 depicts the knowledge-based capability concept linked to the catching-up framework.

The development of capabilities is therefore essentially a process of learning. Hence, there is a need to elaborate a concept of learning which explains how capabilities are generated. Economists, however, have only a limited understanding of the nature of the learning processes that lead to expanding capabilities for high-performing catch-up growth and economic development.[3] This chapter therefore elaborates a concept of learning which draws on explicit theories of knowledge and learning developed in different disciplines such as philosophy, cognitive science and sociology (e.g. Bandura, 1986; Boyd and Richerson, 1985; Polanyi, 1958), and applies them to the economic context.

This interdisciplinary approach shows that learning to catch up is a complex and costly process, involving the accumulation of different forms of knowledge,

[2] This distinction between the material and the knowledge sphere in explaining economic development goes back to List (1909 [1841]), and was highlighted more recently by the "new" economic historians such as McCloskey, Goldstone and Mokyr (see Nübler, forthcoming).

[3] Economic growth and trade theories use concepts such as "learning-by-doing" or "knowledge spillovers". The learning process, however, is not explicitly modelled, but is assumed to occur as the result or "by-product" of production (Arrow, 1962), trade (Young, 1991) and investment in R&D (Cohen and Levinthal, 1989). Human capital theory assumes that learning by individuals takes place as a result of investment in education and training. Stiglitz (1999) discusses knowledge as a public good and public policy implications for the provision, use, transfer and dissemination of such goods.

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characterized by distinct properties and acquired through fundamentally different learning processes – an observation that highlights the relevance of learning not only in schools but also in the production system and in social, cultural and organizational networks. Moreover, the concept demonstrates the relevance of learning not only at the level of individuals, but also at the collective level of social groups – in enterprises, organizations, the economy and society as a whole. In addition, learning itself represents a capability. Learning to learn is therefore a central feature of high-performing learning systems in a dynamic economic context. This concept of collective learning is the third component of the theory of capabilities for productive transformation.

The theory of capabilities contributes to a better understanding of the link between education, training and technological learning on the one hand and economic growth on the other hand. This link was identified as a knowledge gap by the Commission on Growth and Development (2008). The knowledge-based concept of capabilities linked to productive transformation shows that transformation of capabilities through individual and collective learning drives the dynamics of catching up by enhancing the range of options for diversification and the collective competences necessary to generate rapid and sustained processes of productive transformation.

The framework defines a wide scope for industrial policies as they are challenged with promoting the co-evolution of the two interrelated processes of building capabilities for productive transformation in a learning process, and accumulating productive capacities through investment in production factors, in existing as well as new and advanced industries. This chapter is focusing on policies to promote the evolution of capabilities in the knowledge sphere. The framework offers recommendations for an integrated learning strategy that creates capabilities for high-performing patterns and processes of productive transformation. Such a learning strategy embraces education, training, technology, R&D, trade and investment policies, promoting learning in all sectors, at all levels and in multiple locations, as well as fostering institutions to trigger, accelerate and sustain these learning processes. The learning strategy forms an essential part of an industrial and economic development agenda.

This chapter is structured as follows: Section 4.2 sets out a concept of catching up that focuses on the dynamics of economic transformation and introduces capabilities as a main driver of catching-up dynamics. Section 4.3 presents a knowledge-based concept of capabilities, explaining where capabilities reside (collective memories), and Section 4.4 explains how capabilities are generated (collective learning). Section 4.5 outlines a learning strategy for creating a high-performing process of capability development. Section 4.6 draws conclusions.

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4.2 A dynamic concept of catching up

This section develops a concept of catching up by drawing on different traditions in development economics, ranging from the German historical school to institutional, evolutionary and structural economics. It recognizes the wide potential of developing countries to catch up in the light of their imitating or borrowing existing products and technologies from around the world, but also explains the limits developing countries face in exploiting these potentials.

4.2.1 Two dimensions of catching up

The concept maintains that the dynamics of catching up are determined by the structural change and process dimensions of productive transformation. The structural change dimension relates to the patterns of change in the economic structure (diversification, product differentiation and technological upgrading) while the process dimension relates to the pace and sustainability of this change. Performance in catching up is measured in terms of both patterns and processes of productive transformation.

Patterns of productive transformation – What you produce matters

The pattern of change in the economic structure is important as it determines the extent to which countries can achieve their development goals. Indeed, "... not all goods are alike in terms of their consequences for economic performance" (Hausmann et al., 2007, p. 1). Some patterns of structural and technological change and specialization in certain goods contribute more than others to improvements in productivity, income and wages, the generation of more productive and higher quality jobs, and opportunities for learning in the production process.

Empirical evidence shows that high productivity growth rates were achieved in countries that were able to shift production from traditional to modern activities, in particular to tradable and industrial products, and to develop relatively complex export goods (Hausmann, Hwang and Rodrik, 2007; Rodrik, 2009). Manufacturing has been identified as a "leading sector" in the process of productive transformation due to its economies of scale, strong backward and forward linkages, and widespread opportunities for technological progress and knowledge spillover. Furthermore, manufacturing generates a substantial number of productive jobs, through direct effects as well as through indirect effects created by linkages to other sectors and income-induced effects.[4]

Ocampo, Rada and Taylor (2009) identify manufacturing as the sector with the highest potential for productivity and employment growth in low-income countries, although technological upgrading and diversification within agriculture are also important to support productive transformation. In contrast, in higher-income countries with rapid long-term growth, manufacturing has served as an engine for productivity growth, but not for job creation; here, net growth in jobs has come from the service sector. Roncolato and Kucera (2013) discuss the potential role of advanced services as a "leading sector" in economic development, highlighting competing perspectives among economists and arguing that the service sector can be a lagging complement to manufacturing, a leading complement to manufacturing or a substitute for manufacturing.

An emerging literature is analysing the impact of technological change on the properties of tasks and jobs and thereby on the quality of employment. Jobs and tasks are allotted to categories such as routine, non-routine, analytical, interactive, manual, cognitive, skilled or unskilled (Autor, Levy and Murnane, 2003; Balconi, Pozzali and Viale, 2007; Chandler, 1977). Since technologies and production processes used in different economic sectors differ in important economic properties such as fragmentability, factor intensity, modularization, automation of tasks, and knowledge base, they are associated with different job profiles. Consequently, the nature of technological change promoted in a catching-up strategy has important implications for the quality of jobs and the occupational structure of the economy (Nübler, forthcoming).[5]

Countries also need to strike a good balance in achieving multiple development objectives, taking account of potential synergies and trade-offs. Rapid technological deepening and the labour-saving nature of technological change drive productivity growth, but also destroy jobs. The challenge facing developing countries is therefore to diversify into a broad range of new economic activities (and promote domestic and foreign demand) in order to generate new jobs to achieve positive net employment effects. Comparative analysis of productive transformation processes in the Republic of Korea and Costa Rica during the 1960s and 1970s demonstrates that the Republic of Korea achieved significant higher growth rates in productivity and employment by simultaneously promoting industrial widening and technological deepening, while in Costa Rica,

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[4] See Lavopa and Szirmai (2012) for a review of the literature.

[5] See, for example, Lall (2000); Pavitt (1984); Perez (1983); Nelson and Winter (1982).

industrial widening moved more slowly than technological deepening (Nübler, forthcoming).

These empirical findings suggest that countries' performance in terms of patterns of structural and technological change need to be assessed in the light of their development objectives and the aspirations of their societies. There is no "one-size-fits-all" pattern of high-performing productive transformation.

Processes of productive transformation – Pace and sustainability

In addition to high-performing patterns, countries need to develop a high-performing process of productive transformation. This is important in light of high unemployment rates, fast-growing numbers of young people entering the labour market and persistent poverty in many developing countries. High-performing processes are expressed in fast expansion of productive capacities and rapid productive transformation, absorbing technology and diversifying into a wide scope of different products and industries. Reinert (2009) finds that countries achieving a rapid pace of catching up jumped into leading technological paradigms which created "productivity explosions" through increasing returns, fast learning, synergies, innovation and rapid diversification.

High performance of processes is also measured in terms of sustainability. Countries can move from low to middle and then to advanced income levels only if they can sustain high growth rates in income per capita for a significant period of time. The recent debate on the "middle-income trap" suggests that moving from the middle to the advanced income level seems to be a challenge for many middle-income countries. Growth rates tend to decline as they approach the upper middle-income thresholds, and, thus, these countries risk falling into the middle-income trap.[6] While a growing body of studies explores empirically trends and factors that are related to declining growth dynamics in middle-income countries, development economics does not provide models or frameworks to explain the middle-income trap.

To summarize: the two dimensions of productive transformation and catching up are complementary, and therefore need to evolve together. Successful catching up requires high performance in both the structural change and the process dimensions of catching up.

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[6] See, for example, Agénor and Canuto (2012); Eichengreen, Park and Shin (2011); Foxley and Sossdorf (2011); Jankowska, Nagengast and Perea (2012).

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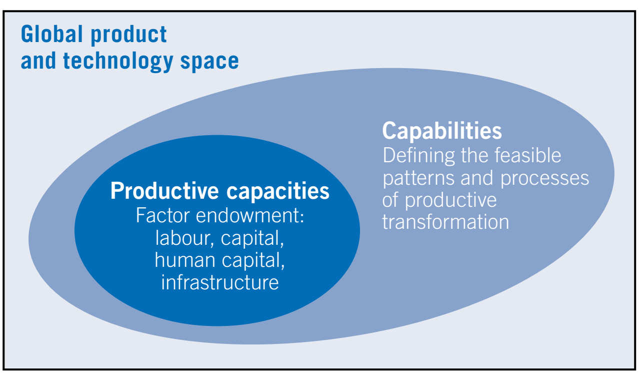
4.2.2 Productive capacities and productive capabilities

The concept of catching up elaborated in this chapter defines catching up as a dynamic process of productive transformation. This concept distinguishes between the "catching-up potential" and the "feasible" or "realistic" space for catching up. The gap between a country's portfolio of mastered techniques, activities and products and those available at the global level defines its "catching-up potential". In figure 4.1 the global product and technology space (GPTS) describes the technologies and products that exist in the world, while the productive capacities space describes a country's existing portfolio of technologies and products it masters at a particular point of time. Hence, a country's catching-up potential is benchmarked against the GPTS. Productive capacities are determined by the production factors accumulated in the country.

Gerschenkron (1962) views the gap between the GPTS and a country's productive capacities as the "benefits of backwardness", as it provides the potential for developing countries to develop rapidly by borrowing technologies from the rest of the world and imitating products already produced in more advanced countries. The challenge facing developing countries is to catch up within the GPTS, to imitate a wide range of different products, to expand the scope of their own economic activities and technologies within the GPTS, to navigate rapidly through this space and to sustain this process.

This concept of catching up argues that each country or society has developed a specific set of capabilities that determines its feasible scope for expanding productive capacities and catching up within the GPTS. They determine a country's realistic direction of change and the nature of the diversification, product differentiation and technological upgrading that a country can achieve. The feasible

Figure 4.1 A concept of catching up



scope or space for productive transformation is illustrated by the capabilities space in figure 4.1. The boundary of this space distinguishes those products and technologies that the country can easily adopt from those that are beyond the country's reach.

Capabilities also determine the pace and sustainability of the transformation process. Countries need to develop competences that enable firms and the economy to identify new opportunities for change, to invest and expand productive capacities into targeted new industries and technologies, and to manage rapid and sustained processes of structural and technological transformation. Developing countries differ in their abilities to expand productive capacities into new products, industries and technologies, manage the transformation process and exploit their catching-up potential.

Abramovitz (1986) introduces "social capabilities" as a variable to explain the differences in performance among today's developed countries during their historical catching-up phases. He concludes that the countries able to catch up rapidly with advanced technologies were behind technologically but advanced in social capabilities. The important contributions by Abramovitz are the insights that countries differ in capabilities, that capabilities determine a country's ability to implement economic and technological change, that these capabilities are embodied in society and that they are not given but acquired. Abramovitz labelled these *social* capabilities because they are embodied in society. This chapter, however, calls them productive or dynamic capabilities to stress their role in driving the dynamics of productive transformation and growth.

4.2.3 Capabilities are expressed in options and competences

The dynamic concept of catching up establishes two distinct links between country-specific capabilities and the dynamics of productive transformation. In the first place, capabilities are expressed in options for structural and technological change. The concept of options implies that country-specific capabilities are not automatically translated into productive capacities and productive transformation. Rather, countries need to translate options into productive capacities through investment in new production factors, infrastructure and R&D, and the reallocation of resources. The concept of options also implies that capabilities are preconditions for productive transformation and that the development of capabilities needs to precede transformation of productive structures and technological upgrading.

This concept of catching up suggests that even countries with similar factor endowments and comparative advantages may have developed different capabilities and therefore have different options for productive transformation within the GPTS. This contrasts with mainstream economic theory, which implicitly assumes that all countries have developed all relevant capabilities, and as a consequence are all able to imitate each product in the GTPS. On this model, the selection of products within the GPTS that countries should target is determined by cost and comparative advantage. Thus Lin and Treichel (Chapter 2 in this volume) fail to take into account capabilities in their Growth Identification and Facilitation Framework and limit their analysis to productive capacities and comparative advantages. The concept of catching up elaborated in this chapter suggests that comparative advantages and capabilities are two distinct analytical concepts, and that the analysis of comparative advantages for diversification and productive transformation needs to be complemented by an analysis of capabilities and the options for productive transformation embedded in these capabilities.

In the second place, capabilities are expressed in collective competences to manage and direct the process of productive transformation. These competences play a central role in shaping the pace and sustainability of the catching-up process. They determine the performance of both individual firms and the economy as a whole in navigating through the GPTS and imitating new products and technologies in which they have no prior experience. The nature of competences countries have accumulated will determine their behaviour in translating options into economic diversification and technological change.

To conclude, the concept of catching up developed in this chapter defines catching up in terms of the two dimensions of productive transformation, and views capabilities as a major force driving the dynamics of both dimensions. Capabilities are expressed in the options defining the scope and nature of productive transformation, and in the competences that allow countries to translate options into productive capacities.

Furthermore, options and competences are complementary, and both need to be developed simultaneously to generate a high-performing catching-up process. The dynamics of productive transformation result from the co-evolution of options and competences for productive transformation as well as from the coordination of capabilities development with investment in productive capacities. Governments aiming at formulating a consistent economic development strategy need to align the development of capabilities with that of productive capacities. The continuous enlargement and transformation of country-specific capabilities is a central precondition and driver of sustained productive transformation and catch-up growth.

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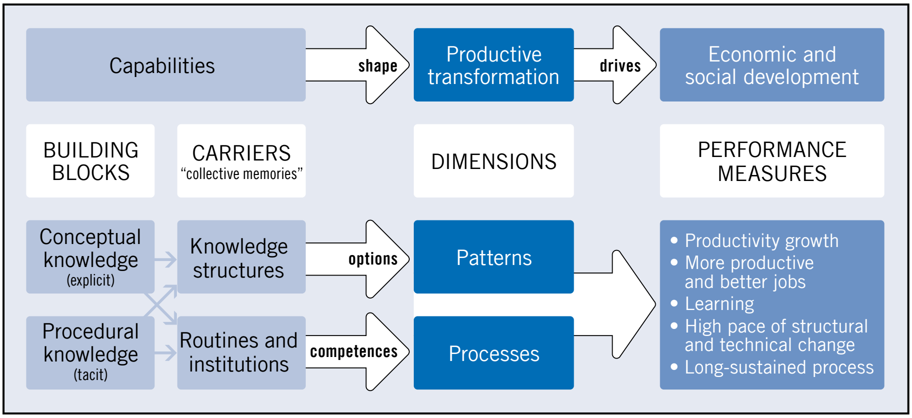
4.3 A knowledge-based concept of capabilities

Policy-makers aiming at promoting capabilities face the critical question: where do capabilities reside? That is, what are the "carriers" of options and collective competences for high-performing productive transformation? This section proposes a knowledge-based concept of collective capabilities. It suggests that capabilities for productive transformation reside in the sphere of knowledge, and therefore in the "non-material" sphere of the economy. Capabilities are intangible. The knowledge-based concept distinguishes between conceptual and procedural knowledge as distinct building blocks of capabilities (see figure 4.2).[7] Conceptual knowledge, or "knowing that", refers to abstract or general ideas, principles, rules and models. Concepts allow individuals to categorize and structure information and data, to analyse and interpret empirically observed phenomena, to gain understanding and meaning and to make choices.

In contrast, procedural knowledge refers to "knowing how to do", and it determines how well individuals, firms and economies perform in the work, production and learning processes. For example, the performance of a football team is not determined only by the conceptual and procedural knowledge of the individual players, but is essentially shaped by the collective procedural knowledge residing at the level of the team. The same could be said for teams of workers in an enterprise.

Figure 4.2 A theory of capabilities for catching up



[7] Chang (2010, p. 54) contends that "dynamics cannot be achieved by the isolated activities of individuals, but are created in the way individual competences are organized and coordinated within enterprises, in the knowledge which is created in a collective manner in the context of a complex division of labour".

The following two sections discuss knowledge structures and routines and institutions as distinct forms of collective knowledge and explains how conceptual and procedural knowledge shape options and competences for productive transformation in different ways. These two sections therefore establish the link between the knowledge and the material sphere of the economy, and the nexus of knowledge, capabilities and productive transformation.

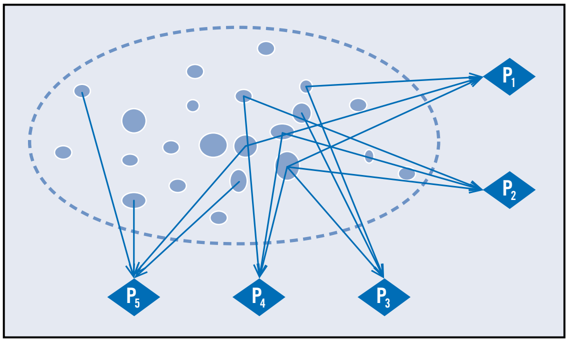
4.3.1 Knowledge structures: Carriers of options for structural and technological change

tEach social group builds up specific knowledge structures in the process of learning. As individuals acquire a broad range of conceptual and procedural knowledge, the social group develops a particular knowledge structure. These knowledge structures can be described by the particular nature, mix, diversity, variety and complexity of knowledge elements. The knowledge structure can be considered as a form of "collective memory".

The particular knowledge structure embedded in the labour force determines a country's options for structural and technological transformation within the GPTS. We define each product in the GPTS by a set of distinct but complementary tasks that need to be performed during production and by the distinct knowledge elements required for performing these tasks. Some products require similar knowledge sets, and the degree of similarity determines the relatedness of products. In contrast, products are considered to be distant when their production has few knowledge elements in common. Hence, we can structure the GPTS into technological knowledge communities, each one defined by particular knowledge sets underlying the tasks and products. Studies analysing the flow of workers and firms between economic activities and products within an economy support the idea that particular economic activities and products are related by similar knowledge and skills elements, and that products are related to distinct technological knowledge communities (Neffke and Henning, 2009; Newman, Rand and Tarp, 2011).

Figure 4.3 illustrates the idea of knowledge structures and options. The knowledge structure existing in the labour force is shown by the blue knowledge space within the broken ellipse, each dot representing a different knowledge element. P1 to P5 represent five different products, and the links to the dots represent the knowledge elements that need to be combined for their production. These five different products can be produced with the existing knowledge structure. We assume that P1, P2 and P3 are already part of the country's production portfolio.

Figure 4.3 Knowledge base of the labour force and options for productive transformation



Source: Nübler (forthcoming).

The country's options space is described by products P4 and P5. These products can be easily developed by combining and recombining the existing knowledge elements in the labour force.

Furthermore, we assume that P1 to P4 to belong to the same technological knowledge community as these products share similar sets of knowledge elements. The product P5 belongs to a different knowledge community which embraces the products P6 to Pn (not shown in the graph). P6 to Pn are not yet developed in the country because its labour force has not developed the complementary knowledge elements. The knowledge structure does not provide options to diversify into these products.

The concept of knowledge communities suggests that countries and firms find it relatively easy to diversify within a technological knowledge community in which the labour force has already gained significant experience and accumulated relevant knowledge sets. These knowledge elements can be easily recombined for the production of new goods. The literature provides many examples from different countries on the evolution of product lines and industries reflecting diversification within knowledge communities through the recombination of complementary knowledge elements (see Nübler, forthcoming). Moreover, firms have wide options to diversify within existing technological knowledge communities when the knowledge elements can be transferred to a wide range of different products. In contrast, knowledge communities which are characterized by product- or industry-specific knowledge tend to embrace few products as they allow firms to transfer these specific knowledge elements only to a limited number of products. For example, the skills profile of jobs in extractive industries is highly specific; therefore, many of the knowledge sets developed in the labour force in this industry cannot easily be redeployed and transferred. Consequently, they provide limited options for diversification.

This framework explains the rapid development of the software industry in India. Over the course of a long historical process, India has developed a particular knowledge structure embracing formal knowledge provided by a school system and curriculum modelled on the British system, English-language skills (as secondary and tertiary education is provided in English), technical and engineering skills developed in high-level institutes of technology, and knowledge of information technology (IT) acquired through early experience in "body-shopping"[8] and working in the diaspora community, largely in Silicon Valley in the United States (see Chapter 8 by Vijayabaskar and Babu in this volume). This particular knowledge structure generated options for India to enter the software industry and enabled the country at the beginning of the 2000s to take advantage of the window of opportunity opened up by the high demand for software services due to the Year 2000 problem. We consider the software industry as a particular technological knowledge community which is defined by a wide range of different products using similar sets of knowledge elements.

While countries and firms find it easy to diversify within technological knowledge communities, they will find it difficult to enter new communities and to develop economic activities and products for which they have not yet developed the relevant knowledge elements. Countries therefore need to develop options to enter more advanced knowledge communities by enriching the knowledge base of the labour force with knowledge elements of strategic significance for entering such communities. Hence, the shift into more advanced knowledge communities for a sustained process of catching up may require countries not only to enhance, but also to fundamentally transform their knowledge structure if they aim at entering "distant" knowledge communities. They need to deliberately develop more sophisticated scientific and technological knowledge elements, teach strategic "core" skills such as discipline, precision, creativity or critical thinking; and support the development of belief systems and cultural knowledge elements that facilitate jumps within the GPTS.

This highlights the importance of learning outside the production system, in schools and training centres, as well as attracting foreign firms or developing "infant industries" as a source of advanced technical knowledge.

This knowledge-based approach explains both incremental diversification into related products within knowledge communities and jumps to distant products

[8] "Body shopping" is the practice of consultancy firms recruiting and training information technology workers in order to contract their services out on short-term basis.

in new knowledge communities. While learning within the production system explains in particular incremental productive transformation, learning outside the production system is critical for explaining jumps into new communities. The "product space" approach of Hausmann et al. (2011) explains mainly incremental diversification. While they recognize the relevance of productive knowledge in shaping capabilities, they implicitly assume capabilities to be largely created in the production system. Hence, they limit their analysis to the generation of capabilities that allow only incremental diversification patterns.

4.3.2 Routines and institutions: Carriers of competences for high-performing process

In addition to knowledge structures, social groups also build up routines and institutions. The knowledge-based concept of capabilities argues that both routines and institutions are established by a combination of rules (conceptual knowledge) and knowing how to do (procedural knowledge). [9] Procedural knowledge determines the performance of the social group in applying and implementing the rules. Routines and institutions are the "memory" in social groups of "knowing how to do". They cannot be designed, but need to evolve in a learning process.

The competences to generate high-performing processes of productive transformation are embodied in routines and institutions. Evolutionary economists argue that institutions and routines shape the behaviour of the economy and enterprises, respectively. Nelson and Winter (1982) take the perspective of the enterprise, arguing that "the behaviour of firms can be explained by the routines they employ". Hence, routines are the carriers of collective competences at the level of firms and organizations, while institutions are the carriers of collective competences at the level of the economy. High performance is achieved when the rules and procedural knowledge underlying routines and institutions meet standards of excellence.

The enterprise level

The competences of firms to switch to a new product or to adopt new technologies from the GPTS are critical for a dynamic productive transformation

[9] This definition of institutions expands the concept provided by North (1990) who defines institutions as "rules of the game" that guide and restrict behaviour of players. Institutions become carriers of collective competences when defined by rules and procedural knowledge ("knowing how to play the game").

process. Their ability to switch and to manage the transition process is embodied in routines that enterprises can transfer and apply to the new economic context. Competences with high dynamic value relate to the ability of firms to analyse options embodied in their labour force and to identify potential new activities that could be developed in light of given knowledge structures, to invest and adapt technologies, to identify and solve problems arising during the switching process, to create and manage knowledge, to manage resources in the light of requirements of the new product or process and to control quality of products and processes.

A study of Viet Nam analysing the entry, exit and switching behaviour of enterprises shows that a significant number of enterprises are switching – that is, entering a new activity and abandoning their past activity (Newman, Rand and Tarp, 2011). Most importantly, the study shows that switching firms have an advantage over newly established firms entering the market in that their productivity levels tend to be above those of newly entering firms. This supports the argument that switching firms can transfer already established routines, while new firms need to build up such routines. Still, switching firms show lower productivity than incumbent firms in the new sector, a discrepancy which reflects procedural knowledge and competences acquired through substantial experience in the sector.

In addition, the Viet Nam study shows that the propensity to switch is greater among domestic firms than multinational enterprises. This observation highlights the important role of domestic enterprises in driving the transformation dynamics as initiators and catalysts of structural transformation and of enhancing procedural knowledge in domestic enterprises for achieving a rapid and sustained catching-up process. In fact, low capabilities in domestic firms to switch into new economic activities may be viewed as one factor explaining the middle-income trap. This supports the argument of Amsden (2009) that ownership of business makes a difference, as domestic firms make contributions to economic development distinct from those of foreign firms.

The economy level

Institutions are important carriers of collective competences at the level of the economy. Different economic traditions highlight distinct functions of institutions that are relevant in a dynamic context. Market theories stress the market-enhancing function of institutions as they coordinate activities, collect and disseminate information, guide and restrict behaviour and choices, and reduce the risk attached to entrepreneurial activities. Institutions promote growth as they create incentives to engage in new economic activities and invest in productive capacities such as new technologies and skills (North, 1990) and in "self-discovery" (Hausmann and Rodrik, 2003). Institutions promote knowledge-related processes such as the creation and sharing of knowledge in research and development by facilitating cooperation between a wide variety of complementary actors such as firms, public and private educational institutions, and training and research organizations (Brown, 1999).

Schumpeter (1911) argues that a society's "entrepreneurial spirit" and "pioneer" entrepreneurship form a central driver of the process of "creative destruction", productive transformation and growth. He further argues that entrepreneurship is created by the institutional structure of society. Societies with a high level of entrepreneurial spirits are those that have developed institutions that reward entrepreneurial activities. Nelson (2008, p. 9) argues that "long-run economic change must be understood as involving the co-evolution of technologies in use and the institutional structures supporting and regulating these".

Moreover, institutions building relationships of trust and social consensus have high dynamic value, as they support reforms and the acceptance by both winners and losers of economic changes (Franck, 1998; Schubert, 2009).

4.3.3 Complementarity of knowledge structures, routines and institutions

Options and collective competences are complementary, and successful catching up requires building up rich and diverse knowledge structures in the labour force, as well as "smart" routines and institutions in firms and the economy. Promising options for productive transformation that are not simultaneously complemented by the development of domestic collective competences cannot result in a sustained and long-term catching-up process.

Costa Rica provides an example. Following a rapid expansion of the education system, in particular of secondary education, during the 1960s and 1970s, the country had accumulated options for developing a wide set of manufacturing products in subsequent years. These options were indeed exploited, in particular from the 1990s, by developing institutions successful in attracting foreign direct investment (FDI) and promoting exports. The country, however, failed to develop institutions that would promote the development of capabilities in domestic enterprises. This strategy resulted in a fundamental transformation and sophistication of Costa Rica's export structure but not of its overall production structure (see Chapter 6 by Paus in this volume). Such a strategy also risks losing the dynamics of structural transformation, as the country is missing out on the diversification and switching activities of domestic firms.

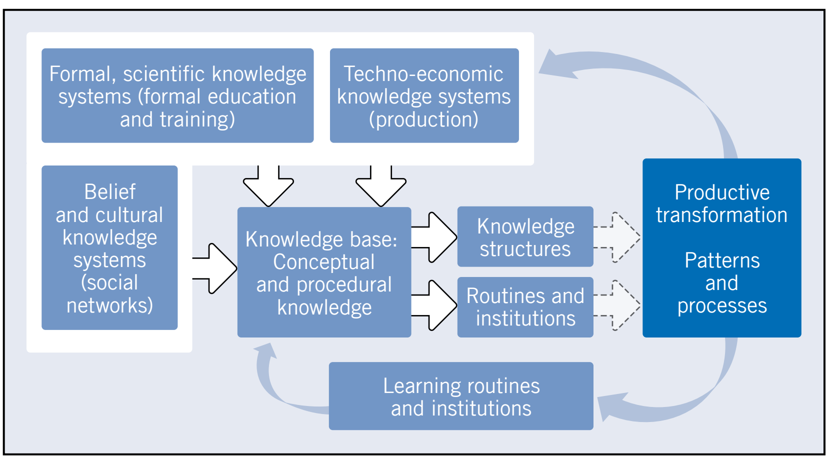
In contrast, the Republic of Korea has followed a strategy of simultaneously enriching the knowledge structure of the labour force and improving routines in domestic enterprises. This strategy resulted in a high-performing process of transformation of both production and export structures and high growth rates in productivity and employment throughout the 1960, 1970s and 1980s (Nübler, forthcoming).

4.4 A concept of collective learning

Theories of learning developed in various disciplines explain that individuals, but also enterprises, organizations and societies, learn by accumulating conceptual and procedural knowledge. Applying these different theories to the accumulation of capabilities suggests that learning at the collective level means essentially enriching and transforming knowledge structures embedded in social groups, and developing increasingly complex and "smart" routines and institutions. Knowledge structures, routines and institutions, identified above as the "collective memories" of social groups, evolve in a process of learning.

The development of capabilities is an evolutionary, cumulative and gradual process. The learning process involved in shaping knowledge structures, however, is different from that involved in building up routines and institutions. Hence, options and competences for productive transformation are shaped in different

Figure 4.4 A concept of collective learning for productive transformation



processes which highlight the relevance of learning at different levels and in multiple places. Figure 4.4 shows the main elements of a concept of collective learning for productive transformation.

4.4.1 Evolution of knowledge structures

Knowledge structures in a firm or economy are built up in a cumulative process. They are formed from conceptual knowledge elements which can be articulated and codified, stored in books and computers, and therefore easily communicated. Individuals develop concepts by organizing and categorizing information and integrating new information into existing concepts, thereby building increasingly complex knowledge structures and mental models. In addition, individuals develop procedural knowledge in a process of experience and practice. Procedural knowledge or "knowing how to do" is tacit knowledge which cannot be articulated. The nature, complexity and diversity of education, training, work experience and socialization to which individuals are exposed shape their mental models, and therefore also the particular mix of knowledge held by the labour force and society.

Shared and socially provided knowledge and belief systems are critical in determining knowledge structures at collective levels (see figure 4.4). The national curriculum taught in the formal education system and the type of technologies applied in the production system, as well as cultural knowledge systems (e.g. ideologies, philosophies, religions) that are prominent in the social system are major determinants of the nature, diversity and complexity of knowledge structures embedded in social groups. The knowledge structure embedded in the team of a firm or in the national labour force changes as advanced formal, technical, business and management knowledge elements and non-traditional cultural knowledge and beliefs are integrated into the existing knowledge system. With the ICT revolution, the Internet and social networks have become major factors influencing knowledge structures.

Countries aiming at transforming their knowledge structures to enhance options for productive transformation face the particular challenge of influencing and transforming shared knowledge systems.

4.4.2 Evolution of routines and institutions

Routines and institutions evolve as social groups engage in a collective learning process. This process involves the adoption of rules (explicit knowledge) and the accumulation of tacit procedural knowledge by repeatedly applying these rules while performing tasks. The social group learns to perform the various tasks by applying the rules and principles, e.g. of sequencing and coordinating tasks. With increasing practice and experience, the team accumulates increasingly complex knowledge of "how to do". This procedural knowledge represents the tacit element of routines and institutions because it can become established only when the social group ceases to focus consciously on the rules, and increasingly shifts focus on to the process as a whole. High performance evolves in a process of practising while aiming to meet standards of excellence set by those who have already mastered the process and themselves demonstrate high performance. The evolution of high-performing routines is reflected in learning curves identified by many studies exploring the impact of learning by doing and experience on the team's productivity. Likewise, routines enabling firms to plan, manage and implement high-performing processes of diversification and technological change are acquired in a learning by doing process.

This concept of learning suggests that enterprises learn to switch into new sectors by "practising switching". They learn to transfer their production routines to a new economic context and to manage this process effectively by repeatedly performing this task. At the level of societies, institutions evolve as they adopt rules such as laws and regulations, and adapt them to the changing environment (adaptive learning), and learn to apply these rules and to develop procedural knowledge while aiming at meeting standards of excellence. Empirical evidence shows that while a country may adopt rules that have been applied successfully in other countries, it requires substantial experience and practice at the societal level to learn the procedural knowledge required for high performance in applying and following these rules.

4.4.3 The dynamics of collective learning: Learning to learn to catch up

This learning concept argues that the productive sphere and the knowledge sphere are interrelated, and that productive transformation represents a major driver of the learning process. The concept highlights two channels through which the productive system becomes the catalyst of the learning process. On the one hand,

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the productive system is a major site of learning, and therefore the nature of products produced and technologies applied in the production process determines the technological, business and vocational knowledge elements involved and the nature and complexity of the routines that workers and the enterprise team can learn. Furthermore, productive transformation influences both the formal and the cultural knowledge sets indirectly, for example, through rising income levels, specific human capital and skills needs. Hence, productive transformation has the potential to enhance capabilities, which in turn widens the range of options and increase competences for productive transformation. This highlights the importance for a dynamic process of catching up of providing increasingly complex learning opportunities in the productive environment, and of fuelling a dynamic process of learning. This relationship is indicated in figure 4.4 by the arrow pointing from the production system to the various shared knowledge systems. The impact of the productive system on the various knowledge systems highlights the importance for a dynamic process of catching up of providing increasingly complex learning opportunities in the production system, but also to enhance employment, wages and income.

The learning concept highlights the circular causation and virtuous circle of learning and productive transformation, which represents an important driver of the dynamics of catching up. Industrial policies are therefore charged not only with driving the investment process and structural transformation for high productivity and jobs growth, but also with targeting economic activities and technologies in industries, agriculture and the service sector that continuously open up learning opportunities in increasingly complex products and technologies.

On the other hand, shaping effective, rapid and sustained learning processes requires workers, firms, governments and societies to learn to learn. Such "meta" routines and institutions are at the heart of learning organizations and learning societies. The concept of learning to learn implies both the adoption of rules that facilitate and accelerate learning (for example, monitoring of progress and rapid feedback mechanisms), and the evolution of learning procedures (knowledge of "how to learn"). Such procedures represent tacit knowledge and therefore can only be acquired in a process of practising learning, while aiming to meet standards of excellence in learning. At the level of enterprises, learning procedures are embodied in learning routines. At the level of society, they are embodied in institutions supporting learning at different levels and in different places.

4.5 Design and implementation of learning strategies

Countries are challenged with developing a comprehensive and consistent learning strategy in order to generate high-performing capability development processes aligned with their productive transformation strategies. In this section of the chapter, important elements of a national learning strategy to effectively build up capabilities for productive transformation are discussed.

4.5.1 Educational attainment structures and options for productive transformation

The education challenge in a catching-up context is to shape a knowledge structure in the labour force that opens up a wide set of options for productive transformation. The educational attainment structure (EAS) developed in a particular country indicates the nature and complexity of formal knowledge accumulated in the labour force. EAS are defined by the share of the different educational categories (no school attendance, primary, lower secondary, upper secondary, tertiary) in the labour force. Since individuals build up conceptual and procedural knowledge in a cumulative process, each educational category reflects particular sets of knowledge elements, with higher education levels reflecting higher levels of complexity and specialization. Hence, the shares of the different educational categories indicate the nature and diversity of formal knowledge in the labour force.

Elsewhere I have developed a typology of educational attainment structures (EASs and their links with feasible options for productive transformation patterns embodied in the labour force (Nübler, 2013). Comparative analysis across countries as well as case studies of high-growth countries demonstrate that the educational attainment structure shapes the feasible patterns of technological and structural transformation (ibid., forthcoming). These findings have important implications for education policies and underline the need to see productive transformation, education and industrial policies as closely related.

The typology of EAS include: (a) strong middle, (b) missing middle and (c) L-shaped.[10]

"Strong middle" EAS are those with high shares of the middle education categories (lower and upper secondary education). These provide the widest range of options for developing and diversifying manufacturing activity. Such structures

[10] See Nübler (2013) for a more detailed typology embracing six different educational attainment structures.

dominate in Asian countries and in particular in the successful catching-up countries. Analysis of countries with high growth rates over a significant length of time shows that these countries expanded education in a particular sequence during the catching-up phase, first increasing the share of primary, followed by lower secondary and finally upper secondary education as the highest educational share in the labour force. This approach built up a broad base of formal knowledge and created options for developing a wide industrial base, as indicated by a high share of manufacturing in total GDP (Nübler, 2013).

Governments played an important role, using various instruments, in shaping these favourable education structures. The Republic of Korea provides an interesting case of enforcing quotas limiting the entry of secondary education graduates to the tertiary level (see Chapter 7 by Cheon in this volume). The government was keen to expand the share of secondary education to prepare the labour force for entering targeted industries that demanded a high share of clerks, technicians, machinists, etc. – all occupations that require secondary education.

"Missing-middle" EAS are those with low shares of secondary education but high shares of primary and tertiary education. Tertiary education shares in missing-middle structures exceed upper-secondary shares by at least 20 per cent. Missing middle structures provide limited options for developing a broad manufacturing base. Rather, the relatively high tertiary education share provides options to develop medium- and high-technology products within a small manufacturing base as well as in high-level service sectors. Missing-middle EAS are found mainly in Latin American countries but also in Thailand and South Africa. Such structures allow countries to grow into the middle-income levels, but not to develop the high and sustained dynamics of catching up that characterize strong middle EAS.

Education policies in these countries face the challenge of transforming the EAS from a missing to a strong middle structure if they aim to develop options for a broad manufacturing base and for subsequent technological deepening thereof. This requires promoting initially lower secondary education and, at a later stage, upper secondary education. Depending on the existing structure, this may entail shifting resources from tertiary to secondary education and decreasing the share of tertiary education.

"L-shaped" EAS are characterized by large shares of non-schooling and primary education, but very low shares of lower and upper secondary and tertiary education. These structures are found largely in the least developed countries (LDCs), and they predominate in African countries. Policies in many poor countries over the past 20 years, in particular those guided by the Washington Consensus, focused on basic education to the neglect of secondary and tertiary education. These countries, as a consequence, are unable to develop even low-technology, labour-intensive industry such as garment manufacturing (Nübler, forthcoming). Educational policies need to transform these structures rapidly into strong middle structures by enhancing the share of lower and upper secondary education. This will shape a knowledge structure with options to enter low- and medium-technology manufacturing. To accelerate this process, policies need to target the formal education of young people and also to provide incentives and opportunities for adults to upgrade their educational attainment levels, in particular to the secondary level.

To conclude, getting the educational attainment structure right, and strengthening and reshaping these structures for a sustained process of productive transformation, pose one of the most important challenges of a learning strategy and of education policies in a catching-up context.

4.5.2 Industrial policies shape opportunities for economy-wide learning

The nature and complexity of production structures and technologies existing in a country determine not only productivity, growth and jobs, but also the opportunities for learning in the production process. Production structures and technologies differ in the knowledge, skills and occupational profiles of jobs and in the complexity of technological and organisational processes. They therefore determine the nature and complexity of knowledge sets workers can acquire in the production sphere and of the routines enterprises can accumulate. Thus the pattern of structural and technological transformation determines the nature and speed of technological learning in the labour force and in enterprises. Furthermore, continuous structural and technological change expands the opportunities for workers and firms to learn to learn, that is, to gain experience in learning and develop effective learning routines.

This argument suggests that countries need to shift deliberately into economic activities, products and technologies that create steep learning curves, and to design paths of structural and technological change that result in a high-performing, dynamic, rapid and sustained learning process at all levels. Manufacturing has been identified by Lall (2000), Chang (2010) and, early on, by List[11] (1909 [1841]) as a type of economic activity that creates great potential

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[11] "If we regard manufacturing occupations as a whole, it must be evident at the first glance that they develop and bring into action an incomparably greater variety and higher type of mental qualities and abilities than agriculture does" (List, 1909 [1841], p. 161).

for learning in a broad variety of complex activities. Hence, industrial policies that promote manufacturing are important elements of a national learning strategy. By promoting economic activities in advanced knowledge communities, they create opportunities for workers to acquire new sets of technological and business knowledge. This generates and expands options for enterprises to diversify into new products within this community. In addition, promoting technologies that provide opportunities to domestic firms to build up increasingly complex technological and organizational routines enhances firms' competences to switch into new products in existing knowledge communities and to also jump into new knowledge communities.

Trade, investment, technology, R&D and exchange rate policies are discussed as important forms of industrial policy that shape and may accelerate or retard learning in the production sphere. Import protection has been the traditional instrument (applied by all successful catching-up countries) to foster infant industries aiming to provide opportunities and incentives to acquire advanced skills and knowledge systems and to become competitive. Recent research has analysed the relevance of tariffs in supporting learning: Nunn and Trefler (2010) have found tariff structures that protect education-intensive activities (the "skill bias" of a country's tariff structure) to be positively correlated with long-term per capita GDP growth.

Export promotion, too, has the potential to support learning.[12] Increasing integration into the world economy through exports, in particular at the early stages of trade exposure, promotes "learning to export", for example, by creating opportunities for firms to acquire knowledge of export markets, and accumulating tacit knowledge of "how to export" through experience. In addition, some studies suggest that trade liberalization has the potential to induce "learning-by-exporting" effects. They show that productive domestic firms, as they become exposed to trade and competition, improve productivity, and that this effect may be due to learning rather than to self-selection of more productive firms into export activities. In contrast, wide evidence shows that rapid trade liberalization, for example in many African countries during the 1990s, contributed to a stagnant or declining industrial sector, which since then has provided extremely limited learning opportunities.

These different variants of trade policy – import protection, export promotion and trade liberalization – play different roles in a learning strategy for catching up. While import protection creates opportunities for learning in the production process, gradual trade liberalization creates pressures to learn and to meet

[12] For a review of the literature on learning by exporting and learning to export, see Silva, Aricano and Afonso (2010).

the quality and performance standards set by international markets. Finally, subsequent export promotion expands production and the learning space within the industry, providing learning opportunities to a wider share of workers and domestic firms.

Exchange rate policies have the potential to promote the growth of more sophisticated and learning-intensive industrial sectors, contributing to faster learning by workers and firms. This strategy is particularly relevant in view of the limited policy space catching-up countries have to apply trade policies. Astorga, Cimoli and Porcile (Chapter 3 in this volume) show the importance of combining real exchange rate policies with industrial and technology policies for creating such learning effects. While competitive exchange rates enhance competitiveness and export demand, active technology and industrial policies promote structural change and diversification of production towards technologically advanced sectors. The combination of these policies creates a virtuous cycle of increasing productivity, technical upgrading, the generation of more sophisticated and productive jobs, and learning. The authors provide empirical evidence from Latin American countries to show that, without the support of industrial and technology policies to create and accelerate learning processes, depreciation of real exchange rates would sustain a labour absorption pattern that is unable to close the technology gap.

Public investment policies also have the potential to provide space and incentives for learning by local workers and domestic enterprises. Infrastructure development projects promote learning by establishing tendering and procurement rules that ensure engagement of the domestic labour force and local enterprises in the production of infrastructure (Nübler and Ernst, 2014). Domestic firms' incentives to learn in such projects are high when governments ensure that opportunities to redeploy the newly developed competences will emerge in future public and private investment projects.

4.5.3 Transforming belief systems

Belief systems such as cultural knowledge, philosophies, ideologies and religions play an important role in the process of shaping capabilities for productive transformation. Belief systems are socially constructed, and provide commonly shared attitudes, values, preferences and work ethics. They influence behaviour by restricting or expanding the choices of individuals.

Belief systems play an important role in technological and economic development. According to the "New Consensus" in economic history, the growth of modern capitalism cannot be adequately explained by “material” factors alone. It argues that industrial development in Western countries was triggered by a major change in social knowledge and belief systems (McCloskey, 2010; Mokyr, 2002). What created modern capitalism was a change in how people thought about business, exchange, innovation and profit; human liberty and dignity; and education and training. The new ideas of the Enlightenment gave human reason supremacy over religious beliefs. An emerging “Engineering Culture” and the “Bourgeois Revolution” drove the creation of new scientific and technological knowledge and its wide diffusion. Most importantly, these new belief systems also rewarded entrepreneurship, which supported the rapid adoption of technologies in the economy, resulting in the emergence of dynamic industrial sectors.

In a catching-up context, economic dynamics require a culture of innovation, creativity, imagination, and openness towards change and new ideas. These traits become increasingly important as countries move from the imitation to the innovation phase. Education systems therefore are challenged with promoting critical thinking, curiosity and diversity (see Chapter 7 by Cheon in this volume). Florida (2002) identifies tolerance, technology and talent as the three Ts of development. He argues that a commitment to tolerance and openness to diversity across all segments of the population is necessary to shape a creative class in a country.

Furthermore, social knowledge and belief systems shape individuals’ choices regarding education, training and occupations. These choices are critical determinants of the knowledge structure in the labour force and the options for technological and structural change in the economy. Evidence shows that such choices cannot be explained by rational choice models. Denzau and North (1994) argue that individuals develop mental models through their own experience and social learning. Choices which individuals make only infrequently are guided by socially provided belief systems. This implies that belief systems, through the value and prestige which they ascribe to different types of education, fields of study, occupations and jobs, significantly influence educational and occupational choices. Brock and Durlauf (2001) argue along similar lines. They explain discrete choices in a social interaction model, and explain how expectations of social groups shape individual choices and the demand for education.

Hence, in a catching-up context, governments are challenged with supporting the transformation of shared belief systems in a direction that motivates students to choose education and occupations that open options for further structural change. Institutions need to be developed that help societies to reshape social expectations and the perceptions of various types of education, fields of study and professions. Reshaping social expectations and values involves a long-term process of socialization, in which social dialogue, promoted by the International Labour

Organization as a form of governance, has the potential to reconcile conflicts between the interests of governments in transforming the knowledge structure for technological catching up and the interests of students, their families and workers seeking to enter occupations with high social prestige (Nübler, 2008).

4.5.4 Institutions, standards and networks: Accelerating and sustaining learning processes

"Knowing how to do" and "smart" tacit procedural knowledge can only be accumulated in a process of experience and practice. This is true at the level of individuals (e.g. learning to develop a software programme) and at the level of firms (e.g. learning to develop high-performing technological or quality control procedures). This learning process can be significantly enhanced and accelerated by working side by side and in direct interaction with experts and experienced teams. The worker or team is able to observe the routines that high-performing experts or expert teams follow and to imitate them. Throughout this process, the learners receive feedback from the experienced workers and teams and improve by practising and aiming to meet their demonstrated high standards. Institutions play an important role in creating such learning conditions.

Apprenticeship is the traditional mode of vocational training where a young person acquires the broad set of vocational knowledge and skills of an occupation by working side by side with a master craftsperson in a workshop or enterprise. Apprenticeship, however, in order to function as a high-performing learning network, needs to be embedded in an institutional framework that defines the rules and standards of training and enforces them in all enterprises. The institutional framework needs to ensure that both employers and young people are motivated to participate in apprenticeship, and that the apprentice is trained in all relevant competences and skills to the set standards. These standards are defined by experts and are enforced within formal or informal networks. In medieval Europe such apprenticeship systems were organized by the guilds, which had received from the state the privilege of regulating and monitoring vocational training in the workshops. Today, they take place within formal national apprenticeship laws and organizations charged with defining and monitoring training ordinances and standards, for example in Germany, Austria and Switzerland; or through informal or customary rules provided by informal associations of craftspeople in many developing countries.

Organizational networks across firms clustered in a region, such as industrial parks and export processing zones, across firms within the value chain and in joint

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ventures, have the potential to become important learning networks. Many successful catching-up countries considered foreign firms to be an important source of knowledge crucial for the development of domestic firms. They applied investment policies that attracted FDI, acquired firms in foreign countries in strategic industries, promoted joint ventures, established routines for collaboration, and ensured that domestic and foreign enterprise teams worked together closely. This resulted in the transfer of technological and organizational routines and rapid learning in domestic enterprises. Such strategies were applied in the Republic of Korea and China, and as a result of rapid learning in domestic enterprises these countries have developed important domestic industries and learnt to compete in international markets, e.g. the automobile industry in the Republic of Korea and, very recently, the solar panel industry in China.

Value chains, too, may become important places of learning for domestic subcontractors if lead firms enter into vital parent–affiliate relationships. Such parental supervision generates the continuous transfer of technological competences, management techniques and quality control procedures to keep sourcing networks at the competitive frontier in the international industry (Kinoshita, 2000). The auto component industry in India provides an example of value chains where the parent firms' insistence on standards and certification has become a major instrument to manage the flow of knowledge within the value chain and to create a learning network, both vertically and horizontally. International assembly firms supplying the world market created joint ventures with domestic enterprises and developed a network of local firms feeding into the value chain. An in-depth study of 101 auto component firms in India shows that even small enterprises operating in the informal economy are often required by parent firms to apply standards and to obtain certification. Unni and Rani (2008, p. 116) note that:

> ... to become a sub-contractor or supplier, it has become mandatory for firms to follow certification procedures like ISO 900:2000 and TS-16949, which maintain and improve quality. About 40 per cent of the firms had ISO certification and a few more were in process of getting it. ... There is increasing pressure by the parent firms on the small firms to get certification, without which they could lose their contracts. The pressure from large firms was basically because they wanted to become TS-16949 companies. For a firm to have TS-16949, it is mandatory that all its sub-contractors have ISO certification.

Experience in the Republic of Korea, China and India contrasts with that of countries such as Mexico and Costa Rica, which have not been able to develop high levels of competences in most domestic enterprises. In Mexico, many efforts to promote a domestic car industry during the past decades have failed, largely because policies and institutions could not create learning processes at the level of domestic enterprises. Even a large proportion of the subcontractors in the auto industry are foreign-owned (Nübler, forthcoming). Chapter 6 by Paus in this volume shows how the development strategy implemented in Costa Rica since the 1980s has created powerful institutions to attract FDI and promote exports in increasingly sophisticated goods and services, but has failed to develop equally strong institutions that could support learning and the accumulation of competent procedures at the level of domestic enterprises.

Standards constitute an important institution that supports, enforces and directs the learning of procedural knowledge and the building of high-performing competences in enterprises. Standards define what is considered a high-performing process and a competent performance of tasks. Standard-setting and enforcement mechanisms support the learning process and accelerate the process of building tacit collective procedures. National and international agencies set labour standards but also technical, quality or process-oriented standards, and monitor, assess and benchmark the performance of enterprises against those standards.

Certification upon mastering of processes according to standards provides an important incentive, if the certificate has economic value, for workers and firms to learn. This was noted above in the example of the Indian auto component value chain, where ISO certification was a prerequisite for domestic enterprises to access value chains. Also, the Indian software sector provides an interesting case of how standard setting and certification at different levels have driven the learning process of Indian firms and their increasing competitiveness in the global software market and in value chains. Currently, India is home to the largest number of firms holding quality certifications such as ISO-9001/9000–3 and the Software Engineering Institute's 5-level Capability Maturity Model (SEI-CMM). These international certifications signal the competences of Indian software firms and therefore have high economic value.

To conclude, professional and organizational networks have the potential to become powerful learning networks, to stimulate learning and to develop collective competences at the enterprise level. However, realizing this potential requires governance institutions at the sectoral or economy level that provide incentives and pressure as well as support to achieve high-performing learning processes in joint ventures and value chains.

4.6 Conclusions

This chapter has developed a theory of capabilities for productive transformation to provide a framework for the analysis of catching up, the forces driving its dynamics and policies to enhance and transform capabilities for high performance in economic development. Catching up is defined as a process of productive transformation which embraces both technological change and diversification into new economic activities and sectors. The dynamics of productive transformation is described in terms of the structural change dimension (the pattern of technological change and diversification) and the process dimension (speed and sustainability). Collective capabilities are identified as a key driver of both dimensions of productive transformation. As a result, catching up and growth are determined not only by the accumulation of production factors, and the changing factor endowment structure, but also by the transformation of country-specific productive capabilities embedded in society.

Furthermore, a knowledge-based concept of collective capabilities is elaborated which argues that capabilities are embedded in the knowledge structure as well as in the routines and institutions developed by social groups such as teams of enterprises or the national labour force. Knowledge structures are the carriers of options, as they define the range of products and technologies that can realistically be imitated. They therefore determine the feasible patterns of productive transformation. In contrast, routines and institutions are the carriers of competences to translate these options into investment and to achieve rapid and sustained processes of catching up. Finally, a concept of collective learning is proposed. Learning for capabilities is viewed as an evolutionary process of transforming and enriching knowledge structures, routines and institutions. The development of high-performing learning procedures (learning to learn) is at the heart of learning societies.

The dynamics of catching up and economic development results from the interrelationship between productive transformation and collective learning. A high-performing dynamics is achieved by the simultaneous evolution of the material and the knowledge spheres, in which structural and technological change and the transformation of capabilities reinforce each other in a circular and cumulative process, creating a virtuous circle of capabilities development and productive transformation. This dynamics is enhanced by the evolution of high-performing learning routines and institutions in enterprises and societies that accelerate learning and thus drive the processes of economic transformation, growth, job creation and development.

High performance in catching up is expressed in structural change patterns that help countries to achieve development objectives and aspirations of their societies, and in rapid and sustained processes of change. This concept of catching up is distinct from the definition used by mainstream economics, which measures catching up in terms of productivity increase and GDP growth rates, and it expands the evolutionary perspective of technological catching up by taking into account also the product space and structural change perspective. The catching-up concept developed in this chapter therefore argues that catching up is a complex, non-linear and cumulative process of economic and social development.

Capabilities are introduced as a complementary criterion to comparative advantages in guiding countries in the selection of economic activities and catching-up paths. Even countries with similar factor endowments may differ substantially in the capabilities and therefore in the options and competences they have for implementing structural change and adopting new technologies. Hence, the analysis of (latent) comparative advantages for "optimal" catching-up paths (see the GIF framework outlined in Chapter 2 of this volume) needs to be complemented by an analysis of country-specific capabilities and the feasible options and competences embedded in these capabilities.

Furthermore, the catching-up concept shifts focus from growth to multiple development objectives, arguing that synergies and trade-offs may arise between the fundamental development objectives of productivity increase, the generation of productive and good jobs, and rapid and sustained learning processes. Countries therefore need to develop patterns of productive transformation that strike a good balance in promoting these objectives simultaneously. This challenges economists to develop a better understanding of the impact of different patterns and paths of technological and structural change not only on productivity, but also on the quantity as well as on the types and quality of jobs generated, and on learning effects generated in different sectors and by different technologies.

Recognizing that the development of capabilities is as important to productive transformation as investment in productive capacities considerably broadens the definition and the scope of industrial policy. Industrial policies need to foster the process of building both productive capabilities and productive capacities. In this context, the development of capabilities in domestic enterprises is of strategic importance for diversification. Domestic enterprises, in particular smaller ones which are often tied to their region, tend to switch into new activities as a survival and growth strategy, thereby driving the diversification dynamics.

Moreover, the capability concept suggests that productive transformation processes pass through different phases as economies shift into new and increasingly complex technological knowledge communities. This implies that countries, as

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they catch up, also need to transform the nature of their capability sets in order to open up the new options and develop those competences required to enter more advanced knowledge communities and related activities. The failure to achieve a fundamental transformation of options and competences may explain the empirically observed middle-income trap. The framework suggests that middle-income countries developed capabilities that enabled them to catch up to some extent; however, they may have failed to develop in time those other capabilities (e.g. R&D competences, belief systems etc.) that are required to shift from the imitation to the innovation phase of catching-up. The capability framework of catching-up suggests that the middle-income trap may in fact be a capability trap.

The concept of collective learning suggests a comprehensive learning strategy. Capabilities are created in distinct learning processes at different places and levels. Industries are an important place of learning. The development of sophisticated technologies, industries and jobs is instrumental in enhancing the dynamics of the learning and capability development process as they provide opportunities to acquire a whole new set of knowledge in the production system. In this view, expanding opportunities for enterprises, the labour force and societies to learn in the production system provides a major justification for developing countries to defy comparative advantages during the catching-up phase. It was Friedrich List (1841) who, on the basis of his historical analysis of the development process of different nations, concluded that the (efficiency) losses arising from policies to support learning and the development of capabilities (productive powers) are justified by the economic development benefits arising from these capabilities in future periods. This argument has been taken up more recently by Chang and others. In this tradition, the theory of capabilities explains that strategies defying comparative advantages and deliberately promoting industries and technological knowledge communities with high learning opportunities have the potential to yield large benefits in terms of catching-up dynamics, growth and employment generation.

Capabilities are also shaped by education and training in schools. The high value of education for economic development lies in its ability to teach the labour force advanced technological concepts and skills, and to reshape social belief systems, even when the economy is still at a low level of technological development. This allows countries that still specialize in low-technology products to enrich the knowledge base of the labour force, to transform the knowledge structure and to develop the options to enter more sophisticated products and technologies or even leapfrog into advanced technological knowledge communities.

Governments have a key role to play in promoting, directing and accelerating the learning process. Policies to promote the development of productive capabilities relate to different areas and require a comprehensive and coordinated strategy.

Education, training, trade, investment, R&D, technology, exchange rate and migration policies can all play an important role in this learning strategy as they contribute to transforming and enriching knowledge structures in the labour force and support the evolution of routines and institutions. Again, synergies and trade-offs may arise when setting these policies to address multiple development objectives.

Finally, "meta" institutions trigger, accelerate and sustain learning processes as they support the development of high-performing learning procedures in the labour force, in enterprises or in economies. An institutional framework reflecting high competences to support rapid and sustained processes of learning and capability development generates incentives and pressure to learn, encourages experimentation and learning from it, rewards critical thinking and creativity and provides direct support measures for such activities. Such competences are themselves built up in a learning process. Societies develop learning procedures (institutions) as they gain experience in learning and build up high competences to learn. These competences are at the heart of learning economies and learning societies.

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5 Industrial policy in the era of vertically specialized industrialization

William Milberg, Xiao Jiang and Gary Gereffi

Contents

5.1 Introduction

The expansion of global value chains (GVCs) since the early 1990s has played an important role in shifting the pattern of international trade and altering the process of industrialization and de-industrialization. Sometimes called global commodity chains or global production networks, GVCs are defined by Sturgeon (2001) as "the sequence of productive (i.e. value added) activities leading to and supporting end use". Trade in intermediates rather than in final goods and services has grown rapidly and thus the level of vertical specialization – the import content of exports – has increased in almost every country in the world. From South Africa's auto parts sector to Cambodia's clothing industry to Kenya's cut-flower producers to India's business services firms, GVCs include a wide variety of traded goods and services production. Services, including financial services, are often produced within global production networks, and services such as logistics are an important aspect of many global networks of goods production.[1]

As a result of these shifts, economic development now often occurs as a process of "industrial upgrading" within GVCs. If economic development requires a change in the structure of production, involving industrial transformation and higher value added activity, and if production is increasingly organized within GVCs, then development must occur within such chains. Economic upgrading in GVCs – whether it is moving into higher value added functions within the

[1] See Cattaneo, Gereffi and Staritz (2010), and Staritz, Gereffi and Cattaneo (2011) for a sampling of the broad range of industries covered by recent GVC studies.

same chain or jumping into more technologically sophisticated but related value chains – is now recognized as an important channel of industrialization (Humphrey and Schmitz, 2002).

Considerable research has identified these shifts in trade and economic development resulting from the expansion of GVCs, and the topic is of increasing interest to international organizations, including the World Trade Organization (WTO), the World Bank, the International Labour Organization (ILO), the Organisation for Economic Co-operation and Development (OECD), the United Nations Industrial Development Organization (UNIDO) and the United Nations Commission on Trade and Development (UNCTAD).[2] The GVC approach helps explain structural shifts in the global economy, such as the boom in intermediate goods trade, the heightened volatility of world trade, the growing number of regional trade agreements, and the misleading nature of published statistics on bilateral and sectoral trade balances (OECD, 2011). But what does all this mean for the role of the State in economic development?

Twentieth-century debates over the merits of industrial policy as a strategy for economic development occurred prior to the spread of these complex international production networks. Industrial policy viewed through the lens of GVCs will thus differ from traditional arguments for industrial policy. The GVC approach puts emphasis on firms rather than States, leaving the role of the State less evident than it was in earlier phases of late industrialization. In this chapter we advance the discussion of industrial policy in several ways. First, we make the case that the prominence of GVCs alters the terrain of action for developmental states. We begin by explaining why the industrial policy strategies of earlier eras, in particular import substitution and export orientation, do not really fit the contemporary global economy. The key element is the role of vertical specialization (VS), defined as the import content of exports. Vertical specialization is generally high when production is organized in GVCs that span multiple countries, which means that intra-industry trade in intermediate goods becomes far more significant.

The expansion of GVCs is closely linked to the growth of intermediate goods trade, but the implications for developing economies depend on the kind of GVCs

[2] The WTO's "Made in the World Initiative" and Director-General Pascal Lamy's statement in *The Financial Times* in 2011 that "'Made in China' doesn't mean anything anymore" are indicative of the considerable interest in GVCs and vertical specialization at the major international organizations dealing with international trade and economic development. In addition to the publication of the joint WTO–OECD trade in value added data set (OECD, 2013), the issue has received attention of the WTO (Escaith, Lindenberg and Miroudot, 2010), the OECD (Miroudot and Ragoussis, 2009), the World Bank (Cattaneo, Gereffi and Staritz, 2010), UNIDO (Sturgeon and Memedovic, 2011), the ILO (Milberg, 2004), and the US International Trade Commission (Dean, Fung and Wang, 2007), and this has greatly improved our understanding of the magnitudes and trends involved.

involved. In the producer-driven chains typical of capital- and technology-intensive industries like automobiles, electronics and pharmaceuticals, for example, multinational corporations (MNCs) controlled the entire production process, and intra-firm trade was predominant. Foreign direct investment (FDI) in these producer-driven chains was closely tied to the import substitution industrialization (ISI) policies that typified the 1960s and 1970s in Latin America and selected countries in Asia and Africa.

It was the emergence of buyer-driven GVCs organized initially by major retailers and global brands from the United States and Europe, however, that ushered in the shift from ISI to export-oriented industrialization (EOI) in East Asia and parts of Latin America, beginning in the mid-1960s and accelerating through the 1990s (Gereffi, 1995 and 2001). The distinguishing feature of these buyer-driven chains was that they were controlled by commercial capital (retailers and marketers such as Walmart, Nike and Starbucks), not industrial MNCs, and thus international subcontracting networks replaced FDI to a significant degree. This meant that production was not only carried out in developing economies, but most of the suppliers were domestically owned firms engaged in assembly production and later in full-package (called original equipment manufacturer, or OEM) production, which relied to a large degree on imported inputs. One of the major upgrading dynamics in buyer-driven chains was for developing countries to try to capture more value by making more inputs locally rather than importing them, and by moving up the value chain from production into design and branding, called ODM (own design manufacturing) and OBM (own brand manufacturing) in the literature (Gereffi, 1999).

As economic development has increasingly occurred within the context of GVCs, it has taken the form of upgrading into higher value added functions within a given chain or into new chains that generate more value added. In this chapter we refer to this as "vertically specialized industrialization", or VSI. With VSI, the focus is less on the national economy and more on linkages to a set of value chain actors. There are both empirical and policy distinctions between EOI and VSI. With EOI, export-oriented economies such as Hong Kong (China), Singapore, the People's Republic of China, and the Republic of Korea in East Asia, as well as Mexico and Central American economies in Latin America, based their growth on cultivating export ties with big buyers in Western markets. These "demand-responsive economies" focused on moving multiple consumer goods through GVCs and upgrading various products, processes and functions along the chain (Hamilton and Gereffi, 2009; Humphrey and Schmitz, 2002).

Whereas EOI was typically focused on exports to advanced industrial economies in the West, VSI relies to a much higher degree on more extensive ties with the GVC supply base already established in developing economies. Export production that is based on VSI involves a high degree of South–South trade (the most significant source of China's imports for its iPhone exports is the Republic of Korea (OECD, 2011)). Following the deep and prolonged recession of 2008–10, many countries are shifting their export markets from North to South in the global economy (Staritz, Gereffi and Cattaneo, 2011), and emerging economies are turning inward to highlight production for domestic markets, and using more regionally organized GVCs (Gereffi, forthcoming). While VSI has highlighted the import content of exports as an industrialization strategy, unlike EOI it can also be utilized to promote GVC policies geared to upgrading for regional and domestic markets.

In promoting the capacity and activity of domestic firms, government strategy must take into account the interests and power of lead firms in GVCs, international (and increasingly regional) networks of competing and cooperating supplier firms and international non-governmental organizations (NGOs). Because lead firms are often able to induce greater competition among suppliers in different countries, States may have less leverage than previously in spurring innovation and productivity growth among domestic (supplier) firms. The broad spread of GVCs implies an industrial policy focus on regulating links to the global economy – especially trade, FDI, and exchange rates – much more than was the case under ISI policies, which focused on building national capabilities, but also in a different way than had been the case in the EOI regimes, where the focus was final goods exports (Baldwin, 2011).

Accordingly, we place the issue of industrial policy into a general framework related to the internationalization of production and thus provide a categorization of the policy issues being framed by different sets of countries, including advanced industrial economies, large emerging economies, and smaller economies. Low-income and smaller countries generally seek to upgrade by reducing vertical specialization and moving into higher value added activities, or by capturing more value added through building more sophisticated functions in the chain. Middle-income countries face the difficulty of moving into more technologically sophisticated activities that might allow them to establish name recognition in existing products or establish new product lines and new brands. Failure to overcome this obstacle may, to some extent, account for the middle-income country "trap" (Jankowska, Nagengast and Perea, 2012; Ohno, 2009). High-income countries face the challenge that upgrading typically involves focusing on "core competences", usually such functions as marketing, product development and finance. These are high value added functions with low employment elasticities. This is likely to be the result of the "de-industrialization" process that high-income

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countries must go through[3] (Rowthorn and Wells, 1987) but could, if poorly managed, lead to persistently high unemployment with the associated policy challenges of demand management and skills development.

Third, we propose a more comprehensive strategy of how ISI, EOI and VSI fit together as a new framework for talking about policy. This is highlighted in sections 5.3 and 5.4 of the chapter, where we show that the policies of countries toward traded goods change significantly when VSI is prominent. Whereas under ISI, developing countries tried to restrict imports and under EOI, developing economies focused on promoting exports, with VSI the main emphasis is on how to use traded intermediates to capture more value in GVCs. Since imported intermediate goods are used in export products under VSI, moving up GVCs implies first allowing needed intermediate goods imports to flow into the country. However, economic upgrading entails that countries also try to encourage the domestic production of these same items, often initially by foreign-owned companies and eventually by domestic firms.

Fourth, we look more closely at recent shifts occurring with the financial crisis of 2008 and the end of broad-based support for the Washington Consensus policies of neoliberalism. We argue that there has been a shift in the composition of global final demand, with buyer-driven GVCs led by firms in industrialized countries shrinking in importance, and with developing countries playing a larger role, in particular the large emerging markets of China and India. Related to this shift in the composition of final demand is a recognition of the relative efficiency of regional supply networks, in part the result of decades of production networks led by MNCs at the regional level, for example in East Asia, North America, Western and Eastern Europe. Changes in the conditions of global demand and supply are likely to frame the industrial policy choices as the process of VSI evolves.

We conclude the chapter with a summary of five industrial policy challenges posed by VSI in comparison with ISI and EOI. Not coincidentally, GVCs emerged in a period of continued deregulation and liberalization, as first noted by Feenstra (1998). Nonetheless, industrialization within the context of GVCs presents some of the old dilemmas of industrial policy and raises some new ones. For example, the rise of GVCs reflects the importance of market access as defined by "buyer" and "producer" lead firms, but the process of upgrading runs up against the same

[3] This kind of de-industrialization occurs because productivity growth in the manufacturing sector is so rapid that, despite increasing output, employment in this sector is reduced, either absolutely or as a share of total employment. However, this does not automatically lead to unemployment, because with higher incomes, new jobs are created in the service sector on a scale sufficient to absorb any workers displaced from manufacturing. Paradoxically, this kind of de-industrialization is a symptom of economic success (Rowthorn and Wells, 1987, p. 5).

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obstacles of market failure as identified in earlier eras of industrialization, having to do with incomplete capital markets or with the uncertainty of cost structures under a new production structure.[4] At high levels of vertical specialization, trade protectionism can hurt domestic firms when their exports rely heavily on imported inputs. On the other hand, upgrading within GVCs requires some "defiance" of comparative advantage, typically encouraged by policy intervention (Chang, 2002).

5.2 Trade in intermediates, vertical specialization and upgrading

The twentieth century saw two waves of industrial policy. In the middle of the century, Latin American and South Asian developing countries adopted ISI policies in order to shift out of commodity production (characterized by competitive product and factor markets and a low income elasticity of global demand) and into production of manufactures. The logic, following the ideas of Prebisch (1954) and Singer (1960), was to boost the terms of trade to raise the income elasticity of demand for exports and to raise the productivity of domestic production.

ISI was always contentious because of its heavy reliance on the State. ISI regimes were criticized for discouraging innovation and encouraging rent-seeking (Shapiro, 2007). Nonetheless, ISI was a successful strategy for many countries for a number of decades, generating long periods of high growth in some cases.[5]

But with the Latin American debt crisis and the subsequent adoption of market-oriented structural adjustment, industrialization efforts shifted focus to global markets and specifically to export growth.[6] EOI slowly became the accepted Latin American neoliberal development strategy (Dussel Peters, 2000).

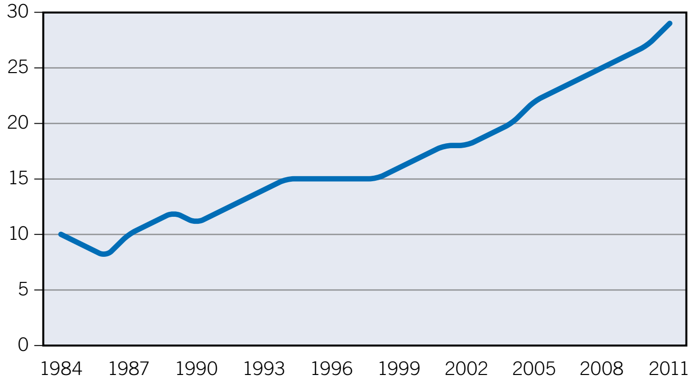
East Asian countries had moved to export-oriented growth earlier – in the late 1960s and 1970s – in part as a result of the emergence of buyer-led GVCs. These were large retailers and brand name firms that found they could lower costs and raise return on investment by outsourcing manufacturing to East Asia, beginning with Japan, but then moving to the Republic of Korea and Taiwan (China). These trade relations were generally not about intra-firm trade since they often did not involve FDI. Domestically owned supplier firms in East Asia were rapidly building capacity to manufacture and export. East Asian success involved strategic

[4] On capital market failure, see Haque (2007). On costing information, see Rodrik (2004). For an overview, see Shapiro (2007).

[5] See Bénétrix, O'Rourke and Williamson (2012).

[6] See Dussel Peters (2000) and Jenkins (2012) for a review of the literature on structural adjustment in Latin America.

Figure 5.1 Developing countries' share of world exports of manufacturing goods, 1984–2010 (percentages)



Source: World Databank, World Bank Group.

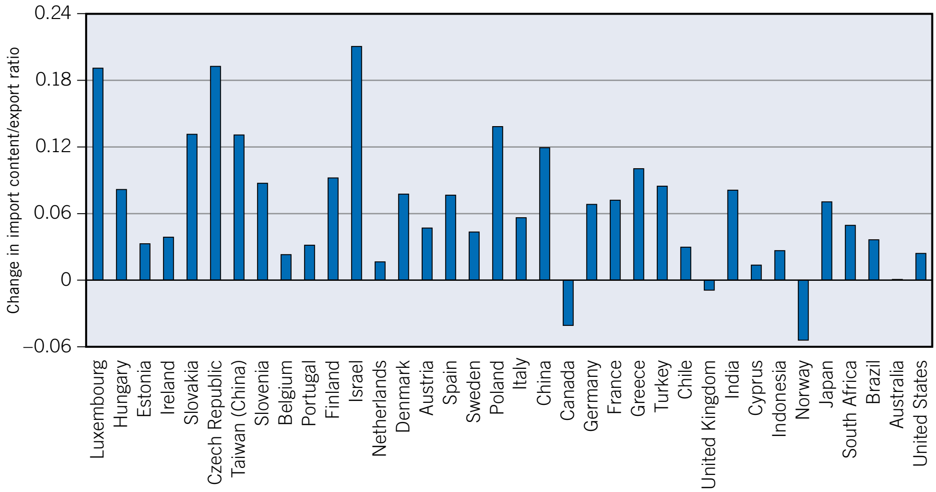
state interventions through the use of targeted credit and export subsidies, strict limits on inward FDI, and import protection to expand output, productivity, export competitiveness, exports and economic growth (Amsden, 1989; Evans, 1995; Wade, 1990). East Asian industrialization typically involved the strengthening of large, often conglomerate, domestic firms with close ties to domestic sources of finance and the developmental state.

Thus the new phase of industrial policy – with a GVC orientation – did not arrive suddenly with the crisis of 2008. It was instead the result of a long-term trend towards greater reliance by large corporations in industrialized countries on domestic suppliers in developing countries, that is, on the expansion of global production networks, and on the gradual development of manufacturing capacity among developing country supplier firms. As figure 5.1 shows, developing countries successfully expanded their share of world exports of manufactures over the past 25 years, just as Prebisch and Singer recommended.

Global production networks started to become prominent in trade and development in the 1990s, beginning with China's entry into the world trade and production system. And in the early 2000s, as the dotcom boom faltered, computer and consumer electronics companies began offshoring their production facilities to low-cost locations.[7] The share of world exports from developing countries continued to grow throughout this period (figure 5.1), but their composition also started to change as imports of intermediates increased steadily in the 1990s and accelerated in the 2000s, accounting for over 50 per cent of world trade for

[7] Friedman (2005) gives some anecdotal support.

Figure 5.2 Change in vertical specialization, 1995–2005



Source: OECD STAN Database.

that entire period, according to data from the UN Comtrade database in Broad Economic Categories.

As Sturgeon and Memedovic (2011) note, intermediates' share of world trade actually fell slightly in the 2000s, but that slight decline (leaving the share still above 50 per cent) obscures some important details. First, the share of generic (commodity-type) products in intermediates fell as more specialized intermediate goods began to account for a growing share of trade in intermediates. Second, the share of manufactured intermediates trade from developing countries increased significantly over this period, rising to 35.2 per cent in 2006 from 25.5 per cent in 1992 (ibid., p. 14). Third, China is not the only country to experience a significant increase in exports of intermediate goods. China is the dominant developing country for exports of manufactured intermediate goods, with 8.6 per cent of the world total in 2006. The next largest export shares are derived from Mexico (2.4 per cent), Malaysia (1.7 per cent), India (1.3 per cent), Brazil (1.0 per cent) and Turkey (0.9 per cent) (Miroudot and Ragoussis, 2009).

Vertical specialization allows a more precise measure of a country's involvement in a global production network. A sector in a given country that does only assembly, using all imported parts, will have a very high level of vertical specialization. A sector where most inputs are produced domestically will have a very low level of vertical specialization. Meng, Yamano and Webb (2011) show that at the national level (a weighted average of vertical specialization across manufacturing sectors within a country), almost every country in their sample experienced a rise in vertical specialization between 1995 and 2005 (see figure 5.2). On the surface, this increase is neither a good thing nor a bad thing. The question is how it has altered state strategies for economic development, and this is linked to the issue of upgrading.

5.2.1 Upgrading and vertically specialized industrialization

The data on vertical specialization give a sense of the growth and size of GVCs, but what exactly is the relation between vertical specialization and economic development? Here we must consider the issue of upgrading in GVCs. Economic upgrading – often referred to as "industrial upgrading" or simply "upgrading" – is defined as the ability of producers "to make better products, to make products more efficiently, or to move into more skilled activities" (Pietrobelli and Rabellotti, 2006, p. 1). In the terminology of GVCs, upgrading is defined as "the possibility for (developing country) producers to move up the value chain, either by shifting to more rewarding functional positions or by making products that have more value added invested in them and that can provide better returns to producers" (Gibbon and Ponte, 2005, pp. 87–88). The focus of most studies of upgrading is on the degree of technological sophistication of production and especially on value added.

Humphrey (2004) and Humphrey and Schmitz (2002) identify four distinct types of economic upgrading: process upgrading, product upgrading, functional upgrading and intersectoral (or chain) upgrading. Process upgrading is productivity growth in existing activities in the value chain. Product upgrading is the move into higher value added products within the same value chain. Most case study work has been on functional upgrading, that is, the move into more technologically sophisticated or integrated aspects of a given production process. Bair and Gereffi (2001), for example, show how Mexican suppliers to US lead firms over time moved into some higher-valued aspects of the production of denim jeans. While in 1993 Mexican firms were involved solely in "assembly" (sewing), over time they adopted a variety of other functions, including the production of textiles, cutting, laundry and finishing and distribution. Nonetheless, the important functions of design and product development, finance, marketing and retailing remain solely the function of US firms.

However, economic upgrading is not always the most appropriate strategy for long-term sustainable growth. One identified path of upgrading from integrated or "full-package" production activities (also known as original equipment manufacturing, or OEM) to original design manufacturing (ODM) and original brand name manufacturing (OBM) has been very beneficial for some firms in GVCs, such as selected East Asian apparel companies (Gereffi, 1999). However, it cannot work for everyone because risk and competition are much higher in the more advanced segments of GVCs. Some firms choose to remain in their more secure niche of OEM production without attempting to further upgrade. Thus, for those firms, economic "downgrading" is a business strategy. In Taiwan's computer industry, for example, Acer decided it could upgrade by developing its own brand of computers and was successful doing so; its competitor, Mitac, initially opted to pursue an OBM strategy as well, but soon returned to OEM where the profits were lower but more secure (Gereffi, 1995, pp. 131–132).

5.2.2 VSI in theory and practice

Entry into a new industry and its export markets is often only possible by providing assembly of imported parts. This has been the typical pattern in the apparel, electronics and motor vehicles sectors. In these cases the early stages of VSI will be associated with high levels of vertical specialization and generally low value added in exports. Export processing zones promote such entry and export market access, but they also pose considerable challenges for economic upgrading.

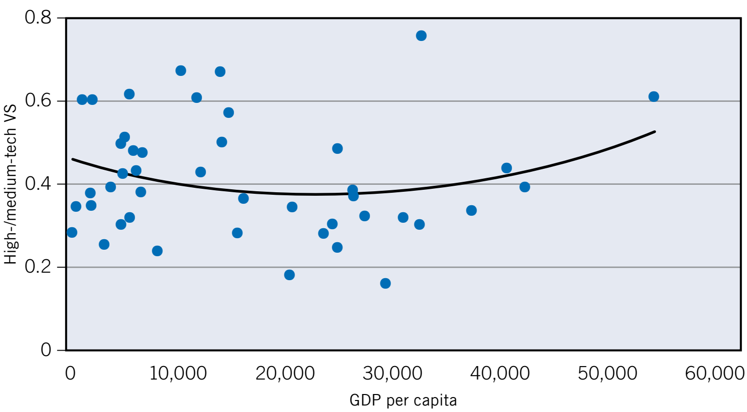
Upgrading in GVCs is inherently complicated because it requires that a firm or group of firms move into higher value added aspects of the chain (thus capturing value added from others in the chain), and at the same time remain as active suppliers in the chain. That is, firms in a particular country will need to reduce the degree of vertical specialization and raise the scope or value of the inputs produced. Successful industrialization will thus correspond with declining vertical specialization. This was the experience of the denim jeans producers discussed above, who took on new aspects of the production process and lowered the levels of vertical specialization in the process.

The garment industry in Eastern and Central Europe (ECE) provides an excellent example of how upgrading and downgrading trajectories have been intertwined. In the early 1980s, some of the ECE economies began to carry out outward-processing trade (OPT) for non-Soviet markets in Western Europe, primarily with German buyers and contractors. Given their legacy as established industrial economies, the emphasis on apparel exports might be considered economic downgrading. Within apparel, more advanced economies like Slovakia were able to move more quickly from OPT to full-package export production (OEM), and eventually to ODM and OBM, while less developed economies such as Bulgaria had far more difficulty moving beyond basic OPT contracting. However, in ECE economies, it was often easier to develop ODM and OBM upgrading strategies for the domestic retail market than for more discriminating fast-fashion markets in Western Europe (Evgeniev and Gereffi, 2008; Pickles et al., 2006).

Lead firms in industrialized countries operate at a high level of vertical specialization as they increasingly focus on aspects of production that involve core competence and add high value (such as pre- and post-manufacturing services, including R&D, design and marketing) and outsource the rest, thereby raising the import content of exports in the process. The famous example of Apple Inc. shows this pattern, as lower value added activities – largely production – have been outsourced to East Asia, while the US parent firm continues to undertake R&D, product design, marketing and finance activities from their US headquarters. Pressure on such lead firms to raise shareholder value encourages this model of rising vertical specialization (Milberg and Winkler, 2013, Ch. 6).

The picture that emerges is a U-shape relation between vertical specialization and value added per worker. Figure 5.3 is a scatterplot of the level of vertical specialization in medium-technology and high-technology industries in each of 45 countries and the per capita income in those countries. In the early phase of industrialization, vertical specialization tends to be high and falling. High-income economies will have high and rising vertical specialization. Countries in the middle may have the hardest task. Having reduced vertical specialization from

Figure 5.3 Vertical specialization and GDP per capita (in US$), 45 countries, 2005



Note: Vertical specialization (VS) is the import content of exports in high-tech and medium-tech manufactures.

Source: Authors' calculations based on VS data reported in the OECD STAN Database.

early stages of assembly production, they must now innovate to create increases in value added per worker. Figure 5.3 does not represent proof of the U-shape relation between vertical specialization and industrialization. We present it here as a conceptual framework for thinking about the global consequences of GVCs. Future research will be needed to test and refine the hypothesis.

China has emerged as a dominant centre of global value chains in Asia. China's enormous success in the era of VSI is built on a variety of factors, including its huge domestic market and strategic use of industrial policies (see the chapter in this volume by Lo and Wu) which has made that country unique among emerging economies in terms of placing conditions on FDI, including (until WTO accession) majority domestic ownership in joint ventures and technology-sharing requirements. A remarkable feature of China's success is the size and geographical clustering of its electronics and apparel production (Appelbaum, 2008; Gereffi, 2009). The clustering of producers gives advantages from easier access to skills, equipment, lead firms and logistics networks.

The role of the State in China's successful record of rapid economic growth and poverty reduction has been closer to that of Japan and the Republic of Korea than any Latin American experience. Chinese development has some unique features beyond the obvious one of scale. China has had low unit costs and it has developed enormous flexibility and speed of response as a supplier within GVCs, based on careful regulation of its labour force and especially of rural–urban migration. Regional and municipal funding of infrastructure and enterprise development has encouraged the growth of industrial clusters with the capacity for large-scale, modular production. Foreign investment and foreign capital joint ventures with local enterprise are encouraged under tightly controlled conditions, including targeted use of Special Economic Zones that were monitored and evaluated and continued only when successful for the development of domestic industry. The undervaluation of the Chinese currency has served as a major subsidy to exporters (Brandt, Rawsky and Lin, 2005).

Although China has been the greatest success story in the era of VSI, VSI is not a strictly Chinese phenomenon. In Mexico, policies to attract foreign investment were initially successful, but have had only limited longer-term success in generating upgrading. There have been recurrent concerns about the inability of export processing zones or assembly-oriented maquila production to generate backward linkages to local suppliers, since Mexico has been attractive to a large degree because of its low labour costs (Dussel Peters, 2000). However, faced with the need to upgrade in order to confront Chinese competition, Mexico's maquiladoras have attempted to move up the value chain by adding new capabilities as the focus of assembly production shifted from relatively low-technology industries

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like apparel and toys to higher-technology production complexes oriented to automobiles, electronics and aerospace, including the coordination of research and development and other headquarters functions (Carrillo and Lara, 2005). Costa Rica has also made explicit efforts to promote VSI by negotiating Preferential Trade Agreements (PTAs) with the United States, the European Union and China that increased the proportion of the country's total exports that are linked to GVCs involving FDI to 43 per cent (Monge-Ariño, 2011).

VSI presents challenges for policy in middle-income and high-income countries as well. Middle-income countries face a problem of having achieved a threshold level of decline in vertical specialization relative to other developing countries, but a further move to increase incomes may require innovation and the possibility of raising levels of vertical specialization in the process of outsourcing lower value added work. The difficulty of switching to this more innovative stage may account as one of the important factors for the "middle-income trap" (Jankowska, Nagengast and Perea, 2012; Ohno, 2009).

Finally, vertical specialization in the industrialized countries appears to have led to a decline in the employment elasticity of innovation. The most innovative US companies generate little employment in the United States, where employment is dominated by the low-wage retail sector. For example, according to Davis (2012), total US employment in 2012 in six of the most innovative firms – Apple (60,400), Microsoft (90,000), Facebook.com (3,000), Cisco (71,825), Google (32,467) and Amazon.com (33,700) – was 291,392. This is a tiny number of jobs, less than the employment of a single, mid-sized supermarket chain, Kroger (338,000), and about one-eighth of Walmart's total of 2.2 million employees in 2011.

5.2.3 "Social upgrading" and VSI

An additional consideration in the analysis is how economic upgrading is translated into social outcomes regarding employment, wages, labour standards and environmental standards. Economic theory (e.g. the neoclassical theory of income distribution) assumes that wages will rise with increases in productivity, and thus that the connection between economic and social upgrading is automatic. And much of the case study literature on industrial upgrading focuses on "success stories" in which economic and social upgrading coincide. A recent empirical study finds that this happy coincidence is not generally the case. Bernhardt and Milberg (2013) define economic upgrading in terms of export market share and unit value growth and social upgrading in terms of employment and real wages. Using detailed sectoral data on apparel, horticulture, mobile phones and tourist services, they find that economic upgrading in GVCs corresponds with social upgrading in only 16 of 30 cases. They conclude that economic upgrading is a necessary but not sufficient condition for social upgrading.

The GVC literature has highlighted the role played by "private governance" mechanisms to address these issues (Mayer and Gereffi, 2010). Examples of "private governance" include voluntary codes of conduct by lead firms in GVCs to regulate labour conditions under in-house corporate social responsibility campaigns or by hired third-party monitoring groups like the Fair Labor Association (FLA) and the Workers Rights Consortium. The role of the FLA in brokering complex agreements between Foxconn and its workers, Apple Inc. and the Chinese authorities seem like a success story for private governance. But there is considerable scepticism about the potential effectiveness of these private efforts. In response, a number of researchers have focused on the role of the State in upholding standards – thus another role for industrial policy. In particular, Piore and Schrank (2008 and 2006) found that labour monitoring by national-level government monitors has been very successful in raising labour standards in a variety of countries in Latin America and the Caribbean.

5.3 Industrial policy after the Washington Consensus

The crisis of 2008–09 made it apparent that the Washington Consensus had run its course, implying the end of the traditional EOI model discussed in the previous section. Economic growth under EOI was limited by the constraint of new or expanding export markets and the ability of countries to enter a niche area that had above-average growth potential and allowed space for upgrading. There was intense competition for these markets, as many countries and firms entered.

EOI was disrupted by a number of forces, ending with the devastating supply shock of the financial crisis in 2008 and the ensuing stagnation in the United States and Europe. The crisis poses a significant challenge to the buyer-driven nature of the export-oriented growth model. Demand (and certainly demand growth) in end markets has shifted from the United States and Europe to large emerging economies of India, China and Brazil. The share of world gross domestic product of the BRICS countries (Brazil, Russian Federation, India, China and South Africa) doubled between 2000 and 2010, reaching 16 per cent by 2010 (figure 5.4). At the same time, the productive capacities of these large emerging economies began to reach formidable heights in terms of technological sophistication and economies of scale.

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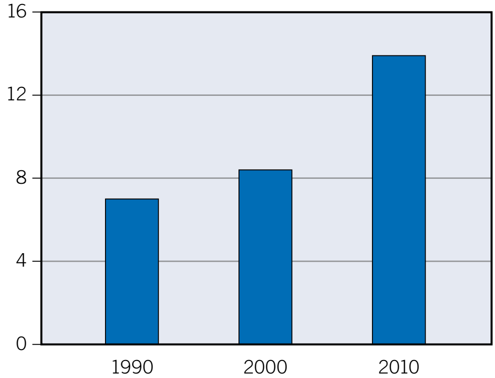
Figure 5.4 BRICS share in world real gross domestic product, 1990–2010 (percentage)



Note: BRICS = Brazil, Russian Federation, India, China and South Africa.

Source: Authors' own calculations, based on data from World Databank, World Bank Group.

Other political and economic factors at work over the last decade have also played a role in challenging the buyer-driven EOI model. These include:

1. The declining role of the World Bank, for political and economic reasons. On the political front, the policies of the Washington Consensus were increasingly viewed as ineffective in promoting development for many countries but also in exposing countries to external shocks, particularly those linked to short-term capital flows. On the economic front, the World Bank shrank in its relative importance in providing development assistance as large private donors, national development banks, government Aid for Trade and sovereign wealth funds expanded in their power and scope.

2. The declining significance of the WTO. With the failure of the Doha development round, the WTO has narrowed its focus to more technical issues of trade facilitation. In this political context, countries increasingly began to see regional trade liberalization as a tool for building policy space regionally, when before such space was viewed as limited to an internal market.

3. The expanded productive capacity of a number of emerging markets, including but not limited to China, Brazil and India. These countries became major participants in world production of manufactures and services and greatly expanded their presence in world trade in commodities and food products.

4. The financialization of the large non-financial corporations in the industrialized countries, firms that had traditionally been lead firms in GVCs. Financialization supported changes on the side of production, with management increasingly seeking to focus on "core competences" and to outsource the

remainder of the operation and shorten the time horizon for evaluating firm success. Maximization of shareholder value over the short term became the common objective of firm behaviour.

5. Expanded capability in emerging markets, leading to the increased capacity and bargaining power of large emerging market suppliers. Beginning in the early 2000s, firms such as Li & Fung and Foxconn gained more ability to set terms of the engagement with lead firms. This increase in supplier power has also been driven by other factors, including the growth of final demand in emerging economies themselves, the removal of international regulations that contributed to the fragmentation of production (e.g. the Multi-Fibre Arrangement in apparel), and technological trends that make the production of modular subassemblies more feasible in key industries, like electronics, aircraft, and autos.

As a result, the political power of the emerging market governments expanded, accompanied by the diminished role for the G8 and international organizations (such as the Washington institutions and the WTO) that have been dominated by advanced economies. Together, these factors have resulted in a decline in the buyer-driven logic of EOI and given rise to a new phase whose main political feature is regional industrial policy.

5.3.1 Regional integration with BRICS as the regional hubs

In the post-Washington Consensus world, the bigger economies are shifting their development strategies to regional production networks and to regional industrial policy. Industrial policy today is cantered in emerging economies, especially the BRICS and their surrounding regions.[8] China's upgrading strategy is on a global scale because it has become a large buyer of raw materials (Kaplinsky, 2010). China's emergence as a major global buyer means that South–South trade will continue to expand as a share of world trade. It also means that the upgrading objective will focus more on the processing of raw materials. To date, China has demanded unprocessed raw materials from the rest of the world, insisting on doing the processing itself. This establishes a clear space for upgrading in the developing world outside of China, with the aim capturing more of the value added from processing raw materials.

[8] Jim O'Neill, the Goldman Sachs executive who coined the term "BRIC" in the early 1990s (which grew to include South Africa in 2010), now argues that a much larger number of "growth economies" (BRICS plus 11) fall into this category at present, including the Republic of Korea, Mexico, Turkey and Indonesia, among others (O'Neill, 2011).

The current South African development policy emphasizes regional integration as the basis for industrial upgrading, focused on mining, agriculture and pharmaceuticals (Davies, 2012). South Africa has announced a strategy of processing minerals shipped to China. The latter would prefer to do the processing itself. But for South Africa, the goal of upgrading will involve skills development and higher wages along with higher profits. Industrial policy, in this case, is aimed at shifting production from China to Africa. The regional dimension of South Africa's industrial policy is based on the view that a larger regional entity will have access to more minerals and raw materials, more productive and processing capacity and larger markets – all aimed at promoting upgrading.

Regional integration strategies, including PTAs but also economic cooperation agreements and production networks led by transnational corporations (TNCs), will increasingly be based on supply-side strategies, rather than the traditional demand-side considerations that usually justify regional integration. The logic of the supply side is different from the traditional demand-side logic of integration, which highlights expanding market size, market access and the possibility of capturing scale economies by serving this larger market. China, despite its global reach in terms of exports and imports, has long recognized the importance of the East Asian regional production network. Latin America is following suit through Mercosur and other regional initiatives. As noted above, South Africa is also shifting clearly to a southern African regional market strategy.

Brazil's development strategy has both similarities and distinctive elements compared to South Africa and China. Although Brazil belongs to Mercosur, a regional trade agreement that includes Argentina, Uruguay, Paraguay and Venezuela, this does not reflect a pan-Latin America vision analogous to that of South Africa, nor does it reflect the economic efficiencies of the less formal East Asian regional division of labour of which China is a part. Like South Africa in the Southern African Development Community (SADC), Brazil dominates Mercosur by its size and level of economic development, and thus enjoys relatively few supply-side or demand-side benefits of regional integration. However, Brazil is very concerned about the so-called "primarization" of its exports (Jenkins, 2012), whereby it emphasizes primary product exports with relatively low levels of processing.

A major challenge for Brazil is how to increase the technological content of its exports in order to upgrade into higher value activities in both the primary product and manufacturing sectors. Its largest trading partner, China, accounted for about 15 per cent of Brazil's exports and imports in 2010. From a GVC perspective, what is particularly notable is that the pattern of Brazil's exports to China is skewed to products (both primary commodities and manufactured goods) with a very low level of processing. The soybean value chain is a good example.

About 95 per cent of Brazil's soybean exports to China in 2009 were unprocessed beans. In contrast, there were virtually no exports of soybean meal, flour or oil to China. In order to pursue its strategy of promoting the Chinese soybean processing industry, China imposed a 9 per cent tariff on soybean oil imports, while the tariff on unprocessed soybean imports was only 3 per cent. More processed imported soybean products also paid a higher value added tax rate in China than unprocessed beans. This same protectionist policy of tariff and non-tariff barriers imposed by the Chinese government to protect its domestic producers was applied to a range of other primary and processed intermediate products from Brazil, including leather, iron and steel, and pulp and paper (Jenkins, 2012, pp. 28–29).

On the import side, Brazil has also been influenced by China's structure of international trade. In 1996, low-technology products accounted for 40 per cent of Brazil's imports from China, and high-technology products for 25 per cent. By 2009 the pattern was nearly reversed: high-tech products were 41.4 per cent of the total, and low-tech products 20.8 per cent. If we look at this trend in terms of the end use of imports, consumer goods imports from China to Brazil fell from 44 per cent to 16 per cent between 1996 and 2009, while the imports of capital goods doubled, from 12 per cent to 25 per cent, and parts for capital goods rose from 12 per cent to 25 per cent (ibid., pp. 29–31). Thus, Brazil has been subordinated to occupy the lowest rungs of the value added ladder in its trade with China in recent decades, which poses long-term structural imbalances for Brazil if the situation does not change.

The regional focus has also gained support from smaller countries, which see regional connections as crucial to complementing their own capacities. Small countries can overcome the ephemeral nature of PTAs with the use of regional trade agreements that are supported by regional links among TNCs. Costa Rica, for example, has clear supply-side constraints related to productive capacity and skills and is looking to join forces with Mexico to enhance skills development. Nicaragua, whose apparel firms have been buying textiles from East Asia, is consciously pursuing supply arrangements with firms in Honduras and Guatemala. In sum, TNC links matter for political and economic integration in a way that was not the case previously.

This is not entirely a new situation: ASEAN had been driven in part by Toyota's search for a secure regional production network, and auto parts were an important consideration of the automotive firms that promoted the NAFTA. Today, China seeks likewise to secure its regional production system; South Africa has announced a regional integration and industrial policy to promote upgrading in raw materials production; and Brazil and its Mercosur neighbours are undertaking a broadening of that customs union to build supply-side capacity regionally.

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5.3.2 Regional development strategies and new forms of industrial policies

The appeal of a region-based development strategy is not just about building a demand base or reducing transportation costs, although both of these do figure in. The logic of a regional industrial policy comes also from the legacy of regional trade agreements and existing TNC production networks. We are still in a world organized by supply chains, but where those production networks face a different set of constraints, the logic of regionalism comes to the forefront of development policy.

Regional supply chains are anchored in a new set of policies that go beyond trade liberalization toward a regional industrial policy. The private sector has a more important role than in previous regionalization efforts and with a broader set of industries involved, ranging from minerals to agriculture to apparel to mobile phones.

Industrial policy in this context is not just a return to the ISI policies of the 1960s and 1970s, but rather a new form that recognizes the elements in play, including new end markets, new products (consumer electronics, engineering services, Internet services and other business services) with new skills requirements and knowledge bases, and new sources of credit and aid. This form of regional industrial policy also accounts for the logic of GVCs, and in particular the shift in the structure of GVCs toward more regionally based systems that have emerged as a result of the factors listed above.

So what will the regional industrial policies of the post-Washington Consensus era look like? They will be driven by the recognition that regional supply chains are anchored in a different set of realities. Trade policy alone is not an adequate industrial policy to guarantee growth and development. Industrial policy will need to promote business directly and to build skills and capacity in response to private sector needs.

With the extensive participation of developing countries in these GVCs, industrialization strategy has changed, and "upgrading" within GVCs plays a greater role in achieving the goal of development policy (Baldwin, 2011; Milberg and Winkler, 2011). China's manufacturing export boom was driven by careful connection with foreign multinational corporations, and especially production for western-branded goods such as apparel, footwear and toys, as discussed above. These were often buyer-led GVCs, in that the lead firm was a large foreign retail firm with brand identity and enormous power over competing suppliers globally. Although India's IT services expansion was to a lesser extent the result of government policy than was China's manufacturing success, it was nonetheless geared to the provision of business services "tasks" as part of GVCs in business and finance.

Export competitiveness remains a crucial feature of this phase, but exports are now the result of participation in global production networks and thus often depend on imports from other parts of the network. Thus vertical specialization can be high in a given sector and country in the initial stages of industrialization.

5.4 Industrial policy and the challenges of VSI

Unlike previous waves of thinking about industrial policy, in the GVC framework state policies are only one determinant of industrialization and social outcomes. Business strategies are the key driver of upgrading for both foreign lead firms and domestic supplier firms. Industrial policy under VSI must look at lead firms and their strategies, as well as States (and non-State actors, such as NGOs) in creating policies, strategies and campaigns that influence economic and social upgrading outcomes. Developing country supplier firms must connect closely to, and bargain with, diverse sets of lead firms. This contrasts sharply with ISI, EOI and state-led "late industrialization" strategies. VSI thus requires the State to find a complicated balance from the perspective of policy. Rather than present a full-blown theory of industrial policy in VSI, we identify six challenges that GVCs and VSI pose for industrial policy that were not present in the era of EOI.

(1) Dis-integration of industry

The first challenge under VSI is to shift from the traditional industrial policy stance aimed at developing "industry", where "industry" was conceived as a fully integrated production structure (e.g. Chenery and Watanabe, 1955). With GVCs, competitive improvements come not with the development of the fully integrated scope of activities in an industry, but by moving into higher-valued tasks associated with the industry. For example, subsidies aimed at encouraging the development of a vertically integrated industry might be extremely inefficient. Protective trade policies, which traditionally could be justified along infant industry lines to build capacity and learning-by-doing, might backfire in the context of GVCs if imports are crucial for export success. According to the OECD: "It can be argued that GVCs require more fine-grained policies given that GVCs impact economies on a much more disaggregated level. Different activities/stages/tasks in the production process are determined by difference factors; hence, for government policies to be effective, they may have to be targeted more at specific activities" (OECD, 2011, p. 35).

GVCs present a new set of externalities that result from coordination of networks, and these spillovers require state support, both for coordination to succeed and spill across sectors (Schrank and Whitford, 2009) and to reveal "the potential rate of return on new activities" (Rodrik, 2008). Experimentation and simultaneous "coaxing" of both upstream and downstream activity are key (ibid.). Chu (2011), for example, describes how China's automobile industrial policy has been built on subsidies for learning and experimentation.

The corollary to this first challenge is the risk of "thin" industrialization, whereby a country enters an industry, but only in its low-skill aspects, such as assembly of electronics products and call centres in the IT sector, without the ability to "upgrade" within that GVC (see Dussel Peters, 2008; and Gallagher and Zarsky, 2007, on Mexico). This is a new form of the "low-level equilibrium traps" identified in earlier eras when countries were stuck producing low value added final goods. As in previous times, such traps require state response. For Chang (in Lin and Chang, 2009), what is required is policy that "defies" comparative advantage. Similarly, Shapiro (2007) writes that countries "need more than a market signal to displace the equilibrium trap".

(2) Export promotion with liberalization of intermediate imports

The second challenge relates to the trade policy dimension of industrial policy. While traditional industrial policy may have included protection of domestic industry with an infant industry logic of import protection, competitive success under GVCs requires easy and cheap access to imports, in particular for necessary intermediates.

(3) Coordination with lead and supplier firms

The third challenge relates to the role of TNCs. Traditional industrial policy sought to build domestic capacity in order to eventually compete with leading TNCs. Since GVCs are governed by TNCs, industrial policy must relate to these lead firms in a very different way. The globalization of production has made industrialization today different from the final goods, export-led process of just 20 years ago. Now the issue facing firms and governments is less that of finding new, more capital-intensive goods to sell to consumers in foreign countries. Instead, it requires moving up through the chain of production of a particular commodity or set of commodities into higher value added activities.

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This involves raising productivity and skills through mechanization and the introduction of new technologies. It also requires fitting into existing corporate strategies and connecting closely with a diverse set of lead firms.

At the same time, the capture of value within GVCs depends on the constellation of power among lead firms, supplier firms and workers. Since traditional trade policy was based on the presumption that industry value added accrued entirely to domestic actors, the issue of power within the production structure was less crucial to the analysis of national welfare.

(4) Promoting regional production networks

We have seen that GVCs have become increasingly regionalized and that the logic of regionalization is no longer simply the traditional goal of market expansion, but is now also based on GVCs, especially found in the electronics sector in East Asia and the apparel sector in southern Africa (Morris, Staritz and Barnes, 2011).

(5) Institutional support for social upgrading

The fifth challenge has to do with the translation of industrial upgrading within GVCs into sustainable domestic social gains, including employment and wage growth and improved labour and environmental standards. A number of recent papers have questioned the extent to which industrial upgrading necessarily brings such "social upgrading". In exploring the conditions under which joint economic and social upgrading happens, value chain analysis highlights the importance of multi-stakeholder initiatives and linkages between commercial firms, workers and small-scale producers, which have facilitated joint upgrading in cases as diverse as cocoa farmers in West Africa, wage increases for apparel workers in Bangladesh, improved working conditions and wages in Foxconn factories in China, and the localization of tourism benefits in China (Barrientos, Gereffi and Rossi, 2011).

(6) Measuring value added in trade

The importance of vertical specialization means that value added in trade will not be the same as trade values measured by standard statistics. The large discrepancy between the two has been well documented in some cases (e.g. Linden, Kraemer and Dedrick, 2007; Xing and Detert, 2010, on Apple consumer electronics products). The OECD (2011) reports that on a value added basis, the US–China bilateral trade imbalance is reduced by slightly more than half. This may have important implications for bilateral and sectoral strategy, since standard trade value statistics can give a distorted picture.

5.5 Conclusions

Rodrik argues that the theoretical case for industrial policy is overwhelming given the omnipresence of externalities and market failures, but that the empirical evidence is less clear. Even China, with its explosive economic growth and rapid export expansion, could be said to have adopted an experimental approach rather than a systematic industrial policy (Rodrik, 2008). In this chapter we have argued that the case for industrial policy has not diminished but rather has changed as a result of the globalization of production.

In a world absent of GVCs, policies normally operate in the space of trade projection or liberalization given the policy objectives. Policies as such mostly deal with how to affect the trade flows between home countries and trading partners (e.g. imports protection and/or export expansion). However, in a world where the GVC is the norm, exports and imports are entangled. Some exports might contain high import content, and some imports might contain high export content. Hence, the policies that affect exports and imports are no longer going to be as effective as they should be in a world absent of GVCs. Instead, policies should be designed to, in a sense, manage GVCs. As soon as we talk about managing GVCs, we are operating in the space of industrial organization rather than macro trade policies. For example, for some of the developing countries, the challenge is no longer about trade protection or liberalization; instead, it is about managing the relation between foreign lead firms and domestic low-value-adding firms for the purpose of industrial upgrading and capturing more value added in the value chain.

What is new about VSI is not the role of TNCs, so the question for the developmental state under VSI is not just about the role of TNCs in economic development. VSI is different from TNC-led development because of its reliance not on TNCs but on developing country manufacturing firms. This has created a qualitative change in world production and trade, and altered the menu of strategies for developing countries, fundamentally shifting development away from the strict TNC-led model of much of the EOI period and shifting trade more into intermediates. These new trade channels were not necessarily TNC-driven trade, but simply intermediates trade.

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The role of the developmental state is different under VSI than in the previous eras of ISI and EOI. We presented a conceptual framework regarding the relation between vertical specialization and the level of economic development, with development from high levels of VS requiring upgrading and a reduction in VS. Development beyond this point has often involved shedding activities to focus on core competence. Given the challenges of VSI in both developed and developing countries, it would appear that the State will once again play an important role in promoting economic development. This role, we argued, acknowledges the legacy of GVC development over the past 20 or more years, but also the recent indications of shifting end markets and changing institutions of global governance. This combination of factors means that industrial policy in the era of VSI will have some new features and respond to some new challenges. Efforts at regional integration with the BRICS countries as the regional hubs are already well under way.

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Part II

Rethinking industrial development strategies: The capabilities dimension

Industrial development strategies in Costa Rica: When structural change and domestic capability accumulation diverge*

6

Eva Paus

> "The most fundamental barrier to sustained development is local capabilities."
>
> Lee (2009, p. 1)

6.1 Introduction

Economic development is a process of economic and social transformation in which production is increasingly shifted to activities with higher value added and rising demand in international markets (McMillan and Rodrik, 2011; Ocampo, Rada and Taylor, 2009; Shapiro and Taylor, 1990). The key driver of such structural change is the ongoing advancement of domestic capabilities at the level of firms, the economy, the labour force and society. Such collective capabilities are defined by a structural and a process dimension. On the one hand, capabilities are reflected in the feasible options that firms or the economy have within the product space for diversification and switching into new products and economic activities. On the other hand, they determine the competences of firms, the economy and society to take advantage of these options (Nübler, in this volume). In particular, technological capabilities at the level of the firm are very important drivers of productive transformation; local firms adopt and adapt existing technologies and eventually innovate and become internationally competitive in

* This paper was prepared as a contribution to the ILO research project on capabilities, productive transformation and development coordinated by Irmgard Nübler.

more knowledge-intensive activities (Astorga, Cimoli and Porcile, in this volume; Cimoli et al., 2009). Such firm-level capabilities will not advance without a properly structured space for learning and the requisite co-development of social capabilities (Paus, 2012).

This chapter analyses the links between structural change and the development of domestic technological capabilities in Costa Rica, a middle-income country in Central America with a population of nearly 5 million and a GDP per capita of US$8,675 in 2011. Costa Rica has long stood out among middle-income countries. During the period of import-substituting industrialization (ISI), from the early 1960s to the early 1980s, the country combined rapid economic growth with the consolidation of a welfare state. Subsequently, under the new economic model (NEM) of liberal market policies, its export structure changed dramatically from primary products to medium- and high-tech products. This transformation stands in stark contrast to the re-specialization in natural resource exports in South American countries and the increasing dominance of low-tech, labour-intensive goods in the rest of Central America.

In light of these achievements, it is not surprising that Costa Rica has been hailed as a "model for development" (Trejos, 2009) and "a clear success story" (World Bank, 2009). However, when we shift the focus from export transformation and growth to the development of domestic capabilities, a different picture emerges. We find that the success story is chequered and the model of development is flawed.

The change in the export structure has been driven chiefly by foreign direct investment (FDI) in the high-tech sectors and does not reflect local firm capabilities. The accumulation of social capabilities under ISI enabled the rise of FDI under the new economic model. But the subsequent deficiencies in the advancement of social capability have created a binding constraint on broad-based upgrading. The development of local firm capabilities has been limited under both strategies. Costa Rica's experience demonstrates that, in the catch-up phase, latecomers need a development strategy that focuses explicitly on the accumulation of local firm capabilities and pays attention to the co-evolution of social capabilities to support both local firms and movement up the value chain by the affiliates of transnational corporations. These findings are reflected in the dynamic framework of catching up, which models catching up as an interrelated process of collective learning and accumulating productive capacities, with interrelated learning taking place at different collective levels, and in which collective capabilities are both causes and consequences of productive transformation in the economy (Nübler, in this volume).

6.2 The development of technological capabilities in small latecomers in the time of globalization: Analytical considerations

6.2.1 Social and firm-level capabilities

A long-established tradition of structuralist thought holds that what a country produces and exports matters for growth and development. Different activities have unequal potential to generate technological spillovers, are characterized by different returns and face different demand elasticities. As a result, economic development is a process in which production is shifted increasingly towards activities that generate greater dynamic benefits.

To analyse the dynamics behind the accumulation of technological capabilities, we need to understand the endogenous processes of transformation in the country. Evolutionary economic thought is particularly germane to this endeavour, with its focus on path dependency and cumulative causation and the recognition that in production learning takes time (Nelson and Winter, 1982). Social and firm-level capabilities have to develop in a synergistic way to enable and, indeed, to force such learning over time (Paus, 2012).

Social capabilities are the broadly diffused capabilities that enable, complement and push the advancement of firm-level capabilities. They have educational, infrastructural, institutional and organizational components (Abramovitz, 1986). This notion of social capabilities differs from the knowledge-based concept of capabilities developed by Nübler in this volume. For example, Abramovitz refers to physical infrastructure also as a form of capabilities, whereas Nübler considers it to be part of productive capacities, which she distinguishes from capabilities.

The educational component is particularly important, since accumulation and diffusion of learning and skills are such a critical factor in a sustained move up the value chain. Basic and advanced schooling and training enable people to master new ways of organizing, producing and distributing in a changing domestic and international environment.

The infrastructural component refers to physical infrastructure and the quality of infrastructure services. In today's global economy, the advancement of ICT-related infrastructure is particularly important for enabling a country's move towards more knowledge-based production.

The organizational component includes coordination capabilities among key institutional entities and private actors in promoting education, training and infrastructure in a way that is in sync with or anticipates the needs of the productive sector. Moving to a knowledge-based economy requires a qualitative jump in social and firm-level capabilities, with an increased demand for coordinating capabilities. Investing in knowledge and technology means expanding research capabilities, building collaborative networks in research and innovation, translating ideas into patents and patents into commercialized outputs; in other words, building a national innovation system. If the capabilities for coordinating such activities are lacking or fragmented, then an important element is missing to support a broad-based move towards more knowledge-intensive production.

Institutions comprise the broad set of rules governing the accumulation process. Economic signals generated by these institutions have to be favourable to private sector investment in upgrading and production diversification. Furthermore, the institutional support and incentive structure that allows and compels local firms to reach a threshold capacity to absorb technology spillover and then move up the technology ladder is particularly important.

During the catch-up process local firms focus initially on learning how to adapt foreign technology to the domestic context, through imitation, reverse engineering, learning by doing and learning by using. But the more a country catches up, the more important innovation becomes for upgrading and competitiveness. Eventually, the endogenous development of new products, services and processes has to become the key source of competitiveness.

The increasing fragmentation of production processes across national borders and the ease with which transnational corporations reorganize their value chains around the globe are distinctive characteristics of the current globalization process. As transnational corporations expand their global networks, latecomers have more opportunities to attract foreign direct investment to their shores, as they have to be a competitive location for the production of only part of a product or service. This is particularly important for small development latecomers such as Costa Rica. Foreign direct investment can help advance domestic technological capabilities if it generates technological spillovers. But there is nothing automatic about such spillovers (Goerg and Greenaway, 2004; Paus and Gallagher, 2008). They will occur only when there is both spillover potential and local absorptive capability (Paus, 2005).

6.2.2 The right incentive structure for dynamic structural change

Tariff protection under ISI gave local companies time to become competitive in the production of new products. But opportunities for learning render pay-offs in knowledge accumulation only if they are accompanied by disciplining measures that control rent-seeking and by support policies that provide the necessary

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complementary inputs for the move towards new activities. In the successful East Asian countries, the reciprocal control mechanism (a term coined by Amsden, 2001) often consisted of export performance standards, under which firms that benefited from protection and infant industry support had to start exporting a growing percentage of their output fairly early in the learning process. Most Latin American and African countries did not have such disciplining measures, or, if they did, they did not enforce them.

Governments need to complement control over rent-seeking with support for the acquisition of new firm capabilities. The larger the gap between firms' existing capabilities and the capabilities needed for new activities, the greater the need for deliberate public policies to support a jump in capability development.

Macro policies play a critical role in shaping the relative prices that influence production and export decisions. The real exchange rate is of particular importance. If it is geared towards inflation control or cheapening of imports and not towards incentivizing exports, it will hinder capability accumulation, and production will shift towards non-tradables.

Progress in the development of national technological capabilities depends critically on the co-evolution of capability accumulation at the levels of firms, individuals, and organizations. If the different elements complement and reinforce each other, if they advance in a co-evolutionary way as part of a coherent, purposeful whole, then national technological capabilities can grow. However, if key institutions are missing, if policies work at cross purposes, or if key complementary inputs are not developed (e.g. specific infrastructure elements or skills), then the development of national technological capabilities will be slowed or even blocked.

6.3 The uneven accumulation of technological capabilities in Costa Rica under ISI

6.3.1 A strong foundation for import-substituting industrialization

Historically, Costa Rica, like all other Latin American countries, depended on a small number of export commodities to generate economic growth, most importantly coffee starting in the early nineteenth century and bananas in the late nineteenth century. Unlike other Latin American countries, however, Costa Rica has a long history of commitment to human development. In 1886 the government established free and compulsory primary education. As a result literacy rates rose dramatically, from 10.9 per cent in 1864 to 67.2 per cent in 1927 (Deneulin, 2005).

During the 1940s successive governments put in place key building blocks for a welfare state and for capability building at different levels of society: social security reform, with both social insurance and social welfare programmes; labour laws with an eight-hour work day and a minimum wage; compulsory and free secondary education, and the second public university, the University of Costa Rica, as well as important research institutions such as the Tropical Agronomical Centre of Research and Teaching.

The commitment to political stability and peace is reflected in the abolition of the army in 1949 and the devolution of political power in the way that the roles and rights of the executive and legislative branches of government were structured (Lehoucq, 2006; Wilson, 1998). The 1949 constitution also created autonomous institutions, semi-independent government agencies responsible for specific tasks. Two other reforms were particularly important for capability accumulation under ISI. First, the nationalization of the banking sector (1948) gave the government tight control over the allocation of credit. Credit was used for the modernization of agriculture and to support the industrialization process (Sánchez-Ancochea, 2004). Second, the establishment of a civil service based on merit rather than patronage (1953) created capacity for policy implementation.

6.3.2 Goals of import-substituting industrialization and government policies

The 1959 Law of Industrial Protection and Development put structural change at the centre of development strategy. Domestic manufacturing of previously imported goods was to generate growth and reduce the balance of payments constraint; the generation of local technologies was to allow a more dynamic development of the primary goods sector; and membership in the Central American Common Market (CACM) was to overcome the scale limitations of a small domestic market.

Governments used mainly horizontal policies to promote private sector movements towards new activities with higher value added: tariff protection, subsidized credit, an overvalued exchange rate (which lowered the cost of imported capital goods), and tax exemptions for the use in domestic production of imported primary, intermediate, and capital goods.

In the 1970s ISI entered a second phase in Costa Rica. The anti-export bias of the policy package had exacerbated the balance of payments problems, which led the government to establish incentives for maquila production and export incentives in 1972. In addition, the government aggressively expanded its role from regulator to producer, starting with the establishment of the Costa Rican Development Corporation (CODESA).

Overall, ISI policies opened a learning space for local producers and supported local production of new products. But they did not entail disciplining measures that would have forced local companies to use the rents provided by protection and subsidized credit to become internationally competitive. In addition, the anti-export bias of a fixed exchange rate cum high tariff protection provided a disincentive for exporting to markets outside the CACM.

6.3.3 Structural change and capability accumulation of local firms

Between 1962 and 1980 the Costa Rican economy grew at an average annual rate of 6.1 per cent – 6.9 per cent during the first phase of ISI (1962–73) and 4.8 per cent during the second phase (1974–80) (Cordero, 2000). Between 1960 and 1979 the share of manufactured value added in GDP increased from 13.2 to 22 per cent, and the share of manufactured exports in total exports rose from 2.4 to around 30 per cent (Buitelaar, Padilla and Urrutia-Alvarez, 2000). The Central American market played an important role in export expansion. Exports to Central America rose from less than 5 per cent in the 1960s to over 20 per cent in the 1970s and 1980s (Rodrígues, 1998).

Structural change was not limited to an expansion of the industrial sector; it also occurred in agriculture and manufacturing. Agricultural production modernized, especially in coffee and bananas (Sánchez-Ancochea, 2004), and new

Table 6.1 The structure of Costa Rica's industrial sector (percent distribution), 1960–80

	1960	1970	1980
Food, beverages, tobacco	69.1	54.4	49.3
Textiles and clothing	11.3	10.3	7.9
Wood and wood products	7.9	5.7	5.0
Paper and paper products	2.2	4.3	4.8
Chemicals and chemical products	4.8	12.1	18.7
Non-metallic mineral products	2.2	2.6	2.6
Fabricated metal products	1.4	8.9	10.1
Other	1.1	1.7	1.6

Source: Sanchez-Ancochea (2004), based on *Costa Rica en cifras*.

Table 6.2 Breakdown of growth, taking into account schooling of workers, 1963–2000 (percentages)

	GDP/L	K/L	Schooling	TFP
1963–73	3.31	1.18	1.06	1.07
1972–80	1.81	1.49	1.27	−0.95
1980–84	−1.67	−0.18	1.33	−2.83
1984–2000	1.45	0.41	0.81	0.23
1963–2000	1.68	0.76	1.02	−1.10

GDP/L = labour productivity; K/L = capital/labour ratio; TFP = total factor productivity.
Source: Rodriguez-Clare, Sáenz and Trejos (2004).

non-traditional agricultural products were cultivated for export, including flowers, decorative plants, fruits and vegetables (Ulate, 1992).

Within the manufacturing sector the share of the traditionally dominant food sector declined, while the participation of chemicals and fabricated metal products increased (table 6.1). The latter also accounted for a major share of the increase in manufactured exports (ibid.). Structural change towards new and higher value added activities was reflected in higher productivity growth. On an aggregate level labour productivity increased at an average annual rate of 3.3 per cent during the first phase of ISI and 1.8 per cent during the second (table 6.2). However, local firms were only partially responsible for the structural change and productivity growth. Foreign producers played a prominent role in both domestic production and exports (Ulate, 1983).

6.3.4 Strong accumulation of social capabilities

Throughout the ISI period successive governments were committed to expanding and deepening access to education and health and to improving infrastructure. In some instances the accumulation of social capabilities was intentionally linked to the needs of the private sector, and at other times the connection was more tenuous.

Public education expenditures increased from 2.6 per cent of GDP in 1960 to 6.2 per cent in 1980 (table 6.3). By the end of this period, enrolment in primary school was universal. Enrolment rates in secondary school doubled between 1965 and 1975, rising from 26 per cent to 53 per cent. The 1970s also saw a major expansion in higher education, with the establishment of three additional public universities, which helped to supply the scientists and engineers that were needed for ISI (Rodriguez-Clare, 2001). The creation of several institutions in the area

Table 6.3 Education and vocational training indicators for Costa Rica, 1950–2000

	1950	1955	1965	1975	1985	1990	2000
Illiteracy rate (%)							
Total	21.2		14.3	10.2	6.9		4.7
Men	20.9		14.1	10.2	7.0		5.0
Women	21.5		14.5	10.3	6.9		4.5
Gross enrolment rate							
Primary school		91.5	105.2	107.1	98.8	102.5	107.8
Secondary school		17.4	26.5	52.7	49.7	50.5	64.7
Public education expenditure/GDP	1.5	2.6[a]	5.2[b]	6.2[c]		3.9	4.7
Enrolments in INA courses			261	13 605	30 405	38 976	118 488

[a] 1960 [b] 1970 [c] 1980 INA = National Training Institute.

Source: CONARE (2008) for education data; INA (2009) for INA enrolments.

of science and technology reflected some awareness of the importance of promoting indigenous efforts in science and technology, although Segura and Vargas (1999) suggest that these efforts were not part of any overall strategy of capability building. The setting up of the National Council for Science and Technology (CONICIT) in 1972 was not primarily a response to any perceived needs of the productive sector, but rather to the desires of the academic sector to promote research (Buitelaar, Padilla and Urrutia-Alvarez, 2000). In 1965 the National Training Institute (INA) was established as a response to studies about national education and projections about future production, and studies by similar institutions in Latin America, such as the Servicio Nacional de Aprendizaje (SENA) in Colombia and the Serviço Nacional de Aprendizagem Industrial (SENAI) in Brazil (Rosal, 2001).

The government also invested heavily in new infrastructure. An expanding road system improved the transportation network in the country. And ICE, the Costa Rican Electricity Institute – a semi-autonomous institution – extended electricity coverage considerably, at subsidized prices, to remote parts of the country.

By 1980 the ISI model had run into trouble. The CACM had collapsed, as civil wars were raging in El Salvador and Guatemala; foreign debt had reached unsustainable levels; inefficiencies in government enterprises were accumulating; and the political coalition underlying the Costa Rican social democratic model was starting to fray. After banana and coffee prices plummeted and interest rates on foreign debt soared at the beginning of the 1980s, Costa Rica declared a moratorium on its foreign debt in July 1981. Its currency, the colón, was devalued by 600 per cent between August 1980 and May 1982.

The economic crisis forced Costa Rica to seek help from Washington institutions, and under pressure from the IMF, the US Agency for International Development and others, the Monge Administration (1982–86) opted for the new economic model (NEM) of market liberalization with a substantially reduced role for government in the economy.

6.4 Structural change and domestic capabilities under the new economic model: Diverging trajectories

The goal of the NEM was macro stabilization and growth through full integration into the global economy. Import liberalization, export promotion, and inflows of foreign direct investment were supposed to give the country access and exposure to new technology, marketing and global networks and so to enhance the competitiveness of local firms.

The biggest achievement under the NEM has been the large inflow of efficiency-seeking foreign direct investment in the high-tech sector. Attracted by the high level of social capabilities that had been accumulated during the ISI period, the country's location, and special incentives, foreign investors have used Costa Rica as an export platform in electronics, medical devices and services based on information technology (IT). But social capabilities have not kept up with the needs of the private sector. Growing deficiencies in education, innovation and infrastructure have become binding constraints on broad-based upgrading.

The lack of coherent support for capability accumulation by local firms has resulted in a highly diverse landscape of production capabilities. The local software sector has thrived, and in both agriculture and manufacturing there are numerous successful local producers and exporters. Particularly in manufacturing, however, most companies are micro and small enterprises, which produce for the local market, have low productivity, and are in no position to benefit from potential spillovers from foreign direct investment.

6.4.1 International trade and investment policies under the NEM

Promoting trade and attracting foreign direct investment have been the cornerstones of Costa Rica's NEM strategy. Import liberalization proceeded gradually, as the average tariff rate fell from over 60 per cent in 1985 to 11.7 per cent in 1995 to 4.6 per cent in 2007. To counteract the anti-export bias entailed in the tariff protection of the early 1980s, the government in 1984 established tax certificates (*Certificados de Abono Tributario*, or CATs) worth up to 15 per cent of the export value and continued a modified drawback scheme that had been in place since 1972.

While the CATs were successful in stimulating non-traditional exports, they led to over-invoicing and fictitious exports and a growing fiscal burden. As a result, they were reduced in the early 1990s and abolished in 1999. In 1996 the Active Processing Regime (*Régimen de Perfeccionamiento Activo*, or PA) became the new structure for the drawback scheme.

To promote exports and attract foreign direct investment, in the early 1980s Costa Rica established Free Zones that offered duty-free imports and a variety of tax exemptions, most importantly from profit taxes. Even though production in the Free Zones is open to both foreign and national companies, the investment and export requirements are too high for a Free Zone to be a feasible option for most local companies. The government also provided incentives for investments in the tourist industry, with the goal of promoting ecotourism.

Since the mid-1990s Costa Rica has aggressively pursued free trade and investment agreements. The goal, according to national authorities, was to mitigate the country's vulnerability to unfair trade practices and guarantee market access. To date, Costa Rica has signed agreements with Canada, the CARICOM, Chile, China, Mexico, Panama, Peru and the United States.

The policy shift to liberal trade and foreign investment was accompanied by changes in the institutional architecture. Some entities were abolished (e.g. ODESA in 1990) or became marginalized (e.g. the Ministry of Economics, Industry and Commerce), while others were newly created and acquired substantial political clout. Most important among these are the Costa Rica Investment Promotion Agency CINDE (1982), the Ministry of Foreign Trade (COMEX) and PROCOMER, a non-State public entity in charge of export promotion and the administration of special export regimes (both established in 1996).

Active government policies were seen as inherently problematic in a strategy where relative prices in international markets were expected to determine production patterns and competitiveness. To be sure, the export contracts and subsidies via tax certificates (CATs) were intended to entice producers to export to new international markets. But these incentives were as deficient in their design as they had been under ISI. In both periods they provided the opportunity for firm learning, but they lacked built-in, enforced disciplining measures that would have obligated companies to turn the created rents into learning pay-offs. The export contracts did not include any mechanisms to force domestic producers to learn, to incorporate technological change and to become competitive by the time that the CATs were phased out.

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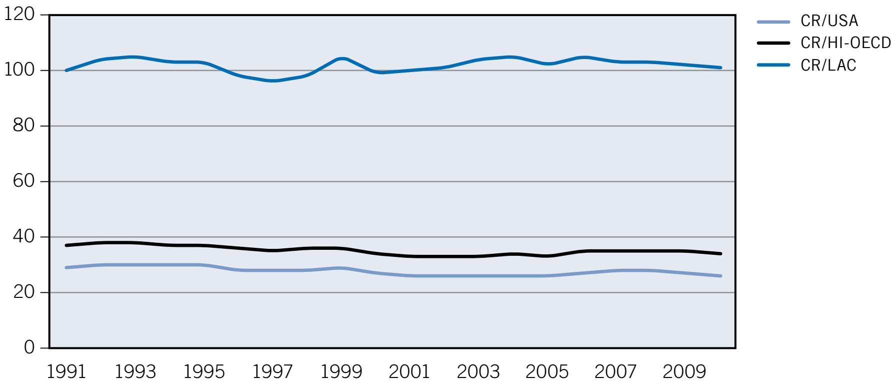
6.4.2 Structural transformation of the export structure: The critical role of foreign direct investment

After the "Lost Decade" of the 1980s, Costa Rica's GDP per capita grew at an average annual rate of 3.7 per cent between 1990 and 2008, although growth was very uneven. The economy did not narrow the gap with the high-income countries of the OECD (figure 6.1). Factor growth continued to be the main driving force behind the growth in labour productivity.[1]

Exports of goods and services (especially tourism) have been a key driver of economic growth. Between 1991 and 2008 the value of merchandise exports increased by 250 per cent to US$6.7 billion. The export share increased from 27 per cent in 1980 to nearly 50 per cent in 2000 and then stabilized around that level. The import share, in contrast, kept rising, reaching 56 per cent in 2008. The resulting trade deficit has been funded largely by growing revenues from tourism and foreign investment inflows (Alonso, 2009). The share of agricultural value added in GDP continued to decline; it accounted for only 7 per cent by 2008. The industrial share remained steady at around 30 per cent, while the service sector grew considerably.

The most remarkable change during the NEM period has been the transformation of the export structure (figure 6.2). The share of agricultural exports

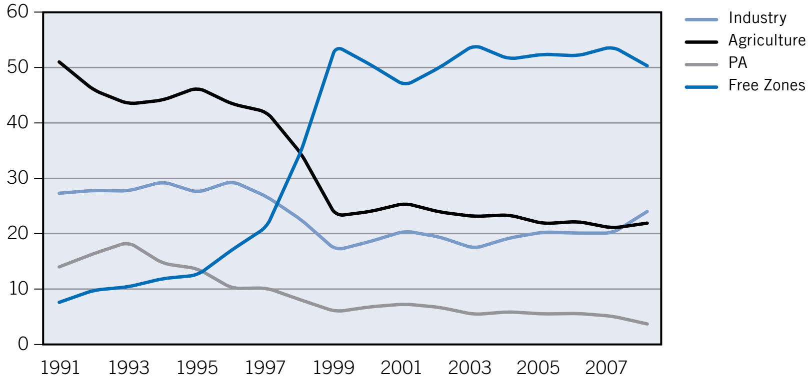
Figure 6.1 GDP per person employed: Costa Rica in comparison with high-income and Latin American countries (in constant 1990 PPP US$)



Source: World Development Indicators.

[1] In a more recent study of the growth of total factor productivity (TFP) in Costa Rica, covering the period up to 2008, Jiménez, Robles and Arce (2009) estimate a higher rate of TFP growth for the NEM period. It is not clear, however, to what extent the difference is due to the difference in the data used for the calculations.

Figure 6.2 Costa Rica's export structure, 1991–2008 (per cent shares)



Source: Based on Prográma Estado de la Nación (2009).

declined from 50 per cent in 1991 to 22 per cent in 2008, and their composition changed considerably. Traditional exports (coffee, bananas, sugar, meat) accounted for over three-quarters of agricultural exports in 1991, but by 2008 non-traditional agricultural exports (e.g. pineapple, melon and yucca) made up 50 per cent of agricultural exports.

Costa Rican export statistics distinguish between three different export regimes: Free Zones, PA, and the regular export regime with no special incentives. Free Zones drove the dramatic transformation of Costa Rica's exports over the last 25 years. In 2008 Free Zone exports accounted for half of Costa Rica's exports, compared with a mere 7.6 per cent in 1991. The two largest sectors are electronics and electrical equipment and precision and medical instruments; together, they accounted for 71 per cent of Free Zone exports and 37 per cent of the country's total exports in 2008 (table 6.4).

Alonso (2009) estimates that, in 2008, 78 per cent of all companies in the Free Zones were of foreign origin and that they accounted for 93 per cent of the Zones' export value. No similar data are available on the national origin of exporters under the PA regime or the regular regime, but we know that there are large foreign investors operating under each regime. In 2008 foreign investment under the Free Zone regime amounted to US$445 million, compared with US$770 million under the regular regime, US$286 million in tourism, and US$35 million in the financial sector (Alonso, 2009).

The location-specific assets that attracted foreign investors included the education level of the labour force, political stability, the attractive tax incentives available in the Free Zones and the geographic location of the country. Initially, the

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Table 6.4 Costa Rica's goods exports by sector and export regime, 2008 (in US$ million)

	Regular export regime	PA regime	Free Zone regime	TOTAL
Agriculture, livestock, fish	2215.5	3.5	82.8	2302.4
Industry	2010.8	357.4	4899.6	7267.8
Electronics and electrical equipment	279.4	2.5	2563.3	2845.2
Foodstuffs	413.0	116.4	495.1	1024.5
Precision and medical instruments	4.6	0.7	983.5	988.8
Chemicals	370.4	14.6	206.6	591.7
Metal and mechanics	261.9	39.3	94.0	395.2
Textiles, clothing, leather products	48.5	114.8	201.4	364.6
Plastic products	143.7	1.0	69.0	213.7
Rubber products	46.0	0.0	166.9	212.9
Paper and paper products	158.0	48.6	1.3	207.9
Non-metallic minerals	90.2	0.0	12.9	103.1
Total	**4226.3**	**360.9**	**4982.4**	**9569.7**

Source: PROCOMER (2009, p. 9).

foreign investment promotion agency CINDE was indiscriminate in its pursuit of foreign direct investment. Much of this investment was in apparel assembly, given the United States' special market access provisions under the Caribbean Basin Initiative and the shared production regime under regulation 807 of the US tariff system. But when the other Central American countries became more attractive sites for assembly operations after the end of the civil wars in the early 1990s, CINDE began to pursue foreign direct investment in higher value added sectors: electronics, medical devices and, later, IT-based services.

In 1996 Intel chose Costa Rica as the site for its first microchip test and assembly facility in Latin America. That decision played a huge role in the magnitude and nature of subsequent foreign investment flows to Costa Rica (table 6.5). It put the country on the map for transnational corporations in the high-tech sector. Today, foreign direct investment in Costa Rica is concentrated in three major sectors: advanced manufacturing in electronics and components, medical devices, and IT and IT-enabled services.

Many of the activities in the Free Zones are at the lower end of the skills spectrum within the high-tech area, e.g. in the assembly and not the design of medical devices. Nonetheless, that can be a good starting point for moving up to higher value added activities within those sectors subsequently.

Table 6.5 Net inward foreign direct investment, by sector (in US$ million)

Sectors	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Agriculture	−11.2	0.5	−8.6	−36.3	50.6	+37.1	62.2	0.5	447.6	68.0	−6.4	34.9
Agroindustry	11.5	5.2	2.8	8.4	−0.3	29.6	−3.2	32.3	19.4	4.8	37.0	3.6
Other retail	15.5	11.1	15.2	6.0	23.9	47.6	56.3	72.8	79.6	−3.0	62.1	71.4
Supermarket												257.5
Manufacturing	296.2	231.6	483.0	386.7	456.0	344.9	439.3	689.2	554.7	407.3	965.9	714.6
Offshoring services	17.3	57.4	52.8	83.2	17.3	73.3	60.4	55.0	80.4	29.9	59.4	244.1
Public works concession	–	–	–	–	–	–	–	2.5	65.0	211.5	26.0	22.7
Telecommunication	–	–	–	–	–	–	–	–	–	–	–	339.0
Electricity generation	–	–	–	–	–	–	–	–	–	–	–	18.2
Financial sector	27.1	43.1	17.2	2.2	22.6	40.9	343.4	74.0	29.0	87.1	70.0	107.4
Tourism	51.3	102.5	76.0	88.3	41.4	53.5	136.1	321.3	291.5	253.6	81.0	113.5
Real estate	15.0	9.0	21.0	31.0	178.4	234.6	364.5	644.6	485.1	265.6	147.0	228.1
Other	−14.1	0.0	0.0	5.7	3.9	−0.5	10.3	3.9	25.9	21.8	23.5	1.8
Total	**408.6**	**460.4**	**659.4**	**575.1**	**793.8**	**861.0**	**1 469.1**	**1 896.1**	**2 078.2**	**1 346.5**	**1 465.6**	**2 156.6**

Source: BCCR, CINDE, PROCOMER, COMEX and ICT (courtesy of Sandro Zolezzi, CINDE).

6.4.3 Limited capability accumulation of local firms

While a small number of local companies have become successful exporters, the vast majority of local firms are small, lack access to information about technology, export markets and financing, and do not export. In the manufacturing sector the successful local exporters are mainly those that had accumulated export experience under ISI and took advantage of the CAT subsidy to develop the requisite capabilities for international competitiveness, e.g. Atlas Electrica (small refrigerators and stoves), Durman Esquivel (tubes for construction) and Abonos Agro (construction materials).

Capabilities in the agricultural sector have increased considerably. Advances in technology have led to yields in coffee cultivation that are among the highest in the world. And smart marketing and upgrading of coffee have moved some Costa Rican coffee into the gourmet and higher value category, e.g. Café Britt.

The local software sector is one of the most significant areas of new local capability development. With no barriers to entry and plenty of opportunities for niche production, software companies find it easier to establish themselves on a small scale, given requisite training and funding. When major transnational corporations in the IT area started operating in Costa Rica and Panama in the 1970s, the University of Costa Rica and the Institute of Technology of Costa Rica established the first bachelor's degree programmes in computer science to produce employees with the necessary skills for the sector. Graduates of these programmes were among the first to set up local software companies (Alonso, 2008). The increase in connectivity through fibre optics at the end of the 1990s gave additional impetus to the sector. In 2006 there were an estimated 600 local software companies, with sales of US$300 million and 9,400 employees. They focused mainly on the development of horizontal and vertical software solutions (Mata and Mata Marín, 2009).

IT firms are an exception, however. Most local firms in Costa Rica have not thrived under the NEM. Formal micro, small and medium-sized enterprises make up 18 per cent of all businesses, and informal microenterprises account for another 81 per cent of production units (World Bank, 2009, p. 30). More than 80 per cent of firms consider the home market their primary market (MICIT, 2009). Among the small number of companies that did export, many ceased to do so after just one year (World Bank, 2009).

In a strategy where the emphasis is on trade and integration into the global economy, provision of economic opportunity has been understood narrowly as access to markets, not as learning space with the requisite support policies and the disciplining measures to force learning. During the first phase of the NEM, the

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government adopted export subsidies as an enticement to enter the international market. As under ISI, however, there were no built-in mechanisms that forced companies to do so. In addition, there was no general recognition that local producers need to be supported with policies that allow them to learn and meet the challenges of international competition, particularly in the face of widespread information failures, coordination problems and market inadequacies.

Many studies have identified lack of information and access to financing as key obstacles to the advancement of firm-level technological capabilities. In recent years various public funds have been established to promote technical change in small and medium-sized enterprises (SMEs). For example, in 2002 the PROPYME Fund was established in support of SMEs. But its budget is small (US$1 million in 2008), and, even at that low level, it was greatly underutilized.

Costa Rica is not alone in its lack of strategic advancement of technological capabilities. Based on an analysis of 12 clusters in Latin America, Pietrobelli and Rabellotti (2004) argue: "The major shortcoming of the current policy approach in most countries is the lack of an integrated and consistent vision of local SME development and upgrading."

6.4.4 Limited technological spillovers from foreign producers

The realization of spillovers depends on the complex interactions between the absorptive capability of the host country and the spillover potential of foreign direct investment (Paus, 2005). Many of the large transnational corporations in Costa Rica's Free Zones (e.g. Intel, Baxter) source their major inputs from their affiliates worldwide or from vetted input suppliers who supply the corporation on a global scale. In addition, some key inputs simply cannot be produced currently in Costa Rica, either because the requisite scale is too large or the necessary technology is too sophisticated. In contrast, small and medium-sized transnational corporations, of which Costa Rica has many, are frequently much more eager to source in the host country, because they do not have the same global networks of suppliers.

A main channel for technological spillovers in Costa Rica is backward linkages, the mobility of human capital trained in high-tech transnationals, and transnationals' impact on other production-relevant areas such as logistics and educational standards, especially in technical areas. Backward linkages from foreign investment have risen in absolute terms but not necessarily in relative terms. Foreign producers' national expenditures increased from US$99 million in 1997 to US$645 million in 2007, amounting to 17.8 per cent of imports (table 6.6).

Table 6.6 Backward linkages from Costa Rica's Free Zones, 2004 and 2008

	Number of companies		**Exports (in US$ million)**		**Imports (in US$ million)**		**Purchase of national G&S (in US$ million)**		**Employment**		**National purchases/imports**	
	2004	**2008**	**2004**	**2008**	**2004**	**2008**	**2004**	**2008**	**2004**	**2008**	**2004**	**2008**
Machinery, electrical materials and parts	37	40	1 560.2	2 436.5	1 655.3	2 487.2	44.9	49.7	8 647	8 331	2.7	2.0
Services	54	112	146.9	307.8	151.9	271.0	48.0	163.4	6 985	21 736	31.6	60.3
Textiles, clothing, leather and footwear	31	22	333.6	196.2	261.1	176.5	21.5	18.8	7 689	6, 557	8.2	10.7
Precision instruments and medical equipment	19	18	541.5	965.9	213.0	363.4	13.6	53.3	4 367	6 437	6.4	14.7
Agroindustry	17	17	306.9	511.6	21.9	43.1	114.8	218.6	2 982	3 226	524.2	507.2
Plastic, rubber and their manufactures	11	12	138.8	233.3	83.5	148.5	26.9	34.7	1 568	2 098	32.2	23.4
Metal products	10	14	48.5	89.8	34.6	53.6	21.1	44.7	740	1 200	61.0	83.4
Agriculture, livestock	3	5	24.7	63.9	0.4	0.9	14.4	28.6	749	1 263	3 600.0	3 177.8
Chemicals and drugs	6	3	67.5	83.4	17.5	19.1	15.7	18.8	114	103	89.7	98.4
Others	16	16	73.2	94.7	51.0	62.0	14.1	15.0	1 772	1 792	27.6	24.2
Total	**204**	**259**	**3 241.7**	**4 983.2**	**2 490.3**	**3 625.2**	**334.9**	**645.5**	**35 613**	**52 742**	**13.4**	**17.8**

Source: COMEX, PROCOMER (2009) and Alonso (2009).

Services and agro-industry spent the most on national goods and services (G&S), both absolutely and relatively. But in the high-tech sectors, the electronics and medical instruments sectors, the relative expansion of backward linkages has been more limited. When we exclude services and agroindustry, the ratio of national purchases to imports has risen only slightly in recent years, from 7.4 per cent in 2004 to 7.9 per cent in 2008. Sourcing from domestic companies is often limited to printing, packaging, services, and logistics; nonetheless, some companies have become competitive suppliers of material inputs to transnational corporations, mainly of metal and plastic parts (Cordero and Paus, 2010).

Domestic sourcing does not necessarily mean purchases from Costa Rican companies. Monge (2005) suggests that the domestic suppliers that provide Intel with high-technology products and services are predominantly foreign companies, part of Intel's global supply network, while mainly national companies provide low-tech services and logistics. Giuliani (2008) comes to similar conclusions on a more general level.

One of the reasons for the limited backward linkages is the insufficient domestic absorptive capacity. There were no sustained efforts to support linkage promotion until the establishment of *Costa Rica Provee* (Costa Rica Provides, or CRP) in 2001. CRP was charged with assisting Costa Rica's potential input suppliers to transnational corporations to become actual suppliers. Its formal integration into PROCOMER in 2004 was an important step towards institutionalizing linkage promotion. CRP supported 18 linkages in 2003 and 213 in 2009, with cumulative supplier sales of US$28.8 million. Two-thirds of these linkage connections were with companies in electronics and medical devices (Programa Estado de la Nación, 2009).

At the end of 2010, CRP was renamed the Export Productive Linkage Department, following the establishment of the Committee on Backward Linkages. Its resources continue to be limited; it has a staff of seven people and a budget of less than US$400,000. With such limited human and financial resources, it is hard to see how the new department can bring about a qualitative jump in domestic linkages.

Studies suggest the potential for many spillovers through labour mobility, but there is no hard evidence of its actual extent in Costa Rica. Monge-González, Bonilla and Rodríguez (2012) find that about one-third of the roughly 41,000 workers who left employment with transnationals between 2001 and 2007 were subsequently employed in local firms. But they did not find statistical evidence that labour productivity in these firms was higher.

Foreign investors have had a considerable impact on technology education in Costa Rica. Intel has been at the forefront in this area. Intel CR has worked with the three public universities on curricula and donated labs to ensure that the required curricula were in place. Also, it has initiated many programmes at the K–12 level to get students and teachers more involved in the sciences through science fairs, workshops for teachers and other activities (Monge-González and González-Alvarado, 2007).

6.5 Social capability accumulation under the new economic model: Falling behind private sector needs

Under ISI Costa Rican governments had an unwavering commitment to deepening access to formal education, providing vocational training, and expanding the country's infrastructure networks. But under the new economic model, social capability accumulation has increasingly fallen short of the needs of the private sector. The lack of strategic vision and funding has resulted in growing difficulties on different educational fronts and huge deficiencies in infrastructure, especially in roads and ports.

6.5.1 Education and vocational training

In the course of economic stabilization and adjustment in the 1980s, spending on education declined considerably, both as a percentage of the government budget and per student. Public expenditures on education as a share of GDP reached a low of 4 per cent in 1988. It was not until 2003 that the share had returned to the 6 per cent level of 1979 (Programa Estado de la Nación, 2009). This has had serious consequences for those who were left out of schooling during those years as well as for society and the economy at large. It has constrained the expansion of the proportion of the labour force with secondary education force and, therefore, the option space for the domestic economy to expand manufacturing. This became obvious in the shift of Costa Rica from a "strong middle" to a "missing middle" educational attainment structure and, consequently, a loss in options for broad-based industrial development (Nübler, 2013 and forthcoming).

Between 1976 and 2008 the average education level of the labour force improved considerably (table 6.7). Nonetheless, graduation rates at the secondary level remain low. According to cohort statistics of the Ministry of Education, only 27 per cent of those who entered primary school in 1990 reached the 11th grade

Table 6.7 Education level of the labour force, Costa Rica, 1976 and 2008 (percentages)

	1976	2008
University	5.2	19.7
Secondary completed	5.2	11.7
Secondary not completed	16.3	25.1
Primary completed	28.5	27.6
Primary not completed	34.6	13.1
No schooling	10.2	2.8

Source: Jimenez, Robles and Arce (2009), based on data from Instituto Nacional de Estadística y Censos household surveys.

(Programa Estado de la Nación, 2005). To improve the low graduation rates, the Arias Administration (2006–10) started the programme *Avancemos,* which provides a monthly stipend to poor families as long as the child remains in secondary school, with the stipend increasing with the grade level.

The gap between the skills needed by the productive sector and the skills supplied by the educational and training systems has grown in recent years. There is a shortage of workers with good proficiency in English and of workers with the requisite technical preparation, both at the level of mid-level technician and PhDs, in the natural sciences and engineering. This gap is felt most acutely by companies that have been successful under the NEM, i.e. many affiliates of transnationals and successful local producers of tradable goods and services.

By the late 2000s there was growing recognition that the problems in the education system were imposing serious constraints on upgrading. This recognition led to several new initiatives. The number of technical high schools has increased. The shortage of mid-level professionals in the technical areas, e.g. graduates of two-year technical colleges, led to the establishment of a fifth public university, the National Technical University (UTN) in 2009. In the area of K–12, there has been an increased focus on using digital technology in teaching and on improving the quality of teaching English. Beginning in 2014, the University of Costa Rica will offer a PhD programme in computer science, and the Costa Rican Institute of Technology will offer a PhD programme in software engineering and a Master's programme in electronics. However, there is no overall framework that sets priorities and guides the coherence and continuity of these different actions across sectors and institutions.

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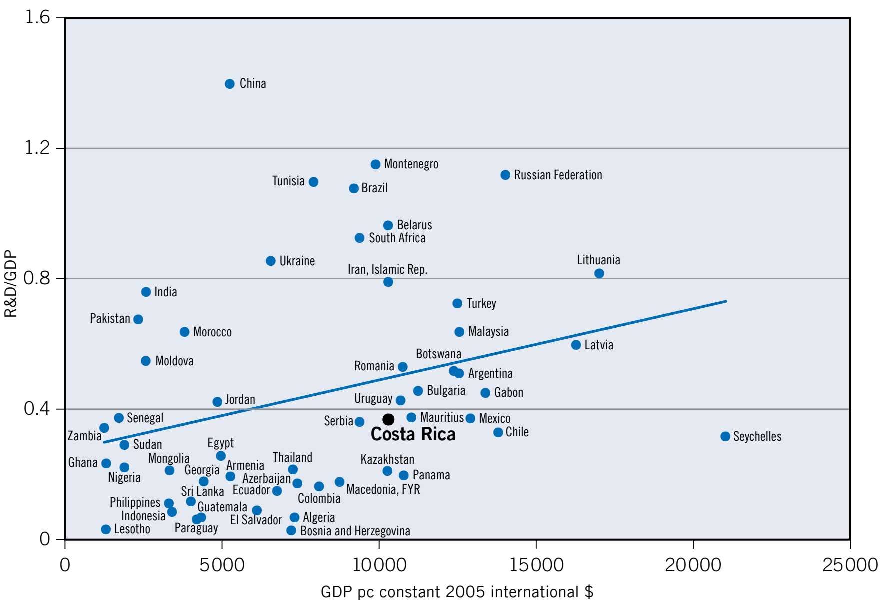
6.5.2 Low capabilities in research and development

The main channel for the acquisition of foreign technology has been capital goods imports. Licensing of foreign technology has been relatively unimportant, and domestic spending on science and technology activities has been small. In 2007 capital goods imports amounted to about US$2 billion, compared with a mere US$52 million in royalty payments for licences and domestic expenditures on science and technology of US$350 million.

Research and development (R&D) expenditures in 2007 amounted to 0.36 per cent of GDP, 0.11 percentage points below the trend line for middle-income countries (figure 6.3). The R&D ratio has changed little over the past 20 years. The private sector accounts for only one-third of Costa Rica's R&D expenditures. Most Costa Rican companies are not involved in R&D, and research activities of transnational corporations in Costa Rica, although increasing, are small (table 6.8).

During the NEM era a number of laws were passed, institutions established, and initiatives launched to promote the advancement of technological capabilities, of science and technology in university circles, and of applied research through linkages between academia and industry. In fact, in 1990 Law No. 7169 created

Figure 6.3 Research and development expenditure relative as a share of GDP, middle-income countries, 2007 (percentages)



Source: Based on World Development Indicators.

Table 6.8 Breakdown of Costa Rica's expenditures on science and technology (S&T) (US$ million)

	2006	2007	2008
Public sector			
Total	**87.2**	**114.0**	**130.6**
R&D	13.0	15.3	19.9
Teaching and training	20.6	26.6	27.6
Scientific and technical services	53.6	72.1	83.1
Academic sector			
Total	**158.5**	**195.1**	**237.2**
R&D	35.4	47.0	56.9
Teaching and training	102.5	120.3	142.9
Scientific and technical services	20.7	27.8	37.4
Private enterprises			
R&D	43.7	27.7	35.9
All sectors			
Total	**301.4**	**350.3**	**416.1**
R&D	97.2	96.2	118.8
Teaching and training	124.4	148.1	171.5
Scientific and technical services	79.8	106.0	125.7

Source: MICIT (2009).

the National System of Science and Technology (Sistema Nacional de Ciencia y Tecnología, or SNCT), which was conceived as the government's instrument for planning the development of science and technology and was considered part of the national development programme. The Figueres Administration (1994–98) made a great effort to boost the country's innovation system. The Ministry of Science and Technology was established in 1996 to steer this endeavour, and the CENAT (Centro Nacional de Alta Tecnología) was set up in 1999 to connect government, industry and academia in high-tech research. The Figueres Administration's all-out effort to bring Intel's first Latin American production facility to Costa Rica can be seen as an element in this larger picture.

Many of these initiatives have generated positive outcomes, but the overall problem has been that too many actions have been short-lived, underfunded and uncoordinated and often did not survive a change in government. There has been no coherent, comprehensive and sustained science and technology strategy.

As transnational corporations increasingly look to tap talent on a global scale, their subsidiaries often seek to build research capabilities in host countries to maintain or enhance their position within the corporate structure. The fact that Hewlett–Packard and Intel have opened small research centres in Costa Rica demonstrates the willingness of affiliates of transnationals to upgrade into more technology-intensive activities in the country. A much larger potential could be realized if the deficiencies in technical education were overcome.

Another example of Costa Rica's potential comes from one of its own: Franklin Chang, a NASA astronaut from 1981 to 2005. Chang established Ad Astra Rocket in Costa Rica in 2005 in Guanacaste; it is a wholly owned subsidiary of the eponymous US parent company. The company's goal was to bring the Vasimir engine to full operational deployment in space by late 2013. There is now a mini-cluster of small local companies around Ad Astra Rocket collaborating in the Costa Rican Aerospace Alliance.

In the agricultural sector, well-established public research institutions have collaborated successfully on applied research with private sector actors, e.g. Colegio Universitario para el Riego y el Desarrollo del Trópico Seco, the Escuela Centroaméricana de Ganaderia (ECAG), the Costa Rican Coffee Institute, and the Instituto Nacional de Biodiversidad (INBio). Overall, however, it is widely agreed that cooperative projects between the academic research sector and the productive sector are few and far between (e.g. Macaya Trejos and Cruz Molina, 2006). The main reasons are lack of knowledge on the part of enterprises of what is happening in the universities, lack of knowledge regarding enterprise needs on the part of universities and research institutes, and the cost of innovation (MICIT, 2009).

6.5.3 Serious deficiencies in infrastructure

Changes in the productive structure, economic growth and growing tourism have increased the demands on Costa Rica's infrastructure significantly. In 2008 there were about 1 million vehicles in the country, three times more than in 1991. Over the same period the number of international passengers coming through San José's international airport quadrupled, reaching 4 million in 2008. The freight handled in the port facilities of Limon–Moín went from 2.1 million metric tonnes in 1980 to 9.9 million metric tonnes in 2007.

Infrastructure expansion, regulation and planning have been woefully inadequate to meet the growing demand. The 2012–13 *Global Competitiveness Report* ranks Costa Rica 57th in overall competitiveness among the 144 countries considered, and 95th for overall infrastructure: 60th for air transport infrastructure, 131st for quality of roads, 140th for port infrastructure (ahead of only Haiti, Bosnia and Herzegovina, Tajikistan and Kyrgyzstan).

The growing deficiencies have elicited constructive responses. Under the Chinchilla government (2010–14), four major road improvement projects have

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begun, three funded by outside loans (the Inter-American Development Bank and the Development Bank of Latin America) and one by private concession. Also, the government has granted a concession to APM Terminals to build and operate a new terminal for shipping containers. The expected investment is US$1 billion, and the terminal should be operational by 2016.

6.6 Conclusions

Over the last 15 years, Costa Rica has achieved a remarkable transformation of its export structure, moving away from primary products to medium- and high-tech goods. This positive structural change is all the more remarkable as the exports of most other Latin American countries have come to be dominated by natural resources or low-tech products. Nonetheless, Costa Rica's export success does not translate into unequivocal development success. On the one hand, the country has been highly successful at attracting foreign direct investment into higher-tech sectors, the result of social capabilities accumulated under ISI, location advantages, and attractive incentives. Using Costa Rica as an export platform, foreign producers have been the driver of the country's export growth and transformation. On the other hand, the domestic production sector has become increasingly dual, as a limited number of companies have become internationally competitive, while a huge number of micro and small enterprises produce for the domestic market and face profound challenges to compete.

Governments' consistent proactive policies to attract foreign investors stand in stark contrast to the lack of coherent and proactive policies in support of the development of local firm capabilities. Furthermore, the public sector's underinvestment in education, infrastructure and R&D under the NEM stands in stark contrast to the emphasis on development of social capabilities under ISI. In other words, the country has developed the options and collective competences to attract foreign direct investment in products and services classified as medium and high technologies; however, its institutions are less "smart" in creating and sustaining high-performing learning processes at the domestic enterprise level (Nübler, in this volume). One of the main lessons that the Costa Rican experience offers for other countries is the importance of consistent proactive policies that foster the co-evolution of social and firm-level capabilities over time.

Costa Rica is an upper middle-income country that needs to compete and develop by increasing productivity and making a concerted shift to a knowledge-based economy. In this chapter I have argued that a disjuncture in the development of social and firm-level capabilities has prevented a move to broad-based upgrading. The recent success of Costa Rica's software industry demonstrates how, with the co-evolution of the right factors, capability can be accumulated. The analysis presented here highlights three major challenges that need to be addressed to put the country's development on a sustained path: the dual nature of the production sector, the lack of coordination in policy articulation and coordination, and the inadequate tax ratio.

The market does not and cannot play a coordinating role in many areas that are critical for the development of local capabilities. Institutional, non-market mechanisms are needed to ensure, for example, that the skills provided by the educational and training system are in sync with the skills needed by the productive sector. A coherent strategy for the production sector has to focus squarely on capability advancement, with the policy design cognizant of the country's dual production structure. This means that government policies need to support aggressively a move towards greater innovation activities, aimed primarily at successful national producers and the affiliates of transnationals in high-tech sectors.

Strategic support for a cohesive strategy to advance national innovation is important and urgent, especially as several development latecomers in Asia have forcefully moved in this direction. In 1996 China's GDP per capita was only 28 per cent of Costa Rica's (constant 2005 PPP US$), but its R&D ratio was nearly twice that of Costa Rica. In 2008 China's per capita income had reached 55 per cent of Costa Rica's level, and its R&D ratio was nearly four times larger than Costa Rica's. China's ability to compete in products across the spectrum of technology intensity poses a profound challenge to the development prospects of Costa Rica and other developing countries.

At the same time, different policies need to target the many SMEs in the country, providing financing and information about technological and market possibilities and advancing the supplier connections with affiliates of transnationals. Developing the SME sector is important because it needs to be able to generate decent jobs for many Costa Rican workers. PROCOMER provides one-stop services for exporters. If support for SMEs was also more "bundled," outreach and support could be more effective. The scale of the policy efforts matters as well. For example, seven dedicated employees with a budget of less than US$500,000 is just not enough to bring about a major increase in linkages between local firms and the affiliates of transnationals.

This lack of support is not unique to Costa Rica; under the free market policies of the Washington Consensus it has been widespread in Latin America. The result of these policies has been equally widespread: the productive sector consists

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of a dynamic group of foreign producers, a small number of successful domestic companies, and huge numbers of SMEs and particularly of micro enterprises with low levels of productivity (Khan and Blankenburg, 2009).

The lack of coordination among different institutional entities in the prioritization and implementation of policies has proved to be a major obstacle to the implementation of a cohesive development strategy in pursuit of a knowledge-based economy.[2] The 2006–10 National Development Plan argued that "a serious atomization of the competencies in the public sector regarding productive sector policies makes it impossible for the State to develop unified and efficient actions for the development of competitiveness"[3] (cited in Alonso, 2008). There are now over 100 autonomous institutions, most with budgetary autonomy, and no institutionalized mechanisms to hold them accountable or make them coordinate activities. Overcoming this challenge and finding ways to connect the dots in the political landscape of institutionalized, atomized policy-making and implementation may require reform of a governance structure where, currently, "much of what is public about public policies is done outside of executive ministries" (Lehoucq, 2006).

Advancing local capability accumulation will require more public resources than the government currently has at its disposal. While concessions to the private sector can overcome some of the infrastructure problems, there are many areas where the government will have to step in and step up. Theoretically, there is considerable room for increasing the tax ratio, since it is three to four percentage points lower than the average rate of countries at a similar level of GDP per capita. However, to translate this theoretical possibility into reality will require a shared understanding among the major interest groups and political parties on the key elements of tax reform.

Achieving broad-based, growth-inducing structural change requires a shift in the analytical focus from growth to capability accumulation and a shift in policy focus from the current faith in a market-led process of upgrading to an embrace of a proactive State to support the synergistic advancement of social and firm-level capabilities. An effective State and coordination of activities may be hard to build, but they have become essential in the current environment of globalization dominated by China (Paus, 2009).

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[2] In a study of policy interventions in key productive development areas in Costa Rica, Monge-González, Rivera and Rosales-Tijerino (2010) find that, in five out of six cases, market failures were not addressed optimally and that stronger institutional coordination would have been needed.

[3] Author's translation.

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Skills development strategies and the high road to development in the Republic of Korea*

7

Byung You Cheon

7.1 Introduction

For more than four decades, since the early 1970s, the Republic of Korea has sustained strong and equitable economic growth. Increased productivity facilitated not only high rates of economic growth but also concomitant growth in wages and employment, which contributed to declining inequality. Skills development has been at the heart of this "high road" to development, which prioritizes "growth with equity" or "shared growth". Education and training has been the cause and consequence of high rates of growth, rapid technological change, the opening of the economy and more equal income distribution, resulting in a virtuous circle of rapid catching up.

Government policies on education and training, pursued in harmony with other economic and social policies, helped substantially in establishing and maintaining such dynamic processes. In other words, education and training policies were closely coordinated with industrial policy; without integrating the skills development strategy into its industrial development strategy, it would have been difficult for the country to sustain this model of development over so long a period.

However, with rapid changes in the economic environment, this equilibrium came under increasing pressure, both internal and external. The Asian financial crisis of 1997 gave further impetus to economic opening and technological change, but also increased social and economic inequality. Since then, the

* This chapter is a revised version of a background paper prepared for an ILO report.

government's role in the national economy, in respect to both skills development and industrial policies, has diminished. The challenge facing the economy in the twenty-first century is how to develop institutions and policies that enable it to respond flexibly to an environment characterized by further economic opening and technological change, while also restoring the "shared growth" conducive to both prosperity and equity by creating new education and skills development policies for the country.

This chapter sets out to review Korea's experience in education and skills development over the past four decades with the aim of understanding how government policies and institutions coordinated these policies with industrial policy. In other words, it explores what Nübler calls "collective capabilities" for catching up and industrial development (see Chapter 4 in this volume).

The chapter is structured as follows: Section 7.2 reviews Korea's rapid economic development and its welfare outcomes since the 1960s and explores the central role played by education and training in this process. Section 7.3 reviews the role of policy-makers and institutions in aligning and coordinating policies regarding education, research and development (R&D) and industrial development. Section 7.4 discusses challenges in the education and training system that the country faces as it moves into the innovation phase of economic development and into the knowledge economy. Section 7.5 presents lessons learned and conclusions.

Contents

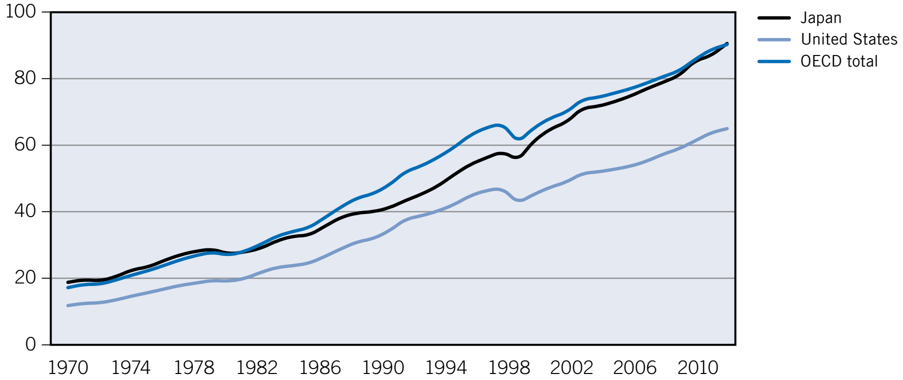
7.2 Economic development and skills development

7.2.1 The high road to development: Up to the crisis of 1997 and beyond

The economic achievement of the Republic of Korea over the past four decades is considered one of the success stories of the global economy. Over this period the country has sustained growth rates of over 7 per cent, as a result of which per capita income has risen from just 17.2 per cent of the OECD average and 11.8 per cent of the US level in 1970 to over 90 per cent of the OECD average in 2010 (figure 7.1). This remarkable "catching-up" process continued even after the financial crisis of 1997.

This fast growth in the Republic of Korea was driven by productivity growth, which had long outstripped the labour productivity growth rates of the developed world (see figure 7.2): between 1992 and 2002 the country's output grew by an average of 5.6 per cent a year, well above those observed in the OECD area.

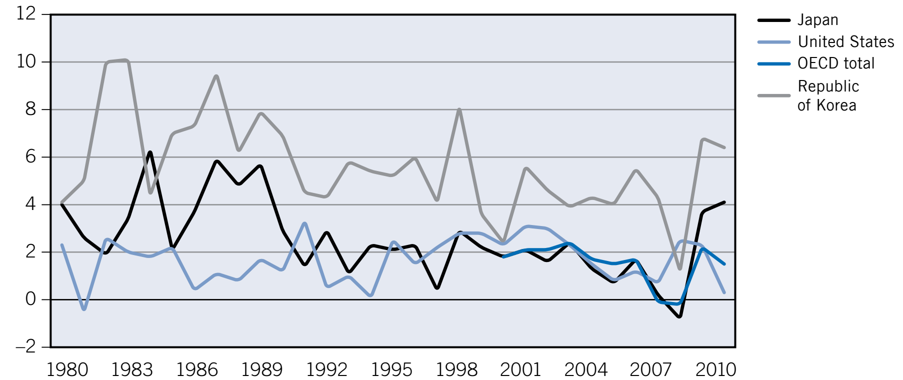
Figure 7.1 GDP per capita relative to OECD, Japan and the United States (Republic of Korea = 100 per cent)



Note: GDP in current prices and purchasing power parity.

Source: Author's calculations, based on data from the OECD STAN Database.

Figure 7.2 Growth rate of labour productivity, 1980–2010 (percentages)

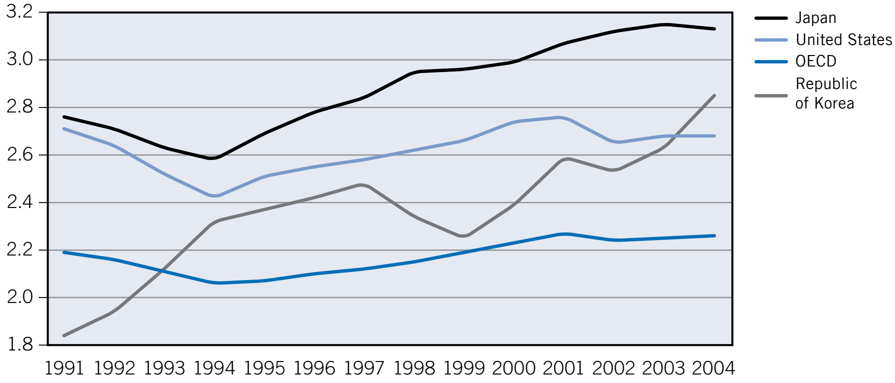


Source: Author's calculations, based on data from the OECD STAN Database.

The most important component of this growth was the increase in labour productivity at an annual rate of 4.3 per cent, double the OECD average (OECD, 2004).

This closing productivity gap reflects the country's success in moving beyond an industrial structure based on low-wage, labour-intensive industries to one based on capital- and R&D-intensive sectors. This process of structural transformation began in the mid-1970s with the creation of heavy and chemical industries through targeted industrial policies. From the early 1980s it moved on to knowledge-based industries with R&D strategies based on catching up through reverse engineering and duplicative imitation (ibid., 2005). Investment in R&D

Figure 7.3 Ratio of R&D to GDP, Republic of Korea, Japan, United States and OECD, 1991–2004 (percentages)



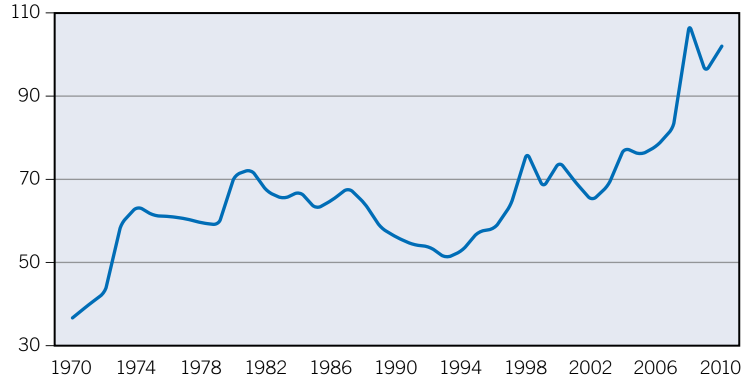
Source: Author's calculations, based on data from the OECD STAN Database.

has increased markedly since the mid-1980s: the ratio of R&D to GDP rose from 1.84 per cent in 1990 to 2.85 per cent in 2005 and has surpassed that of the OECD since 1993 and the United States since 2003, even though the absolute volume of R&D is still low (figure 7.3).

It is well known that the Republic of Korea began the process of industrialization in the mid-1960s with an outward-oriented and export-driven strategy. At an early stage of the country's development, the government had adopted export-oriented growth policies with the slogan of "nation building through exports". Up to the 1997 crisis, the opening up of the national economy was carefully controlled by the government, and between 1975 and 1997 the share of GDP attributable to trade remained relatively stable. However, it increased very rapidly after the crisis (figure 7.4), as the reduction in financial regulations and trade barriers accelerated the opening of the economy to the international market. Lately, too, Korea's strengths in technology-intensive sectors have boosted the importance of international trade in its economy.

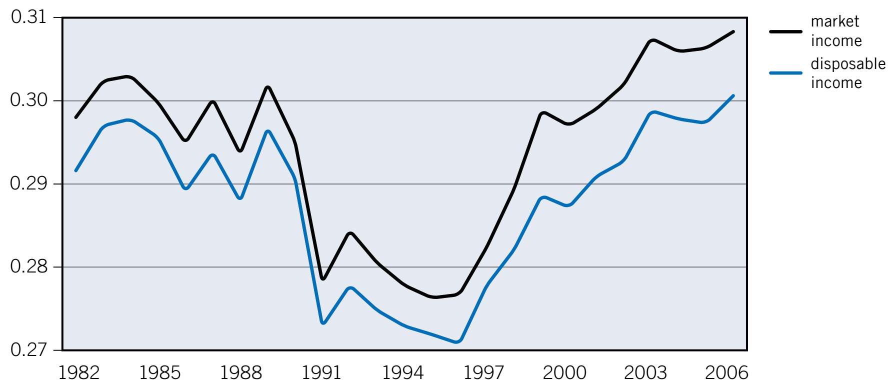
Alongside high productivity and output growth fostered by trade, the high road to development prioritizes "growth with equity", or "shared growth". This phenomenon in East Asian economies has been widely recognized, for example by the World Bank (1993) and by Campos and Root (1996). Before the 1997 crisis, reductions in both inequality and poverty accompanied rapid growth in the Republic of Korea. Income inequality, as indicated by the Gini coefficient, started to decline from the mid-1970s (Jomo, 2006; OECD, 1994) and continued to fall in the years leading up to the 1997 crisis (figure 7.5). As growth increased, so did employment and wages: the employment rate (ratio of those in employment

Figure 7.4 Ratio of trade to GDP, 1970–2010 (percentage)



Source: Author's calculations, based on data from the OECD STAN Database.

Figure 7.5 Trends in the Gini coefficient, 1982–2007



Source: Calculations by Roh Dae-Myung (Korea Institute for Health and Social Affairs), based on the Republic of Korea National Statistical Office, Household Income and Expenditure Survey.

to total labour force) has risen consistently even with high labour productivity growth, and real wages have also risen, albeit more slowly than productivity.

After the 1997 crisis, however, the Republic of Korea was required by the International Monetary Fund to open its economy to global product and capital markets. Combined with government investment in technology-intensive sectors, this resulted in a reduced potential for job creation. Inequality increased markedly, and the employment rate stagnated. The country thus found itself facing an urgent need to find ways to sustain productivity growth while at the same time creating jobs and reducing inequality and poverty – a combination of goals that represented a challenge to both industrial policies and the skills development system.

7.2.2 Growth with equity under pressure: The key role of education and training

Investment in skills development was crucial to Korea's success in achieving sustained high economic growth rates while maintaining equity; it would not have been possible without the expansion of education and training opportunities. As Green et al. (1999) put it, the economic "miracle" has been accompanied by an education "miracle". Just as the country has conjured up an industrialized economy in the space of a generation, so it had constructed a complete apparatus of schools, polytechnics and universities, together with a network of public and private training centres.

Formal education was organized specifically to serve the needs of the economy by providing an increasingly highly skilled workforce. The subsequent expansion of the skills base has made possible Korea's rapid economic development. Nübler (2013 and forthcoming) argues that it is crucial to increase the diversity, variety and complexity of the knowledge structure in the labour force, and transform and enrich the specific mix of knowledge. Development of strong middle educational attainment structures has shown to be critical for enhancing the options for the development of manufacturing and broadening the scope for industrial development.

This chapter shows that the Republic of Korea has achieved a fast expansion and fundamental transformation of the national skills and knowledge base through formal education. The average length of time spent in education, across all age groups of the population, has increased from 7.6 years in 1980 to 11.6 years in 2010. For the cohort age 20–29, the corresponding increase is from 9.9 years in 1980 to 14.1 years in 2010 (table 7.1).

As shown below, the expansion of education was carried out very rapidly and was closely coordinated with the industrial development strategy. As a result, there were no major, protracted episodes of skills shortages despite sustained periods of unprecedented growth. This confirms the capability framework developed by Nübler, which holds that transformation of the knowledge structure in the labour force needs to precede structural transformation in the economy, as it determines the options and space for diversification into new industries.

The resources for this expansion of education were supplied by the population as well as by the government. Korea spent 7.6 per cent of GDP on educational institutions at all levels in 2008, well above the OECD average of 5.9 per cent, and the second highest proportion among OECD countries after Iceland (OECD, 2011). Although public expenditure on education as a proportion of GDP (4.7 per cent) is slightly below the OECD average (5.0 per cent), private spending on education is the highest in the OECD, at 2.8 per cent in 2008. Sustained high

Table 7.1 Average years of educational attainment by age group

	All ages	6–19	20–29	30–39	40–49	50+
1980	7.6	6.5	9.9	9.2	7.5	4.2
1985	8.6	6.7	11.0	10.1	8.5	4.6
1990	9.5	7.7	12.0	11.1	9.5	5.5
1995	10.3	7.0	12.7	12.1	10.5	6.3
2000	10.6	5.7	13.1	12.8	11.2	7.2
2005	11.2	4.2	13.8	13.6	12.3	8.2
2010	11.6	4.8	14.1	14.0	13.0	9.1

Source: Republic of Korea National Statistical Office, Population Census.

growth rates, rapid changes in technology, high rates of job creation, increases in real wages and more equal distribution of incomes have all acted as incentives to the private sector to invest in education and assume much of its cost.

At the same time, rapid change in Korea's economy, affecting export trends and industrial and employment structures, opened up a wide range of new job opportunities; the more highly educated were in a better position to take advantage of them, thus intensifying the demand for education (J.W. Lee, 2001). The outward-oriented development strategy also contributed to the expansion of the skills base. Larger and more competitive markets boosted the demand for skilled workers and for demand-led expansion of training. At the same time, they enhanced prospects for using education and skills, providing the population with incentives to obtain even more education. As a result, a virtuous cycle was created in which education and growth reinforced each other.

Furthermore, a more equal distribution of income contributed substantially to the expansion of the skills base, increasing both access to and desire for higher education as the sole means of improving one's social status. The Republic of Korea vastly reduced educational inequality between 1970 and 1995. In 1970 its Gini coefficient of education was higher than Brazil's, at 0.439, but by 1995 it had declined dramatically to 0.189, the lowest among the group of 12 developing countries examined by Lopez, Thomas and Wang (1998).

However, since the mid-1990s the picture has changed. The educational base has continued to expand, with increasing rates of entry into higher education, but inequalities have become more pronounced. In 2011 high-income households, with incomes exceeding 6 million Korean won (KRW) per month, spent 11.7 times as much on education as low-income households with monthly incomes of KRW 1 million or less. In 1993 the corresponding multiple was only 5.5 (Cheon et al., 2013). This widening discrepancy may reflect increasing expenditure on private education. Korean universities and colleges are comprehensively ranked by the scores that students achieve in their entrance examinations, and heightened competition has prompted many families to spend considerable sums on tutoring and private education. The result is that expansion of education is now increasing inequality and maintaining divisions of social status across generations rather than reducing inequality and increasing social mobility, as was originally intended. This growing inequality in education and income has developed alongside the wholesale opening of the economy to global markets beyond the reach of government regulation, continuing technological change and the weakening of industrial policies.

7.3 Government policy on education and training

The following section reviews Korean government policy on education and training in the era of industrialization (1965–95) and in particular the new focus on higher education policy and R&D policy.

7.3.1 Education and training policies in the era of industrialization

A low level of public expenditure on education does not mean that government policy is of little significance to skills development. Education and training policies in the Republic of Korea have played a prominent role not only in expanding the country's skills base in order to enhance the options for industrial development, but also in managing labour supply and demand and in upgrading skill levels according to the demand of industries. During the industrialization stage (1965–95), skills development in Korea was led by the government and complemented by the private sector. During this period the emphasis was on general and formal education, and the main features of government policy in this area may be summarized as follows:

First, education and training policies were closely linked to the nation's development goals. When decisions were made about the provision of education and training, the needs of the economy took precedence over those of other interested parties, for example, the education profession, government ministries, even parents (Ashton et al., 1999). What this meant in practice was that education and training expanded sequentially, the government implementing a series of policies that would transform the knowledge base of the labour force to prepare it for the planned diversification patterns and to respond to the changing demands for skills when these industries were established.

The Republic of Korea established universal primary education in 1960, before industrialization took off later in the same decade. Middle-school education became universal around 1985, and high-school education some 15 years later, in the late 1990s, although education at high-school level is still not free of charge. The major shift in economic policy in the 1970s, the government-initiated emphasis on heavy engineering and chemical industries, was reflected in an expansion of technical and vocational courses in secondary and higher education and the introduction of a vocational training system. Higher education moved from an elite to a mass basis during the 1980s, before the knowledge-based economy gained full momentum.[1] A new development in the 1990s was the expansion in graduate programmes (J. Lee, 2002), with the number of doctoral degrees conferred per 10,000 persons increasing from 0.6 in 1990 to 1.9 in 2006. In the twenty-first century, the government's decisions on the allocation of funding to human resources development policies are still based on supply and demand forecasts for the strategically important sectors of the national economy. In the terms developed by Nübler (in this volume), forward-looking education policy is broadening, enriching and diversifying the knowledge structure in the labour force and thus widening the option space for domestic firms to shift into new industries and economic activities – and to drive structural transformation according to the national development plans.

Notwithstanding some problems and periodic episodes of imbalance, this forward-looking strategy, in which education and skills strategies have been closely coordinated with industrial policy, has over the past decades continuously expanded the options for productive transformation and upgrading the country's economic structure. It remains a readily available tool for ensuring the supply of those skills required in the existing sectors. Moreover, the sequential expansion of education contributed to enhancing equity by allowing the phased integration of all sectors of society into the modern structure of the polity and facilitating access to the fruits of economic growth.

The education system created the preconditions for successful training at the enterprise level, making it possible for the training system to respond rapidly to the demand for skills required to increase economic productivity (Guarini, Molini and Rabellotti, 2006). With rising demand for more highly qualified workers, fuelled by both economic development and structural changes in the

[1] The threshold of mass higher education is defined as the point at which 15 per cent of the age cohort enter some form of higher education (Trow, 1973). This level was reached in 1982 in the Republic of Korea, although the most pronounced expansion of higher education came later.

economy as different sectors became more prominent, the number of workers trained in-house grew from less than 100,000 in the mid-1970s to nearly 2 million in the mid-2000s.

Second, while the skills development system was for the most part government-led, this leadership was complemented by private sector activity. The government had to ensure that the education and training system would serve the goal of providing a skilled labour force for the economy (Ashton, Sung and Turbin, 2000). To this end, it exercised tight control over the education and training sectors, ensuring that provision was made, through the use of public funds if necessary, to produce enough technically qualified personnel to sustain a high economic growth rate. This was achieved by channelling young people into vocational schools through various policy measures.

Despite this high level of government control over the education and vocational training system, the private sector has played a prominent role in the actual provision of services. The government, always operating under the constraint of a budget biased towards economic development, relied heavily on the private sector to expand the country's educational base.[2] While the public sector has played an especially important role in elementary and secondary education, private funding has borne much of the cost of providing education beyond the basic level; in particular, a substantial proportion of higher education has been provided by the private sector. The private sector's share of educational spending remained high in 2005, at around 40 per cent of the total. The proportion of students in private sector institutions at this point was almost 100 per cent at junior college level,[3] 80 per cent in universities, and 50 per cent in high schools. Even so, the private sector both receives resources from the government – in the form of tax exemptions, subsidies (for capital developments, scholarships and the teachers' pension fund) and loans – and remains under its control.

This combination of public and private sector provision produced good results during the industrialization era (up to 1995). As J. Lee (2002) has argued, private and public sector efforts have been complementary, and together have undoubtedly contributed to improvements in productivity and thus to faster economic growth.

[2] Geiger (1988) describes the Republic of Korea as exemplifying a "mass private and restricted public sector" model, in contrast to "parallel public and private sectors" in the United States and "comprehensive public and peripheral private sectors" in the European Union.

[3] "Junior college" in the Republic of Korea is a two-year course corresponding to "community college" in the United States.

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7.3.2 Higher education: From control to boom

The role of higher education in the Republic of Korea has been closely tied to the needs of the economy and closely regulated by the government. The sector was consequently suppressed during the early industrialization phase, expanding rapidly only from the early 1980s onwards. The main instrument of government intervention in higher education prior to 1981 was an "enrolment quota" system, whereby the government decreed how many students each college was to admit each year. These enrolment quotas were selectively expanded in line with the manpower requirements dictated by industrial policy, which were particularly concentrated in the fields of natural science and engineering.

From the early 1980s onwards, the government began to place more emphasis on R&D and started to promote knowledge-based industries. In addition to growing demand for high skills in the economy, a large and growing pool of secondary school graduates keen to move on to higher education also created demand for an extension of higher education; without considerable expansion of supply, many of those qualified and wishing to go on to the tertiary level would not have been able to do so, to the disappointment and frustration of pupils and parents alike (J.W. Lee, 2001).

Two policy changes gave extra impetus to higher education: the replacement of the simple enrolment quota system with a "graduate quota" system in 1981[4] and the liberalization of laws regulating the establishment and size of universities in the education reform of 1995. With these policy changes, higher education became less demand-led and more supply-driven. There followed a boom in private provision and marketization of higher education (Kim and Lee, 2006).

As the graduate quota system was abandoned in 1987, by the turn of the century Korea produced a higher proportion of engineering and science graduates than almost any other country in the world, and the level remains high even though it has fallen somewhat since the early 2000s. These two policy changes represented a departure from the tightly controlled and demand-oriented system of higher education that had prevailed up to this point. They were intended to increase the quality of higher education by introducing a market mechanism with an element of competition among universities and among students. It is true that the subsequent expansion of higher education contributed to the development since the 1990s of the knowledge-based economy and high-technology industries, especially in the information technology (IT) sector. While this supply-oriented expansion of the knowledge base was intended to create the options for developing those industries targeted by industrial policies, the approach has resulted

[4] Under this system, new entrants may be admitted up to 1.5 times the number of graduates.

in problems in the new phase of economic development, in which government no longer targets industries. Problems relate in particular to over-supply, low quality and mismatch with labour market demands, as discussed further below.

7.3.3 R&D: Beyond the skilled workforce

As the economy moves into a higher stage of development, the creation of knowledge and its transfer to industries becomes more important. In many countries universities perform this R&D function. In the Republic of Korea, however, the universities were focused on teaching and training students to generate a skilled workforce, while R&D was undertaken by government-sponsored research institutes (GRIs) established to undertake mission-oriented research for the government and for industry. The university's primary function in respect of industry was to supply trained personnel, not to transfer technology and knowledge.

Korea's original model for R&D has been characterized as one of innovation through catching up, focused on reverse engineering and duplicative imitation (OECD, 2005). Technological development was achieved by combining the import of technology from abroad with indigenous R&D efforts carried out by GRIs and by firms. During the 1960s and 1970s, when the strategic focus was on creating heavy and chemical industries, innovation was neglected, and the GRIs' role lay in assisting firms in acquiring, importing and absorbing foreign technologies. They also functioned as gatekeepers between government and industry, communicating the government's technology plan to firms, providing technological information deemed crucial to industry's needs, implementing R&D pilot programmes and transferring imported technologies to the private sector (Sohn and Kenney, 2007). Also, Korean scientists and engineers working in the United States were actively recruited.

In the 1980s the locus of R&D work and innovation began to shift from GRIs to private firms. In 1982 the National R&D Programme was established with the aim of localizing technology by helping firms to adapt foreign technology through their own R&D efforts. The number of firms with R&D centres increased from 54 in 1980 to 2,226 in 1995. In the Republic of Korea, therefore, "technology transfer" does not refer to the flow of knowledge from the universities to industry, but rather to the importation of technologies from other countries, such as the United States and Japan (ibid.).

The downside of this "catch-up" model was the weakness of the universities' role in R&D. Although Korean universities have highly qualified faculty trained in global-standard research, their mission has long been confined to teaching, with no encouragement to pursue R&D. While the number of professors in science and engineering has increased from a combined figure of 1,230 in 1980 to 6,268 in science and 14,092 in engineering in 2001, around 80 per cent of the total government R&D budget for that period went to GRIs, with only 20 per cent allocated to universities.

In other words, the Republic of Korea has developed institutions with different levels of "collective competences". Nübler (in this volume) argues that "smart" institutions reflect collective competences or collective capabilities that support the high performance of productive transformation dynamics and processes. The analysis shows that Korea had developed high competences in the area of teaching at university level and of facilitating transfer and adoption of advanced technologies, but it has failed to develop high capabilities to further develop technologies – a shortcoming reflected in an excessive concentration of R&D spending in a small number of firms and very weak links between business, universities and GRIs.

At the end of the 1980s, new policies were introduced to address this issue and to shift emphasis to university research as a lever for economic development. Universities received government funds to set up science research centres, engineering research centres and regional research centres. In 1997 six "technology parks" were established to provide space for new enterprises (within two to three years of start-up). In 1998 the Special Entrepreneurship Act was passed with the aim of fostering high-technology entrepreneurship by facilitating technology transfer from university to industry and defining how patent applications would be handled.

7.4 New challenges call for new responses

Hitherto the Korean economy has been catching up with the advanced economies by borrowing and incrementally improving foreign technologies, products and processes. Today, however, imitation will no longer suffice: the urgent task now facing the country is to transform itself into an innovator at the leading edge of technology. To do this it will need a system to develop the skills and innovative capabilities at its disposal at new and higher levels.

Moreover, the experience and aftermath of the 1997 financial crisis changed the nature of the country's economy, and the skills development system has not adjusted well to the new circumstances of a market-oriented economy fully exposed to the global marketplace and more heavily dependent on trade. This new environment, along with increasing investment in and consumption of IT, has changed the structure of the demand for skills and increased labour market flexibility.

Finally, some features of the old skills development system that were once part of Korea's success have now become part of the problem. For example, the policy of expanding the educational base by transferring the burden of financial support from the government to students and their families, taking advantage of the social demand for education and making use of the private sector, while successful in opening up education to the mass of the population, has lately resulted in lower quality of education and increasing inequality of access.

7.4.1 Identifying the challenges

7.4.1.1 Quantitative expansion but qualitative decline

The Republic of Korea has successfully expanded its skills base by mobilizing the private sector and making efficient use of public resources. However, this route to skills development has given rise to a problem in the widening gap between the increasing numbers enrolling in private educational institutions and the limited resources available to maintain their quality.

Hayhoe (1995) argues that the country's experience illustrates the difficulty of maintaining reasonable academic standards in private institutions, the tendency for these institutions to have low prestige, and the inequities inherent in a situation in which less advantaged students pay a relatively high price for poorer quality education. The quality problem is most serious in the higher education sector, where quantitative growth has not been matched by qualitative improvement.[5] Concerns have recently arisen about labour shortages in the areas of science and engineering, not in terms of quantity, but of quality. Students' scores on the Academic Ability Test in these subjects are declining.

The decline in the quality of education is a reflection of spending priorities. Although total expenditure on education in Korea is high, as noted above, in 2008 spending per student at the tertiary level was well below the OECD average (OECD, 2011). Government expenditure on higher education amounted to less than US$1,000 (at PPP exchange rates), compared with an OECD average of around US$8,000. User charges, amounting to 84 per cent of total higher education costs, are the highest in the OECD, while the level of public subsidies, such as scholarships, grants, student loans, transfers and other payments, is the lowest. This reflects the low level of public funding of higher education generally.

[5] Only three Korean universities were listed in the 2005 survey of 200 top universities published by the (London) *Times Higher Education* (*THE* and QS, 2005), while in the same year the IMD *World Competitiveness Yearbook* ranked the Republic of Korea 52nd of 60 countries in terms of how well their university education met the needs of a competitive economy (IMD, 2005).

More serious is the low quality of junior colleges – almost entirely privately funded and run – which are performing the role of vocational and technical education formerly discharged by the vocational high schools. Labour market outcomes for junior college graduates are now almost the same as those for high-school graduates.

The intense competition for places in prestigious universities has a negative impact on the quality of secondary education, with many students going through "examination hell" at the expense of creativity and variety in their secondary education. More and more parents are sending their children to study abroad in order to avoid the extreme competition for college entrance at home.

7.4.1.2 Mismatch between skills supply and demand

The Republic of Korea has not experienced pronounced or persistent labour shortages or surpluses over the last four decades. It is becoming clear, however, that the increase in the number of college graduates has outpaced the growth of corresponding labour demand. The supply-oriented expansion of educational provision, together with the weakening of demand-driven policies linked to industrial policies, has resulted in increasingly poor labour market prospects for young people.

In the past, rapid economic growth kept pace with rapid educational expansion, so that the country avoided the persistent graduate unemployment that has plagued other developing economies such as those of the Philippines and India (Hayhoe, 1995). The slower growth in the years following the 1997 crisis, however, exposed the problems arising from supply-driven expansion of higher education, with poor labour market outcomes for graduates and a mismatch of skills, workers at both low- and high-skill levels in short supply, and the middle level over-supplied. This mismatch is now considered to be the most important factor in youth unemployment, reflecting the failure of higher education to adapt properly to changes in skill demands and to engage in effective skills development (Yoon and Lee, 2007). The curricula at higher education institutions are too academically oriented, and links are lacking between colleges and the business world. The knock-on effects in the form of increased costs of in-firm training have inevitably led to a loss of competitiveness at the firm level.

These problems cannot be solved by a return to the government-led education and training policies under which industrial development strategies aligned *ex ante* education with industrial policies. The government has abandoned such industrial strategies, and in any case such an approach is less likely to succeed in current conditions, owing to lack of information about rapidly changing skill demands. For example, in the early 2000s the government decided to promote the supply of IT skills, only to find that it had created an over-supply of medium-skilled labour. The solution will have to be found instead in strengthening cooperation and networking between industry and educational institutions and intensifying the public sector's capacity to gather relevant information and transmit it both to students and to educational and training institutions.

7.4.1.3 Imbalance between formal education and lifelong learning

With the major role in skills development allocated to formal and general education, Korea's investment in human capital after entry into the labour market is very low. Central government expenditure on lifelong learning is only 0.1 per cent of GDP, while public expenditure alone (excluding all funding from private sources) on formal education reached 4.7 per cent of GDP in 2008. Participation in lifelong learning is correspondingly low, at around 20 per cent of the population.

The country's current skills development system is characterized by academically oriented education in schools for the younger generation and limited training in firms for the employed. Even though the volume of in-firm training has expanded since 1996, the propensity of firms to invest in training is decreasing. Spending on training fell from 2.1 per cent of total labour costs in 1996 to 1.5 per cent in 2003 – well below the EU's 1999 average of 2.3 per cent. For small and medium-sized enterprises (SMEs), it is only 0.5 per cent. Today, firms in the Republic of Korea prefer to recruit skilled workers rather than produce their own, and workers themselves hesitate to invest in training in an increasingly flexible labour market.

If workers are to have more adaptability to enable them to cope better with the increasing risks posed by globalization, technological innovation and an ageing population, they need to be provided with broad and portable skills over their entire working life. Pressure on the public sector to provide training outside the context of the firm is already increasing.

7.4.1.4 Inequality

The provision of educational opportunity equally to all citizens regardless of sex, age or regional background has contributed to a reduction in poverty and social inequality and an increase in upward mobility (J. Lee, 2002). However, concern is now growing about whether education and training are still having these beneficial effects.

First, the inadequacy of the secondary education system, the falling quality of schools and excessive competition for places at prestigious universities have all led increasing numbers of students and parents to resort to private tutoring, the cost of which is rising rapidly. This appears to be the key education-related factor in growing social inequality (ibid.).

Second, a widening "training gap" is opening up between regular workers in large firms and workers in SMEs, irregular workers and female workers, all of whom are at a relative disadvantage. In 2005 only 9.9 per cent of employees in SMEs participated in the Vocation and Ability Development Programme (VADP), as opposed to 87.0 per cent of employees in large firms. In 2003, when 14.8 per cent of regular workers had had some training over the previous 12 months, the corresponding rate for irregular workers was only 2.3 per cent (author's calculations, based on KLI, 2003).

To restore growth with equity and put the country back on the high road to development, new policy programmes will need to be constructed to ensure more investment in public secondary education, a more effective student loan programme, and more training opportunities for relatively disadvantaged groups of workers.

7.4.2 Change and reform: the government's response

The government's efforts to address the problems associated with the old skills development system and respond creatively to the transition to a knowledge-based economy, began in 1995 with the work of the Presidential Commission on Educational Reform and the incorporation of vocational training provision into the employment insurance system. Although the reforms promoted by the Commission were based on demand-oriented and market-based concepts of education and training, they were not sufficient to solve the problems. Recent government education and training policies, while building on earlier reform ideas emphasizing competition and response to demand, put more stress on networks and social partnership between stakeholders. In other words, new collective capabilities need to become embodied in "smart" institutions and procedures. These will include the ability to coordinate and align evolving knowledge structures in the labour force in order to create options needed for the development of newly targeted industries and technologies (Nübler, forthcoming). It will also be important to ensure that institutions are equipped to supply the skills needed to maintain high productivity in existing industries.

7.4.2.1 National human resource development as a core strategy

In 2001 the government of the Republic of Korea added human resources development (HRD) to the remit of the Ministry of Education (MOE), renamed the expanded ministry MOE&HRD, and promoted its head to deputy prime minister with responsibility for overseeing and coordinating all major policy initiatives related to human resources development. This was a significant step both symbolically, in identifying human resource development as a core strategy for national development, and practically, in creating a central agency for HRD policies that had previously been dispersed among several ministries, enabling such policies to be reviewed and coordinated at the national level with a long-term perspective.

The pursuit of HRD policies on a national scale required the creation of a framework and support system, including a medium- to long-term human resources development vision, implementation strategies, and organizations to implement HRD policies within each ministry. To this end, in 2001 the government set up the Ministerial Commission on HRD, composed of 14 ministers, and passed the Basic Law on HRD in 2002. A range of instruments were devised to help the MOE&HRD and the Commission to coordinate HRD policies; these included a policy evaluation scheme, HRD policy indicators, manpower projections, investment analysis and budget allocation schemes.

The policy coordination established by the MOE&HRD and the Commission resulted in several key documents, including the Comprehensive Plan for Activating Industry–Academia Cooperation, the Comprehensive Plan for Raising Human Resources in Areas of National Strategic Sectors (2003), the Basic Plans for HRD (2001, 2006) and the Medium- to Long-Term Demand and Supply Outlook for National Human Resources (2002).

7.4.2.2 Development of core human resources in the nation's strategic sectors

Traditional industrial policies, characterized by a sector-targeting and sequenced approach to industrial development, have lost much of their earlier importance. Nevertheless, there is still opportunity to pursue industrial policies in the sense of fostering strategically important sectors through subsidizing R&D and HRD and to develop a labour force that has the right mix of knowledge to support economic growth and the creation of jobs.

The so-called "6T Project", including IT and BT (biotechnology), which became the Next-Generation Growth Engine Industries Project in 2003, is expected to play a key role in Korea's development by creating high value added sectors in an economy with an increasing need for sophisticated knowledge and information. What distinguishes the new industrial project from the old industrial policies is its focus on human resources as a source of competitiveness in the world market in the knowledge-based international economy of the twenty-first century. The government recognizes that high-quality human resources are essential for an economy seeking to leap into the ranks of the leading nations and to create and sustain a new impetus for continuous national growth. Comprehensive Human Resource Development Plans in the Next-Generation Growth Engine Industries and Six National Strategic Areas are currently being implemented.

While it is difficult to "pick winners" and thus identify the skills required for the next generation of industries, the government is aiming to identify the qualities that will be required by those who work in leading-edge sectors. For example, the MOE&HRD, together with the Ministry of Commerce, Industry and Energy and the Ministry of Information and Communication, formulated the High-Value-Added Manpower Nurturing Programme, which supports universities providing practical education programmes to meet the needs of industry in respect of work on next-generation semiconductor, telecommunications and display devices. The government has stipulated that universities should deliver workers who are equipped with skills closely tailored to national strategic industries and that graduates should be able to move straight into employment, without further in-firm training.

The key factors in the success of these policies are coordination between government agencies and cooperation between industry and academia. These are the core aims behind the creation of the MOE&HRD and the HRD Commission.

7.4.2.3 Reform of higher education

In a knowledge-based economy, continued development requires a high quality of higher education. Accordingly, the government seeks to raise the country's universities to a level where they can compete with the best in the world and serve as a new engine for sustainable economic growth. In 2003, having reviewed the experience of educational reform over the preceding eight years, the new Democratic Party Government introduced its Plan for Strengthening the Competitiveness of Korea's Institutions of Higher Education. The plan emphasized three goals: enhancing the autonomy of universities; fostering competition to strengthen educational and research capabilities; and providing intensive support to selected universities. The real underlying aim is to restructure the over-supplied higher education institutions and enhance their quality through a system of selective subsidies based on performance evaluation. "Autonomy" means, in effect, voluntary restructuring in the light of an expected rapid reduction of the student population in the near future, encouraged by the offer of government subsidies to those universities and colleges that enter into alliances and

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mergers with others. At the same time, with a view to encouraging reduction of class sizes as well as mergers of university departments, the government will set annual goals for improvement of educational quality, including reductions in student–faculty ratios.

The more outward-looking aspect of higher education reform is the drive to increase global competitiveness through competition, specialization (diversification) and government investment. To this end, the existing system of uniform support to all universities will be gradually abolished. Instead, the government will identify outstanding programmes and institutions among those of similar type and function as "selected for concentrated support" and channel support and investment to them. In line with these policy directions, the government promoted projects such as Brain Korea 21 (BK21), which was expected to help universities grow into world-class research institutions and to establish a professional graduate school system that would produce highly trained personnel tailored to the needs of the country's economy and society. On the basis of a careful analysis and evaluation of the results of BK21, which ran from 1999 to 2005, the government formulated the second BK21 project (2006–12), focused on science and technology development in the industries identified by the MOE&HRD to be of national strategic importance as the new drivers of growth.

7.4.2.4 Industry–academia cooperation and specialization of higher education institutions

The development of the Republic of Korea is particularly interesting in that its economy grew rapidly despite limited direct interaction between industry and universities and little clustering in the vicinity of universities (Sohn and Kenney, 2007). As the knowledge-based economy develops, however, this interaction becomes more important in sustaining development and increasing the labour market performance of college and university graduates.

To promote cooperation between industry and academia, the Act on Industrial Education Promotion and Industry–Academia Collaboration Promotion was passed in 2003, enabling universities to establish companies on campus, to build and operate collaborative research centres on campus, to establish departments based on contracts with firms, and to support collaborative industry–academia education and material development programmes.

The promotion of industry–academia cooperation encourages specialization in higher education institutions. One notable project in this area was the New Universities for Regional Development (NURI) initiative, set up in 2003, and continued under the name of LINC (Leaders in Industry–University Cooperation) by the new government that took office in 2008. The aim of the project is to give intensive support to universities focusing on producing the specialist-trained personnel needed for regional economic development. The project was intended to facilitate exchange and collaboration between universities, industries, research institutes and local government.

7.4.2.5 Addressing the training deficit: Social partnership for training

In a country making the transition to a knowledge-based economy and trying to remain on the high road to development, lifelong learning and training are increasingly important. Empirical analysis (controlling for other variables) has shown that the effects of training in the Republic of Korea have been significantly positive at the levels of both firms and workers (B.-H. Lee, 2004). Yet, despite these beneficial effects, training has played a relatively minor role in expanding the skills base for economic development, compared with the prominence accorded to general and formal education. The adult participation rate in lifelong learning, at 21 per cent, is one of the lowest among OECD countries (the average being over 35 per cent), and investment by firms in training has stagnated since the 1997 crisis.

The solution to this training deficit, which has come about as a result of both market failure and the inadequacies of government policy, might be found in social partnership. The Republic of Korea, however, has little experience in this respect, particularly in the area of skills development. The industrial relations environment tends to be confrontational, with a collective bargaining process overly focused on issues such as wages and working conditions. Recently, due to increasing pressures from social partners and from civil society, the government has taken steps to set up an institutional and organizational framework for social partnership in training. For example, one of the main purposes of the amendment of the Vocational Training Promotion Act in 2004 as the Workers' Vocational Competency Development Act was to promote social partnership as a long-term policy in the country. There have also been some social pacts between labour and employers' representatives that included provisions on training, such as the Tripartite Commission in 2001 and 2005 and the Social Pact for Job Creation in 2003. These laws and agreements, however, translated only to a limited extent into collective competences, giving rise to little genuine active social partnership in the field of training. Nevertheless, they did contribute to an atmosphere conducive to social partnership for training at the industrial or regional level, allowing the emergence of such initiatives as a training consortium programme

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and an HRD sectoral council. As similar experiences at these levels accumulate, social partnership may become an effective institution providing incentives for all stakeholders, including both labour and management, to invest in training.

7.4.2.6 Enhancing equality through education and training

Social integration is as important as economic competitiveness in the "growth with equity" strategy for development. However, as the Republic of Korea shifts to a knowledge-based economy and the focus of education moves on to quality, diversity and creativity, the equity-enhancing effects of education that were so apparent in the earlier decades of development seem to be diminishing. In order to accomplish growth with equity, it is not enough to expand the amount of education and training. It is essential that governments ensure that vulnerable groups in society have access to high-quality education and training opportunities.

Considering the heavy burden borne by families paying for private tutoring, the most important task facing the government in setting out to reduce educational inequality is to increase the quality of public secondary education and thereby restore the public's confidence in it. This is a large issue that lies beyond the scope of this chapter.

The country faces three educational policy issues that it has not dealt with in a long time: the prohibition on the ranking of high schools, the ban on universities administering their own entrance exams, and the ban on accepting payment for places from students or their families. In the revised university admission system starting in 2008, more emphasis is being put on school records rather than on examination results. However, university entrance policies are too hot a political issue for the government to tackle, and are thus being maintained even though they may conflict with the drive to increase the autonomy and diversity of higher education institutions.

Another way in which inequality of access to education could be reduced is through extending the student loan system. In 2012 a government guarantee was introduced into the system in order to ensure access to university education for many more students, with long-term and low-interest loans covering living expenses as well as tuition fees.

In the field of training, meanwhile, many targeted programmes are being devised to support disadvantaged groups such as workers in SMEs, irregular workers, the small-scale self-employed, female workers and the elderly. The current government has identified social inclusion as one of the main goals of its vocational training policies.

7.5 Policy implications

Over the past four decades of rapid economic growth, the Republic of Korea has upgraded not only its economic and industrial structure but also its skills development system. Even though that system has experienced some episodes of mismatch and imbalance and still has many problems to solve, overall it has contributed substantially and fundamentally to the country's pursuit of growth with equity. Education and training policies were successful in developing the skills required for rapid catching up as well as in matching the demand and supply of skills necessary for industrial upgrading, albeit by a process of trial and error in the earlier stages of development before the mid-1990s.

Since then, however, Korea has experienced the great changes that have swept through the world economy, notably globalization, the rapid advance of IT, and the increasing flexibility of labour markets. These changes have made it difficult for the old skills development system to work efficiently and effectively.

In response to these challenges, the government embarked on a range of policy experiments to transform the old system into a newer and more appropriate one. It is therefore possible to extrapolate from the Korean experience policy implications for other developing countries that aim to catch up with developed countries in terms of upgrading their economic and industrial structures and improving social well-being. Five points in particular may be made.

First, the provision of education and training should be determined by the country's stage of development. In the Republic of Korea, sequencing the expansion of education and efforts to improve its quality resulted in efficient resource allocation among the various educational levels over the long term. In particular, the needs of the economy and industry should be reflected in the skills imparted through education and training. Furthermore, countries should develop institutions that can effectively align industrial development with education, training and R&D policies. Korea relied on government control of education and training in the early stages of development and more recently has emphasized private sector participation and social partnership between stakeholders.

Second, even in an environment of globalization where market forces dominate around the world, government still plays an important role in skills development. In the Republic of Korea, a sudden transition to a market-oriented system in the education reforms of 1995 resulted in over-supply, mismatch and skill deficits. These outcomes show that there continues to be market failure in education and training, and that the role of government is more necessary rather than less, albeit in different forms. Although it becomes more difficult and less efficient for government to directly control the whole process of skills development, it can induce stakeholders in education and training to act in ways consonant with the pursuit of social and national goals by designing sophisticated incentive systems, as seen in Korea's reform of higher education.

Third, the participation of stakeholders and social partners in skills development is becoming increasingly important. A skills development system exclusively regulated by the State will fail to meet the actual skills needs of firms, especially as the economy expands, becomes more diverse and moves into more highly developed, knowledge-based sectors. One weak point of Korea's skills development system was the low level of participation by and partnership among the various stakeholders. The country is now searching for a "smart" skills development model with "competent" institutions (Nübler, in this volume) in which active participation of employers and employees in education and training is backed with institutional support from the government. Such experiences as the training consortium programme and certain regional experiments with partnership in HRD show that it is possible to construct a collaborative skills development system even within a less than cooperative industrial relations environment. These instances also indicate the importance of partnership at the medium (sectoral or regional) level, which can achieve results irrespective of a lack of cooperative industrial relations at the central and workplace levels.

Fourth, the Republic of Korea achieved mass general education without introducing specialization into vocational secondary education. In the period of rapid growth, late specialization was feasible and a combination of general education and in-firm training was efficient. However, this system gave rise to many problems in later stages of development, when the country shifted from a strategy based on planning and targeting industries to one promoting broad technologies. This resulted in an over-supply of higher education and a mismatch between educational outcomes and labour market demands. This illustrates the critical nature of attaining the right balance and sequencing between general and vocational education efforts.

Fifth, the Korean case shows that quantitative expansion of the skill base does not ensure growth with equity as a country makes the transition to a knowledge-based economy. Government efforts should focus on equity-enhancing policies in such areas as quality of education and labour market income.

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Building capabilities in the software service industry in India: Skill formation and learning of domestic enterprises in value chains*

8

Manimegalai Vijayabaskar and M. Suresh Babu

8.1 Introduction

It is widely believed that the spread of information and communication technologies (ICTs), particularly segments, such as software, that rely heavily on human capital investments, offers low-income countries (LICs) an opportunity to leapfrog (ILO, 2001). Indeed, a few low-income countries have emerged as relatively successful players in the global market for ICTs. India is definitely one of them. India's growth and presence in the global production of and trade in ICT-related sectors has been remarkable. The *Information Economy Report 2012* states that in the countries outside the Organisation for Economic Co-operation and Development (OECD), India has emerged as a very significant player in this sector (UNCTAD, 2012). The software sector in India has shown an ability to not only sustain but also upgrade into more value adding segments of the value chain to an extent.

The phenomenon of upgrading within high technology global value chains by developing economy firms needs to be understood and explained. This chapter seeks to understand how various institutional mechanisms have enabled accumulation of capabilities to upgrade at the national, chain and firm level. The analysis is framed by the capability and catching-up concept presented by Nübler in this volume. This framework explains the dynamics of catching up as interrelated processes of collective learning and productive transformation, and discusses the role of policies, institutions, networks and standards in driving both processes.

* This paper was prepared as a contribution to the ILO research project on capabilities, productive transformation and development coordinated by Irmgard Nübler.

Capabilities are reflected in the ability to innovate, to proactively expand the range of options for diversification and technological upgrading and to enhance the competences of firms and the economy to exploit those options. For example, technological capability enables firms to generate and manage technical change (Bell and Pavitt, 1993). Therefore, technological capability involves the ability of firms to learn to "upgrade" continuously.

Economic upgrading in value chains refers to the process through which firms and workers move from low value added segments to higher value added segments of a value chain (Gereffi and Kaplinsky, 2001). Upgrading may take many forms, from improving processes to produce the same output at lower costs (process upgrading), to improving the quality of existing products or moving into more value added products (product upgrading), backward or forward integration of processes (functional upgrading), to an ability to use the learning in value chain to enter into other global value chains (lateral upgrading).

The conventional value chain approach has been critiqued for its inability to explain the role of the State in influencing the mode of participation of clusters/firms in the value chain (Parthasarathy, 2004). While it enables us to understand the dynamics of a firm/region once it is incorporated into a specific node in the value chain, it offers little towards understanding the process of incorporation. It is this limitation that Kaplinsky (2000) and Kaplinsky and Morris (2001) seek to overcome by incorporating the concept of "governance" by agents external to the value chain. The ability to upgrade, Kaplinsky (2000) points out, hinges crucially upon "governance", i.e. the non-market coordination of economic activities. Non-market forms of coordination can be exercised by firms or networks of firms as well as by public institutions such as government policy frameworks and regulatory and support institutions (Gereffi and Kaplinsky, 2001; Gibbon, 2000).

Drawing upon literature on civil society governance, Kaplinsky (2000) distinguishes three forms of governance that can be exercised within a sector or a value chain. "Legislative governance" refers to formulation of standards or rules for action either by lead firms in the value chain or by state institutions. "Judicial governance" mechanisms monitor behaviour and ensure that such rules or standards are complied with. Finally, firms need resources such as credit, infrastructure, new technologies or market information to meet the norms and standards mandated by institutions of legislative governance. Therefore, governance also can take on an "executive" role. Together, these forms of governance are said to condition the mode of upgrading. Along with actors within a value chain such as suppliers or client firms or labour, agents external to the value chain can exercise governance – for example, public and/or public–private institutions that govern labour markets, skill formation, credit access and sectoral development. Such governance interventions by external actors are particularly important in enabling the insertion of the sector into global value chains (Humphrey, 2004; Kaplinsky, 2000). The above framework allows us to understand how regional and national governance mechanisms can interact with forms of governance undertaken by actors within a value chain to facilitate learning by firms and labour for upgrading.

The following section (section 8.2) provides an overview of the growth of the software services sector in India, emphasizing the gradual process of its upgrading. In section 8.3 we identify the changing capability requirements wrought by upgrading. Next, we link the process of upgrading to the changing capability requirements. In subsequent sections we map the set of public governance measures and institutions that enabled the creation of a specific knowledge structure within the labour force that in turn provided the opportunity for movement of the sector into the global value chain for software services. Then, we map the state, sectoral and firm-level responses (or collective competences) to emerging market opportunities and to upgrading requirements and the governance mechanisms that facilitated the process. We emphasize (i) the role of public policy in education and skill formation that created the facilitating knowledge structure or mix of knowledge in the labour force; (ii) the role of networks in building up individual and firm capabilities; and (iii) the role of standards in building firm-level and sectoral capabilities. Government procedures, networks and standards, when they are "smart institutions", are carriers of competences to drive learning and the evolution of capabilities within firms and the labour force within the sector and, in the process of upgrading, to create high-performing firm-level procedures. This chapter draws heavily from secondary literature, supplemented with interviews of key informants in selected information technology (IT) firms to obtain insights into firm-level routines and processes for training, codifying knowledge and coordinating.

8.2 The Indian software industry: Trajectories of growth and upgrading in global value chains

According to the National Association of Software and Services Companies (NASSCOM), India's share in global IT sourcing has increased from 51 per cent in 2009 to about 58 per cent of the roughly US$55 billion global market for IT services in 2011.[1] NASSCOM estimates that the Indian IT sector accounted for approximately 7.5 per cent of the country's GDP in 2012, up from 1.2 per cent in

[1] www.nasscom.in/indian-itbpo-industry (accessed on 12 March, 2013).

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1998. The main contention of this section is that the impressive growth registered in recent times is not merely due to lower costs but is also an outcome of a gradual build-up of technological capabilities and the progress of the sector up the global value chain for outsourced IT services.

The global software value chain can broadly be divided into two categories – value chains for services and for products. "Services" refers to software development for a specific client, whereas products are generic and meant for sale to multiple customers. To be sure, while, globally, software products account for bulk of revenues in the software sector, it is in the services segment that the Indian software sector has emerged as a leading player in the global market. Furthermore, India has diversified and upgraded the range of services offered within the software services segment. It has also emerged as a major outsourcing destination for IT-enabled services (ITeS).

An important shift in the provision of software services has been the movement from "body-shopping", i.e. providing services at the client's site, to an offshore delivery model that requires the bulk of software development to be undertaken within the supplier firm and then transmitted to the client firm. According to Mani (2013), offshore exports have increased to 82 per cent of total software exports. The growing share of offshore development, relative to that of on-site services, is one of the indicators of domestic capability improvement. This movement to offshore delivery also involves an ability to coordinate projects, a competence not required in the provision of on-site services. The complexity of offshore projects outsourced to Indian software firms has grown, with many lead firms offering to supply the entire range of software development stages (Bajpai and Shastri, 1998).

There are several other indicators of upgrading as well. Of total IT exports, the share of engineering services and hardware has increased from 7.1 per cent in 2007 to 11.4 per cent in 2011.[2] Within the software services segment, although the Banking, Financial Services and Insurance (BFSI) vertical continues to account for the largest share (IDC NASSCOM, 2012), telecom and manufacturing verticals had come to account for 37 per cent of IT service exports from India by 2008. Both the growing share of engineering services and telecom and manufacturing verticals indicate an ability to provide relatively more sophisticated services over time. Exports from engineering research and development (E R&D) surpassed US$10 billion in 2012, registering a 14 per cent growth rate over the previous

[2] NASSCOM: Indian IT and BPM Industry: FY 2013 Review and FY2014 Outlook. Mumbai, 12 February 2013, accessed from www.nasscom.in/.../FY13%20Performance%20Review%20and%20FY14 on 16 October 2013.

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year. Traditional verticals such as automotive and semi-conductors have registered a higher rate of growth due to increasing E R&D offshoring, while emerging verticals such as energy and utilities have also grown recently (NASSCOM, 2012). There has also been a small but significant shift towards exports of software products. Total exports of software products have increased from US$1 billion in 2008 to 1.5 billion in 2012, encouraging establishment of a separate association for software product firms. Production for the domestic market, too, has witnessed upgrading, as table 8.1 illustrates.

Ilavarasan (2011) highlights another aspect of upgrading of the Indian software industry – the establishment of software-related R&D centres. He points out that, of the 160 R&D centres that have sprung up in the country, two-thirds are in the software product development domain, 15 per cent in engineering services, and 20 per cent are related to embedded software systems. He further argues that firms are also diversifying into high-end consulting, embedded-software development, engineering and R&D services. Mani (2013) too notes instances of product, process and business model innovations in the sector. Mani also uses the trend in number of patents secured by software firms to indicate the upgrading efforts of IT firms in India.

The upgrading of output has been accompanied by upgrading of the processes employed. An increasing number of software firms in India adopt global standards such as ISO 9001 for quality management and ISO 27000 for information security. To quote a NASSCOM document on this, "India-based centres account for the largest number of quality certifications achieved by any single country. Over the last three years, there has been an 18 per cent increase in the number of

Table 8.1 Domestic sales and exports of software services, software products and engineering design services in India

Year	Domestic software sales (US$ billion)	% share of		Exports of software (US$ billion)	% share of	
		Software services	Software products and E R&D		Software services	Software products and E R&D
2005	4.2	83.3	16.7	13.1	76.3	23.7
2006	5.8	77.1	22.9	17.3	76.9	23.1
2007	7.1	77.6	22.4	22.0	77.5	22.5
2008	10.1	77.9	22.1	30.5	72.8	27.2
2009	10.9	75.4	24.6	35.4	72.9	27.1
2010	12.0	75.4	24.6	37.3	73.2	26.8
2011	14.5	75.9	24.1	44.8	74.6	25.4

Source: UNCTAD (2012).

companies acquiring quality certifications, a 30 per cent increase in performance certifications and a 20 per cent increase in security certifications".[3] Thus, we find that, over time, the Indian software sector has not only increased its share in the global market but has also managed to upgrade both processes and the nature of services.

The availability of the right mix of technical, general and linguistic knowledge in the labour force, the key input for the software industry, created the opportunity for the Indian IT sector to upgrade (Nübler, in this volume). The labour force is considered an important competitive asset, contributing to the accelerated growth and critical to building up the technological capabilities of the industry in India. There has been a sustained supply of trained, relatively low-cost professionals, providing an options space for developing various domains in IT and ITeS. Given this crucial role of low-cost skilled labour in the growth and technological dynamism of this sector, our discussion of technological capability-building will pay attention primarily to this dimension. In the next section we map the various capability requirements along the different segments of the software value chain. We highlight the changing individual and organizational capability requirements as the industry transformed itself from a provider of low-end programming services leveraging low-cost programming labour to one that is simultaneously diversifying and upgrading the range and quality of services delivered. This will be a prelude to our subsequent analyses of the process of capability formation.

8.3 Skills, knowledge and information requirements in the software sector and organizational capabilities

An interesting feature of software services sector is the co-existence of rapid technological changes in software technology and tools along with continued labour intensity in software development. Knowledge at the level of the individual and the labour force, therefore, is a key driver of competitiveness in the Indian IT sector. Notwithstanding the importance of the skills and human capital of individual workers in the production process, the rapid upgrading within value chains was made possible by the particular knowledge structure and mix of knowledge sets in the labour force and collective competences that translated the knowledge structure into productive capacities driving the software sector. This section analyses the requirements of the software sector in terms of skills, knowledge and information

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[3] http://www.nasscom.in/quality, accessed on 20 September 2013.

requirements and of organizational competences involving coordination, quality control, problem identification and problem solving, facilitation of on-the-job training and learning. The following section will then show how, over decades, India has developed those capabilities that enabled the country to take advantage of the rising global demand for software production.

Software consists of a set of instructions that enable computer hardware to perform the required operations. Given the variations in the type of languages in which instructions are written and types of uses for which they are written and the nature of the market, software constitutes a highly heterogeneous category; as a result, the knowledge sets and skills required across these different segments of the industry are diverse. Further, different languages and packages need to be deployed across a range of client domains – retail, health care, automobile, telecom, etc. As noted, Indian software firms specialize in customized software, with few firms moving into generic product development. Despite the diversity in the types of software, software development across these segments can be roughly divided into the following sequence of tasks or activities (Heeks, 1996):

1. Idea/problem identified
2. Justification/feasibility
3. Analyses and specification of software requirements
4. Prototyping
5. Designing software
6. Coding/writing software
7. Testing
8. Software delivery and installation
9. Maintenance

A reading of these tasks reveals that there is a fairly clear demarcation of conception and design from implementation. Stages 1 to 3 would not only involve an understanding of the process requirements and their translation into source codes,[4] but also need considerable market information and knowledge of processes to develop the product idea. Subsequent stages essentially require an ability to program in specific software languages. Although there is a scaling down of skill requirements as we go down the process chart, the latter tasks, namely, coding, testing and maintenance, require a considerable amount of labour. India entered

[4] Source code consists of the various steps of instructions in human-readable form that need to be given to the machine. It is derived from a flow chart of the processes required for the final output/product. To be read by the computer, these instructions need to be translated into machine language.

the global software value chain through these relatively low-skilled segments of software development. Client firms would perform stages 1 through 5 in-house and outsource the last four segments of software development. These segments demanded large amounts of low-skilled labour able to code in a specific language and to follow instructions for coding. Hence, an important initial condition was the ability to tap into a large pool of labour that could follow instructions in English for software writing and then write the software code.

However, as Brooks (1975) has pointed out, this model, with a clear-cut distinction between high-end conception and low-end execution does not quite capture the way software development actually takes place within firms. The process, he argues, is much more messy and iterative, with frequent feedback loops from coding and testing to design and back to coding. Hence, while it is important for programmers to have a sound knowledge of coding, it is also important that they understand the requirements and specificities of the domains for which they develop software. This demand for an understanding of system and domain requirements, particularly, increases when the complexity of software development increases. Another important requirement is communication skills for interaction with client firms. With the movement to offshore services and entry into turnkey projects that involve elements of design, domain knowledge becomes more critical. While not all programmers are required to master domain knowledge, it became imperative that at least some sections of the workforce should comprehend how user systems function. Additionally, growing complexity of software projects undertaken warranted a build-up of competences at the firm level to develop process systems that ensure that different modules can be developed by separate teams and then integrated.

Finally, the movement into development of embedded software warrants access to high-end domain and technical skills that were seldom required in the earlier phases of the industry's development. Development of embedded software requires engineers who have bachelor's or master's degrees in electronics or computer science but who also have experience in hardware integration and an ability to understand and develop complex algorithms. Therefore, the industry continues to require large numbers of programmers with knowledge of programming in specific languages even as they gradually demand higher-end, domain-specific technical and coordinating capabilities. Given the variation in skill requirements across projects, firms prefer to recruit people with an ability to learn skills. The emphasis on "learnability" in recruitment and the importance of tacit knowledge for some of the skills required imply that firms have to invest in extensive in-house and on-the-job training. In addition to individual competences and skills, firms also need to build upon employee learning to generate a body of knowledge that can be transferred among employees and across specific projects. Therefore, we can delineate the following capability requirements of the sector as it seeks to transform itself over time from a low-wage-based provider of software services to a provider of a range of both high- and low-end services:

1. Basic programming skills
2. Communication skills
3. High-end programming and low-end domain knowledge for turnkey projects
4. High-end domain knowledge for embedded software and domain-specific software development
5. Intra-firm coordination capabilities for turnkey projects
6. Firm-level process capabilities to trap and consolidate project-specific learning and so build up dynamic sectoral capabilities.

To understand the process of capability building, it is important to understand how state policies enabled the entry of Indian software firms into the global software services value chain. Indeed, institutions of legislative and executive governance have been crucial for the generation of such capabilities in the India.

In India the imperative of import substitution till the early 1990s has fundamentally shaped this process. While there has been an argument that the growth of the IT industry in the country is due to the "benign neglect" of the State, more serious studies point to the contribution of executive governance strategies of the national government in the build-up of knowledge and infrastructure that enabled the sector to enter into global markets (Balakrishnan, 2006). The long history of public intervention in higher education, calibrated measures of protection to ensure that firms had access to high-technology imports even as they were forced to develop domestic capabilities, and promotion of the Electronic Corporation of India Limited (ECIL) as a national champion for computer manufacturing are clear governance efforts to create and incentivize capability building and can be seen as "smart". Software was recognized as a potential sector for exports and employment generation as early as 1972 with the launch of the Software Export Scheme and the provision of concessions for exports through the establishment of export processing zones (Saraswati, 2012). In effect, these policies enhanced the mix and diversity of knowledge embodied in the labour force, creating opportunities for upgrading. Furthermore, as well as enabling access to technologies, they enhanced other production factors and infrastructure.

In the mid-1980s the emphasis in policy shifted towards increasing domestic competition and building competitiveness in the world market. An important intervention has been the setting-up in the early 1990s of software technology parks with excellent data transfer and communication facilities. This executive governance measure has been critical to firms' ability to move into offshore services (Parthasarathy, 2000). Thus, the build-up of certain capabilities under the earlier growth regime facilitated formation of new capabilities more appropriate to the new phase. This is particularly evident in the creation of a low-cost skilled labour pool, as the following section argues.

8.4 The evolution of a knowledge structure: Public policy and public–private response

The importance of human capital for development of the Indian software industry is well recognized in the literature (Arora and Bagde, 2010; Athreye, 2005a). However, success was not driven merely by the skills of individuals, but rather by the development of a particular mix of knowledge sets in the labour force. The evolution of this knowledge structure is critical to the understanding of the success of the Indian software sector (Nübler, forthcoming). Upgrading in the sector hinges upon endowments of the labour force and their organization and mobilization to build up capabilities at the level of firms and the industry. Given the growing knowledge- and design-intensity of production, it is imperative for firms seeking to shift into new software activities and domains and to upgrade technologies to have access to the right mix of skills and knowledge in the labour force. At the same time, it is also important for them to learn/adapt their skill sets to changing market requirements. Skill formation is therefore conditioned simultaneously by governance mechanisms within and outside the value chain, such as intra-firm training and learning routines governance by producer associations, and public governance that enables the formation of institutions providing technical education and ensuring quality standards. This section will highlight how public and firm-level governance mechanisms have worked to create a knowledge structure in the labour force that enhances the opportunities for diversification and generates a steady supply of human capital to meet skills requirements in response to expected changes in the sector.

The criterion of "learnability" that we mentioned earlier has translated into a demand for those who are seen to have good analytical skills and an ability to grasp new skills quickly. Firms tend to be of the opinion that such abilities can be more readily found in engineering graduates than in other disciplines. Engineers are believed to have a better ability to understand process logic. Further, entrepreneurs believe that the more meritorious students enter into engineering colleges, rather than the physical or social sciences, due to the high reputation and social standing

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attached to engineering occupations.[5] In the initial phases, before firms could build their reputation through output delivery, they had to rely on the quality of labour force to signal their capabilities to potential clients. Firms would claim that they recruited only engineering graduates and only from the best colleges. Another reason for the preference for engineering graduates is their abundant supply. In the following sub-section, we outline the role of executive and legislative governance by the State in the emergence of this abundant supply of engineers.

8.4.1 Technical education: State-directed executive and legislative governance in India

Until the mid-1980s the imperatives of import-substituting industrialization (ISI) warranted investments in higher education, particularly in technical education. Backed by public funding, the technical education system could feed the growing needs of an industrializing economy. Engineering was seen as a major career option, given the demand in the heavy and capital goods sectors and in public services such as transport and electricity. This support provided the initial set of incentives to specialize in engineering. While there were a handful of engineering colleges even during the colonial period, several measures were taken to create new institutions in the 1940s. The All India Council for Technical Education (AICTE) was constituted in 1945 to regulate technical education in the country, to prescribe and monitor standards for recognition and affiliation. While tertiary technical education was provided almost entirely by the public sector till the mid-1980s, since then there has been a gradual move towards opening up this stream to the private sector, with the public sector assuming the role of a regulator (Basant and Mukhopadhyay, 2009). Private provision of education was seen as an ideal solution to the problem of fiscal constraints, on one hand, and the need to expand tertiary education, on the other. Investments in education were deemed socially productive, and, hence, tax concessions were offered, paving the way for a surge in investments by private capital. Education being a policy subject of regional state governments, this process was uneven, with some states – particularly the southern states – being the early movers.

Banerjee and Muley (2008) point out that, while the sanctioned intake in engineering colleges seats increased from 2,500 in 1947 to 653,000 in 2007, growing at a compound annual rate of 9.7 per cent, this rate particularly accelerated in the last decade. Between 1997 and 2007 the intake of engineering students rose

[5] Information gathered through fieldwork carried out for Rothboeck, Vijayabaskar and Gayathri (2001).

from 115,000 to 653,000 – a compound annual growth rate of 19 per cent. The number of colleges offering engineering degrees had grown to over 1,500 in 2006, of which 1,121 institutions have been set up in the previous ten years. This expansion, as table 8.2 shows, has allowed for a steadily increasing supply of technical human power in India, particularly in IT-related disciplines.

Out of the total output of engineering graduates, the premium Tier I colleges, the Indian Institutes of Technology (IITs) and Tier II colleges, National Institutes of Technology, account for only 1 and 2 per cent of the total, respectively (Banerjee and Muley, 2008).[6] This segment, however, constituted a dominant share of early emigrants to the United States and played a major role in signalling the quality of Indian technical labour. It was, in fact, the public-sector-created engineering pool from these tiers that established the initial set of networks through which body-shopping or offshore software development could take place. Major additions to the Tier III intake have come from the private sector, which accounted for 76 per cent of the sanctioned intake in 2006 (ibid.).

This increased supply happened to coincide with a phase of declining employment absorption in the manufacturing sector since the 1980s (Raveendran and Kannan, 2009). Just as there were greater opportunities available for students to pursue engineering, there was a decline in demand in the traditional manufacturing sector, leading to an "excess supply". Left with few other employment options, a substantial number of engineering graduates joined software development firms. Another important factor that drew labour into the sector was the relatively attractive remuneration and incentive structures on offer in this sector. This was in turn enabled by the policy that removed the ceilings on salary levels that existed in the country.[7]

Apart from increasing the number of seats on offer, the entry of private capital also fostered competition between colleges to build reputations, as the fees they could charge depended upon their ability to attract good employers. Increasing capacities in engineering streams that were seen to be more in demand, such as electronics and computer science, was another outcome of this trend. New courses, such as Master's in Computer Applications (MCA) were started, directed towards training students in software applications. These new colleges predominantly offer

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[6] Tiers indicate the reputation and quality of engineering education provided in India. Tier 1 institutions, according to Banerjee and Muley (2008), refer to the top colleges and universities in this regard, followed by the other two tiers.

[7] "Corporate salaries of senior executives till the early 1990s were determined by the central government's office of the Controller of Capital Issues ... With liberalization in 1991 these restrictions were gradually relaxed and largely abolished." (S.L. Rao: "Money grabbing habit: Better salaries have meant greater greed", *The Telegraph,* 12 November 2012).

Table 8.2 Indian IT labour supply: IT software and services, 2007–08

Engineering graduates	536 000
Degrees (four years)	290 000
Diploma and MCA (three years)	246 000
IT professionals*	303 000
Engineering IT graduates (degree)	180 000
Engineering IT (diploma holders)	123 000

* IT professionals include computer science, electronic and telecom professionals.

Source: Adapted from NASSCOM Factsheet 2010, accessed from http://www.outsource2experts.com/PDFS/NASCCOM_2010_Global_Outsourcing_Report.pdf on 16 October 2013.

Bachelor's degree courses in engineering or technology and are affiliated to public universities to ensure a degree of control over quality. Another aspect of human capital development has been the diffusion of knowledge of written and spoken English.

8.4.2 Diffusion of English: Enriching the knowledge structure for transnational communication

India's colonial legacy has fostered institutions that make possible the diffusion of communication skills in English. While the British intention to rule through "the natives" produced a class of native bureaucrats trained to communicate in English, access to knowledge of the English language also signified social mobility among the upper caste middle classes as access to premium jobs was linked to command of English. While most government schools provided education in various regional languages, a range of private schools enjoying a good share of public subsidies offered education in the medium of English. Given the primacy of English communication even in post-colonial government, English language ability continues to command a premium. This promoted an incentive regime that favoured English as the medium of instruction. While taught as a second language even in government schools, English was invariably the medium for imparting tertiary education. Although good instruction in the English language commanded a price, investing in it continues to be a major route for social mobility. This demand for English-language instruction has also led to the rise of private coaching centres in small and medium-sized towns. The diffusion of knowledge of English among the engineering labour pool clearly facilitated the development of India's globally operating IT sector.

In sum, a variety of institutions, created at different levels and different times, have contributed to expand the knowledge structure in the labour force and provide Indian firms in the IT sector with a relatively abundant supply of skilled labour. India's initial phase of industrialization (ISI) and higher education policy created the demand for and supply of technical knowledge, while the legacy of colonialism introduced incentives to acquire English-language skills that persist even today. These developments took place at the national level. These institutions have broadened the knowledge base, which created opportunities for Indian IT firms to enter and upgrade in global value chains in IT.

8.5 Procedures for developing knowledge and skills required in labour markets

In addition to governance measures that have created a knowledge structure in the labour force, firms and public–private initiatives have also developed specific governance institutions for dealing with the dynamic demand for skills in the Indian IT sector. In other words, the country not only created capabilities for development of the software industry, but it also developed "smart" institutions or collective competences to respond to skill needs arising from market and technological change within the software sector.

8.5.1 Firm-level procedures for skill formation

Despite substantial investments in human capital formation, value chain requirements continue to create new gaps in skill supply and demand, forcing firms to continuously invest in firm-level training. Even in the initial phases, given the emphasis on "learnability", firms tended to invest substantially in in-house training at the entry level. A recent report states that about 2 per cent of industry revenues is spent on training, 40 per cent of which is spent on training new employees (India Brand Equity Foundation, 2013). Formal training programmes exist in all large enterprises. Infosys Technologies is reputed to have one of the largest training campuses in the world. Such training equips new employees with programming and problem-solving skills in addition to exposing them to organizational procedures and routines. Some firms, in fact, are reputed for their training capabilities; employees from such firms tend to have better market opportunities. Firms also rely on external training institutions for specific skill sets.

Another major incentive for firms to invest in training lies in the growing tightness of the labour market due to a gap between supply and demand (Athreye, 2005a and 2005b). This tightness led to (i) wage increases, which adversely affected cost competitiveness in the low-end services segment; (ii) increased attrition rates, pushing wages even higher; and (iii) loss of in-firm investments in training as a result of attrition. All these factors constituted important challenges as well as incentives for Indian firms to move up the value chain (ibid.). Given the reliance on large number of engineering graduates, basic programming work obviously did not employ their skills fully. Moving into more complex software services for larger segments of business processes requires domain knowledge that engineering graduates possess. Over time, as firms moved into more complex software development, they encouraged employees to specialize in specific domains. While in the initial years such specialization was seen as an obstacle to career advancement for individuals, given the low-end work undertaken for various domains, the current presence of a critical mass of development work in specific domains creates adequate incentives for employees to opt for specialization.

8.5.2 Addressing skill gaps: Recent public and public–private initiatives

In spite of the apparently large stock of human capital, there have been consistent fears of labour shortages in the software sector since the late 1990s. This "shortage" was primarily due to the practice of established firms recruiting only from a specific set of premium engineering colleges and, further, imposing a set of merit criteria that excluded even many in the engineering streams. Despite the boom in the numbers of engineering colleges, entrepreneurs continue to perceive a lack of "quality" in these institutions, which studies have recently borne out (Basant and Mukhopadhyay, 2009). This situation has fuelled a range of private initiatives to develop specific software skills. Such institutions are not affiliated to any universities. Instead, they offer certificate and diploma courses, which have gained importance over time through recognition in the labour market for software programmers. Some of them also train students to take other global certification tests in software development or other emerging skill certifications. The reputation of such certifications is established solely through their credibility in the labour market. This sector has grown along with the software industry, with revenues estimated to be around 23.5 billion rupees in 2012.[8]

[8] According to estimates by Dataquest, 17 September 2012.

In fact, some of these schools provide quite sophisticated training. An example of this is the National Institute of Information Technology (NIIT), one of the world's largest training institutions. NIIT offers a 3½-year graduate programme (GNIIT) that includes one year of internship with a software development firm. NIIT also works with public and private schools to provide educational support in software development skills and at present has expanded its training services to several other countries as well. Another major player is APTECH, which has very interesting placement tie-ups. Hexaware Software, which was initially a part of APTECH and was then spun off as an independent entity, directly contacts the placement cell of APTECH and recruits students who have completed various certificate courses. APTECH offers a range of short- and long-term courses across a range of high- and low-end software skills for both students and working professionals. While NIIT and APTECH are the major players in this domain, there are several others that provide similar training that addresses the emerging skill gaps in the sector.

State and central governments are also taking steps to tackle this growing problem. First, several Institutes of Information Technology (IIITs) have been set up on a public–private basis in different parts of the country. A number of leading software firms are also involved in improving the curriculum, quality of teaching and physical infrastructure to meet the changing needs of the sector. Further, NASSCOM works with the University Grants Commission (the apex state body that regulates the functioning of universities) and the AICTE to revise technical curricula to meet emerging demand. Another public–private venture, the Software Engineering Institute, offers training in sophisticated software engineering. Oracle, for its part, offers product management skills training in collaboration with the Indian Institute of Management (IIM) in Bangalore, in addition to supporting research and training at Anna University and IIIT Hyderabad, while Motorola provides training and technology support to 15 engineering colleges in and around Bangalore.

The expansion of technical education has broadened the base of the labour market by allowing for more entrants. However, it has also simultaneously created a segment of the technical labour force whose English-language and communication skills are inadequate, as they tend to have completed their primary and secondary education in a language other than English. To remedy this, several "finishing" schools, operating in association with the Ministry of Human Resources and Development (MHRD), have been set up to supplement technical skills with "soft" skills. A variety of institutions were created within firms and both private and public–private partnerships to fill in perceived gaps in the skills of the IT workforce. Furthermore, firms created procedures to enhance

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human capital and the tacit, procedural knowledge of their workforce through training procedures. Higher attrition also prompted firms to invest substantially in documentation and standardization of processes and procedures to minimize their losses. Such cooperative and firm-level institutions can themselves be seen as carriers of collective competences, which facilitate learning and high-quality processes at the firm level. The next section maps the emergence of such standards and their role in building firm-level capabilities.

8.6 Process upgrading through standards: Legislative governance for quality, procedures and firm routines

Once inter-firm competition intensified and firms began to innovate new offshore and global service delivery models, they had to move beyond signalling merely the competences of individual employees to signalling organizational capabilities (Athreye, 2005b). This incentivized the acquisition of quality and security certifications mentioned earlier in this chapter. Quality assurance through the establishment of recognizable quality standards has been critical to the upgrading of the Indian software industry, learning at the enterprise level and the development of high-performing collective procedures (see also Nübler, in this volume). Internationally recognized certification of skills increases employability and also substantially reduces the transaction costs of recruiting. This in turn provides incentives to employees to acquire such skills according to international standards, since this makes their skills highly transferable across firms. Such standards also extend to organizational processes. Standards serve to signal to clients the quality of internal processes. Adhering to such standards helps to reduce errors in programming and to build documentation and better human resource practices. Importantly, certifications make sure that software development capabilities are embedded in teams rather than in individual programmers. This is a particularly important coping mechanism for firms struggling with the problem of high attrition and consequent loss of skills embodied in personnel. The nature of standards has also changed with the changing requirements of the upgrading process. While the initial specialization of the Indian software services sector was in segments that required mostly codified programming skills, its entry into more complex and customized software development warrants a set of codified, tacit and semi-codified firm-specific capabilities. Obviously, establishing standards for such tacit capabilities is not easy. We highlight the modes through which such standards were developed over time.

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In the early years of exports, the exposure to quality business processes, frontier technologies and communication protocols required for negotiating with clients was lacking. The early forays into body-shopping partly compensated for this lack. Programmers, by being present on-site and interacting with clients, were exposed to learning-by-doing that stood the sector in good stead when firms upgraded to offshore software development. As mentioned, given the lack of reputation and credibility in the early years, firms reportedly used the quality of labour as a signalling device to indicate their competence. They claimed not only to recruit exclusively engineering graduates but also to recruit only from institutions that had already established reputations in the United States through students who had emigrated to study and work in US-based firms. The subsequent broad-basing of recruitment meant that firms had to move away from using the reputation of engineering colleges towards relying on a set of other globally recognizable standards not only to signal to clients but more importantly also to ensure the quality of their own workforce. In addition to firm-level responses to such challenges, there are also a set of public–private initiatives addressing this dimension of capability formation.

8.6.1 Firm-level procedures to update skills through certification

In most IT firms fresh recruits are put through in-house training and are expected to clear some tests at the end of the training programme. There is, however, a constant threat of redundancy of their specific skill sets. Many software programming skills are prone to become outdated with the advent of new modes of computing and development. Firms provide a range of incentives for employees to update their technical and project management skills by acquiring individual certifications. For instance, whenever a newer version of a software product is released, the firm usually gives a period of six months within which the professional needs to upgrade his or her skills and obtain a re-certification in that software (Arora et al., 2000). Individual employee mobility is also increasingly tied to acquisition of certain certifications, either in the technical or in the managerial domain. Online learning modules are made available for employees to prepare for such certification tests. Incentives for certification are also provided during periods called "benching" when employees are not deployed on specific projects. Given the large-scale demand for labour, at any given time there is a section of the labour force that is "on the bench" and can be deployed as and when any new requirements arise. During such periods employees are required to obtain additional certifications that can benefit them and the firm in the long run.

8.6.2 Standards for documentation: Codification of tacit knowledge

The software development process, as discussed earlier, is still not entirely subject to codified development procedures. As a result, learning-by-doing routines are a crucial mode of acquiring capabilities. However, since this learning is embodied in the individual programmer, attrition deprives firms of such vital competencies. Documentation of software development processes is therefore critical to codification of this tacit knowledge, and prominent firms have devised extensive documentation and dissemination procedures of these across their workforce. The process of documentation and codification has been aided by firms' move to acquire process and quality certifications.

As IT is a process-driven industry, signalling the quality of software development processes has been a major marketing device (Arora et al., 2001). As noted earlier, India is home to the largest number of firms that have obtained quality certifications such as ISO-9001/9000-3 (standards prescribed by the International Organization for Standardization) and the Software Engineering Institute's 5-level Capability Maturity Model (SEI-CMM). Currently, more than 50 per cent of the world's CMM Level 5 companies are based in India. In addition, India is also very close to hosting the highest number of ISO companies in the world. Such certifications, in addition to enabling firms to attract new clientele, also facilitate codification of tacit knowledge gained in the process of development, which has proved useful for firms diversifying into other service segments such as R&D and IT-enabled services.

Standard setting has also been a major governance initiative by both public and private institutions in the domain of training quality. There is a growing recognition of the lack of quality of technical education in the country, with the National Employability Report of 2012 reporting that 83 per cent engineering graduates in the country are unemployable.[9] A NASSCOM study conducted in 2011 has shown that 75 per cent of IT graduates are not ready for jobs in the Indian IT sector.[10] This lack of quality among engineering graduates has pushed state and central governments, along with private stakeholders, to promote standard-setting institutions. One such initiative is the national roll-out of skill certification through the NAC (NASSCOM Assessment of Competence), which creates national standards for competence. Others include accreditation to private training institutes ranging

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[9] http://engineering.learnhub.com/lesson/21444-83-percent-of-indian-engineering-graduates-unfit-for-employment-survey-findings, accessed 12 March 2013.

[10] Ibid.

from foundation-level courses to the post-graduate level in IT-related fields. The National Centre for Software Technology (NCST) also conducts tests for competence in software at various levels. While in 2010 nearly 90 per cent of the revenues of private non-formal training came from initiatives addressing individuals outside the context of the firm, this training has been supplemented by the rapid growth in recent years of corporate training initiatives, with many multinationals starting their own authorized training centres to provide their own certified courses. These institutions train potential employees to get certifications such as Microsoft Certified Systems Engineers (MCSE), Microsoft Certified Systems Developer (MCSD), Certified Novell professional (CNP) or e-commerce certifications. According to Brainbench Inc., although India ranked behind the United States in the number of certified software professionals (145,517 against 194,211), the number was 30 times greater than in Germany (the country with the largest number of certified professionals in the EU) and 100 times more than in China in 2005 (cited in Kaul, 2006). Such a profusion of globally recognized certifications has been a major mode of labour market upgrading. Importantly, it has also enabled employees with lower skill levels to acquire new skill sets and thus broaden their skill base in the sector. Standards can therefore play a vital role in enhancing capabilities by stimulating learning, codifying collectively acquired knowledge and creating competences at the level of the firm or sector. They further safeguard firms against the loss of knowledge through the mobility of individuals, emphasizing the collective nature of such capabilities.

8.7 The role of institutional networks in enhancing capabilities

In addition to firm-level governance and public policy measures such as formal training institutions, Humphrey and Schmitz (2002) point to the importance of networks of learning both across firms clustered in a region and across firms within the value chain. Learning through various informal learning sources has been critical to build up competences that contribute to the evolution of the Indian software sector. In this, the role of entrepreneurial networks, producer associations and the circulation of labour emerge as key sources of learning for firms. Diasporic networks, entrepreneurial and trade networks, diffusion of practices of multinational corporations through labour circulation, client–service provider networks and government–industry networks all play a pivotal role in this regard, particularly in the transfer of tacit knowledge. This learning importantly extends also to knowledge about markets, access to finance and builds reputation. The roles of different types of networks therefore need to be understood to explain the growth and consolidation of capabilities required in software production. The following section addresses the spaces of learning opened up by the various networks in the software services value chain. We map the roles played by such networks in the build-up of various capabilities.

8.7.1 Diasporic networks: Brain drain to brain gain

There is an increasing recognition of the role played by the diasporic communities in building capabilities in their home countries (Saxenian, 2006). The case of Taiwan (China) serves as a model for some of the initiatives undertaken in other low-income countries, including India. In California's Silicon Valley, a number of Indian professionals work in top positions in technology firms and a sizeable number of entrepreneurs are of Indian origin (Pandey et al., 2004). As many had graduated from Tier 1 colleges, they quickly forged networks for information-sharing and mobilizing finance for entrepreneurial ventures (Mani, 2013; Pandey et al., 2004).

These networks were critical not only to body-shopping but also in the move to offshoring of services. The initial impetus for offshoring and credentializing Indian service firms was, in fact, enhanced by the presence of such expatriates. Even the entry of Texas Instruments (TI) into Bangalore that pioneered the offshore model was enabled by the presence of an expatriate Indian as one of TI's vice-presidents (Patibandla and Petersen, 2002). There are several other similar instances of Indian technocrats in US firms and other multinational firms creating links with Indian entrepreneurs and labour pools. The Indus Entrepreneur (TiE) Network, a network of Indian technocrats based in Silicon Valley, has played a major role in building up entrepreneurial capabilities in hubs such as Bangalore. In addition, missions undertaken by regional governments sought to attract investments among the Indian diaspora: representatives of regional governments reached out to the diasporic community from their states with requests for investment in their home states. There are also instances of such networks helping their host training institutions to conduct special training and exposure programmes for current students.

The Indian government, too, recognized the importance of diasporic networks for tapping into the capabilities of expatriate technocrats. It formed a high-level committee on the Indian diaspora in 2000 to facilitate interaction between the expatriates and their home nation. One initiative is an exchange programme called "The transfer of know-how through expatriate nationals"; it encourages expatriate nationals to undertake short-term consultancies in their home country. Through these various programmes and incentives, the government seeks to attract the managerial and technocratic skills required as the industry moves into more complex processes.

8.7.2 Learning through multinationals

Lateef (1997), Parthasarathy (2000) and others cite, as an important factor contributing to the beginnings of software exports from India, the establishment of subsidiaries of multinational firms for software development in India to take advantage of the low-cost skilled labour pool. Although domestic firms undertake substantial exports, the Indian software industry is also home to a sizeable number of multinational corporations, as evident from the growing presence of foreign firms in the membership of NASSCOM.[11] Other studies point to the networks of learning facilitated and enabled by the multinationals (Athreye, 2003). The presence of multinationals is of two kinds. One set of multinationals are global leaders setting up some back office operations in India, whereas the other set consists of expatriate Indians setting up operations in India.

Since the entry into global markets, the presence of multinationals has created incentives for learning and capability formation in five distinct ways. First, the tightness in labour markets and the agglomeration of software development fostered high levels of labour circulation, including between multinationals and domestic firms. This circulation facilitated networks of learning as employees who were exposed to organizational routines of the multinational firms could carry over this tacit knowledge to domestic firms. The circulation of labour across firms, while depleting firms of skills simultaneously also provides them with an opportunity to acquire skills that they lack through the market. This is particularly useful when firms seek high-end skills that are not available through formal training processes.

Second, in terms of organizational routines, multinationals were the first to implement certification procedures for internal processes and also developed propriety tools for software development. Development of proprietary tools was particularly useful for improving the productivity of software development. It involves use of blocks of code written by a firm for earlier services for new software development, thereby cutting the time and labour involved.

[11] http://www.slideshare.net/pratimaonline/bpo-voice-why-nasscom-is-important-for-indian-outsourcing-industry, accessed on 16 October 2013.

Third, domestic firms could also develop better business models as they learned from multinationals. Athreye (2003) points out that even the movement of Indian firms from providing onsite services to setting up offshore development centres was itself enabled by learning from the business models of multinationals. It was TI that pioneered the process of developing software in India and transmitting codes to its parent firm in the United States via satellite. In addition, telecom, software and hardware multinationals also outsourced software development work to domestic firms, which helped employees to acquire domain-specific skills that fed into the move towards more complex software development and diversification into R&D services.

Fourth, learning was also possible through the formation of joint ventures between Indian and foreign firms. A classic example is that of Nortel Networks, which established a joint venture with an Indian firm. The Indian partner went on to set up an independent firm that in fact proved to be a competitor for Nortel in the same product space. This model, Athreye (2003) points out, was also adopted by other multinationals such as CISCO and TI. Fifth, multinationals also forged links with academic institutions for both research and training, as discussed earlier. Funding of research and teaching in frontier areas in some of these institutions are some of the key activities undertaken.

8.7.3 Entrepreneurial networks: The role of NASSCOM

In addition to institutions such as TiE, the formation of the trade association, NASSCOM, has been a key driver in the evolution of the software services sector. Started in 1988 with 38 members (who accounted for 65 per cent of total exports), NASSCOM now consists of more than 1,100 members (Kshetri and Dholakia, 2009). In addition to having affiliates in several countries, it has dedicated staff in the Indian Embassy in Washington, DC, for lobbying with the US industry and government. This lobbying activity has become particularly important in the context of the backlash in the United States against outsourcing due to a fear of loss of jobs.

NASSCOM undertakes a range of activities ranging from enforcing standards to helping explore new business opportunities, supplying market information, working with the government to identify critical gaps in capabilities and seeking support to address them. For instance, it enforces certain security standards for its members with regard to networks and data transmission and seeks to bring data protection standards up to European and US levels. It also has invested substantially in brand building. Another important role has been its lobbying and working with the national and regional governments on various issues affecting the industry. It collaborated with several state governments to formulate IT policies and also with the Ministry of Information Technology to tackle Internet-related crimes, software piracy and data theft. Further, several members serve on government committees. This power enables them to lobby successfully for infrastructure and other government subsidies such as tax exemptions. Its lobbying with government has helped enlarge the scope of the domestic market, with state governments earmarking a share of their budgets for building IT infrastructure such as e-governance.

The various formal and informal institutions underpinning these networks and the transfer of knowledge therein provide examples of how "smart" institutions may facilitate and incentivize learning and capability accumulation within social networks in the process of upgrading.

8.8 Conclusions and implications for sustained upgrading

The preceding discussion has highlighted how multiple governance mechanisms and public–private networks enabled the entry and upgrading of the Indian software sector in the global software value chain. Based on insights from literature on value chain governance, this chapter maps the build-up of competences as an outcome of interactions between firm, chain and sectoral governance mechanisms. Importantly, mediatory institutions such as the industry association and the Indian diaspora have facilitated such interactions. We have endeavoured to distinguish policy measures that facilitated the entry of the Indian software sector into the global software services value chain from policy responses to sustain and upgrade within the global value chain. Initiatives in the first phase, rooted in an imperative of import substitution, fostered the development of both social and physical infrastructure that enabled domestic firms to leverage low-cost human resources to gain a foothold in the global value chain. Subsequent public governance, embedded in a larger policy shift towards trade openness, was embedded in a regulatory environment that assigned a facilitating role to the State and was shaped by greater interactions with industry associations and assigning private capital a bigger role in building up educational infrastructure. We have sought to identify the synergies between public governance mechanisms and firm-level capability building through creating incentives and providing support infrastructure primarily in human capital accumulation. This interaction between sectoral demands and governance response has been vital to both the entry and the subsequent growth and upgrading in the global software services value chain. In other words, the build-up of collective competences at the firm level has been a co-evolutionary process, with public policies responding to sectoral demands that in turn are shaped by perceived barriers to upgrading or growth at different stages in the sector's evolution.

Even amidst such sectoral dynamism, gaps persist in the build-up of capabilities. A key gap, identified by Ilavarasan and Parthasarathi (2012), concerns the lack of linkages between small firms and large domestic or multinational firms in the sector that can sustain capability-building among small firms. They point to the inadequacy of intermediary institutions such as venture capital funds and an inability to tap into skill networks despite the continuous formation of new small firms. Evidence from this chapter in fact underscores the need for such intermediary institutions to enhance skill and capabilities to negotiate and move up in the global value chain. As it emerges from these discussions, industry associations can be ideal for this role, as NASSCOM has demonstrated.

Another constraint has been the lack of quality teaching resources and a mismatch between supply of and demand for skills. The high salaries offered to employees may also have implications for sustainability of the sector by depleting teaching resources and resulting weakness in the quality of higher education, as Tilak (2013) has pointed out. Even within engineering disciplines there has been a distortion, with more supply and demand from students for electronics, computer science and IT and few takers for other disciplines such as mechanical and civil engineering. This is happening at a time when projections indicate that future demand will be more for engineers with a basic grounding in other disciplines and topped by skills in software development. As a consequence, the government has decided not to create any more institutions offering degrees solely in IT like the IITs. The Indian experience clearly highlights the need for linkages between the educational system and industry. "Smart institutions" that can remain sensitive to the changing requirements of industry and adjust their curricula accordingly have been crucial to the success of the IT sector in India. Effective use of the State's supply capacity and inviting the private sector to bridge the demand gap in terms of skilled labour requirements are both central to creating a favourable ecosystem in which firms can move up. In this context it also important to recognize the role of various formal and informal networks that facilitate learning within and outside firms. Relevant policy initiatives need to pick out these networks and strengthen them.

The next important issue concerns monitoring of standards. The high levels of unemployability of engineering graduates in general and lack of job readiness among substantial numbers of IT graduates clearly point to lack of adequate attention to the judicious governance of skill formation. Despite the rise of new institutions to address this gap, skill shortages continue to pose barriers for

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upgrading by domestic firms, small firms in particular. Poaching of human capital by multinationals increases such barriers (Saraswati, 2012). We also find that despite limited movement into the software product market, barriers to upgrade in this direction created by branding, advertising and market access by global players persist. This problem is exacerbated by the fact that Indian firms continue to spend relatively little on R&D.

NASSCOM, which wields considerable power in policy-making, has been found wanting in its vision for leveraging the sector's potential to enhance dynamic linkages with the domestic economy. Although many export firms have diversified into the domestic market, work with industries to generate new software that may improve capabilities in the user segments has been limited. This disjuncture and lack of embeddedness due to weak domestic linkages are likely to limit the possibilities of positive spillovers that upgrading in global value chains could generate in the domestic economy. While the various governance mechanisms that we have highlighted have facilitated sectoral upgrading, the extent to which such upgrading can generate positive spillovers in the rest of the economy will be critical to social upgrading. The Indian case highlights the need for a simultaneous emphasis on upgrading within the value chain and on a set of measures that ensures social embedding of these processes.

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Export sophistication, growth and the middle-income trap*

9

Piergiuseppe Fortunato and Carlos Razo

9.1 Introduction

Structural transformation is at the heart of economic development. Successful developing countries progressively change their production structure, replacing low value added activities and unsophisticated goods with higher value added activities and more sophisticated products. A low-income country usually relies heavily on extractive resources, monoculture export and subsistence agriculture. Economic take-off starts with the shift of existing resources into processing activities and the production of basic manufacturing goods. During the "industrialization stage" mechanization spreads to the primary sector, thereby sustaining the fall in agricultural employment. At the same time, strong complementarities with the service sector ensure a steady rise in employment and output in commercial services, transportation and finance.

In these initial stages of diversification, the growth path invariably begins inside the global production frontier, with developing countries undertaking the manufacture of goods already produced elsewhere. Inside the frontier, countries are looking to catch up with those already at the frontier through rapid capital accumulation and technological adaptation in activities already in the industrial pipeline. These goods are also the ones that will drive export diversification.

* The authors would like to thank Richard Kozul-Wright, Irmgard Nübler, Alfredo Saad-Filho and all the participants in the ILO/UNCTAD Workshop on "Growth, Productive Transformation and Employment" for useful comments and suggestions. The views expressed in this paper are the authors' only and do not necessarily reflect, and should not be represented as, the views of any of the institutions with which the authors are affiliated.

To sustain the development process, however, inside-the-frontier innovations are not enough. An emerging literature highlights the importance of capabilities and the need for a country to progressively increase its capability to develop and diffuse new products (and processes) and so to catch up (see the chapter by Nübler in this volume). Hence, it is the ability of a society and of firms to accumulate skills and knowledge, to combine the productive knowledge of its individuals and to develop collective competencies that determines its ability to diversify and increase internal value added and so to produce goods that are progressively more sophisticated and competitive in international markets, challenging the advanced competitors on the technological frontier.

Structural change and the development of capabilities are nevertheless challenging endeavours. Changing the economic structure of the economy requires the acquisition and refinement of productive knowledge. This may become a chicken-and-egg problem when learning takes place mainly in industries. A country cannot produce goods of which it has no knowledge, and it does not accumulate knowledge of products that it does not produce. Hausmann et al. (2011) acknowledge this, pointing out that countries move from the products that they already produce to others that are similar in terms of the knowledge required to produce them. Industrial development is assumed to be a gradual and path-dependent process, and countries are unable to jump into distant products.

Hausmann et al. (2011) examine differences among countries in terms of the complexity of products they export; they assume that a country's export structure reflects its capabilities to shift and diversify into products identified as related to products it already produces. Countries displaying a more complex and varied productive or export structure are assumed to have developed more capabilities. A country's economic complexity is measured by the number, variety, and rarity of the goods that it exports.

Hausmann et al. find that economic complexity is not perfectly correlated with each country's level of income but that the divergence between the expected and the actual level of economic complexity of a country is a good predictor of future economic growth. That is, countries with a more complex productive structure than that predicted by their level of income exhibit faster growth in subsequent years.

Nübler (in this volume) develops an explicit concept of capabilities, arguing that capabilities are not only created through learning in industries but also by knowledge acquired in formal education and in social networks such as families and communities, and, furthermore, that transformation of these knowledge systems in the labour force can open up options for jumping into distant products in the product space. Hence, a sustained process of productive transformation and of catching up from low- to middle- and eventually into advanced income ranks

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requires deliberate and continuous learning at different places – in society, in schools, in firms – in order to expand options for gradually increasing sophistication of exports and for jumping into advanced technological regimes.

Historically, few middle-income countries have been able to enter the group of high-income economies. This suggests that, at middle levels of income, sustaining structural transformation and economic growth becomes more difficult. On one hand, these countries have reached a level of development high enough to prevent them from competing on the same ground with low-income countries. On the other hand, they still lack the proper knowledge structure in the labour force and the mix of institutional and production factors that would enable them to enter and compete in knowledge-intensive products. As a result, many of the countries that reach middle-income status are unable to continue the process of income convergence with rich economies and remain trapped in what has been called the middle-income trap.

For example, a majority of Latin American countries, although they had achieved a relatively high level of development as early as the end of the nineteenth century, have been held back by a failure to diversify and upgrade their manufacturing sectors. More recently, among the group of successful East Asian economies, growth performance has differed significantly; more constrained growth has been associated with the expansion of manufacturing activities inside global value chains such as performing simple assembly or processing of light industry products for export (e.g. garments, footwear, and foodstuffs) or the supply of electronic parts and components. In comparison to the high achievers such as China, Taiwan (China) and the Republic of Korea, middle achievers Malaysia and Thailand and low achievers Indonesia and the Philippines have found it difficult to establish domestic producers able to diversify and upgrade to the more technologically sophisticated parts of the chain (Ohno, 2009; Studwell, 2013).

The successful structural transformation experienced by the Asian first-tier newly industrialized countries (NICs) has been analysed recently by Jankowska, Nagengast and Perea (2012). Their study is based on the Product Space methodology (Hidalgo et al., 2007), which maps the relative proximity, or similarity, of traded products and shows that, in the case of the Asian NICs, structural transformation was a gradual process. New production was sequentially developed in industries (e.g. iron, steel and electronics) using skills and capabilities transferable with relative ease from existing industries. This strategic increase in high "connectivity" sectors[1] allowed undertaking a gradual yet systematic transition towards higher value added activities, especially those requiring similar technology and

[1] A high connectivity sector is one that can easily jump to other potential exports.

production techniques. By contrast, Latin American countries tend to be characterized by economic specialization in industries that are relatively far from high value added products, leading to less connectivity of their export profiles.

This chapter examines empirically this linkage between, on one hand, the dynamics and the composition of the export structure (as measured in particular by the level of sophistication of the exported products) and, on the other hand, economic growth. We do not look directly at structural change. In a sense we test the impact of the type of exports on growth without looking into the channel of transmission. To factor out the key features that characterize growth-enhancing products, we employ the measure of product sophistication developed by Hausmann, Hwang and Rodrik (2007). This measures sophistication of traded goods based on the income levels of countries exporting such goods. We then normalize this measure to a 0–100 scale. According to this index, the higher the average income of its exporters, the more sophisticated the product, i.e. a high (low) level of sophistication indicates that the product is exported mainly by rich (poor) countries.[2] In line with Hausmann, Hwang and Rodrik (2007), our illustrative regressions confirm that the sophistication of exports has a positive and significant effect on economic growth. However, we find no evidence of direct effects of technological intensity or export diversification on economic performances.[3]

The main contribution of this paper lies in the study of the dynamic variations in the export structure and the likelihood of remaining trapped at intermediate levels of income. We assume a Markov process and group countries on the basis of their export sophistication. Then we estimate how the probabilities of transition between groups change through time. Our results cast a shadow on the development perspectives of many developing countries, which are exposed to the risk of being unable to shift their production to highly sophisticated products. In line with the results of Hausmann et al. (2011), our analysis shows that, even in the long run, countries are unlikely to jump to products that are far from the knowledge embedded in the goods that they already produced. Knowing which export goods promote higher income levels is clearly not enough. The absence of productive knowledge

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[2] This index is very similar to the sophistication index proposed by Lall, Weiss and Zhang (2006). There are small differences in the calculation process of each index. However, both of them capture the fact that a high sophistication level is correlated with high levels of per capita income.

[3] This is in line with the results of Imbs and Wacziarg (2003) and Klinger and Lederman (2006). They suggest that, while developing countries are characterized mainly by progressive diversification and inside-the-frontier innovation, more advanced economies tend to concentrate their exports and base their growth on a narrower set of products and services on the frontier, leading to a more specialized economic structure. Running regressions on a vast sample of countries at different levels of development therefore is likely to produce insignificant estimates for the coefficient gauging the impact of export diversification on economic growth.

and capabilities hinders countries from producing the goods that promote growth. These findings support the framework of catching up suggested by Nübler in this volume. Nübler argues that collective capabilities are not created automatically, but rather they require deliberate policies to enrich the knowledge structure in the labour force and to build "smart" enterprise routines and institutions in the country, in addition to creating the right incentives to invest in a new range of activities crucial to climbing the ladders of sophistication and to fostering development.

In a closely related contribution, Felipe, Kumar and Abdon (2010) provide empirical support for the contention that countries that are unable to upgrade and diversify their exports may become caught in a middle-income trap. They classify countries according to the sophistication and connectivity of their exports. They find that 120 of 154 countries are in a "bad product" trap, as they export mostly unsophisticated and unconnected products. They conclude that escaping this trap will require policy interventions aimed at addressing the market failures that are pervasive in many developing countries.

The remainder of this chapter is organized as follows. Section 9.2 describes the data on export sophistication and discusses the methodology. Section 9.3 summarizes the results of the growth regressions. Section 9.4 presents the dynamic results on sophistication and highlights the risk of middle-income-traps. Section 9.5 offers some concluding remarks.

9.2 Export sophistication index: Methodology and descriptive statistics

9.2.1 Methodology

To measure the quality of exports and its variations over time and to determine whether it is crucial to the process of development, we focus on a key characteristic of a country's export package: sophistication. We use a measure of export sophistication created by Hausmann, Hwang and Rodrik (2007). It is an outcomes-based measure of the sophistication of a country's export package – essentially the GDP per capita associated with the basket. This metric has two clear advantages over those used in the previous literature. First, it is defined at a highly disaggregated level (in the case of Hausmann, Hwang and Rodrik, HS 6-digits), which allows a fine-tuned evaluation. Second, it is outcomes-based, whereas past metrics were based on a priori assumptions of sophistication (e.g. all agriculture is less sophisticated, all manufactures are more sophisticated).

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The export sophistication index attempts to capture the implied productivity of exported goods. The intuition behind it is that, when exporting a good, countries *reveal* their productivity levels, like the concept of revealed comparative advantage. For instance, in the absence of trade interventions, products exported by richer countries will have features that allow high wage earning producers to compete in world markets. Advanced technological content is certainly one of these features, but is not the only one. Other factors, such as the availability of natural resources, marketing or branding, quality of infrastructure, transportation costs or the degree of fragmentability of the production process,[4] may also play an important role in determining a country's export basket.

In this context Hausmann, Hwang and Rodrik (2007) developed a methodology to construct a quantitative index that ranks traded goods according to their implied productivity and that in a broad sense captures the different factors determining a country's export basket.[5] The overall assumption is that the higher the average income of the exporter, the more sophisticated the export. We follow Hausmann, Hwang and Rodrik (2007) and construct an export sophistication index by country for every second year during the period 1996–2008.

The index is constructed in three stages. The first stage involves measuring the GDP per capita (i.e. the implicit productivity level) associated with each exported product. This product level measure of sophistication is designated $PRODY_k$ and is calculated as the revealed comparative advantage (RCA)-weighted gross national income (GNI) per capita of each country exporting product *k*:

$$PRODY_k = \sum_j \frac{\frac{X_{kj}}{X_j}}{\sum_j \frac{X_{kj}}{X_j}} Y_j$$

where X_{kj} represents the value of exports of product *k* by country *j*; X_j the total value of exports of country *j*; and Y_j its GNI per capita. So, if a product accounts for a large share of poor countries' export baskets but a small percentage of rich countries' export baskets, then it will have a lower *PRODY*, as it is a "poor-country" export. Conversely, if a product accounts for a large share of rich countries' export packages but is not significant among poor countries' exports, it will have a higher *PRODY*, as it is a "rich country" export.

[4] The fragmentability of production has intensified in recent years. When the production process is divisible, parts of it may be relocated to low-wage countries, reflecting the possibilities of separating segments of the value chain.

[5] A similar metric has been developed by Lall, Weiss and Zhang (2006).

In stage II we use this product level variable to measure the overall level of income associated with a country's export basket, i.e. the export sophistication level of country *j* during year *t* ($EXPY_{jt}$). This is done by evaluating the average of the *PRODY* of all goods that a country exports, each PRODY weighted by its share of total exports. Formally:

$$EXPY_{jt} = \sum_k \frac{X_{kjt}}{X_{jt}} PRODY_k$$

Naturally, since *PRODY* is measured using the GNI per capita of the typical exporter, rich countries have a high *EXPY* and poor countries have a low *EXPY*. This is by construction: rich countries export "rich country" goods and poor countries export "poor country" goods. There is significant variance in this relationship, however. There are many countries that have roughly equivalent levels of GNI per capita, but some of them have somehow managed to export a relatively more sophisticated set of products than others.

Finally, in stage III, we construct the export sophistication index, SI_{jt} by normalizing the export sophistication level, $EXPY_{jt}$, to a scale from 0 to 100 for every year. The country with the highest *EXPY* is set at 100 and the country with the lowest *EXPY*, at zero. The formula we apply for this normalization is:

$$SI_{jt} = \frac{EXPY_{jt} - EXPY_t(Min)}{EXPY_t(Max) - EXPY_t(Min)} * 100$$

SI_{jt} is, then, the normalized productivity level, on a scale 0–100, associated with country *j*'s export basket.

Sophistication measures of this kind display a positive correlation with technological intensity. Such a correlation, however, is not as close as would have been anticipated by standard trade theory. Lall, Weiss and Zhang (2006) show that there are cases where high technology products have low levels of sophistication, suggesting, for instance, that some production processes can be fragmented and, thus, parts of the process relocated to lower wage countries.[6] Likewise, there are low technology products with high sophistication levels as measured by the index, suggesting that the products have specific requirements for natural resource or logistics, or other needs that are out of reach for poorer countries – or that these products are subject to policy interventions.

[6] For instance, Srholec (2007) shows that the specialization of some developing countries in high-tech exports can be attributed to the effect on trade statistics of international fragmentation of production in electronics.

9.2.2 Descriptive statistics

We calculate the sophistication index (SI) for 158 countries for every second year during the period 1996–2008, i.e. 1996, 1998…2008.[7] The countries included are those for which data on exports by product, GNI per capita and per capita growth rates were available for the period under examination. The construction of the SI is based on two data sources: (i) UNCTADstat, for trade data by country for 259 products, using the Standard International Trade Classification (SITC) Rev. 3 at the 3-digit level, and (ii) World Development Indicators, for data on GNI and per capita growth rates.

Table 9.1 presents some descriptive statistics for our sophistication index, SI.

Table 9.2 presents the countries with the highest and the lowest average SIs in the sample for the analysed period.

In order to illustrate how the export sophistication level of some countries varied across time, figure 9.1 depicts the evolution of the SI for selected

Table 9.1 Descriptive statistics for the SI, 1996–2008

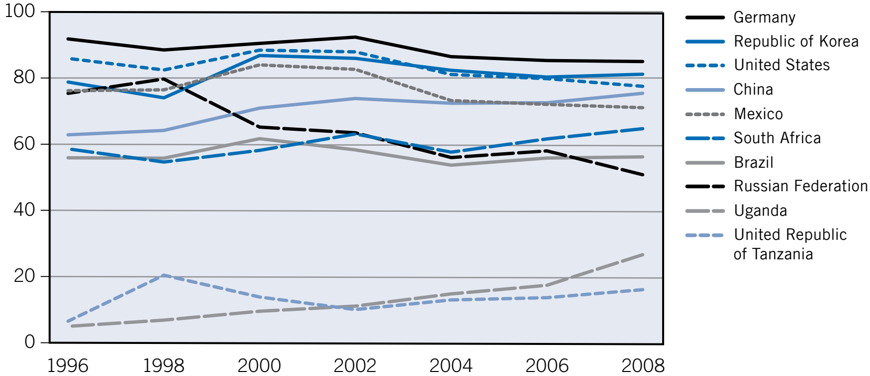
Year	No. of countries	Mean	Standard deviation
1996	158	43.06	25.39
1998	158	45.79	23.55
2000	158	48.21	24.99
2002	158	46.88	25.48
2004	158	44.33	23.59
2006	158	45.93	22.98
2008	158	44.65	23.88

Table 9.2 Top five and bottom five countries by average SI, 1996–2008

Country	Highest average SI	Country	Lowest average SI
Ireland	95.69	Burundi	7.42
Switzerland	95.66	Rwanda	4.70
Japan	94.82	Ethiopia	4.60
Finland	91.84	Mali	4.18
Singapore	90.53	Malawi	2.70

[7] A list of the 158 countries and territories in our analysis and their corresponding SI for each year can be found in the Annex to this chapter.

Figure 9.1 Evolution of the sophistication index for selected countries, 1996–2008



countries.[8] The countries selected include top exporters from the developed world: the United States and Germany; emerging economies: Brazil, China, Republic of Korea, Mexico and South Africa; and two countries from Africa with a relatively good performance within their region: the United Republic of Tanzania and Uganda.

In this sample Germany, the United States and the Republic of Korea present the highest SIs, the United Republic of Tanzania and Uganda the lowest. China notably increased its SI during the period analysed, in contrast with the deterioration of Russian Federation's SI. Mexico's SI has decreased in recent years, but it remains above Brazil's, while South Africa shows an upward trend since 2004.

9.3 Suggestive growth regression

We now turn to the analysis of the relationship between export sophistication and growth. The aim of this section is to assess the relative importance of sophistication as a source of growth as opposed to such usual suspects as export diversification or embedded technological intensity.

[8] Note that, since the SI has been normalized on a 0–100 scale, this figure actually shows the changes in export sophistication of each country in our sample *relative* to the others. Plotting the time series of the non-normalized index would not qualitatively change the figure, however. For consistency, we therefore employ for this merely descriptive excercise the same normalized index later used for the regressions and the simulations.

We build up a cross-country data set merging the data on sophistication described in the previous section with observations on other familiar determinants of growth. As a measure of export concentration, we employ the Herfindahl-Hirschman Index (HHI), based on UNCTADstat data. We use these data also to estimate highly technology-intensive goods as a share of total exports. All remaining independent variables are drawn from the World Development Indicators 2009.

We run a series of ordinary least squares (OLS) robust regressions with the growth rate as a dependent variable. All regressions include as explanatory variables the initial values (i.e. the values in 1998) of our sophistication measure (*SI*), the *HHI* and the share of total exports attributable to highly technology-intensive goods (*High Tech*).[9] Also, we control for the initial value of GDP per capita (*Initial GDP*), net inflows (new investment inflows less disinvestment) from foreign investors divided by GDP (*FDI*), gross capital formation (as a share of GDP), the sum of exports and imports of goods and services measured as a share of GDP (*Trade*), and, as a measure of human capital, the net rate of enrolment in primary school.

Table 9.3 summarizes the results of our analysis. In all the specifications the sophistication index is always positive and significant. In contrast, the share of highly technology-intensive goods in exports and the HHI index do not seem to affect economic performances once *Initial GDP* is included among the regressors.

These results, which confirm and update those of Hausmann, Hwang and Rodrik (2007), show that a country's relative level of export sophistication has significant consequences for subsequent growth. That is to say, if a country has a sophisticated export basket relative to its level of income, subsequent growth is much faster. Among characteristics of the exports structure, sophistication appears to be the primary determinant of economic development. Among the other growth determinants, physical capital appear to be a better predictor of growth than any of the other usual suspects; in fact, the parameters of both FDI and domestic capital formation are always positive and significant, in contrast to the variables intended to capture the impact of human capital and trade.

These results are only suggestive, since the time horizon is short and they may suffer from potential bias due to omitted variables. They are, however, in line with the work of Hausmann, Hwang and Rodrik (2007), which uses panel regressions over the period 1962–2000 and controls for country and year fixed effects.

9 Our product classification by technology intensity is based on Lall (2000).

Table 9.3 Cross-country growth regressions, 1998–2008

Variables	(1) Growth	(2) Growth	(3) Growth	(4) Growth	(5) Growth
EXPY	0.0147*** (0.004)	0.0153*** (0.004)	0.01** (0.003)	0.01** (0.004)	0.01* (0.004)
HHI	0.00002 (0.00003)	−0.00001 (0.00003)	−0.00002 (0.00002)	−0.00002 (0.00002)	−0.00002 (0.00003)
Tech/ exports	0.004 (0.006)	−0.0065 (0.006)	−0.002 (0.005)	−0.0015 (0.006)	−0.0015 (0.006)
GDP per capita	−0.00003*** (0.000001)	−0.00003*** (0.000001)	−0.00003*** (0.000001)	−0.00003*** (0.000001)	−0.00003*** (0.000001)
FDI/GDP		0.022*** (0.005)	0.014*** (0.004)	0.014*** (0.005)	0.0135** (0.005)
Capital formation			0.03*** (0.005)	0.03*** (0.005)	0.03*** (0.005)
Trade/GDP				0.0003 (0.001)	0.0003 (0.001)
Schooling					−0.0007 (0.001)
Constant	0.434** (0.154)	0.46*** (0.145)	−0.065 (0.15)	0.052 (0.16)	0.067 (0.16)
Observations	168	168	168	168	168
R-squared	0.08	0.19	0.35	0.35	0.35

9.4 The degree of export sophistication as a Markov process: Methodology and results

The capacity to improve one's export structure and the degree of sophistication of exported products are therefore of paramount importance for the overall process of economic development. This section proposes a simple simulation exercise aimed at exploring the potential evolution of export structures around the globe and its consequences.

In order to study the likelihood of climbing the ladder of export sophistication, we assume that the sophistication of the export structure in each country evolves over time as an exogenous first-order Markov process, where the conditional probability distribution of future states of the process depends only upon the present state, not on the sequence of events that preceded it.[10] In fact, at any point of time, *t*, the state of the evolutionary process of a country's export structure is described entirely by the characteristics of the present state (e.g. the capital stock, the behavioural rules of each firm and the public policy in place) and not by the entire history. Therefore, this state can be used to predict short-term changes and the new structure that will emerge at time $t + 1$.

Stochastic Markov processes have been widely used in economic modelling. In their seminal contribution, Nelson and Winter (1982) made use of a Markov process to describe technological evolution, arguing that "verbal account of economic evolution seems to translate naturally into a description of a Markov process – though one in a rather complicated state space" (ibid., p. 19). More recently, Markov processes have been used to model productivity changes over time (Fernandes and Isgut, 2005; Michael and Hao, 2009) and switches of growth regimes. Jerzmanoswki (2006) estimates a Markov-switching model of growth with four such regimes: miracle growth; stable growth; stagnation; and crisis.

In this paper we consider five possible states, or sophistication groups, based on the value of the sophistication index (SI) for each country, with each group covering 20 percentage points on the SI scale. The groups are classified in descending order, with Group 1 containing countries with the highest level of export sophistication. The group classification criteria are outlined in table 9.4.

We then classify the 158 countries and territories in our sample into their corresponding export sophistication group for every year. Table 9.5 lists the number of countries in each sophistication group by year.

In order to construct the transition probability matrix, we first calculate the probabilities of switching sophistication group every two years during the period analysed. In other words, we construct six transition probability matrices: 1996–98, 1998–2000, 2000–02, 2002–04, 2004–06 and 2006–08. Next, we

Table 9.4 Export sophistication groups: classification criteria

Export sophistication group	Criteria
Group 1	$80 \leq SI \leq 100$
Group 2	$60 \leq SI < 80$
Group 3	$40 \leq SI < 60$
Group 4	$20 \leq SI < 40$
Group 5	$0 \leq SI < 20$

[10] This is the so-called Markov property.

Table 9.5 Number of countries per export sophistication group, 1996–2008

Group	1996	1998	2000	2002	2004	2006	2008
1	16	15	24	25	14	13	14
2	25	28	23	23	26	31	35
3	33	44	47	42	44	48	28
4	53	53	45	43	54	47	55
5	31	18	19	25	20	19	26
Total	158	158	158	158	158	158	158

Table 9.6 Average transition probability matrix

Initial state/future state	1	2	3	4	5	Total
1	0.83	0.16	0.01	0.00	0.00	1
2	0.10	0.78	0.11	0.01	0.00	1
3	0.00	0.09	0.77	0.13	0.01	1
4	0.00	0.01	0.11	0.77	0.10	1
5	0.00	0.01	0.03	0.23	0.72	1

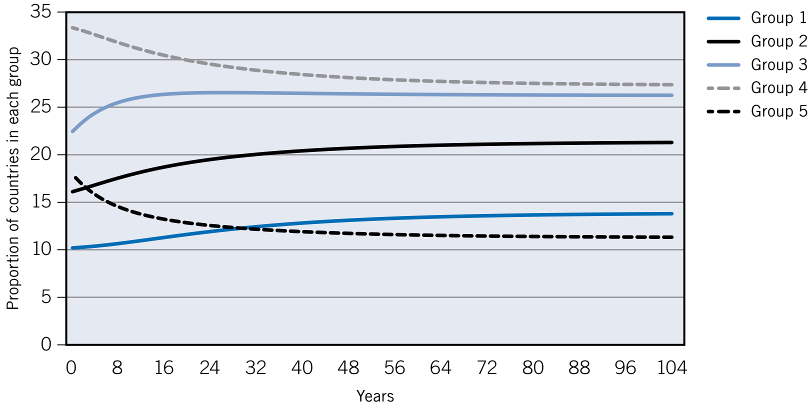
average the transition probabilities of those six matrices and construct an average transition matrix, *M*, shown in table 9.6.

This average transition matrix can be used to conduct our simulation exercise and explore the future evolution of export sophistication over time and across countries. Starting with *M*, we calculate the probabilities that a country starting in Group *i* will be in Group *j* after a given number of periods, *n*. Furthermore, based on this result, we calculate the proportion of countries in each group after *n* periods.[11] Figure 9.2 shows the evolution of the proportion of countries in each export sophistication group.

Figure 9.2 shows the evolution of the proportion of countries in each export sophistication group beginning in 1996. The projection begins in year 12 (2008). It reveals two notable trends. The first is that, over the next 30 years, the proportion of countries in the highest sophistication groups will increase slightly. Group 1 will increase its proportion of countries from 10 per cent to 12 per cent,

[11] The probabilities that the Markov chain, starting in Group *i*, will be in Group *j* after *n* steps are given by the power of the average transition probability matrix, $M^{(n)}$. Thus, if the initial distribution of countries in each group is given by a vector *g*, where the sum of the vector equals 1, then the distribution of countries after *n* periods, $g^{(n)}$, will be given by $g^{(n)}=g\,M^{(n)}$. For more on Markov chains and their properties, see, for instance, Grinstead and Snell (1997, Chapter 11).

Figure 9.2 Projected evolution of the proportion of countries in each export sophistication group



whereas Group 2 will grow from 16 per cent to 20 per cent. The second trend is that, within the same period, the proportions of countries in the lowest sophistication groups, 4 and 5, will decrease at a greater rate than the groups 1 and 2. The proportion of countries in Group 4 decreases from 34 per cent to 29 per cent, and the proportion in Group 5 drops from 20 per cent to 12 per cent. Both trends are positive, considering that they point in the same direction: increasing levels of export sophistication.

However, the chart also highlights a problem: getting stuck in intermediate sophistication levels and being unable to climb even higher. After the first 30 years, the proportion of countries in each group changes only slightly and remains practically unchanged after year 80, where the probabilities tend to reach a steady state.

As shown in section 9.3 and in Hausmann, Hwang and Rodrik (2007), export sophistication predicts subsequent economic growth. Thus, the inability to climb the sophistication ladder has important implications for growth. In our case, as transition probabilities reach their steady state, 65 per cent of the countries will remain in middle or low sophistication export levels, which implies lower growth rates.

We then perform an exercise like the one above but separating countries according to their initial income level. In other words, we calculate two transition probability matrices for each pair of years, one for the 20 per cent richest countries and another for the remaining 80 per cent. After obtaining the pair of matrices for 1996–98, 1998–2000, 2000–02, 2002–04, 2004–06 and 2006–08, we calculate two average probability matrices, one for each set of countries. To summarize the result of this exercise, we find that, in the steady state, the richest countries will remain in the top two sophistication groups, with probabilities above 80 per cent, whereas the other countries will remain, with 80 per cent probabilities, in the middle and lower sophistication groups.

These results show that, under the dynamics observed in the last two decades, climbing the ladder of sophistication is not an easy task. For middle- and low-income countries there is a risk of getting stuck in middle or low levels of export sophistication. This can have important implications for growth. In fact, over the course of economic development, low value added, labour-intensive assembly operations must be progressively replaced by more technologically sophisticated activities. This requires introducing new or improved goods and services and developing or adopting innovative production processes and better modes of business operation.

9.5 Concluding remarks

Successful developing countries progressively change their production structure, replacing low value added goods with more sophisticated activities and a wider array of products. As countries undergo this transformation, three important changes are seen. First, production diversification increases in line with rising income levels, but subsequently it slows down and then even reverses as countries become more specialized as they enter a post-industrial stage. Second, while investment becomes less important at high levels of income and the importance of innovation grows, for most developing countries operating inside the production frontier, the links between a rapid pace of investment and technological adaptation are crucial to successful diversification. Third, educational systems shift their focus along with structural changes in the economy, from developing workers' skills to adopt and adapt technology to preparing and enabling workers to develop new processes and products.

These changes do not occur automatically, and, thus, many middle-income countries fail to increase the sophistication of their production and export structures. This in turn adversely affects growth performance. Our analysis confirms that climbing the export sophistication ladder is extremely difficult for developing countries. As transition probabilities approach their steady state, in fact, most countries get stuck in the intermediate levels of export sophistication. We have shown that, under the export dynamics observed during the period 1996–2008, only very few middle-income countries will eventually manage to climb to the top of the sophistication ladder.

An emerging literature identifies productive capabilities as the determinants and drivers of productive transformation dynamics and increasing export sophistication. Capabilities are not distributed exogenously, but they can be actively built up over time. Industrial policies in particular may play an important instrumental role, facilitating evolution of a knowledge structure that provides the options for moving along trajectories of progressive sophistication in the product space. Education and training policies are central to expanding the options for jumping into products and technologies that are more distant from the existing export structure (Nübler, 2013). Developing the right set of capabilities enables middle-income countries to move up the value chain and break into fast-growing markets for knowledge- and innovation-based products and services.

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Annex

Export sophistication index for 158 countries and territories, 1996–2008

Country/territory	SI 1996	SI 1998	SI 2000	SI 2002	SI 2004	SI 2006	SI 2008
Albania	31.56	36.68	38.61	35.20	35.23	40.67	39.07
Algeria	83.17	100.00	73.75	71.20	61.77	61.52	42.11
Angola	58.89	55.12	56.23	55.28	53.33	56.35	34.31
Antigua and Barbuda	37.43	87.05	98.95	93.29	45.65	24.99	55.69
Argentina	52.10	57.68	58.04	52.99	48.24	51.47	53.33
Armenia	35.72	29.11	34.52	32.72	29.91	29.72	35.14
Australia	56.22	59.48	60.39	61.69	55.53	55.00	64.06
Austria	85.92	84.20	84.42	87.81	81.09	80.35	82.61
Azerbaijan	39.61	51.29	54.83	55.21	50.31	52.97	35.09
Bahrain	57.83	58.00	54.42	55.89	51.73	57.73	76.47
Bangladesh	25.90	30.06	29.26	25.81	24.67	25.04	18.28
Belarus	65.50	66.75	64.75	64.28	61.80	61.43	64.57
Belgium	75.70	75.03	77.95	81.68	79.81	78.97	78.31
Belize	21.20	22.54	21.09	11.50	14.97	20.30	23.04
Benin	3.42	4.47	6.27	14.79	12.46	20.63	9.85
Bhutan	20.77	22.60	20.73	19.41	26.19	45.93	11.87
Bolivia, Plurinational State of	37.38	43.02	40.09	42.20	39.25	43.36	29.07
Bosnia and Herzegovina	49.25	45.32	50.67	60.09	54.39	57.24	61.32
Botswana	35.90	43.57	23.09	23.52	27.15	24.69	28.13
Brazil	55.87	55.76	61.65	58.27	53.65	55.80	56.15
Bulgaria	52.81	55.62	54.78	52.99	51.01	50.26	55.16
Burkina Faso	3.12	8.55	14.01	8.72	0.89	25.99	18.11
Burundi	6.31	0.00	0.00	10.25	8.47	20.75	10.83
Cambodia	24.45	31.34	29.17	24.18	25.32	24.40	11.41
Cameroon	33.07	33.12	45.33	39.15	35.10	41.97	30.83
Canada	80.21	80.89	82.42	80.72	71.11	70.80	64.82
Cabo Verde	37.02	49.67	53.22	31.21	25.85	44.40	48.51
Central African Republic	8.02	13.20	16.61	9.78	5.77	7.62	12.17
Chad	1.02	4.68	7.83	6.81	49.63	39.25	25.09
Chile	31.70	35.66	39.31	34.68	31.51	27.44	30.69
China	62.82	64.14	70.88	73.79	72.35	72.50	75.36
Colombia	41.77	44.00	51.65	52.82	47.42	47.65	49.04
Comoros	16.96	25.08	5.67	3.10	4.31	7.63	0.48
Congo	56.98	49.45	54.16	53.56	47.06	50.81	34.68
Costa Rica	31.56	45.92	58.71	60.14	63.01	69.43	61.34
Côte d’Ivoire	14.78	20.81	24.05	14.26	22.48	28.49	24.41
Croatia	54.99	53.79	58.92	57.81	57.78	55.82	56.72

Country/territory	SI 1996	SI 1998	SI 2000	SI 2002	SI 2004	SI 2006	SI 2008
Cyprus	57.20	61.55	65.72	69.44	68.86	67.22	67.40
Czech Republic	76.54	79.40	84.18	86.22	79.70	80.47	82.54
Democratic Rep. of the Congo	14.52	14.94	26.19	24.46	20.24	20.27	15.80
Denmark	78.16	76.41	79.74	80.71	76.60	74.22	74.74
Djibouti	32.52	47.47	41.84	51.71	32.65	38.53	30.44
Dominica	31.67	37.06	37.19	38.89	31.80	34.30	31.54
Dominican Republic	34.79	38.65	40.90	41.49	38.36	40.85	48.39
Ecuador	33.39	33.11	45.18	39.90	40.44	43.97	32.81
Egypt	43.89	44.61	46.72	42.99	44.48	51.74	48.53
El Salvador	35.50	35.40	44.05	40.11	39.11	37.21	38.24
Equatorial Guinea	36.39	47.90	53.63	56.55	53.36	57.85	37.86
Eritrea	22.08	24.41	23.95	18.33	24.24	26.83	19.11
Estonia	60.61	63.14	77.39	66.96	66.61	64.07	65.92
Ethiopia	2.54	4.61	5.63	6.34	4.72	1.71	9.84
Fiji	22.15	26.46	27.21	29.46	27.50	27.17	30.26
Finland	93.13	89.38	100.00	95.72	88.71	86.75	88.33
France	80.67	79.40	83.91	84.52	78.06	78.07	77.21
Gabon	51.88	51.37	52.97	48.96	44.07	48.14	31.74
Gambia	23.93	22.09	19.74	24.40	30.18	13.62	28.53
Georgia	35.27	39.53	42.03	40.93	34.64	37.67	37.34
Germany	91.79	88.46	90.44	92.33	86.43	85.26	84.96
Ghana	17.41	23.59	21.31	8.39	10.17	13.79	9.74
Greece	46.82	50.75	54.30	54.13	55.13	55.48	58.66
Grenada	21.90	42.59	50.02	29.15	26.13	39.51	37.48
Guatemala	30.25	32.51	34.53	36.11	39.09	34.07	32.58
Guinea	16.24	17.84	20.00	19.41	15.71	20.81	10.35
Guinea-Bissau	18.98	34.84	37.76	23.10	22.99	14.10	14.96
Guyana	15.43	17.01	16.05	15.94	16.43	14.98	13.10
Honduras	24.18	26.05	26.00	24.27	22.53	22.82	25.03
Hong Kong SAR (China)	76.19	75.11	81.53	81.01	76.89	78.03	79.29
Hungary	68.01	77.81	86.98	88.73	83.67	82.13	82.97
Iceland	37.65	44.31	43.77	45.44	41.88	43.12	56.65
India	41.20	40.47	46.81	48.41	49.74	51.10	54.83
Ireland	95.67	84.90	93.27	100.00	100.00	100.00	100.00
Israel	61.66	61.55	70.38	62.35	62.70	58.99	68.04
Italy	79.29	77.79	80.81	79.01	75.97	76.06	76.65
Jamaica	21.50	24.59	24.92	21.94	20.76	23.93	27.67
Japan	100.00	93.42	98.77	98.07	90.15	89.47	88.69
Jordan	31.16	38.54	61.11	45.19	42.80	43.40	49.91
Kazakhstan	50.61	48.94	55.49	51.63	47.95	50.50	38.26
Kenya	24.08	25.48	23.88	35.78	29.46	26.63	27.27

Country/territory	SI 1996	SI 1998	SI 2000	SI 2002	SI 2004	SI 2006	SI 2008
Kiribati	3.71	11.95	13.10	20.51	25.70	29.73	27.00
Korea, Republic of	78.76	74.00	86.78	85.92	82.31	80.27	81.12
Kyrgyzstan	32.27	31.08	22.08	25.72	28.67	34.52	43.72
Lao People's Dem. Rep.	23.79	28.43	23.53	25.93	24.71	25.49	22.82
Latvia	53.87	51.89	54.27	54.57	55.91	60.82	64.62
Lebanon	52.94	51.31	48.93	47.01	45.46	42.79	49.36
Lesotho	30.15	34.54	31.72	28.61	25.15	24.63	18.18
Lithuania	57.55	59.57	58.50	55.69	55.99	58.89	61.97
Luxembourg	89.69	91.42	95.37	94.22	87.07	85.06	85.83
Madagascar	11.49	22.76	29.27	17.69	23.28	24.91	22.48
Malawi	3.51	4.41	6.63	1.73	4.31	0.00	0.00
Malaysia	81.94	77.07	85.74	84.53	75.13	75.83	64.17
Maldives	28.31	34.50	31.04	24.35	29.35	14.60	11.87
Mali	0.00	8.81	6.45	4.90	4.79	2.83	5.62
Mauritius	28.99	30.89	31.22	29.46	30.08	36.30	34.87
Mexico	76.15	76.41	83.95	82.59	73.17	72.01	71.01
Moldova, Republic of	37.19	41.01	40.65	40.17	38.51	45.31	45.39
Mongolia	19.90	28.83	28.31	21.88	20.74	20.43	17.87
Morocco	26.16	33.26	36.38	34.95	35.79	38.71	29.66
Mozambique	17.81	27.41	24.63	45.72	51.56	41.60	62.79
Namibia	25.51	29.79	26.67	26.21	28.88	26.86	26.53
Nepal	15.97	23.75	36.39	37.82	33.18	36.15	31.83
Netherlands	80.77	81.01	77.70	80.10	75.93	74.35	73.54
New Zealand	62.53	65.51	63.45	63.95	62.51	63.44	65.38
Nicaragua	33.30	20.07	19.35	33.34	23.79	16.08	24.89
Niger	25.78	26.29	17.45	13.62	7.03	12.15	2.18
Nigeria	60.46	59.58	60.02	57.74	53.89	55.84	33.31
Norway	70.76	73.93	65.54	66.01	60.63	62.53	50.03
Pakistan	31.32	34.47	37.57	36.17	34.94	31.66	31.86
Panama	26.32	29.44	33.17	31.35	22.29	19.20	20.13
Papua New Guinea	14.11	22.71	24.18	17.85	20.46	20.10	9.18
Paraguay	19.14	22.52	26.22	25.32	23.22	29.47	33.42
Peru	30.13	32.69	33.43	28.22	24.68	22.97	23.50
Philippines	78.75	77.24	88.60	87.08	78.85	79.80	72.71
Poland	62.69	64.28	71.67	70.36	68.95	68.76	72.88
Portugal	63.46	67.02	72.07	71.16	67.34	68.45	68.89
Romania	53.00	53.40	55.85	53.95	52.90	57.20	63.84
Russian Federation	75.35	79.69	65.15	63.43	55.95	57.96	50.76
Rwanda	8.65	3.08	2.13	0.00	4.57	3.50	6.52
Saint Kitts and Nevis	42.08	61.36	63.36	63.74	59.54	72.41	81.45
Saint Lucia	30.72	35.19	39.20	46.12	41.82	51.04	57.02
Saint Vincent and the Grenadines	29.91	31.35	32.72	27.83	28.31	29.52	38.99

Contents

Country/territory	SI 1996	SI 1998	SI 2000	SI 2002	SI 2004	SI 2006	SI 2008
Samoa	36.57	30.54	33.93	33.99	28.59	28.73	30.21
Saudi Arabia	64.11	64.85	60.42	61.72	58.94	58.67	39.63
Senegal	30.95	41.95	33.17	38.47	34.53	39.25	45.23
Seychelles	48.52	48.87	49.83	40.21	38.04	37.19	45.41
Sierra Leone	13.64	18.13	5.49	46.04	0.00	44.48	31.43
Singapore	97.04	86.61	93.84	93.62	87.05	86.70	80.77
Slovakia	70.99	74.00	78.12	76.66	73.09	74.98	78.51
Slovenia	79.54	79.28	83.71	82.82	80.06	79.10	82.15
Solomon Islands	8.63	18.55	19.08	11.93	6.71	4.31	2.17
South Africa	58.57	54.60	58.12	63.08	57.58	61.58	64.67
Spain	76.71	76.17	80.18	77.96	72.06	71.30	73.18
Sri Lanka	31.03	28.62	29.79	28.16	27.85	27.59	24.73
Sudan	12.77	18.48	40.99	38.96	40.09	43.10	33.44
Suriname	20.49	26.25	45.79	17.90	15.09	15.46	67.50
Swaziland	43.89	41.79	40.31	33.75	38.64	50.07	50.23
Sweden	94.85	90.07	95.82	94.27	87.96	84.68	85.42
Switzerland	96.90	89.48	98.54	95.27	97.68	96.95	95.68
Syrian Arab Republic	50.12	44.22	50.66	48.25	45.44	45.58	37.03
Tajikistan	22.11	47.44	45.56	51.64	36.28	60.08	54.28
Tanzania, United Rep. of	6.50	20.41	13.81	10.02	12.93	13.61	16.03
Thailand	65.26	65.30	71.56	72.23	67.27	68.23	65.55
The FYR of Macedonia	41.23	44.24	47.60	43.68	41.85	42.10	43.04
Togo	14.84	14.99	20.49	21.43	23.89	29.51	26.57
Tonga	16.32	20.03	31.29	12.73	15.42	13.97	16.40
Trinidad and Tobago	48.95	57.44	58.12	54.83	58.24	57.79	49.92
Tunisia	40.05	41.76	43.66	42.46	41.36	46.87	45.27
Turkey	48.38	49.61	54.41	55.22	55.05	57.28	60.00
Turkmenistan	71.30	46.58	67.73	60.91	63.40	61.38	39.77
Uganda	4.95	6.83	9.52	11.07	14.75	17.36	26.60
Ukraine	57.89	57.04	59.54	61.48	58.06	60.58	63.08
United Kingdom	85.99	82.59	86.80	89.33	81.22	82.18	79.55
United States	85.90	82.41	88.40	87.88	81.04	79.79	77.47
Uruguay	48.61	52.79	54.84	50.16	48.19	46.73	47.63
Uzbekistan	12.53	27.54	28.72	24.37	25.31	31.39	38.50
Venezuela, Bolivarian Republic of	56.59	60.66	58.08	57.92	52.21	56.09	35.74
Viet Nam	36.37	37.53	43.73	41.07	41.58	45.03	37.09
Yemen	59.28	57.89	58.76	55.65	51.86	54.90	37.72
Zambia	26.89	27.77	33.54	27.79	30.21	24.18	26.14

Part III

Industrial policy in the making: Design and implementation

Industrial policy as an effective development tool: Lessons from Brazil*

10

João Carlos Ferraz, David Kupfer and Felipe Silveira Marques

10.1 Industrial policy is back in the game

The literature on industrial policies is, to say the least, very passionate: pro and con arguments are usually constructed based on proponents' visions on the roles that the State and the market should play in economic development. The empirical evidence does not help much; it is not conclusive, leaving room for opposite interpretations – industrial policies are functional, or they are harmful to development.

In the context of the international financial crisis, however, policy-makers, academics and opinion leaders are becoming more receptive to policies that, until very recently, were shunned. Industrial policy is gaining priority on the public policy agenda, even if under such guises as innovation, green economy, local development, etc. However, behind most of these policy directions, two elements are always present: promotion of the competitiveness of firms and/or the defence of jobs in national economies.

In this revival of interest in industrial policy, despite the multiple dimensions of the theoretical or policy debate, a broad consensus underpins most justifications and initiatives: innovation-based competitiveness is a determining factor of economic development. That is, development is related to the economic transformation of a country, and economic transformation, in turn, comes out of technological change and from the knowledge content of economic activities, which is necessary to induce as well as to sustain productivity gains (Krugman, 1990; Lin and Monga, 2010; Mazzucato, 2013).

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* This article is dedicated to Alice Amsden. She left us too early.

But how is such a machine of growth put into motion? Do Schumpeterian entrepreneurs and market forces suffice? History offers rare cases of countries managing to overcome economic lethargy in the absence of an active State (Gerschenkron, 1962). For the most part, however, as Chang argues:

> ...developed countries did not get where they are now through the policies and the institutions that they recommend to developing countries today. Most of them actively used "bad" trade and industrial policies, such as infant industry protection and export subsidies (Chang, 2003, p. 2).

In fact, Amsden (2001, p. 185) argues, "[a]s a catch-up strategy, free trade appears to have been limited to Switzerland and Hong Kong". Evans (2010, p. 37) is even sharper: "History and development theory support the proposition 'no developmental state, no development'."

Drawing on the Brazilian experience, this chapter develops a threefold set of arguments: firstly, industrial policies must be put into use to induce economic development; secondly, policy effectiveness depends on the State's capabilities to support the evolution of the competences of firms; thirdly, a development bank capable of effectively providing long-term financing is a strategic asset of industrial policies.

The next section discusses some of the challenges that any industrial policy faces. Section 10.3 is an account of the recent Brazilian experience. Section 10.4 focuses on long-term financing and the role played by the Brazilian Development Bank (BNDES). The final section summarizes conclusions.

10.2 Persistent challenges of an industrial policy

10.2.1 Desires versus possibilities

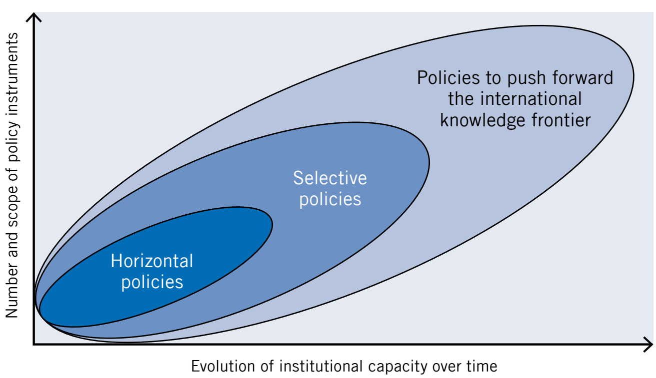
In any policy action, feasible goals based in a deep sense of reality are a necessity. These goals must consider simultaneously the level of development of two related dimensions: institutional capabilities and economic activities. The level of institutional capability – that is, the ability of (mostly) public institutions to deliver a proposed set of actions at a specific time – defines the potential scope of an effective industrial policy. Concurrently, the level of development of economic activities defines the potential capacity of the economic system to advance further.

Evolution of institutional capabilities and economic activities must be embedded in policy design, and policy goals must aim at a feasible transformation process. To a great extent, existing production capabilities at any given time in any country and sector define the possibilities for evolution and transformation. Leapfrogging is possible within the limitations imposed by the existing and potential competences to be explored. In other words, in an effective industrial policy, the boundaries of possibilities must constrain desires.

In this context, Peres and Primi (2009) discuss institutional capacity in relation to three types of policies: horizontal, selective (sectoral) and international competitive frontier, each characterized by different sets of instruments, targeting and institutional arrangements (see figure 10.1). Countries with only the most basic institutional capabilities may be capable of carrying out just simple horizontal policies such as tax deductions. As institutional capacities increase, they may engage in the promotion of selective policies. Eventually, as a set of economic activities of a country is near the international frontier, strong institutional capacities may be required to induce local firms and research institutions to push ahead the international frontier. Such a stylized matching of levels of state capabilities with generic types of industrial policies can make sense only if policies are effective.

In short, industrial policy design must take an evolutionary perspective of goals and ambitions. An industrial policy for economic transformation should be able to discern and act upon the different competitive challenges of various economic sectors, aiming at further progress as defined by the international competitive frontier. At the same time, the level of development of institutional capabilities delineates limitations on policy ambitions. These limitations must not be

Figure 10.1 Industrial policy framework: Objectives and institutional capacity



Source: Peres and Primi (2009).

taken as absolute and impassable restrictions; that would lead only to limited and defensive industrial policies or none at all. Rather, such limitations must be considered a starting point for designing and implementing industrial policies, with the vision to incorporate, in time, more ambitious goals as countries manage to climb to more advanced levels of capabilities. Along similar lines and focusing on potential transformation, Hausmann and Rodrik (2003) argue that, in order to promote structural change and economic development in the long term, it is necessary to give priority to investments in activities of greater knowledge density, but appropriate to existing levels of capabilities. This proposition finds support in the framework developed by Hidalgo and Hausmann (2009), in which they show that "the level of complexity of a country's economy predicts the types of products that countries will be able to develop in the future".

On a different level of discussion, should one type of policy or another be favoured? We argue that, in a context of open economies and a world in crisis, it is a strategic requirement to pursue public policies that make effective and efficient use of all available tools – horizontal, selective and other policy instruments – to induce industrial transformation. Various tools can be devised to help identify what activities might be fostered. Hausmann, Rodrik and Velasco (2008) propose the Growth Diagnostics Framework, an approach based on a decision tree methodology that identifies the most important constraints on growth for a given country and suggests how to isolate them and make them the focus of policy actions. Lin and Monga (2010) offer a model, largely of a macroeconomic nature, as the authors themselves point out, that proposes a step-by-step guide for policy-making based on a country's productive experience and potential capabilities in producing tradable goods and services.

10.2.2 Capture versus cooperation

Interaction and cooperation between state institutions and economic organizations are required if feasible objectives that find resonance in the real economy are to be put forward. The very notion that industrial policy can be "practised" without such cooperation and interaction is, to say the least, very undemocratic.

Coordination, however, is necessary to avoid capture. One of the most cogent criticisms made of industrial policies is the private sector's potential to "capture" the State. The easy way out – drawing from East Asian experiences – would be to defend the existence of an insulated bureaucracy in the State, disconnected from political pressures. However, the notion of "insulation" is not applicable to democratic and open societies in the twenty-first century. In this vein, Evans (1995),

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Stiglitz (1998) and Devlin and Moguillansky (2009) have emphasized that partnership and public–private alliances – that is, consultation and coordination between public and private institutions, focusing on concrete objectives – are necessary to avoid capture and to put policies on an effective course. At the same time, however, it would be naive to believe that the business sector and workers will not try to defend and lobby for their own interests. How can such a crucial dilemma be handled?

Three requirements may help to mitigate the risk of capture, to help keep the state autonomous, and to maintain relatively stable industrial policies. (State autonomy here is defined as the capacity of a democratically elected administration to pursue the goals and priorities that were sanctioned by its election). First, in each and every stage of a policy process – from diagnosis through design, implementation and assessment – the role of public and private agents must be made explicit, with formal rules that segregate public and private responsibilities and functions. Second, every policy action must state the expected benefits and the obligations of all involved, making clear the implications for each stakeholder and what will be the counterparts to be provided by the beneficiaries of policies. Third, mechanisms of oversight and monitoring should be in place in order to improve transparency and accountability of public actions.

10.2.3 Can industrial policy be effective?

In the academic and public debate over industrial policy, not much is discussed about a central dimension: the determinants and the challenges of policy implementation. The literature consistently underestimates how much the success of an industrial policy depends on implementation rather than on the policy concept.

According to Coutinho et al. (2012), the arsenal of any industrial policy comprises six policy instruments: financing, tax, trade-related measures, public procurement, technical and informational assistance, and regulation. Financing conditions – interest rates, loan duration, the availability of equity and venture capital funds, etc. – determine the cost of capital. The structure of a tax system defines incentives for firms to run a business. Trade-related measures – tariffs and non-tariff measures – define conditions for more or less competition in world trade. Procurement by public authorities may or may not induce the development of local competencies. Technical support may provide information that enables firms to define a business plan in a given direction. Regulations on competition, consumer protection, environment and intellectual property define the rules of the game on a given playing field. Each policy instrument per se or in a package can be a powerful tool to induce competitiveness, or they can lead to capture, generating undesirable rents for a group of agents to the detriment of a wider constituency.

The usual debate on industrial policy has been, in fact, concentrated on dilemmas of this sort: Which instruments are relevant, and how can the State be more effective? From a pragmatic perspective, it seems unnecessary to circumscribe, a priori, the arsenal of an industrial policy to a limited set of instruments if all or some of them can be means to attaining a policy goal. But, to define which are relevant, it is necessary to bring to bear an analytical perspective drawn from the literature on competition and industrial organization.

Coutinho and Ferraz (1994) and Ferraz, Kupfer and Haguenauer (1996) have demonstrated that the aforementioned set of policy instruments may be more or less relevant depending on the nature of a given economic activity and on the level of development of the firms in specific sectors. For example, patents are crucial in the pharmaceutical industry but less relevant for mining. Environmental regulations are crucial to mining but less so for software development. The argument here is that the essential features of competition and the profile of the industrial organization of an economic activity define, to a great extent, which policy instruments are relevant to induce the development of firms.

Still, even if it is possible to determine theoretically which policy instruments are relevant, if industrial policies should aim at the evolution of productive structures towards higher productivity and knowledge content, then an effective policy framework must, first, design objectives starting with the assets that a given set of firms possesses at a given time. Second, there must be close correspondence between policy objectives and institutional capabilities. Development arises not only from the evolution of the capabilities of firms to innovate, but also from the evolution of the capabilities of policy institutions. From this perspective, policy effectiveness is determined partly by the extent to which policy objectives are, at a given time, within the reach of existing capabilities in policy-making (and implementation). At the same time, policy should incorporate the means to tackle existing shortcomings in policy institutions and advance towards more ambitious goals.

Stiglitz (1998) proposes a "policy prescription" for policy-makers: (i) recognize that "development" presupposes feasible and attainable targets; (ii) make explicit the existing restrictions related to available resources and capabilities for policy-making – or policy implementing; (iii) design policies within the bounds of initial constraints, but establish high-priority targets to gradually overcome institutional bottlenecks; (iv) even if existing limitations must be accepted, institutional shortcomings must not justify the lack of initiatives aimed at building the capabilities required for more complex policy objectives.

10.3 Flexible continuity: An account of the recent Brazilian experience

A development framework has emerged in Brazil since 2004 and is still undergoing consolidation. It is marked by four major features: (i) maintenance and consolidation of a democratic process, with anchor institutions that ensure the respect of contracts and transparency in public dealings; (ii) macroeconomic stability, made up of three components: inflation targeting, flexible exchange rates and fiscal responsibility; (iii) economic and social inclusion, leading to the consolidation of a national mass consumption market; (iv) inducement to invest, especially in areas, such as infrastructure and education, that will systematically increase competitiveness and welfare. In Brazil industrial policy is part of such a development framework.

10.3.1 The period 2004–10

Since 2004 a series of three different industrial policies have been put in place (see table 10.1):

- PITCE – *Política Industrial, Tecnológica e de Comércio Exterior* (2004–07), when the institutional basis was reformed and modernized;
- PDP – *Política de Desenvolvimento Produtivo* (2008–10), aimed at fostering investment (which was quite functional in the face of the international financial crisis; and
- PBM – *Plano Brasil Maior* (2011–14), focused on the aggregation of value through innovation.

Given that the political configuration of two Lula administrations and the 2011–14 Dilma administration is the same, an important question is: Why so many changes? A prompt answer: These three sets of policies were responses to different economic challenges that marked the periods when they were launched.

The PITCE (2004–07) was the initial attempt to bring industry back to the priority policy agenda after many years of absence. It was designed to deal with Brazil's longstanding weaknesses, focusing on activities (innovation) and sectors (capital goods, electronics, pharmaceutical, software) that should be strengthened. Its main contribution was to set up a new institutional framework, including legislation to induce innovation; a high-level tripartite forum to promote consensus on industrial strategies and priorities; and the creation of facilitating agencies to promote industrial development and exports.

Table 10.1 Industrial policies in Brazil, 2004–14

Policy	PITCE (2004–07)	PDP (2008–10)	PBM (2011–14)
Economic conditions	– Slow GDP growth (average 1.7% 2001–03) – External account restrictions	– High GDP growth (average 5.1% 2006–08) – Improvements in terms of trade	– Moderate GDP growth (average 3.3% in 2009–11) – Raising industrial imports
Focus, goals and institutional framework	– Selected sectors – Creation of an institutional support system	– Large number of sectors – Focus on investment and the management of the international crisis	– Large number of sectors – Defence of the internal market and fostering systemic competitiveness

Source: Authors' elaboration, based on Kupfer, Ferraz and Marques (2013).

The PDP (2008–10) was put in place in a context of economic growth and an abundance of foreign currency afforded by improvement in terms of trade. The policy focused on fostering investment and sustaining the growth cycle. The policy maintained focus on the sectors promoted through the PITCE, but a wider range of sectors could benefit.[1] Investment in all those sectors was the main focus of the PDP. The institutional set-up was then very instrumental in mobilizing action once the international crisis came.

The PBM (2011–14) phase is marked by the continuation of the international crisis and fierce competition from imports. Emphasis has been placed on the local aggregation of value added, with actions designed to promote the competitive position of local firms and to improve the systemic conditions for competitiveness.

Kupfer, Ferraz and Marques (2013) explain the main features of these policy experiments. For the purpose of this discussion, three attributes are important. First, continuity with flexibility: innovation and competitiveness have been priorities in all three iterations of Brazilian policies. Nevertheless, policy emphasis and organization have been modified to take up unexpected challenges, especially those arriving from the international front. Second, concern and efforts to define explicit goals, to mobilize the relevant policy instruments and to interact with the business sector and workers have increased. Third, industrial policies became increasingly meshed with other development policies such as science and technology, education, environment and infrastructure. They share common goals and implement policy instruments in a concerted manner. This is the case, for

[1] Coutinho et al. (2012) and Ministry of Development (2008) explain the focus and sectoral organization of PDP.

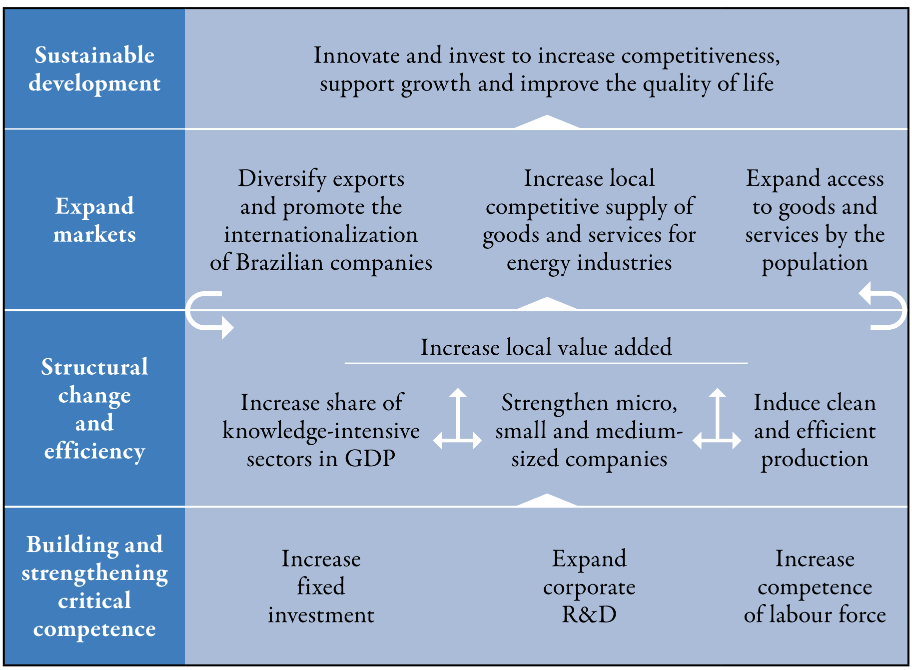
example, with financial instruments to foster low carbon emissions; the design and implementation of innovation programs to support selected policy goals such as second-generation ethanol and the fostering of a local supply industry to serve infrastructure projects.

10.3.2 The current industrial policy: Plano Brasil Maior (2011–14)

PBM has ten strategic objectives, which are divided into three dimensions (competences, structural change and efficiency, and market expansion) that contribute to the overall target of sustainable development (figure 10.2) (Ministry of Development, 2011).

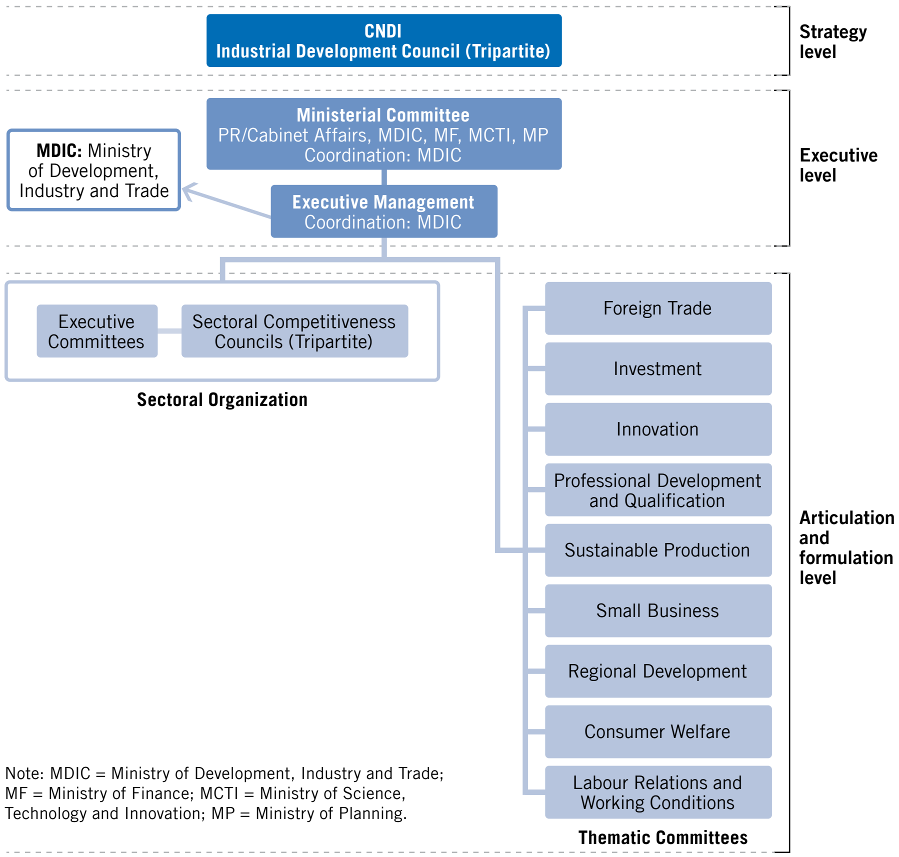
These three dimensions are conceptually linked. The first dimension, *competences*, encompasses objectives related to capacity building. Increased fixed investment, as well as corporate research and development (R&D) and workers' skills, are essential components of competitive competences. Strengthening

Figure 10.2 PBM strategic map



Source: Ministry of Development (2011). Available at: http://www.brasilmaior.mdic.gov.br/

Figure 10.3 PBM configuration



Note: MDIC = Ministry of Development, Industry and Trade; MF = Ministry of Finance; MCTI = Ministry of Science, Technology and Innovation; MP = Ministry of Planning.

Source: Ministry of Development (2011). Available at: http://www.brasilmaior.mdic.gov.br

critical competences leads to the second dimension, *structural change and efficiency*, which includes increasing value added, developing knowledge-intensive sectors, strengthening small and medium-sized companies, and supporting clean production. Higher competitiveness should then lead to a concomitant *market expansion* – both domestic expansion, by increasing access to quality goods for the local population, and export diversification and internationalization of firms. The PBM gives special emphasis to energy-related industries. These three dimensions, with their strategic objectives, lead to the ultimate goal of the PBM: “Innovate and invest to increase competitiveness, support growth and improve the quality of life.” The PBM strategic map is used to guide the work programme of state agencies and to organize the debate among stakeholders to develop consensus on priorities.

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Interaction among government agencies, the private sector and other stakeholders is essential for the effectiveness of PBM and is reflected in its configuration (figure 10.3). Representatives of the President's Chief of Cabinet, Ministry of Finance, Ministry of Science and Technology, Ministry of Planning and, of course, Ministry of Development, Industry and Trade form PBM's Executive Committee. They are in charge of ensuring the execution of policy directives defined by PBM and confirmed by the National Council for Industrial Development (CNDI). Responsibility for interaction with the business sector and workers is placed in the CNDI, PBM's highest advisory level, and in the 19 Sectoral Competitiveness Councils.[2]

10.3.3 Quantifying policy implementation

The *Política de Desenvolvimento Produtiv*o (PDP), 2008–10, proposed 425 policy measures under its framework. Practically all of them (420) were made fully operational. Only 31 measures were announced when the policy was launched. The other 389 were developed and implemented after launch, up through the end of 2010. To a great extent, PDP's effectiveness can be explained, first, by the political priority given by the Lula Administration to the industrial policy; second, by the commitment to it by relevant ministries, in particular the Ministries of Trade and Industry, Science and Technology and Finance; and, third, by the management system put in place to ensure the implementation of the proposed measures. An online information system, developed by the Brazilian Agency for Industrial Development (ABDI), reported the progress of each measure proposed under PDP.

The current policy, *Plano Brasil Maior* (PBM), was launched with 36 policy measures; 28 are fully operational. By April 2013 another 263 measures had been announced and included in the PBM working plan. Implementation is facilitated by the commitment of public institutions to the policy goals. These alignments can come about when the relevant agencies are part of the policy organization and concur on the diagnoses of the emerging challenges and the possible prescriptions for corrective actions.

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[2] PBM has 19 Sectoral Competitiveness Councils, divided in five groups of productive systems: (i) Knowledge Intensive Systems: Mechanical Engineering, Electro-electronics, Supply Chain for Oil & Gas and Shipbuilding; Health Complex; Automotive; Aeronautics and Defense Industries; Capital Goods; and Information and Communication Technologies – ICT; (ii) Scale-Intensive Systems: Chemical–Petrochemical; Bio-ethanol and Renewable Energies; Personal Grooming and Cosmetics; Mining; Metallurgy; and Pulp and Paper; (iii) Labor-Intensive Systems: Footwear, Textile and Apparel; Furniture; and Civil Construction Complex; (iv) Agribusiness Systems; and (v) Trade, Logistics and Services: Wholesale; Trade Logistics; and Services.

10.4 Development bank: A strategic asset of industrial policies

Long-term financing has strategic importance: it can foster more and better work opportunities, infrastructure, and competitive capabilities. If markets are shallow, incomplete or "fail", a development bank is an essential instrument to foster sustainability, investment and accumulation of competences. If financial markets are procyclical, development banks can act in times of credit crunch. If investors are always eager to reap quick returns, development banks, in contrast, are patient.[3] These are some of the arguments for development banks and for providing them with resources and instruments needed to face the challenges of growth.

The Brazilian Development Bank (BNDES) is the main provider of long-term financing in the country, holding two-thirds of credit with a maturity of over five years. It is a fully state-owned company under private law, with institutional funding[4] and 2,700 employees.[5] BNDES is quite efficient and among the world's largest development banks in terms of assets and loan portfolio (table 10.2).

However, more than absolute size, it is the availability of instruments that a development bank operates with that defines its relevance for an industrial policy.[6] That is, both scale and scope matter. BNDES has an extensive range of financial instruments, offering: (i) direct financing support for large-scale industrial and infrastructure projects (credit and project finance), (ii) commercialization of machinery and equipment through commercial banks, (iii) support for the export of engineering-intensive goods and services, (iv) credit for micro and small companies' finance and guarantee funds, (v) equity and venture capital funds and direct investment in firms, always maintaining a minority stake.

This large scope of products enables BNDES to face Brazil's various industrial challenges. Priority PBM sectors were granted, on average, about 80 per cent of BNDES' disbursements between 2006 and 2012. Knowledge- and engineering-intensive sectors (Mechanical Engineering, Electrical and Electronic and Health Industries[7]) accounted for about 30 per cent of total disbursements (figure 10.4).

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[3] Ferraz et al. (2013) analyse BNDES' countercyclical role in 2008–09.

[4] The FAT, the Workers Assistance Fund, is the institutional funding of BNDES. FAT is a fund, established by the government in 1988, based on social tax contribution from the net operating revenues of all Brazilian enterprises. FAT transfer to BNDES is independent of the federal budget and is done at undetermined terms, resulting in a quasi-equity funding mechanism.

[5] More on BNDES history can be found in BNDES (2013).

[6] Ferraz et al. (2013) discusses BNDES' role and challenges in financing development.

[7] The Mechanical Engineering, Electrical and Electronic and Health Industries, because of their knowledge- and engineering-intensive component, have been grouped together in the *Brasil Maior* Plan. They correspond to the following sectors: Oil & Gas and Shipping (supply sector); Health Sector (pharmaceuticals, medicine, medical and hospital equipment as well as health services); Automotive; Aeronautics as well

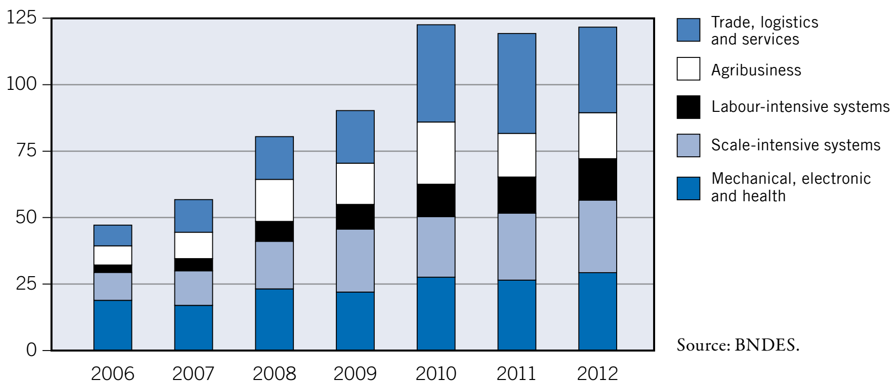
Table 10.2 Statistics of national development banks in four countries, 2012 (in US$ million*)

	BNDES (Brazil)	**KFW (Germany)**	**CDB (China)**	**KDB (Rep. of Korea)**
Total assets	367 825	657 347	1 191 597	147 067
Loan portfolio	254 019	526 401	1 016 959	85 572
Net income	3 009	3 063	9 995	836
Return on assets (%)	0.90	0.47	0.92	0.50
Non-performing loans (%)	0.06	0.21	0.30	1.60
Date established	1952	1948	1994	1954
Number of employees	2 853	5 190	8 038	n.a.

* At 2012 average exchange rate.

Source: Balance sheets of BNDES, Kreditanstalt für Wiederaufbau (KfW), China Development Bank (CDB) and Korea Development Bank (KDB).

Figure 10.4 BNDES disbursements to PBM's production systems (in R$ billion)



Source: BNDES.

The effect of the international crisis on BNDES' disbursements to productive sectors was a small reduction related to scale-intensive[8] and agribusiness industries that are highly exposed to foreign demand. At the same time, with the expansion of the internal market due to the increasing purchasing power of the population, the share of Commerce, Logistics and Services has increased steadily over the years.

Besides allocating financing to priority sectors, BNDES contributes to fostering investments and job creation in Brazil. Recent studies show that firms financed

as Defence and Aerospace Sector; Mechanical engineering capital goods; Electrical and Electronic; and Information and Communication Technologies (ICTs).

[8] These include Chemicals; Renewable Energy; Personal Hygiene, Perfume and Cosmetics (HPPC); Mining; Metals; and Pulp and Paper.

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by BNDES raised investments 10 percentage points higher than unsupported firms with very similar corporate profiles (Coutinho, 2013). A similar effect was found in job creation by small firms: compared with unsupported firms, BNDES-financed firms expanded formal jobs by 10 more percentage points (Machado and Parreiras, 2013).

10.5 Conclusions

From the Brazilian experience, general lessons can be drawn. First, industrial policy is an essential component of a national strategy towards sustainable development, just as policies on infrastructure, education and science and technology are essential. Second, once political priority is placed on industrial policy, full commitment and close cooperation among relevant ministries and agencies are necessary, as is interaction with the private sector, provided that roles, compromises, benefits and counterparts are explicitly agreed and made public. Third, the importance of policy implementation cannot be underestimated: public agencies must have well-defined goals and responsibilities as well as efficient technical competences and negotiating skills. In particular, policy-makers should pay particular attention to the challenges of coordination and information-sharing. Finally, the availability of the necessary instruments to implement policy is of key importance, in particular the presence of an efficient and effective development bank to provide long-term financing for economic transformation.

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The State and industrial policy in Chinese economic development

11

Dic Lo and Mei Wu

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11.1 Introduction

The explanation of Chinese economic development over the past three decades, i.e. the era of market reform and increasing integration into the world market, has been a matter of scholarly debate. There exists a substantial body of studies that highlight the crucial role of the State in the development process (see, for example, Felipe et al., 2010; Gabriele, 2010; Heilmann, 2009; Kotz, 2005; Poon, 2009). These include studies that are in the tradition of theories of industrial policy that have been developed with reference to the broader experience of East Asian industrialization.

Conceptually, industrial policy is usually defined as addressing structural change of the economy – sustained rapid industrialization, in the Chinese case. But structural change is necessarily a complex process with multiple determinants, most importantly the productivity and demand regimes in question as well as the underlying institutional framework. Therefore, assessing the role of the State in the development process requires an analysis of the coherence of state influences over these multiple determinants. To ascertain the efficacy of state industrial policy further requires analysis of the appropriate match – or mismatch – between the policy design and implementation, on the one hand, and the interaction of these multiple determinants, on the other.

This chapter endeavours to show that the role of the State in Chinese economic development has been complex and multifaceted. It is much more than a case of East Asian-type industrial policy in action, where the State practises selective intervention in business activities with a view to promoting the development of targeted industries or projects. We seek to show that state influences on

Chinese economic development have taken the form of both creating the enabling environment and direct intervention, the latter encompassing industrial policy. We argue that, on the whole, the State has played a significantly positive role in Chinese economic development – in terms of promoting structural change and thereby growth in productivity and employment. There are, however, important policy lessons to learn from the complexities of the experience, which includes both successes and failures.

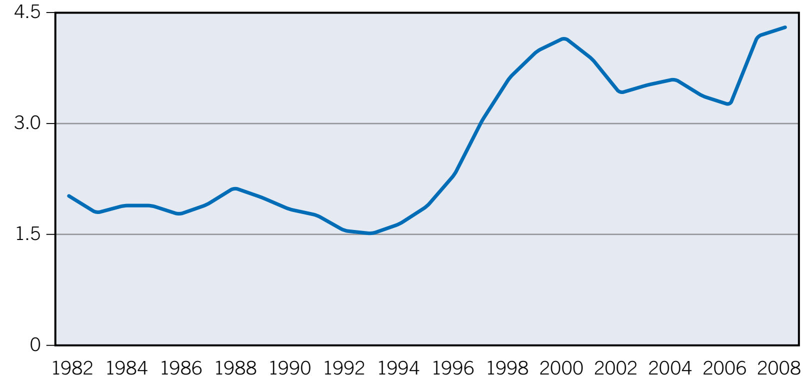
The chapter is organized in five sections. Following this introduction, section 11.2 identifies four main stylized facts of Chinese economic transformation that are posited to form the foundation for any plausible inquiry into the role of the State in the development process. The section then discusses the implications of, and relationships between, these stylized facts, with reference to the industrial policy literature and broader theories. Section 11.3 analyses the specific actions of the State with respect to promoting industrialization, at the levels of creating the enabling environment and direct intervention. It also analyses the efficacy of industrial policy with reference to the development experiences of three particular industries – automobile, semiconductor, and high-speed railways. Section 11.4 turns to discussion of the related issue of the evolution of the policy orientation of the State, particularly with respect to labour compensation and protection. Section 11.5 sums up.

11.2 Stylized facts of Chinese economic transformation and implications

Industrial policy, and state economic actions in general, can have positive, neutral or negative effects on economic development, depending on the nature of the overall process of structural transformation. In the Chinese case, any analysis of the role of the State and state industrial policy in the development process of the past three decades must take into consideration the following four important stylized facts (Lo and Li, 2011; Lo and Zhang, 2011).

Structural change. Chinese economic development has undergone a transition from labour-intensive industrialization in the first half of the reform era, circa 1978–92, to capital-deepening industrialization in the second half. Figure 11.1 charts the evolution of the incremental capital–output ratio (ICOR) of the Chinese economy. It is apparent that the economic growth path was characterized by the substitution of labour for capital in production in the first half of the reform era but has shifted to rely on capital deepening from the early 1990s onward.

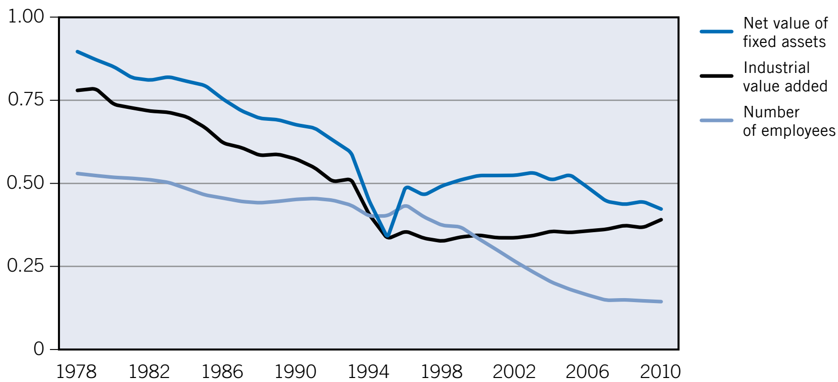
Figure 11.1 Incremental capital-output ratio (five-year moving averages), 1982–2008



Note: $ICOR = dK/dY$, where $dK = I$ = total fixed asset investment, dY = GDP of current year minus GDP of the previous year.

Source: *China Statistical Yearbook*, various years.

Figure 11.2 Shares of state-owned enterprises in output, employment and capital of total industry, 1978–2010



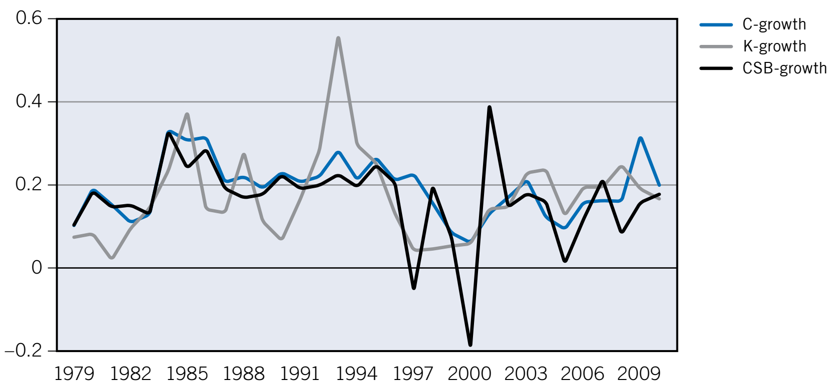
Note: A significant proportion of non-state-owned enterprises also have state agents as the ultimate owners–controllers.

Source: *China Statistical Yearbook*, various years.

State ownership and control over economic activities. State ownership predominated in the first half of the reform era and has remained a significant part of the economy in the second half. For industry alone, the value added share accounted for by state-owned enterprises (SOEs) underwent a secular decline from 78 per cent in 1978 to 32 per cent in 1998. Thereafter, the share has increased steadily, reaching 38 per cent by 2010 (figure 11.2). What has remained of state industry is mostly large-scale, capital-intensive SOEs, as indicated by the fact that the capital share of SOEs has significantly exceeded the output share, whereas the employment share has been far lower, i.e. SOEs are characterized by a much higher capital-labour ratio than other enterprises. SOEs have continued to control the “commanding heights” of Chinese industry. In the meantime, perhaps of equal importance is the continuing state control over the allocation of the financial resources of the economy. As of 2010 state banks still, directly or indirectly, accounted for more than 70 per cent of the total assets of the banking sector (Lo and Jiang, 2011). And the banking sector has remained the predominant part of the financial system as a whole.

State capacity. On the whole, decentralization of state power has characterized the Chinese economic transformation. Local governments at different levels have been powerful players in economic decision-making. The interaction between central and local governments – sometimes synergic, sometimes mutually defeating – has thus had strong influences over the direction and pace of economic development. These influences should be seen in the broader context of continuous market liberalization. State firms have become increasingly profit-oriented over the reform era. This shift has taken place amid the continuous expansion of non-state firms as well as the increase in competition in the market environment due to both internal and external liberalization. The character of these attributes of market liberalization is difficult to gauge in a clear and straightforward way. One possible indication is the working of the commercialized (and partly privatized) state banks, which are representative of the workings

Figure 11.3 Annual growth of capital formation and bank loans, 1979–2009



Note: K-growth = growth of gross fixed capital formation, C-growth = growth of year-end outstanding loans of the total banking sector, CSB-growth = growth of year-end outstanding loans of state banks.
Source: *China Statistical Yearbook*, various years.

of the mixed economic system. Figure 11.3 shows the annual growth of fixed-asset investment and total outstanding loans by state banks and the banking sector as a whole. Two important characteristics of the workings of the banks, and state banks in particular, are discernible. First, they have exhibited an inclination towards severe fluctuations between expansion and contraction – an amplified phenomenon of Minskyan-type financial instability that characterizes the notional market system. Second, they have been strongly supportive of productive investment over the long term. It is this system that the State has to work with in its action for promoting industrialization.[1]

Evolution of demand regimes. It is well known that Chinese economic development in the first half of the reform era was mainly consumption-led, but it has become mainly investment-led (and, to a much lesser extent, export-led) since the early 1990s (Lo and Zhang, 2011). The share of aggregate expenditures accounted for by final consumption decreased by more than 10 percentage points from the first period to the second. Nevertheless, in both periods the reformed economic system has been able to provide the necessary demand conditions for industrialization – for promoting productive investment and for underpinning the increasing returns of the established industries. It should be noted that China started its reform era with one of the highest industry-to-GDP ratios in the world in the late 1970s and has witnessed a process of sustained rapid industrialization throughout the three decades that have followed.

What are the implications of these stylized facts for assessing the role of the State and of state industrial policy in Chinese economic development? In the first place, the stylized fact concerning structural change is immediately relevant to the literature on East Asian-type industrial policy, which has been dominated by the debate over comparative advantage-following (CAF) versus comparative advantage-defying (CAD) strategies (see the exchange in Lin and Chang, 2009). It seems reasonable to conclude that Chinese industrialization in the first half of the reform era was on a CAF path, whilst that in the second half has been on a CAD path. Even if this judgement is valid, however, analysing the CAF–CAD characteristics of structural change might be insufficient to ascertain the role of industrial policy. Theoretically, it could be argued that a CAF path of structural change is in line with market principles (although this begs the question of whether the market can actually produce such outcomes). Even so, it does not follow that a CAD path of structural change must be the product of state intervention or, more

[1] For further details on the characteristics of Chinese finance and state actions to curb excessive fluctuations and promote productive investment, see Lo and Jiang (2011).

specifically, of state industrial policy. In a world of increasing returns and demand-led productivity growth, the demand regimes matter in shaping the path of structural change. Thus, the question remains as to what, in the Chinese experience, has been the role of state actions in shaping the evolution of the demand regimes, as characterized in the fourth stylized fact.

Meanwhile, the industrial policy literature also addresses the conditions for the working of alternative development policies. In particular, there is the further debate on the developmental state versus crony capitalism. Stylized facts two and three, concerning the position of the State in the economic system, must be taken into account in a coherent framework of analysis. Whereas the existence of a sizeable state sector provides a powerful means for state intervention in shaping the directions of economic development, the economic agents in question – the enterprises, state banks, and local governments of different levels – might not necessarily work in line with the character of the developmental state. It is evident that, in the context of a mixed system associated with stylized facts two and three, these agents have from time to time fluctuated among characteristics of short-term profit orientation, long-term developmental concerns, and rent-seeking and crony capitalism. Ascertaining the role of the State and state industrial policy in the transformation process requires an analysis of the conditions that allow one set of characteristics to dominate the others.

The preceding discussion can be related to the literature of competing policy doctrines and theoretical positions concerning late industrialization. A convenient way to review this hotly contested issue is to start with the "orthodox" position, known as the Washington Consensus. Its canonical policy doctrine in this particular area, "trade regime neutrality" as an industrialization strategy, hinges on the assumption that technological transfer and thereby economic development is an automatic outcome of the market (Lo, 2012). This doctrine is consistent with standard neoclassical growth theory. But, even within neoclassical economics, the mainstream of theories of endogenous technological change suggests that technology is mainly the product of investment, and business investment typically presupposes some degree of exclusive rights over the utilization of the product (Romer, 1994). Hence, technological development necessarily requires the existence of a policy–institutional environment that is not confined to the market.

More recently, a modified position from the Washington institutions has been advocated by World Bank chief economist Justin Yifu Lin and shared by economists such as Dani Rodrik and Joseph Stiglitz. The central proposition is that structural change in line with the principle of comparative advantage (i.e. CAF) might not always materialize, because of market failures in delivering the necessary technological development. Thus, it follows that there is a need for some forms of market-friendly government intervention to foster industrialization (Lin, 2010).

Yet another position further from the orthodox view is embodied in the theories of industrial policy associated with the work of economists such as Alice Amsden, Ha-Joon Chang, Ajit Singh and Robert Wade. The central proposition is that, given the importance of dynamic increasing returns and economies of scale and scope in economic development, industrialization is more than realizing the principle of comparative advantage, Hence, there is the need for market-orienting government intervention to foster industrialization, i.e. to deliberately distort the market in order to promote technological development (Chang, 2009). The precise means can vary, but the general point is for the government to create "economic rents" (for a clearly defined period) that are awarded to firms with good performance in technological and economic development.

Finally, the position of theories of the "national innovation system", most clearly framed by William Lazonick (2004 and 2009), puts technological development at the centre of industrialization. The central proposition is that, in the era of the information revolution, the precondition for late development is the building up, not just of production capacity as such, but also of the innovation capability for absorbing, assimilating and improving upon imported technology. This requires a range of long-term oriented business institutions in addition to government promotion.

Across the various positions summarized above, there is a progressive shift from pure theory to realism. The Washington Consensus and the modified positions of the Washington institutions implicitly assume a pure market within which productivity-improving structural change takes place. The theories of industrial policy and the "national innovation system", in contrast, are more aware of the complex and shifting nature of the world market in reality. In particular, in recent years an influential view has emerged claiming that the process of globalization, including North–South economic relations, has been increasingly shaped by financialization (Wade, 2006 and 2008). The rising predominance of speculative financial activities implies a tendency of short-termism, i.e. capital is increasingly forced to minimize fixed investment and demand "flexibility" in the productive sector (especially in labour employment). From the perspective of developing economies, therefore, relying solely on the working of the market might make it difficult for their industries to move out of the assembling stage and up the value added ladder. More important, in the context of financialization and the associated pressing demand for flexibility, developing economies need to find appropriate ways to raise their productivity fast enough to avoid being stuck in the "race to the bottom" in the world market (Lo, 2012).

11.3 The strength and limitation of state industrial policy in action

Against the background described above, the role of the State in Chinese economic transformation can be inferred from its action/inaction in two different respects. The first concerns its role in the creation of an appropriate condition (i.e. enabling environment), or otherwise, for industrialization. The second concerns its direct intervention in the process of industrialization.[2]

In the first half of the reform era, state action in the first respect and inaction in the second respect were the norm. Based on the capital accumulation of the pre-reform era, i.e. the building-up of a vast capital goods sector in the 1950s–1970s, it was possible to let economic development follow a path of consumption-led, labour-intensive industrialization. This path broadly accorded with the principle of comparative advantage. It arose mainly through the market-directed, explosive expansion of collectively owned rural (township and village) enterprises. The action of the State focused on fostering market reform, with SOEs being designated to take up the burden of the adjustment cost associated with the reform. SOEs together with state banks were responsible for sustaining the existing pattern of egalitarian income distribution. They provided job security and social services for virtually the entire urban population, thus fostering the "consumption revolution", which was essential for the industrialization drive of that period.

In the second half of the reform era, state intervention was evident in both respects – after a painful, neoliberal process of restructuring public finance, SOEs and state banks in the mid-1990s. Public finance took the lead in massive infrastructural investment and investment in industrial upgrading. This gave rise to the path of capital-deepening, investment-led industrialization, carried out mainly by SOEs in upstream materials industries and transnational corporations (TNCs) in high-tech industries. What remained of SOEs was mostly big firms with a profit orientation; these characteristics fit well with the prevailing path of industrialization. Commercialized state banks, whilst for a time becoming reluctant to lend to productive activities, had to get back to industry because of severe state restrictions on the scope of speculative activities and capital flight.

The strength or limitation, and success or failure, of China's state industrial policy can be assessed in this context. In the first half of the reform era, the State's broad policy of promoting manufacturing exports (to substitute for primary commodities) was evidently a success. Meanwhile, the specific, or selective, Japanese–Korean-type policy of promoting the development of some particular sectors or

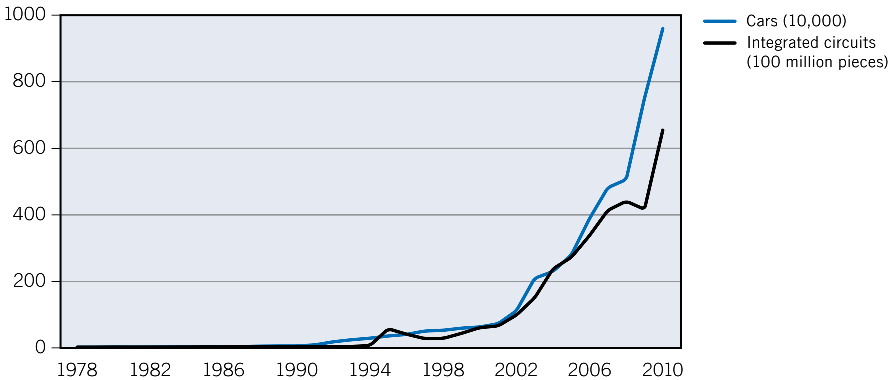
[2] The discussion in the next three paragraphs draws on Lo and Zhang (2011), which provides further details.

projects was evidently a failure in China. Entering the second half of the reform era, both broad and selective state policies have seemed to succeed in promoting industrialization. Market-based incentives together with fast productivity growth have been sufficient to promote the export of manufactures. Also, state industrial policy targeting the development of particular industries has appeared largely to have achieved its objectives. Over the reform era as a whole, the success or failure (and the strength and limitation) of state industrial policy has been determined by the following two conditions working together: the sufficiency (or insufficiency) of the enabling policy environment, and the nature of the economic agents that undertook the actual activities selected (e.g. SOEs, private firms, TNCs). The development experiences of the following three industries, which we will be analysed in some detail – automobile, semiconductor, and high-speed railway – appear to substantiate this conclusion.

Before we turn to the three case studies, however, it will be useful to quickly summarize the evolution of official positions on industrial policy over the reform era. The first state document to explicitly use the term "industrial policy" was the seventh Five-Year Plan (1986–90). In 1989 the State Council released the document *Decisions on the Important Issues of Current Industrial Policies*, which stated that industrial policies would be used to enhance industrialization and macro controls. This idea was made concrete in the subsequent eighth Five-Year Plan (1991–95). The State Council, in the document entitled *Outline of National Industrial Policy in 1990s*, published in 1994, stated that industrial policies would be used to promote the development of the "pillar industries" of the economy. Nevertheless, the mid-1990s was a period of neoliberalization, with state efforts focusing on internal and external market liberalization (mass privatization of SOEs, commercialization of state banks, restructuring of public finance, liberalization of foreign trade and the current account, etc.). It was really starting from the tenth Five-Year Plan period, 2001–05, that industrial policies in the spirit of selective intervention were put into practice on a systematic scale. The 16th National Congress of the Communist Party in 2002 put forward the notion of pursuing "a new path of industrialization", with emphasis on the development of science and technology capabilities, environmentally friendly and resources-saving technology, and information engineering and related industries. The culmination of these emphases was in the speech by President Hu Jintao in 2006, entitled "Medium- to Long-Term Plan for the Development of Science and Technology". It set out the target of transforming China into an "innovation society" by the year 2020.

As forerunners of the practice of state industrial policy in China, the development experiences of the automobile and semiconductor industries are revealing. The automobile industry had its industrial policy as early as 1987, which was

Figure 11.4 Output of cars and integrated circuits, 1978–2010

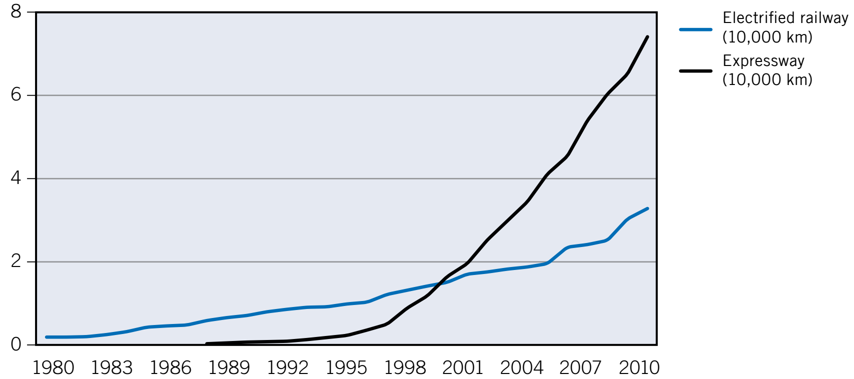


Source: *China Statistical Yearbook*, various years.

subsequently refined into a fully fledged version in 1994. The main thrust of the policy was the strategy of "market protection in exchange for technology transfer". Protection from imports, and from the pressure of market entry, was granted to six designated car makers, all of which were Sino-foreign joint ventures: the "Big Three", composed of Shanghai Volkswagen, First Auto Work Volkswagen and Second Auto Work Citroën, and the "Small Three", composed of Beijing Chrysler Jeep, Guangzhou Peugeot and Tianjin Daihatsu. Meanwhile, the semiconductor industry also had its industrial policy first worked out in 1986, and then revised to come out with a fully fledged version in 1992. The main thrust of the policy was the strategy of "concentrating investment in key enterprises for technological development". The key enterprises in question were all SOEs (and their subsidiaries in partnership with TNCs in various forms including joint ventures): Wuxi Huajing, Shouxing Huayue, Beijing Shougang NEC, Shanghai Beiling, and Shanghai Philips. Again, protection from the competition of imports was an important ingredient of the policy.

In terms of actual development, a clear pattern is observable for both the TNCs-led automobile industry and the SOEs-led semiconductor industry. In the first half of the reform era, both failed to develop. In the second half of the reform era, the two industries, like other high-tech industries, finally took off, with explosive output expansion and fast technological progress (figure 11.4). Lack of investment was the immediate cause of development failures in the former period, against the background of massive investment and very fast technological progress of these two industries in the world generally. In the case of the automobile industry, the strategy of "market protection in exchange for technology transfer" did not work: the TNCs did not have sufficient incentives to invest in

Figure 11.5 Length of expressways and electrified railways, 1980–2010



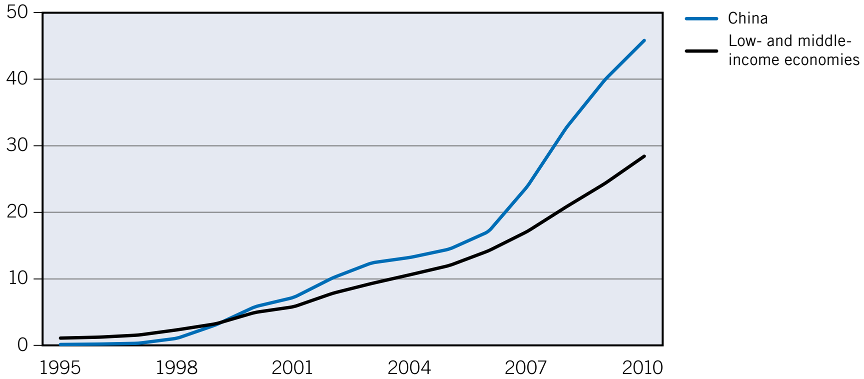
Source: *China Statistical Yearbook*, various years.

technological upgrading. In the case of the semiconductor industry, the designated SOEs did not receive the investment funding as envisaged and promised in the industrial policy. Insufficiency in (domestic) demand reinforced the insufficient incentives to invest, both for the TNCs and the domestic agents (SOEs, state banks, local governments, and even the central government itself).

Three factors account for the successful development of the two industries in the second half of the reform era: state creation of demand, state action to foster investment in technological upgrading, and the formation of innovation-based market competition. State infrastructural investment in infrastructure accomplished the demand creation: the building-up of the highway system (figure 11.5), which boosted the demand for cars, and of the telecom infrastructure (figure 11.6), which boosted the demand for semiconductors. Massive state investment in infrastructure was initially implemented as a response to counter the East Asian financial crisis, but it seemed to become a long-term strategy. This was a complete reversal of the policy doctrine of the 1990s – more precisely, of the neoliberalization period of 1993–97 – when the overarching objective was to balance the state budget via austerity measures (Lo and Zhang, 2011).

Put in the broader context, the successful development of the two industries since the late 1990s can be accounted for by both market responses to the favourable investment-led demand conditions and state activism in investing in the industries and/or creating the necessary conditions for their development. State activism was not confined to the central government. There were also prominent cases of success at the provincial level, the Guangdong provincial government's automobile industrial policy being a case in point. The policy lesson that the provincial government derived from the failure of Guangzhou Peugeot in the 1990s

Figure 11.6 Internet users (per 100 people) in China relative to low- and middle-income economies, 1995–2010



Source: *World Development Indicators* data bank, accessed 26 January 2012.

was that government investment and market competition are both necessary for the development of the industry. Thus, it has restructured the industry by taking the lead in the formation of several joint venture companies with TNCs, including Honda and Toyota. Meanwhile, at the broader, national level, state action to foster technological progress has recently manifested itself in the form of massive increases in research and development (R&D) expenditures. This has been a general policy, not confined to particular industrial sectors (table 11.1).

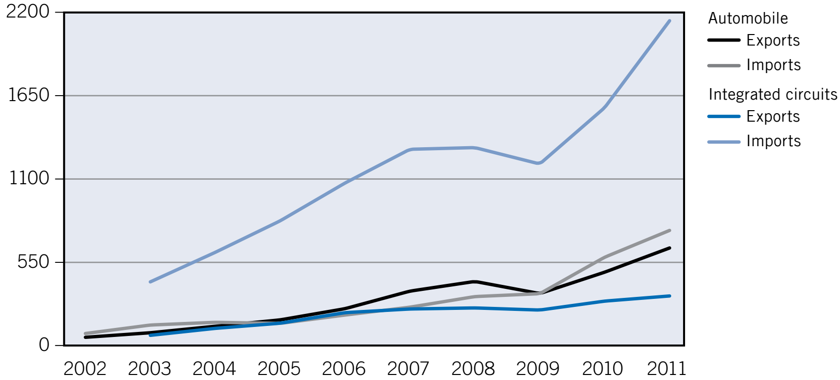
The nature of the immediate carriers of industrialization has also changed, amidst the formation of an environment of basically innovation-based market competition. For both the semiconductor and auto industries, the predominance of joint ventures and increased competition among these companies characterize the model that has emerged. Until the late 1990s SOEs dominated the semiconductor industry, but since then joint ventures have dominated. Joint ventures have always dominated the automobile industry, but the number of players has

Table 11.1 Research and development (R&D) expenditures

	R&D expenditure as % of GDP				**Relative to low- and middle-income countries**			
	1997	**2000**	**2004**	**2007**	**1997**	**2000**	**2004**	**2007**
High-income countries	2.29	2.43	2.31	2.37	4.09	3.68	2.85	2.42
Low- and middle-income countries	0.56	0.66	0.81	0.98	1.00	1.00	1.00	1.00
China	0.64	0.90	1.23	1.44	1.14	1.36	1.52	1.47

Source: *World Development Indicators* data bank, accessed 26 January 2012.

Figure 11.7 Exports and imports of automobile and integrated circuits (US$100 million)



Source: Ministry of Industry and Information Technology, official website.

increased to involve virtually all of the world's main car-making TNCs – over and above the protected "Big Three, Small Three" before the turn of the century. There have also emerged some purely indigenous car makers (notably, Geely, Qirui and Jianghuai), which by 2010 had successfully entered the ranks of the top ten car makers in China. The predominance of local production by joint ventures in the two industries, rather than by wholly TNCs-owned enterprises or imports, reflects the intention of state industrial policy and the action of the domestic economic agents – in particular, local governments – that are the main domestic decision-makers in forming the joint ventures.

Besides output expansion, the fact that local producers have been able to keep up with the pace of TNCs in the world market of turning out the latest automobile models indicates the production capacity – and the innovation capability – that has been built up in China. Another important indication is the rapid export expansion of the two industries in recent years, although from a modest base (figure 11.7). However, whereas exports and imports have been basically in balance in the automobile trade, very large and rapidly expanding trade deficits have been the case for integrated circuits. It might thus be possible to infer that there is a serious limitation with this model of industrial development, i.e. joint ventures as the main vehicles for the development of high-tech industries. Specifically, this limitation is the greater difficulty, as is in the case of semiconductors, of acquiring and developing a frontier technology, as contrasted with a mature technology, as in the case of car making. Hence, the broader picture shows China's persistent and expanding deficits in technological trade, which is spectacular compared with the average of the developing world (table 11.2).

Table 11.2 Royalty and license fees, receipts and payments, China and low- and middle-income countries compared, 1997–2010 (balance of payments, current US$ million)

	1997	2001	2005	2010
Low- and middle-income countries				
Receipts	980	852	1 862	3 689
Payments	5 419	8 851	18 140	37 319
Balance	–4 440	–7 998	–16 279	–33 630
China				
Receipts	55	110	157	830
Payments	543	1 938	5 321	13 040
Balance	–488	–1 828	–5 164	–12 209

Source: *World Development Indicators* data bank, accessed 26 January 2012.

Put differently, a serious limitation with the prevailing nexus of state industrial policy and industrialization, especially where local governments are the main policy-makers, might arise from the predominance of TNCs as the main vehicles of development. TNCs might be instrumental to industrialization in the stage or areas of technological catching up. But when it comes to the development of frontier technology, serious constraints might arise from a possible mismatch between the strategies of the headquarters of TNCs and the objectives of the Chinese government. The fact that there have been virtually no car exports from subsidiaries of TNCs (quite in contrast to indigenous Chinese car makers) might not necessarily be a symptom of such a mismatch, but neither does it support the view that the industry has become internationally competitive.

In this connection a new model has emerged in recent years, in which the main vehicles of the development of frontier technology are the SOEs. The development of high-speed railway technology is a prominent case. (The state plan to develop large-scale civilian aircraft manufacturing is also in line with this new model.) China started to import world-frontier technology in high-speed rail in 2004, with the targets of building up 200 km/hour trains in the first stage and 250 km/hour trains by 2009 (Renner and Gardner, 2010). The targets were more than achieved. Not only did domestic firms fully assimilate the imported technology, but they also managed to improve upon it. By 2010 quite a number of railways had put into full operation trains with speeds ranging from 250 km/hour to 350 km/hour. By 2011 an entirely domestically produced train even managed to test the speed of 500 km/hour.

Within a short period of time, between 2008 and 2011, China built up the largest network of high-speed rail in the world, in conjunction with massive government investment as a response to the worsening world economic environment ensuing from the financial crises in the advanced countries. Now it has started to compete in the world market with world-frontier TNCs. This development has been characterized by: (i) a state industrial policy that is based on the anticipation of an enormous demand, i.e. high-speed rail as a more efficient and environmentally friendly substitute for domestic air flights, (ii) ample funding from state-controlled finance, (iii) oligopolistic, large-scale SOEs as the immediate carriers, i.e. the two designated companies, China Northern Railways (CNR) and China Southern Railways (CSR), and (iv) well-defined targets for technology transfer and business operations in dealing with TNCs.

In terms of technological development, the emerging new model is clearly succeeding in promoting the development of high-speed railways. This experience offers important lessons for the development of other frontier technology industries. But there are potential dangers associated with the new model, as have been raised in the debate on crony capitalism. Already, there have been symptoms of bureaucratic excess and corruption. It remains a challenge for the further development of the model whether and when the relevant agents – SOEs, state banks and government bodies – will behave in an entrepreneurial way rather than indulging in unproductive rent-seeking or inefficient monopolistic practices.

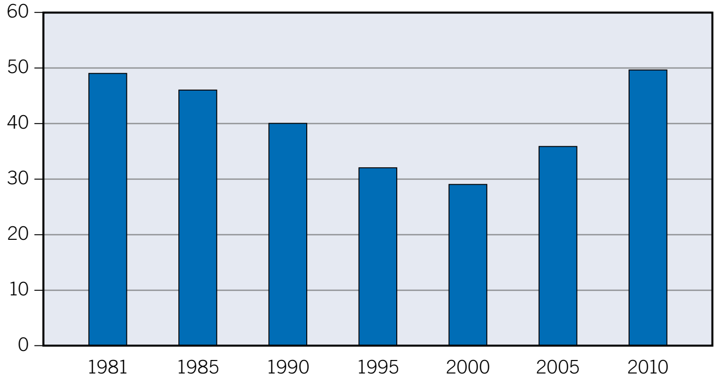
Contents

11.4 State orientation: Market reform, economic growth and labour

The preceding discussion on the role of the State in Chinese economic development should be viewed in connection with the evolution of the policy orientation of the State, particularly with respect to labour and broader social development. Immediately following the outbreak of the East Asian financial and economic crisis, in the years 1998–2002, China's state leadership adopted a range of economic policies that, in effect, reversed the previous, unidirectional pursuit of market reform (Lo and Zhang, 2011; parts of the discussion in this section also draw on Lo, 2007). While designed to be short-term, anti-crisis measures, the policies have become an essential part of the new policy line known as "constructing a harmonious society". The state leadership established this policy line in the early years of the new century. It represents a quest for a model of economic and social development that avoids worsening social polarization under market reform.

At the heart of the new policy line has been the emphasis on labour compensation-enhancing economic growth, rather than growth based on "cheap

Figure 11.8 Proportion of workers who are unionized (percentages)



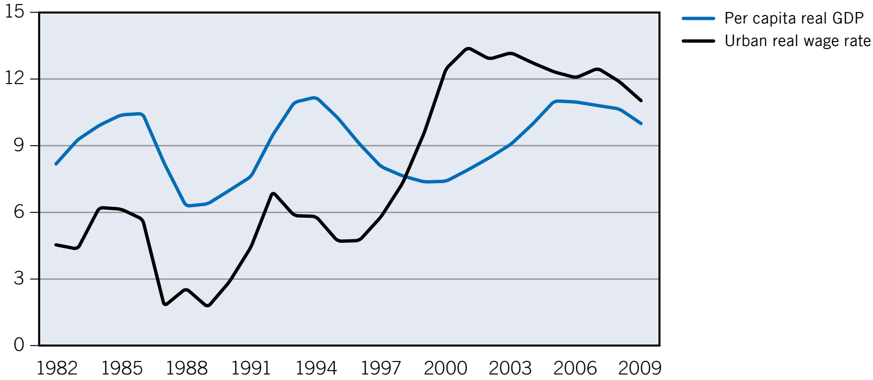
Note: Figures are the number of members of All China Federation of Trade Unions divided by the total number of employees in the secondary and tertiary sectors.

Sources: National Bureau of Statistics, China Statistical Yearbook, various issues; All China Federation of Trade Unions, China Statistical Yearbook of Trade Unions, various issues; and http://www.china.com.cn/2011/2011-03/03/content_22041017.htm, accessed 16 June 2012.

labour". Policy measures of this nature have included increasing protection of labour rights, the enforcement of proper employment contracts, the implementation of minimum-wage legislation, and the promotion of the establishment of trade unions. It is of note that, before the turn of the century, the Chinese state leadership had basically adopted a laissez-faire approach towards employment, particularly outside the state sector. This was particularly evident in the declining influence of the only existing official trade union, the All China Federation of Trade Unions. Union members as a proportion of the total of employees in the secondary and tertiary sectors decreased from 49 per cent in 1981 to 29 per cent in 2000 (figure 11.8). The situation has changed since then, with union membership up to a level of 36 per cent in 2005 and 50 per cent in 2010. The rebound in unionization owes much to the enforcement by the central government of the stipulation that enterprises of all types of ownership are required to allow unions to be set up and for workers to join unions. For a long time local governments, private employers and most notably foreign capital-funded enterprises have fiercely resisted this requirement. Yet, from the point of view of the state leadership, this requirement is essential to the promotion of collective bargaining over labour compensation. Collective bargaining is, in turn, considered indispensable for reversing the decreasing trend in labour's share of national income.

To the extent that unionization is indicative of enhancing labour rights in employment, its evolution does appear to be consistent with that of the wage rate. It is a spectacular (and socially worrying) phenomenon that, until the late 1990s,

Figure 11.9 Annual growth rate of real GDP per capita and real urban wage rate (five-year moving average, per cent)



Source: National Bureau of Statistics, *China Statistical Yearbook* and *China Statistical Abstract*, various years.

labour compensation had experienced very sluggish growth, quite in contrast to the sustained rapid growth of the economy. Indeed, there have been widespread reports that, outside the formal, mainly state-related sector, the wage rate had been almost frozen for fully 20 years, since the beginning of reform. This was especially true in the labour-intensive, export-oriented factories in the coastal provinces, owing to the almost unlimited supply of unprotected, un-unionized labour from the rural areas of inland provinces. Even in the formal sector, the evolution of the wage rate has seriously deviated from that of per capita GDP. As figure 11.9 shows, before the turn of the century, the growth rate of the real wage rate in urban areas persistently lagged behind that of per capita real GDP. Indeed, in the neoliberalization period of enterprise downsizing and mass unemployment in the mid-1990s, the two indicators moved in opposite directions: the growth of the real wage rate slowed while the growth of per capita GDP accelerated. Since the turn of the century the reverse has emerged. The growth of the real wage rate now substantially exceeds that of per capita GDP, while both are moving upwards.

The labour sector policies described above – together with other, broader social development policies that have been incorporated into the policy line of "constructing a harmonious society", such as the expansion in social welfare provision and the attempts to reconstruct a government-funded health-care system – are not simply wishful thinking. Rather, these policies have a solid material base: they appear to be consistent with the prevailing capital-deepening path of industrialization. Put another way, the transition from labour-intensive

Table 11.3 Average annual growth rates (per cent) of real GDP, employment and labour force

	(a) Real GDP	(b) Employment	(c) Labour force	(a) – (b)	(b) – (c)
1978–1992	9.39	3.63	3.60	5.76	0.03
1992–2010	10.33	0.78	0.89	9.55	–0.11

Note: A revision of statistical coverage in 1990 implies that employment and labour force data before and after that year are not strictly comparable. For the period 1978–89, the growth rates of real GDP, employment and the labour force are 9.50 per cent, 2.96 per cent and 2.90 per cent, respectively.

Source: *China Statistical Yearbook*, various years.

to capital-deepening industrialization is consistent with the prioritizing of the new policy line, which puts labour compensation enhancement on a par with employment and productivity growth. As table 11.3 shows, in the 1978–92 period, along with fast growth of output and productivity, the growth of employment outpaced that of the labour force. In the period from 1992 to 2010, both output and productivity growth have accelerated, while employment growth has lagged slightly behind the growth of the labour force. Staying on the prevailing path of economic growth and employment expansion, and therefore the relevant state policies, depends on whether the productivity gains in industry can be effectively channelled into the development of the labour absorption capability of the services sector. What is of note at this point, though, is that the fast productivity growth associated with this development path forms the material base for the pursuit of the policy objectives.

In so far as the policy orientation of "constructing a harmonious society" reflects the State–society relationship in China at this particular stage, the assessment of the economic role of the State can go beyond the previous discussion. The point can be made that the efficacy of a specific industrial policy, and of the role of the State in economic development, can be ascertained only in connection with the overall objectives of social and economic development. Both the labour-intensive path and the capital-deepening path of industrialization might have comparative efficiency attributes. And the industrial policy for promoting the development of high-speed rail or large-scale civilian aircraft manufacturing based on SOEs, for instance, might be deemed inefficient from the perspective of the former path but not of the latter path. The emergence of a prevailing path is as much a process of evolution as the choice about the interaction between the State and society.

11.5 Conclusions

Throughout the reform era the State has played a significant positive role in Chinese economic development – in the form of shaping the conditions for industrialization as well as direct intervention via industrial policy. There have been cases of both success and failure. With hindsight, we can infer that successes have been achieved when there was an appropriate match among state policy, market conditions, the demand regime, and the actions of the business entities. Conversely, failures have been due to mismatches.

Chinese economic development has undergone a fundamental transition from labour-intensive industrialization in the first half of the reform era to capital-deepening industrialization in the second half. This transition has accelerated productivity growth, which forms a solid material base for the concurrent social development objectives of the State. In turn, these broader social goals, with their emphasis on enhancing labour protection and compensation, are consistent with the capital-deepening path of industrialization. In this sense, the prevailing pattern of social and economic development has internal coherence. An appropriate match seems to be in place.

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Contents

Industrial policy in a harsh climate: The case of South Africa

12

Nimrod Zalk

12.1 Introduction

This chapter reviews South Africa's progress with the development and implementation of industrial policy over the post-apartheid era. This history falls into three broad phases: from the end of the Second World War to democracy in 1994, 1994–2007, and post-2007, with a particular focus on the last period. Economic policy, especially between 1994 and 2007, has been overwhelmingly dominated by orthodox laissez-faire economic reforms. These reforms were meant to achieve a step change in fixed investment and thereby catalyse higher levels of growth and employment across the economy, including manufacturing. However, they have not delivered significant or sustainable investment, growth or employment gains.

A policy shift on industrial policy began to emerge from 2007. Since then there has been significant progress with the development and implementation of industrial policy in terms of both cross-cutting instruments and sectoral strategies. Despite this, mobilization of the necessary support instruments has proceeded very slowly and has been subject to severe constraints. Meanwhile, the economy has suffered three major external and internal shocks: ongoing currency overvaluation and volatility, the global financial crisis and Great Recession, and a domestic electricity supply and price shock.

This chapter consists of six sections. The next section covers the literature on the role of the manufacturing sector and industrial policy. The third part reviews the most fundamental pre- and post-apartheid government policies affecting industrialization. The fourth section highlights South Africa's 2007 shift in industrial policy from neoclassical-based to structural-based reforms, with particular emphasis on ongoing structural constraints related to monetary policy, capital formation, industrial financing, infrastructure provision and the supply of key intermediate inputs. The fifth section further discusses the implementation of this new approach in light of the three economic shocks and the identification of key institutional constraints. The last section concludes that, for industrial policy to succeed in South Africa, considerably greater coherence and coordination are required between industrialization objectives and macroeconomic and other economy-wide policies.

12.2 The importance of manufacturing and the need for industrial policy

There has been a recent international resurgence in the twin concerns of industrialization and industrial policy, even, to a limited extent, in institutions such as the World Bank, for which active industrial policy has long been anathema (Wade, 2012). This interest has arisen against the background of the disappointing results of orthodox policy reforms in a range of developing countries since the late 1980s and the manifest unsustainability of a finance-led economic model for developed countries in the light of the global financial crisis and associated Great Recession. At their core, orthodox economic policy prescriptions are premised on the notion that unencumbered markets in general and financial markets in particular rationally allocate resources to their most productive and developmental uses. This premise persists despite some developments within neoclassical economics itself that questions such conclusions, largely based on market imperfections. As Kindleberger and Aliber (2005) have demonstrated, historically unregulated (or lightly regulated) financial markets are prone to vast and irrational inflation of asset prices (mania), which inevitably is followed by collapse (panic) and spillover onto the real economy (crash). Hence, even within the two exemplars of the Anglo-American finance-led model, vigorous debate has restarted about how to stimulate manufacturing through industrial policy measures.

For emerging economies, economic development is fundamentally a process of catch-up with the per capita living standards of developed countries. Orthodox policy proposals draw on theory that predicts catch-up will occur automatically through factor-price equalization across countries, in which trade increases the return to the abundant factor (assumed to be labour in a developing country) and decreases the return to the scarce factor (capital). The role of trade policy is reduced to maximum trade liberalization that will reveal and unlock production and exports of products and services in which countries have an underlying comparative advantage. This theoretical conclusion requires a range of assumptions that are rarely met in real-world production and trade. They include the following: there are no qualitative differences among economic activities (no sector is more productive or has stronger linkage effects than another); returns to scale are constant or diminishing; there is perfect information about technological possibilities; and – critically – the adoption of technology is costless and instantaneous. It also assumes full employment and that capital is immobile. These theories solidified into what has become known as the Washington Consensus. Although even its original proponents questioned whether full opening of the capital account was desirable, the influence of the rational market hypothesis – which holds that unrestricted financial markets will allocate capital to its most efficient and productive uses (Palma, 2009) – effectively resulted, in practice, in the inclusion of capital account opening in policy advice based on the Consensus.

In contrast to the Washington Consensus, there is a long trail of literature emphasizing that there is "something special" about the role of manufacturing in economic development associated with the Kaldorian view of manufacturing's irreplaceable role in generating dynamic increasing returns (Thirlwall, 1983). This literature identifies three channels through which manufacturing transforms the structure of an economy: (i) increasing returns at the firm level – that is, producing proportionately more output relative to inputs; (ii) dynamic increasing returns at the sector or cluster level – productivity improvements due to economies of proximity of related supplier and competitor firms and institutions; and (iii) economy-wide linkages and multipliers, as manufacturing draws in inputs from primary sectors, manufacturing itself and services as well as generating forward linkages to the rest of the economy.

In contrast to orthodox theory, this literature emphasizes that developing country growth and competitiveness are fundamentally driven by cumulative learning to adopt and adapt existing technologies and build interlinked firm- and cluster level capabilities (Amsden, 1992; Lall, 2004). These capabilities take time to build up, but they can be rapidly destroyed and will not necessarily be redeployed to another sector that is closer to the country's notional comparative advantage in a world where one or more of the assumptions on which comparative advantage rests are likely to be violated.

Amsden (2003) describes how developing countries build on nascent industrial production capabilities by allocating economic rents conditionally, through a set of "reciprocal control mechanisms" (RCMs) that depend on performance. In one form or another, these rents require financing instruments to underwrite periods of learning to reach global competitiveness in target industries (Khan, 2000). The mixture of disciplining and financing instruments needs to be actively mobilized, can take a variety of forms, and must induce effort towards international competitiveness.

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12.3 Apartheid-era industrialization

South Africa's industrialization has been characterized as dominated by a "minerals energy complex" (MEC) in two senses, both as a set of core sectors and as the predominant system through which capital accumulation has taken place (Fine and Rustomjee, 1996). These MEC sectors comprise various mining activities and further processing into semi-manufactured commodities so closely linked that the latter – despite formal statistical classification otherwise – are better understood as more closely linked to mining than to manufacturing.

Discovery of precious minerals – particularly gold – in the late nineteenth century kicked off a process of mining and mining-linked industrialization (Chabane, Goldstein and Roberts, 2006). State-owned enterprises (SOEs) and the state-owned development bank, the Industrial Development Corporation (IDC), played the central role in post-Second World War industrialization (Clark, 1994), supplemented by other instruments, particularly the extensive yet unstrategic use of import tariffs. Apartheid-era industrialization proceeded largely on the basis of "upstream" processing of mineral- and other natural resource-based commodities without sufficient impetus or policy coherence to develop the more labour-intensive and value adding "downstream" manufacturing sectors, which did not become internationally competitive. Using cheap coal as a feedstock, low-priced electricity was used as a policy instrument to create and expand a range of capital- and electricity-intensive industries that processed minerals and other primary resources into semi-processed commodities. Various industries including Electricity, Rail, Ports, Telecommunications, Steel, Petrochemicals and Aluminium were established by the apartheid State, generally through the introduction of SOEs.

The two SOEs that provided the most critical sets of inputs into downstream manufacturing, mining, and agriculture were privatized in the late apartheid era – Sasol (petrochemicals) in 1979 and Iscor (steel) in 1989. Limited regulatory mechanisms were put in place to discourage the abuse of dominance of (now) privately owned natural monopolies, let alone to strategically leverage their potential to contribute to the diversification of manufacturing. The lack of effective regulation has allowed the extraction of monopolistic rents from downstream firms, predominantly in the form of the practice of import parity pricing (IPP), whereby domestic prices are not set by domestic competition but instead are marked up to what they would cost to import (Roberts and Zalk, 2004).[1]

[1] This practice results in uniquely high rents in the South African economy due to a confluence of factors: high weight/value ratios of intermediate products, relative under-industrialization of the sub-region, and long distances and high transport costs of alternative sources of import supply.

Notwithstanding a lack of coherent strategy outside of MEC manufacturing sectors, by the end of the apartheid era, important – although not fully competitive – capabilities were established in a range of downstream sectors including metal fabrication, capital equipment, automotives and agro-processing.

12.4 Washington Consensus conforming policy (1994–2007)

South Africa's post-apartheid policies – fundamentally informed by the 1996 Growth, Employment and Redistribution (GEAR) strategy (Department of Finance, 1996) – embodied Washington Consensus-type reforms theorizing that liberalization of key markets would lead to more efficient allocation of capital and thereby raise private investment levels and growth and employment rates.

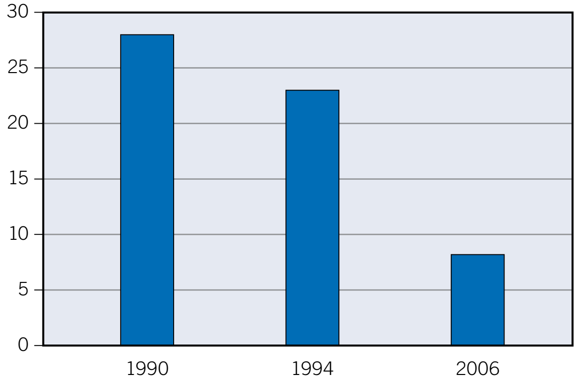
GEAR assumed that domestic price stability would generate the necessary degree of certainty needed to undertake large-scale private investment. Monetary policy has been tight, anchored in the formal adoption of inflation targeting in 2000, with a target range of 3 to 6 per cent. This policy was accompanied by ongoing and substantial liberalization of the capital account; restrictions were lifted and limits were raised for corporate offshore investment and remittance of profits as well as individual portfolio investment. A number of large domestic companies received approval to shift their primary listings offshore – largely to the London Stock Exchange – on the premise that they would be able to raise funds more cheaply on international capital markets and thereby raise their investment levels in South Africa.[2]

A lower fiscal deficit, it was argued, would result in lower interest rates and would thus "crowd in" private investment. Fiscal restraint, reinforced by substantial improvements in tax revenue collection, has indeed led to a lower debt-to-GDP ratio than that inherited from the apartheid State. Spending on health, education, housing, and limited forms of welfare grants (largely child support and old-age pensions) expanded, but not – until 2002 – expenditure on physical infrastructure.

A commitment to privatize various SOEs was only partially carried out. However, SOEs in a range of sectors were expected to become self-financing and generally commercialized, in preparation for privatization, through substantial cost-cutting of staff, new investment, and even maintenance of existing

[2] Firms that have shifted their primary listings offshore include Billiton (mining/mineral processing), South African Breweries (brewing), Anglo American Corporation (mining), Old Mutual Life Assurance (financial services), and Dimension Data (information technology).

Figure 12.1 Average industrial tariff, South Africa, 1990–2006 (percentages)



Source: International Trade Administration Commission.

infrastructure. This expectation encompassed much of the activities of utilities such as Eskom (electricity), Transnet (freight transport) and development banks such as the IDC in relation to sectors outside MEC manufacturing. However, they continued to provide concessionary terms to MEC manufacturing sectors in pricing of electricity, freight and cost of capital.

Trade liberalization – in Washington Consensus terms – should reveal nascent comparative advantage and reallocate investment to more productive activities. From 1993 onwards the trade liberalization process initiated by the late apartheid regime was accelerated, as South Africa joined the World Trade Organization (WTO) during the Uruguay Round. South Africa has implemented a tariff phase-down even more rapidly than required under its WTO commitments across a range of industrial and agricultural sectors, but with the exception of two "sensitive" industries: automotives, and clothing and textiles. The average industrial tariff declined precipitously between 1990 and 2006 (figure 12.1). South Africa also entered into two main regional free trade agreements, with the European Union (1999) and the Southern African Development Community (1994).

Edwards and Lawrence (2006) argue that trade liberalization has been the main cause of growth – albeit, by their own admission, limited – in South African manufactured exports since the early 1990s, driven largely by the growth of "medium technology" manufactured exports. Hence, they prescribe further trade liberalization as the main policy mechanism to increase manufacturing exports more generally. These are flawed conclusions for two main reasons.

First, this analysis fails to deal with the specifics of the main sectors that comprise the medium technology category and with the critical role that industrial policy – both past and present – has played in their relative export dynamism. The major advancing sectors have been steel and other semi-processed metals, chemicals, automotives, and mining capital equipment. As noted above, semi-processed metals and chemicals were the lead sectors of apartheid industrial policy, had their origins as state-owned enterprises and recipients of major support from the IDC, and had developed capabilities that rendered them largely internationally competitive by the end of the apartheid period. Post-apartheid automotive policy did indeed involve large tariff reductions, but in the context of an export–import complementation scheme whereby automotive assemblers had to increase their production volumes and procurement of domestic components year by year in order to earn the same value of import credits (as discussed in greater detail below). Mining capital equipment had developed competitive capabilities over a long period of time due to the specific and demanding requirements of the South African mining sector. Most other sectors fared far less well under trade liberalization, and employment losses in these sectors were far greater than gains in other sectors. This experience is entirely consistent with Shafaeddin's (2005) study that finds that, for Latin American and African countries, trade liberalization has in general not been associated with diversification of manufactured exports except where industries are already very close to the global competitive frontier – in which case liberalization can be useful in providing the final impetus to international competitiveness.

Second, given that trade has already been liberalized by more than two-thirds and that in this context aggregate manufactured export growth has been considerably below the growth rates of peer medium-income developing countries, it is arithmetically implausible that removal of the last one-third of tariffs could have a major dynamic effect even if Edwards and Lawrence's argument is accepted at face value.

Part of GEAR envisaged a range of grant-based "supply side", predominantly aimed at assisting small and medium (SMEs) manufacturing firms to adapt to a sharp increase in international competition. In practice, on-budget support for these measures was generally of limited scale and widely dispersed across a range of sectors and multiple policy objectives.

In contrast, and despite the emphasis of policy statements on SMEs, substantial on- and off-budget support continued to be extended to a number of capital- and electricity-intensive MEC sectors in three important ways. First, a range of resource processing firms received generous tax allowances and IDC funding for expansions in the post-apartheid period.[3] Second, this support was not tied

[3] This included firms in industries such as carbon and stainless steel, aluminium, chemicals and paper and pulp.

to strong reciprocal conditionalities, in particular not meaningfully linked to the pricing policies of these natural monopolies in the domestic market. Third, these companies also continued to receive cheap electricity over most of the post-apartheid period.

In no industry have arrangements been more generous than for the main carbon steel producer. Iscor, which was established as an SOE by the apartheid state, was privatized in 1989. It has undertaken various expansions since the early 1990s, assisted with tax rebates and IDC funding. In 2001 its steel making and iron ore mining operations were unbundled, but with the effective guarantee of low-cost iron ore for a large part of its requirements through a "cost plus 3 per cent" supply arrangement from the mining entity.[4] These arrangements paved the way for the introduction of foreign ownership and ultimate majority shareholding by ArcelorMittal. Despite such favourable arrangements a commitment to introduce a "developmental pricing" model, made at the time of assuming majority shareholding, has never materialized.

Perhaps the most significant domain in which post-apartheid economic policy has ostensibly departed from Washington Consensus orthodoxy has been with respect to the promotion of a black capitalist class through Black Economic Empowerment (BEE) policies. BEE has gone through a few iterations since the mid-1990s, with transactions taking place chiefly in sectors where the State has some direct form of leverage, such as the issuing of licences or as a major procurer. Mining policy in particular has been almost overwhelmingly focused on facilitating transfer of significant ownership of the mining sector into black hands through the introduction of a new licensing regime in 2002. However, other developmental objectives – particularly leveraging mining rights for the greater development of downstream value-adding and more labour-intensive sectors – have received little practical attention.

There have also been major weaknesses with respect to post-apartheid institutions for skills development. The previous artisan system was replaced by a skills levy linked to sector education and training authorities (SETAs). This has resulted in top-down choices on allocation of funding and a proliferation of relatively easy-to-do "soft" training and relative neglect of investment in dedicated training facilities, equipment and curricula in the skills required by manufacturing.

[4] This supply arrangement was intended to be "evergreen" – that is, to last in perpetuity, but it has been subject to complex legal dispute since 2010.

12.5 Industrial policy since 2007: National Industrial Policy Framework (NIPF) and Industrial Policy Action Plan (IPAP)

Although there clearly have been industrial policy *interventions* since 1994, there was no formal industrial *policy* until 2007. The Cabinet approved the National Industrial Policy Framework (NIPF) (DTI, 2007a) in January 2007 and its first implementation blueprint, the Industrial Policy Action Plan (IPAP) (DTI, 2007b) in August 2007.

In contrast to the WC, the NIPF rejects a "one size fits all" policy approach, recognizing that:

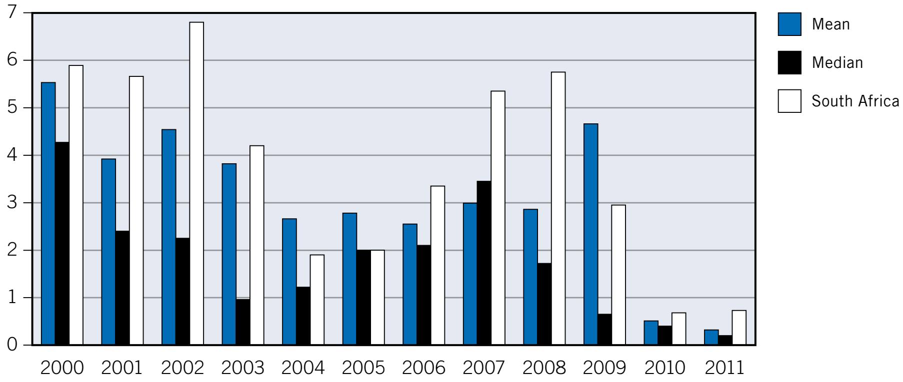
> Countries that have uncritically embraced the WC have demonstrated disappointing growth and development results, [while] it is precisely those newly industrialised countries (NICs) that have not blindly followed this route that have demonstrated the highest levels of economic development (DTI, 2007a, p. 29).

In particular, the NIPF emphasizes that "South Africa cannot rely so heavily on either consumption or commodities as the basis for our growth and development" and sets out four strategic industrialization objectives (DTI, 2007a, pp. 6–7):

- To facilitate diversification beyond [the] current reliance on traditional commodities and non-tradable services. This requires the promotion of increased value-addition per capita characterized particularly by movement into non-traditional tradable goods and services that compete in export markets as well as against imports.
- The long-term intensification of South Africa's industrialization process and movement towards a knowledge economy.
- The promotion of a more labour-absorbing industrialization path with a particular emphasis on tradable labour-absorbing goods and services and economic linkages that catalyse employment creation.
- The promotion of a broader-based industrialization path characterized by greater levels of participation of historically disadvantaged people and marginalized regions in the mainstream of the industrial economy.

The NIPF and successive versions of IPAP (DTI, 2007b, 2010a, 2011 and 2012) are rooted in a structural analysis of the economy in general and addressing key constraints to industrialization in particular. In the context of South Africa's employment challenge, growth and diversification of the tradables sectors – and

Figure 12.2 Short-term real interest rates in South Africa versus mean and median rates of other middle-income developing and transition economies, 2000–11 (percentages)



Note: Countries are Brazil; Chile; China; Czech Republic; Hungary; Hong Kong (China); India; Indonesia; Republic of Korea, Malaysia; Mexico; Poland; Russian Federation; South Africa; Taiwan (China); Thailand; Turkey.

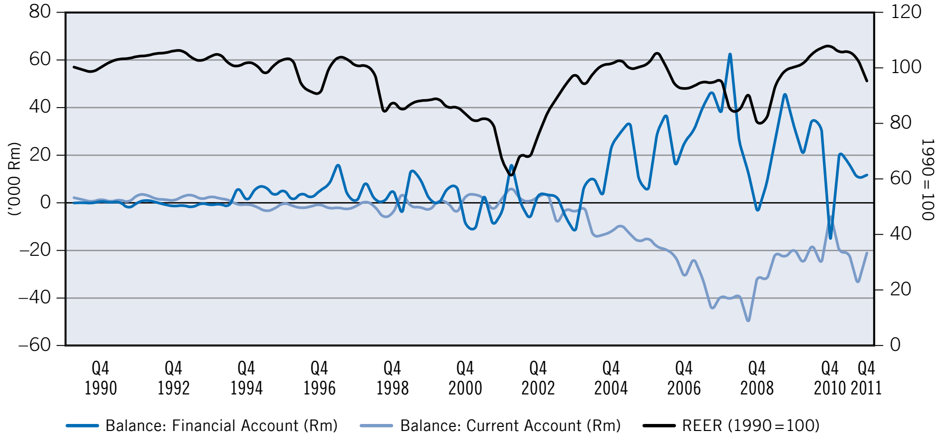
Source: SARB.

manufacturing in particular – are critical, first, because the tradables sectors are less skill-intensive than the private non-tradables sector, and thus likely to absorb more labour in the context of a weak education and skills system; and, second, because manufacturing has the highest growth multipliers, and many manufacturing sectors have high employment multipliers.

The structural analysis that follows takes the two most important prices in the economy as its starting point: the interest rate and the exchange rate. As noted above, South Africa runs a very tight monetary policy regime. Its short-term real interest rates have been consistently above the median for other middle-income developing and transition countries (figure 12.2), despite lacklustre growth and a structural unemployment crisis. It is particularly striking that rates remained high even as the impact of the global financial crisis began to be felt, in late 2008. Rates remained well above the median in 2010 and 2011, although the gap narrowed considerably as most countries, including South Africa, cut their rates in response to the crisis.

South Africa has seen persistent currency overvaluation and volatility over the post-apartheid period, particularly from 2004 onwards (figure 12.3). This pattern is linked to three factors: bond market inflows due to high real interest rates; inflows into the Johannesburg Stock Exchange, particularly on the back of the spike in commodity prices since 2004; and speculative offshore trading of the rand (Hassan and Smith, 2011). The country has thus experienced a version

Figure 12.3 Balance on current and financial account ('000 Rm) and real effective exchange rate (REER) (1990 = 100), 1990Q1 – 2011Q4



Source: SARB.

of "Dutch disease" despite the fact that mining – still the most important component of the export basket – experienced no real value added or export boom.

Even before the crisis Rodrik (2008, p. 36) observed:

> [T]he South African case highlights ... the tension between the conduct of monetary policy and the health of the tradables sector. While South Africa has not gone to the Salvadoran extreme of dollarizing, its inflation targeting framework tends to deliver an appreciated currency – especially during a commodity boom. This increases the premium on appropriate industrial policies. In effect, the less room for maneuver there is on the exchange rate front, the greater the need for a compensating industrial policy.[5]

This in turn raises the issue of the rate and composition of investment and the role and scale of industrial policy, its financing instruments and associated policy instruments. Orthodox reforms were predicated on the reasoning that liberalization of trade and capital markets in particular would result in a more efficient reallocation of capital, in particular raising the rate of private fixed investment by increasing access to capital and lowering its cost. Since 1994 there has indeed been

[5] Notwithstanding this Rodrik went on to endorse a set of policy reforms for South Africa that included further capital account and trade liberalization.

a massive transformation in the allocation of capital. Ashman, Fine and Newman (2011) argue, however, that, far from capital market liberalization helping to mobilize capital for private fixed investment in South Africa, there has been a massive exodus of long-term South African capital in the form of both legal and illegal capital flight (with the boundaries between the two shifting as some of what was previously illegal became legal). The rate of capital flight rose steadily over the post-apartheid period, averaging 12 per cent of GDP between 2001 and 2007 and peaking at 20 per cent in 2007. The vast majority of capital flight is associated with transfer pricing by large conglomerates, particularly trade misinvoicing in relation to minerals and metals exports. Side by side with this export of long-term investible capital there has been a corresponding increase in highly volatile short-term portfolio inflows into bond markets and the Johannesburg Stock Exchange.

Since 1994 private credit extension has grown very rapidly, fuelled by short-term portfolio inflows. However, only a tiny proportion of aggregate private credit extension has gone to fixed investment – about 5 to 6 per cent in 2010. Credit has predominantly taken the form of consumer credit and home mortgages. This has led to a large increase in household debt levels and contributed materially to the trade deficit.

The small pocket of private credit extension going into fixed investment has itself been sectorally concentrated in consumption-driven sectors, with the lion's share going into the Finance, Insurance and Real Estate (FIRE) sectors. Despite the massive growth in the relative share in investment and GDP of the Finance and Insurance sector in particular, aggregate private investment rates did not improve over most of the post-apartheid period. It is only since 2002, when public sector investment began to ramp up, that private investment outside of the consumption-driven sectors has began to improve. Most starkly, there has been virtually no improvement in the savings rate, hovering between 14 and 15 per cent of GDP over the entire period. Despite tepid investment and savings growth, the size of the financial sector doubled between 1994 and 2010, from 6 per cent to 13 per cent of GDP. The relative profitability of manufacturing in relation to FIRE has fallen steadily since 1994 (figure 12.4). Thus, in addition to a version of external "Dutch disease" due to currency overvaluation, there has also been a form of "internal Dutch disease" as relative prices and profitability have shifted against manufacturing.

There are, therefore, significant market failures with respect to private extension of finance for the medium- to long-term investments required for industrialization. Aside from the cost of capital being high relative to key developing and developed country competitors, there is also a tenure problem, a mismatch between sources and uses of funds that constrains long-term fixed investment.

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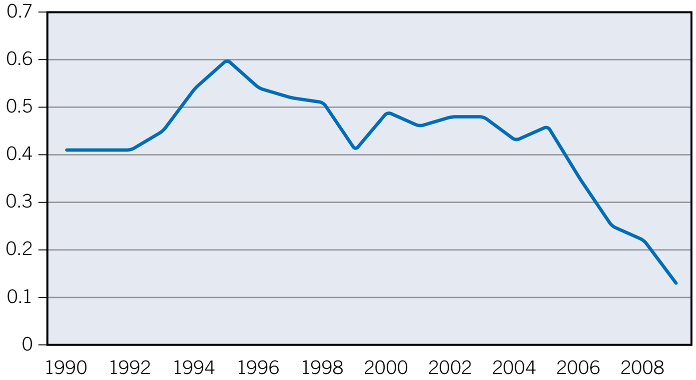
Figure 12.4 Profitability per capita of manufacturing relative to finance and insurance sectors, 1990–2009

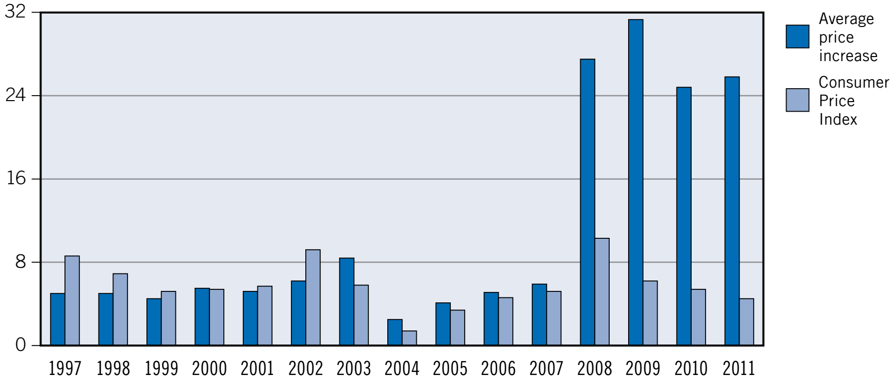


Source: SARB.

Commercial banks are reluctant to match short-term sources of funding (mainly deposits and short-term capital inflows) against the medium- to long-term requirements of industrial and infrastructure funding. Working capital also emerges as a critical constraint, particularly for medium-sized and small firms, and the constraint increases with the length and complexity of the production process, e.g. for capital equipment firms that need to finance a long supply chain and production process. Domestic firms competing against foreign rivals cannot secure the levels of highly concessionary trade finance offered by their competitors' exim banks and export credit agencies – invariably state-backed irrespective of whether they are in developing or developed countries.

Since 2002 South Africa's infrastructure backlog has begun to be addressed with increasingly large public investment plans in the electricity and rail sectors in particular. The excess electricity supply overhang of the late apartheid period gave way to an acute shortage and ultimately, in early 2008, an electricity supply crisis. Since then a large coal-fired build programme has been mobilized, to be supplemented by increasing investments in renewable generation. However, the build programme is being funded predominantly through a narrow "user pays" financing model requiring that electricity prices should rise very rapidly to meet the costs of decades of investment backlog. Over the four years 2008 to 2011 electricity prices have risen by between 25 and 30 per cent per annum (figure 12.5), with further increases of over 15 per cent anticipated over the period 2012 to 2016. Municipal distributors of electricity have in some cases piggy-backed on the underlying increases by adding margins of a similar magnitude on top of those increases. In five years South Africa has gone from having the lowest-cost

Figure 12.5 Eskom annual average electricity price increases price adjustment and change in the consumer price index (CPI), 1996–2011 (per cent)



Source: Eskom.

electricity in the world to parity with a number of developed countries such as the United States and Canada. According to the current price trajectory, electricity prices will rise to amongst the most expensive in the world. As a result a number of industries are currently vulnerable and have either experienced or are subject to firm closure, including zinc and chrome smelters, foundries and steel mini-mills. Coal-based electricity and its attendant negative externalities of carbon emissions and pollution have undoubtedly been historically under- or unpriced, respectively. However, the structural transition from a high energy- and emissions-intensive economy to a low-carbon one cannot realistically be achieved simply through the shock therapy of rising electricity prices, in the absence of a comprehensive and coherent national strategy for fundamental structural change.

Port charges in South Africa are already amongst the highest in the world before further major infrastructure investment expenditure (Demont, 2007). If rail and port upgrades are funded on the same narrow "user pays" principle, this will have a similar impact as the electricity build programme.

The privatization and (in the case of steel) subsequent approval of majority foreign ownership without a regulatory regime that regulates prices of natural monopolies has resulted in ongoing and sometimes worsening of monopolistic pricing in key input sectors such as chemicals and steel. Market power derived from a natural monopoly position combines with South Africa's distance from other markets and low level of industrialization within the region to render these margins much larger than elsewhere in the world (figure 12.6).

The global financial crisis and the subsequent and on going Great Recession have had a profound effect on manufacturing exports and will pose challenges

Figure 12.6 Steel prices: hot rolled coil, US$ per tonne, 2004–12

	2004	2005	2006	2007	2008	2009	2010	2011	2012 (Jan.-June)
USA	668	599	659	620	942	552	699	852	778
Canada	671	580	628	595	919	545	689	845	774
China	410	408	394	455	593	449	530	618	571
Japan	536	553	449	491	768	592	715	834	740
Republic of Korea	410	534	497	532	663	542	689	784	725
Taiwan (China)	472	531	447	532	824	514	657	704	688
EU (average)	559	563	588	688	960	546	705	792	703
Germany	548	584	583	696	960	549	710	803	700
World average	534	546	559	600	870	540	684	792	720
Russian Federation	517	449	497	564	864	461	605	679	618
Arcelor Mittal South Africa (AMSA)	615	632	599	616	840	618	744	842	795

Sources: MEPS, Metal Bulletin, CRU, ArcelorMittal South Africa (AMSA).

going forward. Recession, slow growth and deep economic uncertainties in the United States and the European Union (EU), South Africa's two largest export markets, particularly for diversified and value added products, have resulted in lower export demand. China and India have become increasingly important sources of demand for South African exports of traditional raw and semi-processed commodities as their resource-intensive industrialization phase sucks in imports of these materials. The sustained slow growth outlook for the United States and the EU poses a major challenge of reorienting trade, especially in non-traditional diversified and value added exports, to higher-growth developing countries.

12.6 Implementation of NIPF and IPAP: Progress and constraints

There has been considerable progress in formulating industrial policy, identification and mobilization of support instruments, and implementation of industrial policy since 2007 in the form of NIPF and IPAP. However, this has occurred in the context of the three economic shocks identified above and a number of institutional constraints, of which the most important are outlined below. NIPF and IPAP both emphasize that co-ordination of policies and instruments affecting the industrialization process is critical:

> In order for the industrial economy to fire on all cylinders and an industrial policy to be successful, coordination and alignment is required across a range of supporting policies and institutions (DTI, 2007a, p. 9).

In particular, IPAP notes the need for "a comprehensive and integrated response to scale up industrial policy". It identifies the following key areas of intervention and policy integration (DTI, 2011, p. 29):

- Stronger alignment between macro and industrial policies
- Industrial financing channelled to real economy sectors
- Leveraging public and private procurement to raise domestic production and employment in a range of sectors
- Developmental trade policies which deploy trade measures such as tariff setting and enforcement and standards in a selective and strategic manner
- Competition and regulation policies that lower costs for productive investments and poor and working class households
- Skills and innovation policies that are aligned to sectoral priorities
- Deploying the above policies in general and in relation to more ambitious sector strategies, building on work already done.

12.6.1 Macro and industrial policy alignment?

As implied in the analysis above, there has been limited progress in achieving alignment between macroeconomic and industrial policies. The South African Reserve Bank (SARB) appears to have shifted to a "flexible inflation targeting" regime since 2009 (Marcus, 2012), meaning that considerations of growth and employment would be taken into account in setting interest rates in addition to the primary objective of moderation of inflation. It also temporarily engaged in a policy of additional reserve accumulation between the end of 2009 and mid 2011 but appears to have quietly abandoned such intervention, citing the financial costs of the exercise (SARB, 2012). The ongoing liberalization of capital outflows makes the exodus of long-term capital easier, rendering the economy more reliant on volatile short-term inflows.

12.6.2 Industrial financing

Successive iterations of IPAP have identified the need for a variety of industrial financing instruments to address a range of market failures. The IDC has begun to respond to this challenge by re-prioritizing within its commercially funded balance sheet and making the important shift from acting as a private investment bank to a much greater emphasis on its development bank mandate. To this end it has identified lendable funds of around R102 billion ($12.75 billion) over five years directed towards priority sectors, depending on economic conditions. A tax incentive for large industrial investments was put in place in 2010. However, on-budget finance has lagged behind IPAP priorities (table 12.1). It was only in mid-2011 that additional financing was agreed in light of increasing concerns about the fate of the manufacturing sector, given the severity and interminability of the global crisis. This culminated in the creation of the Manufacturing Competitiveness Enhancement Programme (MCEP), with an additional budget allocation of R5.7 billion ($0.71 billion) over three years.

The Portfolio Committee on Trade and Industry has repeatedly questioned whether the fiscal allocation towards IPAP has been sufficient. For instance, "[t]he Committee, while acknowledging the substantive increase in budget for incentives related to IPAP sectors, is also of the opinion that for the IPAP to be an effective tool to drive industrialization thereby addressing poverty and unemployment will require a further increase in its budget allocation" (Portfolio Committee on Trade and Industry, 2012).

12.6.3 Leveraging of public procurement

The NIPF and each iteration of IPAP have identified South Africa's infrastructure build programme as a major opportunity to resuscitate and grow important sectors of manufacturing by leveraging public procurement. Leveraging public procurement was also identified in 2009 as a critical measure in the country's multi-stakeholder response to the global crisis (National Economic Development and Labour Council, 2009). However, it took until the middle of 2012 to give practical effect to this policy lever in the form of amendment and operationalization of regulations under the Preferential Procurement Policy Framework Act (PPPFA). The amended regulations enable the designation of certain industries for domestic procurement by public procurement programmes. Initially designated sectors have included rail rolling stock, buses, certain inputs into coal and renewable electricity generation and certain labour-intensive products.

Table 12.1 Nominal and real on-budget IPAP investment support (million Rand)

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13 estimate
Small and Medium Manufacturing Development Programme (SMMDP)	11	6	5	3	2	0	0
Small and Medium Enterprise Development Programme (SMEDP)	0	0	0	1 349	577	0	0
Manufacturing Development Incentives	0	0	0	0	0	1 839	3 227
Sector Development Programme	0	0	0	0	0	3	3
Manufacturing Competitiveness Enchancement Programme (MCEP)	0	0	0	0	0	0	1 224
Services Sector Development Incentives	0	0	0	0	0	333	439
Customised Sector Programmes (CSPs)	47	0	0	0	0	0	0
IDC: Customised Sector Programmes (CSPs)	0	0	0	49	51	57	56
Business Process Services (BPS)	70	110	110	130	63	0	0
Film and TV production incentive	72	96	154	197	246	0	0
CSIR: Aerospace	6	10	10	10	10	17	21
National Foundry Technology Network	0	0	0	0	7	7	21
National Tooling Initiative	0	0	0	0	32	36	49
UNIDO: Automotive Supplier Development Programme	0	0	0	5	7	7	0
TOTAL R' Current	**206**	**222**	**279**	**1 742**	**995**	**2 300**	**5 041**
GDP Deflator Index (2005 = 100)	*107*	*115*	*125*	*134*	*145*	*156*	*161*
TOTAL R' (2005)	**193**	**193**	**222**	**1 297**	**685**	**1 471**	**3 122**

Note: Excludes tariff-based incentives such as the Motor Industries Development Programme (MIDP) as well as the Clothing Textiles Competitiveness Programme (CTCP), which has in effect been funded through the additional tariff revenue collected as a consequence of ending the Duty Credit Certificate Scheme (which allowed clothing and textiles exporters to earn a corresponding import credit).

Source: National Treasury – Estimates of National Expenditure, DTI budget votes, IMF (GDP deflator).

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12.6.4 Trade and competition policy

Under NIPF and IPAP tariff setting has shifted from being unidirectional to being informed by strategic sectoral priorities. The general principle informing tariff setting is a downward trajectory for tariffs on industries that produce intermediate inputs for downstream manufacturing, particularly sectors that enjoy considerable domestic market power, and an openness to retain or increase tariffs affecting sectors that can demonstrate value-adding and more labour-intensive potential where "water" exists between the bound and applied rates. Sectors that have had tariffs cut or removed over recent years have invariably been the largest, most concentrated and politically influential industries. This calls into serious question the credibility of deeply ideological claims that industrial policy will invariably be "captured" by entrenched interests and "rent-seeking" (e.g. CDE, 2009; South African Institute of International Affairs, 2008). There is a risk that this policy space will be seriously diminished if the Doha Round is concluded according to the Swiss formula methodology for tariff reduction, which proposes deeper tariff cuts with greater degrees of flexibility (or lighter cuts with less flexibility).[6]

Standards also have taken on a more strategic role under IPAP, which recognizes their increasing role as tariffs come under pressure through multilateral, regional and bilateral trade negotiation processes. South Africa's standards institutions contribute to the creation of new industries through enabling standards, such as recent enabling standards in the green and renewable energy space. They also play an important role in deterring substandard products that undermine fair trade and consumer safety. Greater coordination has been forged between regulatory and enforcement agencies to tackle issues of customs fraud, illegal imports and goods that do not meet mandatory standards.

Implementation of competition policy has also become more strategically informed by the twin objectives of tackling anti-competitive behaviour in industries providing inputs into production sectors – manufacturing, agriculture and mining – and protecting the purchasing power of poor and working class households. In addition to tariff reductions on the upstream industries referred to above, the competition authorities have undertaken a number of investigations in the steel, chemicals, construction, cement and agricultural subsectors. There have been numerous findings of cartel behaviour or abuse of dominance, leading to

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[6] Because South Africa made bound rate commitments well in excess of those of its developing country counterparts in the Uruguay Round and cut tariffs beyond what was required in terms of bound rates, it will be disproportionately adversely affected unless it is able to negotiate specific recognition of these prior cuts.

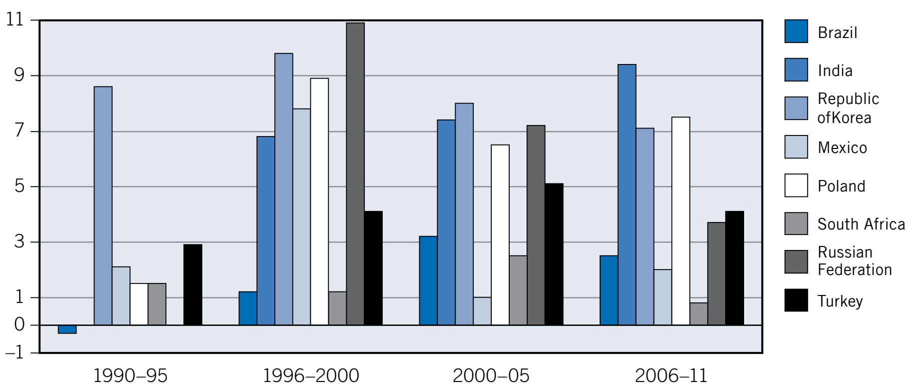
large fines. However, the ability of such competition findings to flow through to changes in pricing behaviour remains to be seen, given the *ex post* nature of competition remedies and resistance to them.

12.6.5 Manufacturing performance and sector strategies

As with GDP growth and aggregate export performance, South African manufacturing performance has been muted. Manufacturing value added (MVA) growth has been slower than in peer middle-income developing and transition economies (figure 12.7). Contrary to some mainstream explanations for South Africa's economic failings, and leaving aside the substantial methodological problems with notions of labour market "rigidity" and "flexibility", it is significant to note that – even in its own terms – there is no clear relationship at the country level between high levels of manufacturing and GDP growth on one hand and levels of '"labour market rigidity" on the other (figure 12.8). Indeed, South Africa is similar or ranks as "more flexible" than the other BRICS countries, namely Brazil, the Russian Federation, India and China.

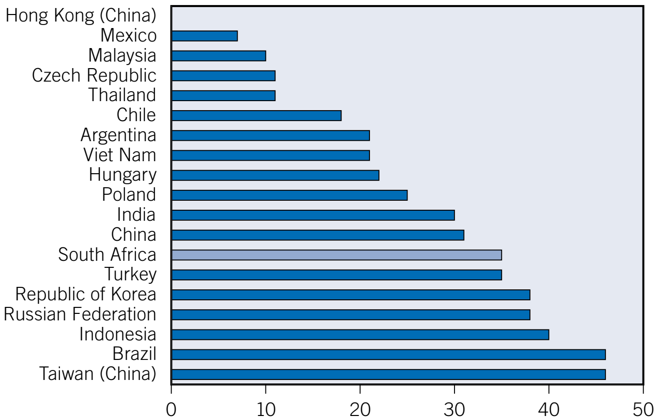
Growth in average real MVA in local currency terms has been very modest at 2.7 per cent compound annual growth (CAGR) between 1994 and 2011. There have been net employment losses in formal manufacturing employment with a CAGR of –1.3 per cent over the same period. Of the nine sectors that outperformed average MVA CAGR, five are capital- and energy-intensive MEC sectors. The remainder comprise furniture; machinery and equipment; motor vehicles,

Figure 12.7 Annual average manufacturing growth rates, selected countries, 1990–2011



Source: UNIDO.

Figure 12.8 World Bank rigidity of employment index, 2010



0 = minimum rigidity
100 = maximum rigidity
Source: World Bank.

parts and accessories (Automotives); and food and electrical machinery and apparatus (table 12.2).

As outlined above, three groups of sectors received effective industrial policy support between 1994 and 2007, albeit in the absence of a formal industrial policy: automotives; clothing and textiles; and a range of upstream sectors, particularly steel, petrochemicals and aluminium.

The Automotives sector was promoted through the Motor Industry Development Programme (MIDP) starting in 1995. Under the terms of the MIDP, exporters of automotive vehicles and components earned import rebate credits that could be used to offset import duties on components and vehicles not produced in South Africa. The disciplining mechanism of the MIDP was a sharp phase-down of import tariffs on both vehicles and components. For instance, vehicle tariffs declined from 80 per cent in 1999 to 30 per cent by 2007. This drove automotive original equipment manufacturers (OEMs) to rationalize platforms and increase economies of scale. Vehicle production increased from 388,442 units in 1995 to 534,490 units in 2007, with exports increasing tenfold over the same period. Challenges remain, however. Imports of both vehicles and components remain substantial. Domestic component production has been concentrated in fairly resource-intensive areas such as catalytic convertors and leather seat covers.[7] The focus of the next phase of automotive policy – as the MIDP gives way to the Automotive Production Development Programme (APDP) from 2013 through 2020 – is to address such issues as further increases in economies

[7] Catalytic convertors are a major user of costly platinum group metals (PGMs), while leather seat covers obviously use leather as a major input.

Table 12.2 Compound annual average growth rate (CAGR) of manufacturing value added (MVA) and employment, by sector, 1994–2011 and share in 2011

	MVA CAGR 1944–2011 (%)	Share 2011 (%)	Employment CAGR 1944–2011 (%)	Share 2011 (%)
Manufacturing	**2.7**		**–1.3**	
Leather and leather products**	16.4	0.4	–2.2	0.5
Furniture	5.7	1.1	–2.2	2.9
Other chemicals and man-made fibres*	5.6	6.9	–0.2	4.2
Basic chemicals*	4.7	5.8	–2.3	1.6
Machinery and equipment	4.6	6.6	1.4	9.8
Motor vehicles, parts and accessories	4.5	8.0	0.2	7.5
Basic iron and steel*	4.1	5.4	–1.5	4.3
Coke and refined petroleum products*	4.0	7.5	1.1	2.3
Food	3.8	12.5	–1.7	14.9
Electrical machinery and apparatus	3.7	2.9	–2.0	3.2
Basic non-ferrous metals*	2.7	2.8	0.2	1.9
Professional and scientific equipment	2.1	0.6	0.8	0.8
Paper and paper products	1.9	3.3	0.9	2.8
Plastic products	1.5	2.5	–0.7	3.3
Metal products excluding machinery	1.3	5.1	–0.8	9.1
Rubber products	1.2	0.9	–3.4	1.1
Television, radio and communication equipment	1.2	0.9	–3.6	0.6
Wearing apparel	1.1	2.0	–3.6	4.6
Other manufacturing	1.1	6.8	–1.0	3.9
Wood and wood products	0.9	2.2	–1.0	3.2
Glass and glass products	0.9	0.6	–2.4	0.9
Non-metallic minerals	0.7	3.1	–3.6	4.1
Printing, publishing and recorded media	0.7	3.0	0.7	4.5
Textiles	0.2	1.3	–3.4	3.0
Tobacco	0.2	0.7	–0.4	0.2
Other transport equipment	0.1	0.9	0.2	1.4
Beverages	–0.3	5.6	–1.5	2.9
Footwear	–1.2	0.4	–7.4	0.7

* MEC manufacturing sectors. ** Leather sector excluded due to questions about data reliability.

Source: Quantec RSA Standardised Industry Database.

of scale at the assembly level and growth and diversification of value added and employment in automotive components.

From 1995 to 2009 Clothing and Textiles was supported under an architecture like that of the MIDP, whereby exporters earned import rebates based on export levels. However, this programme – the Duty Credit Certificate Scheme (DCCS) – had profoundly different results. It supported a small pocket of exporters while helping to fuel the surge of imports caused by a combination of China's entry into the WTO and the expiry of the multi-fibre agreement in 2005. The DCCS was discontinued in 2009 and replaced with an on-budget support programme: the Clothing Textiles Competitiveness Programme (CTCP). The CTCP allows manufacturers to earn a value added-based production incentive in the form of credits that can be redeemed only through investments in specific competitiveness and upgrading activities. Even though its implementation coincided with the worst economic crisis since the Great Depression and ongoing currency overvaluation and volatility, the CTCP managed to stabilize employment levels in the sector by late 2011.

As already set out above, upstream sectors such as Carbon and Stainless Steel, Aluminium and Petrochemicals benefited from a range of supportive measures between 1994 and 2007 but de-linked from effective disciplines on exploitation of market dominance. Steel and polymers are the most significant material inputs into downstream manufacturing. For instance, steel makes up between 23 and 43 per cent of the direct and indirect input costs of the metal fabrication and machinery and equipment sectors. Thus, monopolistic pricing fundamentally impedes the ability of these sectors to compete in export markets and against imports. Research conducted for the Department of Trade and Industry (DTI) estimated that 10 per cent lower steel prices would induce downstream firms to increase output by 44 per cent and employment by 22 per cent, while a 20 per cent decrease would induce increases of 68 per cent and 45 per cent, respectively (DTI, 2010b).

The NIPF and each version of IPAP have identified monopolistic pricing of intermediate inputs as a fundamental constraint to downstream manufacturing growth and diversification and have highlighted the importance of competition and minerals policies to address these challenges. The competition authorities have responded to IPAP imperatives since 2007 and engaged in a concerted effort to address *ex post* evidence of anti-competitive conduct, but they lack the powers to directly regulate prices or change market structure.[8] Anticipating these difficulties, Fine (1997) had recommended the regulation of the South African steel industry.

However, minerals policy in particular has not been deployed in a meaningful way to ensure that South Africa's mineral endowment is passed through to promote the development of downstream manufacturing in the form of jobs and value addition. For instance – notwithstanding rhetorical commitment to downstream beneficiation – current mineral licensing legislation does not include

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[8] Since natural monopoly industries are capital intensive and have a minimum efficient scale, the options for addressing behaviour through structural change are limited, for example a single integrated plant cannot feasibly be broken up.

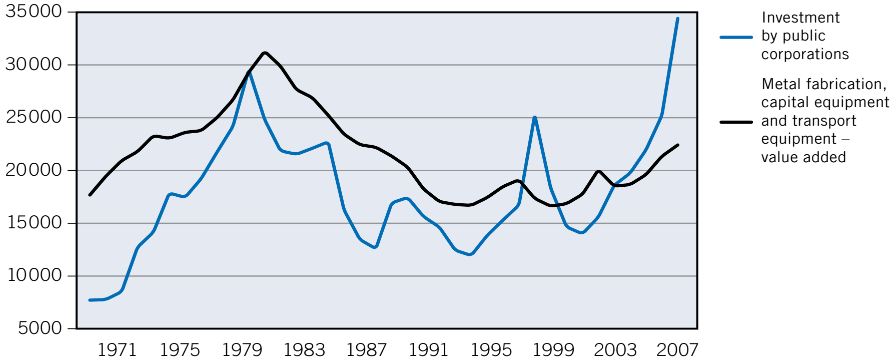
beneficiation as an objective (African National Congress, 2012). Rather mineral licensing has focused predominantly on leveraging BEE ownership participation in the mining sector. There have been a number of other missed opportunities to introduce conditionalities that would ensure that natural resource rents flow to downstream industrial development, including during the unbundling of Iscor into its mining and steel parts; the sale of the mining component; and linked to tax incentive support to the steel sector since 1994. A similar pattern emerges in other natural monopoly sectors such as polymers and aluminium.

The Metal Fabrication, Capital Equipment and Transport Equipment (MFCTE) cluster are core sectors that rely on steel as a major raw material input. Historically, the performance of the MFCTE cluster has been strongly linked to the level of public investment, particularly by SOEs (figure 12.9). Thus, the real MVA of the MFCTE sectors in general peaked at the same time as public investment in the early 1980s and has never since approached similar levels. Important capabilities and skills in these sectors have been dissipated over the last 30 years due a confluence of factors in addition to monopolistic pricing of inputs. These factors include: low domestic investment demand and slow progress in mobilizing public procurement regulations; exchange rate overvaluation and volatility; trade liberalization; and inadequate financing instruments, particularly for various forms of working capital requirements. The Capital Equipment sector of the MFCTE group has, however, demonstrated relatively strong performance, largely because of its mining capital goods segment linked to South Africa's historical mining investment and an important source of diversified manufacturing exports.

Thus, IPAP focuses on a coherent package of measures that includes leveraging public investment expenditure; financing for supply-side upgrading and skills development; tackling monopolistic pricing of raw material inputs; and support for building on areas of dynamic capabilities such as product development in mining capital equipment.

The Agro-processing sector also accounts for a substantial part of manufacturing. The Food segment – but not the Beverage segment – has grown considerably above the manufacturing sector average. It has traditionally relied on the domestic market plus the EU as its key export market. The global crisis and the prospect of lengthy stagnation in the EU fundamentally challenge this model. Significant opportunities exist to expand the sector in a variety of directions: first, through expediting the necessary regulatory measures to create a domestic biofuels sector, which could create tens of thousands of jobs across the value chain from agriculture through to refining and distribution; second, to replace imports in selected high import penetration produce such as soy; third, to target high growth net-food importing developing countries to diversify trade in this sector;

Figure 12.9 Investment by public corporations and value added in Metal Fabrication, Capital Equipment and Transport Equipment (million South African Rand in real 2000 prices), 1970–2007



Sources: SARB and Quantec SA Standardised Industry Database.

fourth, to support greater product development in relation to wealthier consumers in the domestic and export markets.

Green industries and industrial energy efficiency are considered major new initiatives. South Africa's commitment to procure 17.8 GW of renewable energy by 2030 provides an opportunity to catch this technological wave and participate as part of production chains rather than as importers and service providers to imported technologies, as happened with the ICT technological wave. Procurement and supply-side upgrading are the critical instruments to facilitate participation as component suppliers to wind, solar photovoltaic and concentrated solar power projects. Solar water heater manufacture and services is another opportunity as revisions to building energy efficiency standards require new buildings to install this or similar technologies. Opportunities also exist in such areas as industrial energy efficiency and waste management.

12.6.6 Policy and institutional coherence

The above analysis illustrates that extensive work has been carried out to identify transversal and sector-specific constraints in relation to key industries or groups of sectors and to develop and implement detailed sector strategies. Despite this, various progress reports on the implementation of IPAP repeatedly raise two key institutional constraints: first, the need for greater alignment of macro-economic policies with industrialization imperatives and, second, the need for stronger supportive action from other government departments (DTI, 2011).

12.7 Conclusions

This chapter reviews South Africa's progress over the post-apartheid era with the development and implementation of industrial policy. Orthodox laissez-faire economic reforms dominated the 1994–2007 period but did not deliver significant or sustainable investment, growth or employment gains. A policy shift began in 2007. Since then there has been significant progress in the development and implementation of industrial policy both in terms of cross-cutting instruments and sectoral strategies.

However, mobilization of the necessary support instruments and policy alignment has proceeded very slowly, even as the economy has been subjected to three major shocks: ongoing currency overvaluation and volatility, the global financial crisis and ensuing recession, and a domestic electricity supply and price shock.

The major lesson to be drawn is that successful industrialization is not simply a matter of deploying "microeconomic" instruments such as tariffs and fiscal incentives, however well designed. It also requires considerably greater integration across a range of economy-wide policies. These include provision of public goods such as reasonably priced modern infrastructure and skills development institutions that are aligned to industry needs. Most important is the need to ensure that relative prices and profitability favour investment in value-adding productive sectors of the economy rather than shorter term debt-driven consumption and speculative activities. This requires significantly stronger measures to maintain a competitive and stable exchange rate and, by implication, to manage short-term capital flows and the composition of domestic financing activities.

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Kick-starting industrial transformation in sub-Saharan Africa

13

Tilman Altenburg and Elvis Melia

Contents

13.1 Introduction

Sub-Saharan Africa is experiencing a very promising period of sustained economic growth. Since the late 1990s the economy has grown considerably faster than the population, and per capita income consequently has increased. The region has increasingly been integrated into world trade, and foreign direct investment tripled between 2002 and 2012. In general terms, sub-Saharan Africa's economic future looks much brighter than it did in the 1980s and 1990s, when the region was associated with backwardness and failed economic policies, including policies that led to de-industrialization. Many recent international economic reports portray sub-Saharan Africa as a region of growth and investment opportunities (McKinsey Global Institute, 2010 and 2012; Robertson et al., 2012). The *Economist* now regularly celebrates Africa as "the world's fastest growing continent", "the hottest frontier" and the "hopeful continent".

There are doubts, however, about whether the current boom will translate into sustainable and inclusive socio-economic development. Two characteristics of the boom are alarming.

First, thus far growth has not had the desired effects on employment, income and human development: it has not translated into sufficient jobs, and most employment expansion has occurred in the informal economy, usually at very low levels of productivity. Low labour absorption rates especially affect the young new entrants to the labour market. While the share of income poor (below the US$1.25/day threshold) in the overall population of sub-Saharan Africa decreased from 59.4 per cent in 1993 to 49.2 per cent in 2008, the absolute number of income poor actually increased from 330 to 399 million due to population growth.[1] According to World Bank data, economic growth has had less of a poverty-reducing effect than in the rest of the world, a difference that can be attributed to resource dependence and high inequality (the Gini coefficient is around 0.45 on average) (World Bank, 2013).

Second, there is little indication of structural change towards productivity-driven economies. Growth has mainly been driven by the exploitation and export of natural resources. Between 2000 and 2011 petroleum and mineral resources accounted for more than two-thirds of exports, and agriculture for an additional 10 per cent (ibid.). The revenues from commodity exports stimulated domestic consumption, creating spillover effects into wholesale and retail activities as well as real estate markets, but little progress has been made in terms of manufacturing and production-oriented services. Manufacturing is decreasing as a percentage of GDP and of exports. The region is basically earning revenues from commodity exports and spending them on manufactures, with the trade deficit increasing. This dependence on commodities also has made the region's economies more volatile.

Many observers point to the need to diversify the economies of the region towards higher-productivity activities in manufacturing, modern agriculture and services (Dinh et al., 2012; ILO, 2011; Page, 2013; UNECA and AU, 2011; UNIDO and UNCTAD, 2011). The challenges of latecomer development – in terms of existing productivity gaps, small markets, low levels of economic sophistication and diversification and lack of capital – are such that it is hard to imagine how they could ever be met without a coordinating developmental state.

Against this background, this chapter explores the role of industrial policy in sub-Saharan Africa. It does so in four steps. In section 13.2 we briefly analyse the region's recent economic performance, highlighting the opportunities resulting from the current commodity-driven boom as well as the disconnect between growth and productive transformation. We show why structural change is required to make growth sustainable and inclusive, and we argue that such change is unlikely to occur without proactive and targeted industrial policy. Section 13.3 then specifies challenges that any industrial policy for the region would need to address. It draws attention to the heterogeneity of the region, bringing out some of the differences within it and stressing the need for country-specific industrial policies. It also shows, however, that the region's countries share a number of structural characteristics that set them apart from wealthier and technologically more advanced economies. Due to these characteristics, industrial policies for the

[1] http://povertydata.worldbank.org/poverty/region/SSA

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region need to be fundamentally different from those typically applied in more mature industrial economies. Section 13.4 addresses the issue of government failure. While it is nowadays widely recognized that market failure in principle justifies proactive policies to promote structural change, questions of how and to what extent governments should intervene in factor allocation are a matter of intense debate. Governments also tend to fail, and their interventions may actually allocate scarce resources in ways that are even worse than those of the imperfect markets that they tried to correct. This criticism of industrial policy is particularly strong when it comes to sub-Saharan Africa. Overall, the region scores very low on indicators of government effectiveness, and its track record of earlier industrial policies has been poor (Bates, 1981; Lall, 2004). The last section draws practical policy conclusions. It describes which economic opportunities seem particularly worth exploring in the region and what national stakeholders can do to develop a realistic and shared strategy for industrial transformation.

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13.2 High growth, slow structural change: The need for industrial policy in sub-Saharan Africa

After stagnating throughout the 1975–95 period, sub-Saharan Africa more recently has experienced continuing growth. Since the turn of the millennium, African economies have averaged GDP growth rates of 5.6 per cent per annum (AfDB, 2012).[2] Oil-rich countries such as Angola and Equatorial Guinea have pulled ahead, but other economies, in hitherto resource-scarce regions such as East Africa, have also grown at unprecedented rates, making Africa's growth a continent-wide phenomenon.

The turnaround in the late 1990s can be explained partly by political factors and improved economic governance. After an initial upsurge in armed conflicts following the end of the Cold War, the number of conflicts decreased towards the turn of the millennium as external finance dried up and militia wars were met with better international peacekeeping efforts (Goldstein, 2011). In parallel, economic policies improved throughout the region. Since the 1990s most sub-Saharan African countries managed monetary, fiscal and trade policies more successfully and avoided the macroeconomic instabilities of the past (Fosu, 2013).

[2] All data for this chapter stem from the usual "authoritative" sources. But a note of caution is in order: Jerven's (2013) *Poor numbers* demonstrates the magnitude of flaws inherent in contemporary SSA statistics, which makes it difficult to draw meaningful conclusions on the region's growth trajectories.

The main reason for the region's economic boom, however, has arguably been the increasing international demand for resources, which led to a sustained upward trend of prices. In 2002 mineral prices surged, and in 2006 prices for agricultural commodities also rose sharply (Morris, Kaplinsky and Kaplan, 2012). This benefited sub-Saharan Africa, which is particularly well endowed with oil and mineral resources and has the world's largest reserves of underexploited agricultural land. Export revenues soared from US$100 billion in 2000 to $420 billion in 2011 (World Bank, 2013), while foreign direct investment (FDI) tripled from $15 billion in 2002 to $46 billion in 2012.[3]

Most, but not all, FDI inflows targeted extractive industries. Investments also increased in real estate, construction works and improved transportation, electricity, telecommunication and water infrastructure (ibid.). Furthermore, export revenues and capital inflows spurred income growth and domestic consumption. Consumer spending accounts for more than 60 per cent of Africa's GDP (ibid., p. 5), which in turn has attracted international investment in the retail sector, especially in countries with growing urban middle classes, such as Nigeria, Kenya and Ghana.

Africa's economic expansion is thus largely built on extractive industries and increased public and private expenditure, associated with revenues from extractive industries, for real estate, construction and consumer goods. Otherwise, there has been very little structural change. Agriculture's share in GDP is still higher than in any other region, although services are now the largest contributor. Both are characterized by very low productivity. Thus, the main structural change of the last decades has been a shift of labour force from low-productivity agriculture to low-productivity non-tradable services. Mining, oil and gas industries are highly productive, accounting for 75.9 per cent of regional exports (World Bank, 2013), but they employ less than 1 per cent of the region's workforce (McKinsey Global Institute, 2012). Manufacturing value added as a percentage of GDP declined from 15 per cent in 1990 to 10 per cent in 2008 (UNIDO and UNCTAD, 2011). Sub-Saharan Africa's shares of global manufacturing output and exports are dismally low and have stagnated over the period 1990–2005 (Page, 2012; UNIDO, 2009).[4] While East Asia's manufacturing sector has greatly benefited from globalization, sub-Saharan Africa has experienced *negative,* or *productivity-reducing* structural change over the past two decades in the sense that productive sectors shrank as a share of GDP, and excess

[3] http://www.economist.com/debate/overview/249

[4] Both figures for sub-Saharan African manufacturing (exports and output) have stagnated and even slightly declined. Excluding South Africa, they are less than 0.5 per cent of the world's share.

labour has moved from higher to lower productivity sectors and to informality (McMillan and Rodrik, 2011).

The region's lack of manufacturing industry is not just a reflection of low per capita GDP. Page (2012) compared the economic structure of contemporary African countries with that of seven successful Asian economies at the point in time when they had GDP per capita levels similar to those currently recorded in Africa. He shows that even at that early stage, the Asian countries' manufacturing sectors were twice as large in terms of labour and value added.

Is this a problem? We think it is. Historically, for a number of reasons growth has been associated with structural changes in the direction of manufacturing. Manufacturing tends to be more productive than other sectors. In Africa labour productivity in manufacturing is on average more than twice that in agriculture (McMillan and Rodrik, 2011; Page, 2012). At the same time, manufacturing tends to be labour intensive, especially at early stages of industrial development, and can therefore absorb part of the surplus of workers who flock to the cities in search of work. Dinh et al. (2012) estimate that close to 80 per cent of the sub-Saharan African workforce is employed in low-productivity, low-income jobs, either in small-scale agriculture or the informal economy. Thus, there is a great need for productive urban employment. Manufacturing is also associated with greater product sophistication, which has been found to cause higher per capita GDP growth (Hausmann, Hwang and Rodrik, 2007; UNIDO, 2009). Lastly, manufacturing is associated with diversification, which cushions price volatility. Sub-Saharan African exports tend to be highly concentrated in a narrow range of products and are thus particularly vulnerable to external shocks.[5]

Altogether, sub-Saharan Africa's growth process is socially exclusive. The main driver of growth, the oil and mining industry, employs extremely few people and has hardly any productive forward and backward linkages. Moreover, incomes earned from extractive industries are typically regressive.[6] Manufacturing and modern services, which could potentially integrate a larger part of the workforce in productive jobs, have not yet benefited from increased consumption. The largest part of the workforce is still stuck in smallholder agriculture and petty trading, where productivity is very low. As a result, the pace at which poverty is

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[5] A recent report illustrates this vividly: "The value of African exports fell by 31 per cent in 2009 and grew by 25 per cent in 2010 – but in volume terms, these figures equate to only 11 per cent and 9 per cent of exports in these two years. In other words, price accounts for almost two-thirds of the growth or contraction in the value of trade" (UNECA and AU, 2011, p. 42).

[6] Revenue management in the region is often weak, leaving room for illicit enrichment of those who are politically connected. Also, oil and mining companies demand few highly skilled workers who receive high wages. Secondary effects tend to increase inequality further: real estate price booms make landowners more wealthy, and rising land and food prices are particularly harmful for the poor.

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reduced in sub-Saharan Africa is markedly slower than in all other developing regions (AfDB, 2012).

All this suggests that sub-Saharan African countries need to push for structural transformation. The region faces the challenge of kick-starting productivity-driven and labour-absorbing economic development. Historical evidence suggests that this is impossible without targeted and well-coordinated policy support (see, for example, Chang, 2003). Too many market failures work against such a deep transformation. Price signals help entrepreneurs identify where they can exploit comparative advantages, but they are highly imperfect when it comes to finding future production possibilities in economies where substantial learning-by-doing is involved. Individuals who invest in a particular activity today cannot anticipate how knowledge spillovers may lead to diversification and new technological opportunities at a later stage of maturity of the given industry. Even if they could, they would not make all the investments needed for structural change, because they would not be able to appropriate all the gains of those activities. Furthermore, building up new industries in a pre-industrial society requires investments in infrastructure and related upstream and downstream activities of different sorts. Unless these investments are undertaken simultaneously, the industry cannot thrive. Hence, considerable coordination and government guarantees may be needed to get the new industry started (Altenburg, 2011).

13.2.1 Specific industrial policy challenges for the region

Sub-Saharan Africa is a heterogeneous region. The prospects for industrial development greatly differ according to many factors, including whether countries are resource-rich, large or small, coastal or landlocked, how developed their neighbours are and how they are governed. At the same time, the region's economies show a number of commonalities, which they share with a few other low-income countries but that set them apart from more advanced countries, including most developing economies of Latin America and Asia. These commonalities include a high share of agriculture and commodities and a low share of manufacturing in GDP; self-employment of a large portion of the workforce; widespread informality of economic relations; weak linkages between some modern economic sectors and the traditional small-scale economy; and particularly low productivity and incomes. These conditions call for a very specific bundle of industrial policies.

At the same time, industrial policies need to account for differences within the region. This short overview chapter cannot do justice to the diversity of country conditions and their implications for structural transformation. All it can do is highlight key challenges for major country groupings with similar starting conditions. Collier and O'Connell (2007) suggest a useful typology for this purpose. They distinguish three types of countries with very different opportunities for growth: coastal and resource scarce; landlocked and resource scarce; and resource rich. In this last category endowments trump location, because for resource-rich countries, both the coastal advantages for manufacturing are erased (by Dutch disease effects) and the transportation hindrances of being landlocked become negligible. This section starts with the commonalities and works out what they imply for industrial policies. Then, it addresses some of the specific industrial policy challenges for the three country groupings.

We highlight *five characteristics that are widely shared among the economies of sub-Saharan Africa* (with the exception of the Republic of South Africa). All of them pose specific requirements for industrial policy (Altenburg, 2011).

First, the region's economies are still at very early stages of the structural transformation from agrarian to industrial societies. Agriculture still accounts for 32 per cent of GDP and 65 per cent of employment.[7] Furthermore, many of today's urban residents have an agricultural background, having migrated relatively recently. To engage in manufacturing requires new sets of entrepreneurial, technical and managerial skills as well as specific attitudes – passion for business, readiness to take risks, achievement spirit, curiosity, persistence – that are quite different from those in traditional agriculture, especially when the aim is to create competitive enterprises that are part of modern production networks. Such skills and attitudes can be acquired in different ways. While a good education system lays the groundwork, additional sources of knowledge are also important; these can be formal (business schools, vocational training) or informal (knowledge transfer within business families). In largely agrarian societies these pools of knowledge have to be built step by step. Moreover, traditional norms may discourage entrepreneurial behaviour. In some sub-Saharan African societies, for example, social obligations to share accumulated wealth with family and kin are strong (Grimm et al., 2013), which may undermine the profit-maximizing behaviour that drives capital accumulation in firms. Similarly, business transactions may be complicated by tensions between contractual law and informal norms of reciprocity. Especially in the least developed countries of the region, governments therefore have a role in establishing basic institutions for market economies and nurturing the skills and attitudes of a newly emerging "entrepreneurial class". Some sub-Saharan African countries have systematically tried to link up with

[7] http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AFRICAEXT/0,,contentMDK:21935583~pagePK:146736~piPK:146830~theSitePK:258644,00.html

entrepreneurs in the diaspora, who have accumulated skills through their exposure to diversified business communities (Plaza and Ratha, 2011).

Second, the economies of the region are latecomers to the globalizing economy. While they are still at early stages of industrial development, they already face competition from international enterprises. The latter have often accumulated know-how and capital over long periods of time, established good relationships with suppliers, customers and other business partners, created pools of skilled labour and built a brand reputation. Newcomers from lagging world regions, therefore, do not compete on equal terms. They lack comparable network externalities and typically suffer from diseconomies of scale. Although some African countries offer competitive wage cost, they can hardly compensate for the cluster synergies that some Asian export countries have been able to build up over the last decades. Thus, the latecomer situation creates a vicious circle: "Firms located in Africa face costs that will be above those of Asian competitors, but because costs are currently higher individual firms have no incentive to relocate" (Collier and Venables, 2007, p. 1). To break out of this circle, governments need to adopt a much more supportive role – e.g. providing tax incentives for exporters or investing in labour productivity – than one would expect in economies that compete on fairly equal terms.

Third, sub-Saharan African economies are deeply fragmented. The productivity gap between the majority of the workforce that is engaged in traditional farming and rural or urban microenterprises and the typically small modern mining or industrial sectors is very large and even widening (OECD, 2009). Economic theory suggests that, without market distortions, competition reallocates labour and capital from less efficient firms and activities to more productive ones. This mechanism obviously does not work well in sub-Saharan Africa. Despite the recent economic boom, only 28 per cent of Africa's labour force has stable wage-paying jobs (McKinsey Global Institute, 2012). Apart from labour markets, enterprise structures are also segmented in such a way that there are few productive linkages and knowledge spillovers between high- and low-productivity firms. This is especially true for FDI, which, according to the United Nations Commission on Trade and Development (UNCTAD), has a tendency in Africa "to reinforce enclave-type development", contributing very little to economic diversification through backward and forward linkages in the region (UNCTAD, 2013). Strengthening inter-firm linkages across sub-sectors of the business community and exploiting modern investments as vehicles for technology diffusion should therefore be a key aspect of industrial policy in the region. Options range from incentives for joint ventures, to supplier development programmes and franchising arrangements, to financial incentives for technology transfers.

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Fourth, sub-Saharan African economies have to cope with particularly high rates of poverty and underemployment. Therefore, industrial policy in this region needs to pay particular attention to distributive employment and poverty effects. The history of economic development shows the importance of competition and “creative destruction” (Schumpeter, 1942) as drivers of innovation. Competition ensures that more productive ways of doing business replace less efficient ones. In rich societies policy-makers widely agree (in theory at least) that industrial policy should prepare the ground for newly emerging activities rather than shielding the losers from structural change. In poor countries, in contrast, industrial policy must pay particular attention to the social costs of such creative destruction. This is particularly important in labour-intensive activities that provide the livelihoods for many uneducated poor (such as traditional farm employment, retailing or cottage industries), for whom employment alternatives are scarce and difficult to access. This does not mean that reforms should be avoided. Competitive pressure is important to increase productivity, but it needs to increase at a slow pace that allows even poor households to learn and adapt their livelihood strategies, and it should be accompanied by a range of focused support measures.

Fifth, due to a combination of low incomes and small populations, sub-Saharan African economies are mostly very small: 38 of the region’s countries have fewer than 20 million inhabitants each, and so far only three (Nigeria, the Democratic Republic of the Congo and Ethiopia) exceed 50 million. Most countries belong to the “bottom billion” countries, where per capita income, even measured at purchasing power parity (PPP) prices, is less than US$2,000 per year (UNIDO, 2009). Small markets often result in suboptimal scales of production and thus high unit costs. Firms may export to overcome these restrictions; but this is difficult in the region, as the cost of trading across borders tends to be very high, due to both trade restrictions and poor infrastructure. Even within countries, inefficient transport systems increase the cost of trading, which further adds to the segmentation of markets and diseconomies of scale.

As noted, there are also major differences between sub-Saharan African countries. We adopt Collier and O’Connell’s (2007) categorization to outline key policy challenges that are specific to each of their three groups of countries.

(a) Landlocked and resource-scarce countries

Sub-Saharan Africa is unique for its many landlocked countries. Their main problem is logistic dependence on coastal neighbours. Freight service costs are high, and transportation time can be unpredictable due largely to rent-seeking and deficiencies in the transit infrastructure of coastal neighbours. This puts landlocked countries in a particularly difficult position for structural transformation. Also, any type of instability in coastal neighbours is detrimental for landlocked economies. The options for landlocked economies to circumvent their geographical impediments are very limited. What they can do is to dovetail with the economies of faster growing coastal neighbours by promoting regional integration, investing in regional infrastructure and streamlining administrative procedures for cross-border trade. Furthermore, they can engage in exporting goods and services that are easier to get to markets. These include e-services, such as business process outsourcing or other "trade in tasks" (Page, 2012), financial services for the region (which Rwanda, for example, is building up) or high-value horticultural goods that are airlifted. Collier (2008) suggests following the Philippines' model of vocational education specifically geared toward richer countries' labour demands while simultaneously making remittances and relocations or diaspora business investments back home easier. All of these strategies require the creation of specialized supporting institutions.

(b) Coastal and resource-scarce countries

The standard literature depicts this as the most promising category, but sub-Saharan Africa's performance has been weaker here than that of the coastal and resource-scarce countries of other developing regions. Apart from Mauritius, no sub-Saharan African economy has managed to climb the industrialization ladder in the way that newly industrialized countries of East Asia have done (Collier, 2008). What can governments of coastal and resource-scarce countries do to encourage entry into labour-intensive manufacturing? Product concentration and spatial agglomeration are perhaps the most important aspects for kick-starting such entry. This can be achieved via special economic zones such as export processing zones near a seaport city, with a concentration of good infrastructure and business-friendly regulations. However, to date, labour costs in the region are still relatively high when compared with those of some Asian competitors, and the many small countries in sub-Saharan Africa (those with low population density) are at an added disadvantage (Farole, 2011). But, as labour costs in China are set to rise, the Chinese government itself has begun to engage with African governments in setting up special economic zones in Africa as a form of "mutual benefit" development aid (Bräutigam and Xiaoyang, 2011). Such cooperation is cause for optimism.

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(c) Resource-rich countries

Many sub-Saharan African countries are well endowed with oil, gas and minerals as well as arable land. But, according to the "resource curse" literature, such endowments are not necessarily a blessing (Sala-i-Martin and Subramanian, 2003). Collier and Goderis (2007) find that due to three factors, resource-rich economies have grown much more slowly than would be expected in view of their potential to invest huge amounts in public goods such as infrastructure or education. First, Dutch disease effects lead to exchange rate appreciation, making all other sectors, including manufacturing, less competitive. Carefully crafted combinations of fiscal, monetary and trade policies are needed to counteract Dutch disease effects (Asche and Wachter, 2013). Second, price volatility makes resource-rich countries especially prone to macroeconomic instability, which makes it difficult for private sectors to plan ahead and tempting for the state to overextend itself during boom times. Third, and most important, the availability of resource rents provides adverse incentives to governments and tends to undermine good governance. As a result, poverty has been declining at a slower pace in the region's resource-rich countries than in resource-poor countries – despite faster growth (World Bank, 2013).

Given the number of newly resource-rich countries in sub-Saharan Africa, it is paramount, from an industrial policy perspective for the region, to find ways to bring about structural transformation in spite of these challenges. Ideally, this is done through a combination of two measures – a dual track approach. First, government leaders of (newly) resource-rich sub-Saharan African countries who see themselves as developmentally oriented need to take the necessary *defensive* measures to protect their economies from the resource curse. This can be done by carefully educating oneself on the curse's pitfalls, its recognizable symptoms, and the counteractive measures to be taken. For this, the Extractive Industries Transparency Initiative can be a helpful tool. Second, opportunities do exist for *offensively* exploiting forward and backward linkages to and from extractive industries that can provide the starting point for industrial diversification. Here, too, guidelines aided by robust research are coming on stream. A team of scholars engaged in the Making the Most of the Commodity Price Boom project (MMCP), indeed goes so far as to suggest that opportunities for resource-rich countries to diversify are so abundant (especially regarding backward linkages) that the notion of a resource "curse" should be reviewed (Morris, Kaplinsky and Kaplan, 2012). The authors provide ample empirical evidence from eight such economies in the region for the argument that it *can* be done, and they provide a roadmap for *how* it can be done.

It should be noted that new oil and mineral deposits are currently being explored throughout the region. Given the rapid pace of oil and mineral discoveries in recent years, the number of countries classified as resource-rich is increasing. According to new estimates, only four or five countries in the region will not be involved in mineral exploitation by the year 2020 (World Bank, 2013). This will create opportunities for landlocked countries with few other options, but it also can undermine coastal countries' efforts to build export-oriented manufacturing industries on the basis of labour cost advantages.

Summing up, the challenges for industrial development in sub-Saharan Africa are unique, and the choice of industrial policies must reflect this. In advanced industrialized economies markets are typically regarded as fairly well-functioning institutions for resource allocation, and market failures are widely regarded as exceptions, which justify temporary corrective interventions. Our brief description of the challenges of African latecomer societies has shown that the standard assumptions of neoclassical theory – such as perfect competition, constant returns to scale, full rationality of decision-making and tradability of knowledge – are highly unrealistic (see also Cimoli et al., 2006). If sub-Saharan Africa's pre-industrial societies wish to progress towards market-driven industrialization, deep institutional transformations are needed. Thus, the need is for a developmental state that orients a national transformation project, organizes a social contract, nurtures an entrepreneurial class where it does not exist, supports primary capital accumulation and transforms traditional institutions – from social norms and values, property rights regimes and contract enforcement mechanisms to new education and financial intermediation systems – in ways that fit the purposes of industrial development. In a nutshell, industrial policy in the region must be much more encompassing than it is in advanced industrialized countries.

13.3 Governance capacities for successful industrial policy

Productive transformation in sub-Saharan Africa calls for a very active leadership role for the State, both in identifying the general pathway and implementing specific policies. But overcoming market failures through government action is difficult. Governments may make wrong choices due to incomplete information (Pack and Saggi, 2006); even if they were to obtain the necessary information, it is not certain that industrial policies would be designed solely in the public interest and implemented diligently. This problem is especially pertinent in poor countries, where governments are much weaker and institutions tend to be less effective than in rich countries.

In general, political leaders have two sets of motives: their personal political survival and material well-being (i.e. their narrow interests) and the country's prosperity (i.e. their broad goals). In pursuit of both their narrow and broad motives, leaders are guided by institutions. Institutions are "formal constraints (e.g. rules, laws, constitutions), informal constraints (e.g. norms of behaviour, conventions, self-imposed codes of conduct), and their enforcement characteristics" (North, 1994, p. 360). In developing countries, where the enforcement characteristics of formal constraints are particularly weak, it is essential that informal constraints "accommodate" (Helmke and Levitsky, 2006, p. 14) in ways that help align the elites' narrow interests with their broad goals for the country.

Compared with East Asian success stories, harmonizing formal and informal institutions has proved to be more difficult in sub-Saharan Africa. The combination of fragmented societies and weak States left most independence leaders in a difficult position. The inherited colonial state structures, with their half-heartedly transplanted legal-rational institutions, were ill suited for sustaining a monopoly of violence. To counteract factional divisions, most African leaders set out to strengthen their positions by amending their independence constitutions to centralize power in the presidency, and by simultaneously building up informal loyalty networks, cascading down from the presidential level to each district and public agency. Thus, hybrid political systems evolved, with outwardly legal-rational institutions that were thoroughly hollowed out by informal patronage systems. These hybrid systems, which would come to be known as neopatrimonialism (e.g. van de Walle, 2001), initially provided some stability, allowing many leaders to align their personal with their national goals. Thus, the first decade of African independence, from the early 1960s into the mid-1970s, was marked by active industrialization strategies, and, as the period coincided with global growth, this initially yielded economic successes.

But patronage systems are not effective in allocating resources. Rewarding clients conflicts with the principles of strategic industrial policies, which require the withdrawal of subsidies from inefficient firms. With the economic downturn in the 1970s, resources available to African leaders diminished, and governments became more dependent on donors and subject to the austerity prescriptions of structural adjustment programmes. Political conditionality, however, did not have the intended effect on public expenditure. Informalization intensified, arguably to keep the various elite factions from fragmenting and plunging countries into civil wars (Reno, 1999). As ruling coalitions became ever more unstable, more resources were needed to nurture the patronage system. This thwarted issue-based policies such as industrial development programmes.

This period of instability made economic progress impossible for most sub-Saharan African countries. Between 1975 and 1995 many economies of the region stagnated or even contracted. The private sector remained miniscule and dependent on the State, and hostilities increased between ethnic communities, as

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the only perceived way a community could prosper was for its representatives to have access to the State – the main gate to resources (Cooper, 2002). Apart from tight State–business collusions that made effective industrial policy interventions virtually impossible (Handley, 2008), neopatrimonial power structures also drastically widened income inequalities. Hence, while the structural adjustment era brought about a more stable and predictable macroeconomic environment, it did not lead to the desired outcomes of lean, efficient States and freely thriving markets. The region still scores poorly in the World Bank's governance indicators or Transparency International's Corruption Perception Index (with some notable exceptions, including Botswana and Mauritius).

Beginning with the wave of democratization in the early 1990s, a new mainstream "good governance" approach emerged, trying to constrain neopatrimonialism and build a "Weberian state" with a clear-cut separation of the public and private spheres. Proponents implicitly assumed that checks and balances in the political sphere and accountability and meritocracy in the bureaucracy would also improve economic performance. Empirical evidence, however, casts doubt on this assumption.

A more heterodox reading of historic institutional evolution in early Western industrializing countries (North, Wallis and Weingast, 2009) and emerging Asia (e.g. Khan, 2007)[8] reveals quite different trajectories. At the heart of successful economic development were not necessarily democratic checks and balances or the rule-of-law for all citizens, but prolonged periods of political stability. Avoiding factional outbreaks of violence, by whatever means, allowed for the institutionalization of violence-monopoly organs. Such stability facilitated the process of economic growth, which in turn– sequentially – led to political liberalization. Khan (1996) suggests that economic development can be achieved while wide-scale corruption, elite impunity, and nepotism have not been rooted out and that it becomes easier to improve governance as countries get richer. What is more, attempts to "transplant" political systems from rich countries – i.e. the institutions of political competition and strict accountability of rulers – may even be counterproductive if they promise citizens a level of legal justice that cannot be implemented and curtail the elites' informal means of keeping the peace among factions that could plunge a country into civil war.

Thus, different pathways may lead to economic development. Governments in sub-Saharan Africa are currently testing various pathways and sequences of institutional reform. Ghana and Kenya, with their progressive institutions, openness to civil society and media scrutiny, are among the countries pursuing the "good governance" route. Ethiopia's and Rwanda's leaders, meanwhile, seem to prioritize

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[8] For sub-Saharan Africa's own post-colonial trajectory in this regard, see Mkandawire (2001).

economic transformation over political transformation, thus emulating the reform sequence of some Asian countries. Altenburg (2013) shows how industrial policy performance varies across a number of African countries despite shared characteristics of neopatrimonialism. Ultimately, each country, more or less democratic, more horizontally or vertically interventionist, has to find the specific policy mix that dovetails with its institutional landscape. Still, democratic institutions and civil liberties are desirable values in and of themselves; and stricter formal institutions can better constrain (and ideally pre-empt) predatory governments.

13.4 The way forward

Despite the difficulties and challenges encountered, some sub-Saharan African countries were able to make substantial progress. This suggests that with the right policies in place these countries can harness new opportunities to diversify their economies, increase productivity and create more decent jobs. We have identified five promising opportunities, although there may be more.

13.4.1 Taking advantage of booming domestic demand

Two decades of sustained economic growth in sub-Saharan Africa have increased real incomes by an average of 2.3 per cent per capita annually in recent years (World Bank, 2013). The "consuming classes" (defined as households with annual incomes of US$5,000 or above, measured at PPP) are expanding on an unprecedented scale. For the whole of Africa, the number of such households increased from 31 million to 90 million in barely over a decade (McKinsey Global Institute, 2012). Higher consumer spending has triggered investments in retail activities, housing and other activities – but hardly any investment in manufacturing. A large part of simple consumer goods and inputs for the construction sector are imported. Retail chains have started to replace traditional markets, thereby raising entry barriers (in terms of quality and economies of scale) in the supply chain and replacing local supplies with imports.

To reap the benefits of increased domestic consumption, the competitiveness of local suppliers needs to be strengthened. During earlier phases of import-substituting industrialization, this was mainly pursued via import restrictions, which often ended up increasing bribery and illegal imports rather than developing competitive domestic industries. Governments should therefore employ trade policies very carefully[9] and focus more on supply-side measures to encourage local entrepreneurship. Collaborative partnerships between large companies (mining and construction companies, hotels, retail chains) and government agencies to strengthen local suppliers and service providers have often proven to be effective. A bit of "nudging", e.g. by linking production licenses for large companies or government procurement to training and support measures, may sometimes be needed.

13.4.2 Exploiting regional integration

Most national markets in sub-Saharan Africa are very small, due to a combination of low average income, small populations and poor infrastructure. This is a major competitive disadvantage for manufacturing industries in particular. Regional integration can mitigate this disadvantage, particularly as neighbouring countries have similar demand conditions that are not as challenging for local producers as exporting to OECD countries. In fact, the few industrial products that sub-Saharan African countries export go mainly to other countries within the region. Producing for regional markets allows for scaling up supply capacity and improving marketing and logistics in a relatively familiar environment. Thus, it can be a stepping stone to extra-regional sales at a later stage.

While regional trade has recently picked up, it is held back by three factors: poor transport infrastructure; the high administrative costs of trading across borders; and regional inequality, because countries with less competitive industries often perceive more risks than benefits from integrating with more advance neighbours (Asche and Wachter, 2013).

The policy implications are straightforward. First, cross-border infrastructure projects are crucially important. Second, other trading costs related to, inter alia, cumbersome clearance processes, import duties, legal or illegal facilitation payments and warehousing costs can be reduced by, for instance, abolishing duties and streamlining customs procedures as well as holding customs and transport authorities and service providers accountable (Arvis, Raballand and Marteau, 2007). The third part is trickier. The challenge here is to coordinate industrial policies at the regional level to ensure that all participating countries gain, including the least competitive ones. This calls for special incentives rather than mandatory requirements for investors to set up factories in specific locations (Asche and Wachter, 2013).

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[9] Even when import restrictions are not in the spirit of the WTO, the fact that small countries play a marginal role in global trade means that the non-compliance of sub-Saharan countries with WTO commitments almost never leads to legal enforcement (Bown and Hoekman, 2008).

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13.4.3 Forward and backward linkages from commodity sectors

Agriculture and mining account for a large part of regional GDP, and these activities benefit from high world market prices and inflows of investments. Therefore, it seems reasonable to pursue an industrialization strategy based on forward and backward linkages from these activities. Especially linkages from agriculture – including agro-processing as well as input supplies and spillovers from increased agricultural productivity into rural non-farm employment – can potentially reach many rural poor. Adelman (1984) dubbed this approach “agricultural demand-led industrialization”, a concept that has been taken up by several governments in the region (see also Yumkella et al., 2011). Linkages from oil and mineral resources have so far remained weak. For example, Krause and Kaufmann (2011) found a number of backward linkages between a major aluminium smelter (MOZAL) in Mozambique and local SMEs, but these were limited in scope despite comprehensive support from donor agencies. Recent research by Morris, Kaplinsky and Kaplan (2012) offers a more optimistic picture, arguing that Dutch disease effects do not necessarily undermine forward and backward linkages and providing examples of linkage creation where countries invested in specialized capabilities.

13.4.4 Integrating into global value chains

Exporting light manufactures to the rest of the world, in most cases made by order for large Western corporations, has been the starting point for industrial development in many Asian and some North African (Tunisia, Morocco) countries. From there, some countries, including the Republic of Korea, Singapore, Malaysia and, more recently, Bangladesh, managed to upgrade and diversify their production base gradually (e.g. Amsden, 1989). India has shown that upgrading in global value chains also works in tradable services (Athreye, 2010). In all these cases low-cost advantages were decisive in the beginning, but the successful exporters seized opportunities to increase productivity in such a way that salaries could be raised significantly without sacrificing competitiveness.

Sub-Saharan African countries attract substantial investment in labour-intensive exports. First, this is due to low labour costs in some countries. Ethiopian wages are only one-quarter of China’s and half of Vietnam’s (Dinh et al., 2012). Second, sub-Saharan Africa is privileged by duty-free and quota-free access for light manufactures to the United States under the Africa Growth and Opportunity Act and to the EU under the Cotonou Agreement. So far, however, very little investment has been attracted to the region. As successful garment exporters, Mauritius and Lesotho are two exceptions. The reasons for the overall disappointing performance are manifold, including low labour productivity compared with Asian competitors (remember that competitiveness requires low *unit* labour costs, not low salaries per se), higher transport costs and investment climate issues.

For coastal countries, establishing privately managed duty-free export processing zones for light manufactures is an option. It may shield investors from infrastructure bottlenecks and red tape in the host economy. The current steep rise of labour costs in China favours the relocation of such industries, but sub-Saharan African countries will have to compete with low labour cost countries in Asia, such as Cambodia and Bangladesh. Therefore, increasing productivity remains crucial. In some cases the local availability of raw material is an asset – e.g. Ethiopia's shoe exporters benefit from low labour costs *plus* good-quality hides (Altenburg, 2010). Besides light manufactures, trade in services may offer attractive opportunities even for landlocked countries (UNIDO, 2009). Some of these, such as call centres and data entry, have the benefit of low entry barriers in terms of skills and capital. From there, countries can pursue strategies to upgrade into higher-value services.

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13.4.5 Marketing natural and cultural resources abroad

Sub-Saharan Africa has a lot to offer that is unique and attractive to people all over the world. Wildlife tourism already attracts millions of visitors each year to East Africa, Namibia and Botswana. Mauritius, Seychelles and Cabo Verde are also preferred tourist destinations. Tourist arrivals in sub-Saharan Africa recently grew faster than the global average, at 5.0 per cent versus 3.8 per cent (World Bank, 2013), but the region's potential is still largely unexploited. Beyond tourism, cultural industries offer a range of business opportunities in the spheres of music, dance, literature, film, crafts and design. To the extent that these industries build upon the region's unique resources and cultural heritage, they are partly shielded from international price competition. In Nigeria, a local film industry has emerged, catering mainly to the African market. Also, international movies are increasingly filmed in Africa. Handmade crafts that build on local traditions, African designs incorporated into textiles and furniture, and ethnic food targeting African diasporas all have a market in OECD countries (Biggs et al., 1996).

How big these opportunities are, and what specific combination of opportunities is most promising, of course varies greatly among countries. Thus, governments and their partners in business and civil society face the challenge of identifying the right objectives and designing the appropriate policies to achieve them. How can this be done?

There is no simple formula, no scientific procedure. Some authors have suggested tools to assess how countries are currently positioned in the global economy, what competitive specialization they should strive for, and what reform steps are needed for that purpose. Some of these tools are useful, but – due to their generic character – also have serious limitations. Therefore, we suggest a pragmatic combination of several elements.

One planning tool has been suggested by Lin and Monga (2010) in their Growth Identification and Facilitation Framework. Their main suggestion is to "identify the list of tradable goods and services that have been produced for about 20 years in dynamically growing countries with similar endowment structures and a per capita income that is about 100 percent higher than their own". The assumption is that the comparator countries' competitiveness may deteriorate due to increasing wage costs, which would then open up opportunities to attract relocating industries. While this is a good starting point, other determinants need to be incorporated into the analysis, such as economies of scale, transportation costs and proximity to important markets. Benchmarking such determinants against relevant competitors also helps to define promising avenues for competitive specialization.

Another, more pragmatic way of identifying promising pathways is to observe what innovative entrepreneurs are doing, assist them in expanding their business, and encourage more entrepreneurs to pursue the same or related types of business. Ethiopia's cut flower industry emerged along these lines (Altenburg, 2010). Overall, entrepreneurial experimentation and learning should be encouraged. It is mostly entrepreneurs, not bureaucrats, who identify viable business opportunities. Governments have an important role in enhancing the ability to take advantage of them, pressing for social inclusion and technological upgrading. This will work only if industrial policy is organized as an evidence-based learning process with feedback loops and deep involvement of firms at all level.

13.5 Conclusions

Sub-Saharan Africa has been on a high-growth track since the late 1990s, propelled mainly by booming international commodity markets. Analysts and media reports have largely shifted from the "Africa pessimism" of previous decades to predicting a promising high-growth future. However, doubts remain about the sustainability of the current development path. First, little has been achieved so far in terms of economic diversification and productivity growth. Second, growth has been economically and socially quite exclusive, with very limited positive effects on poverty alleviation and job creation in the modern parts of the economies. In order to become economically sustainable and socially inclusive, sub-Saharan Africa needs a structural change of its economies towards productivity-driven activities outside the commodity sectors.

To manage this, proactive and targeted industrial policies are essential. These policies need to be substantially different from standard industrial policy packages in more advanced economies, where markets function reasonably well in allocating resources productively. Sub-Saharan Africa is still largely agrarian; the bulk of non-farm employment is generated in micro-enterprises; inter-firm specialization and collaboration are still weak; economic transactions are strongly influenced by informal institutions that are not necessarily well aligned with the prevailing governance principles of market economies; and social norms and values in some countries are not conducive to the development of entrepreneurship. To overcome these constraints and nurture competitive industries, a particularly active role for the State is needed – one that goes beyond the facilitating role that it usually plays in economically more advanced market economies. The challenge is to *kick-start industrial transformation* in pre-industrial societies. At the same time, industrial policy needs to safeguard the poor whose livelihoods would be jeopardized by unfettered competition. The policy mix and the sequence of reforms need to be carefully tailored to country conditions. Also, within-region differences in terms of resource endowments, geography and level of development need to be considered.

While the State thus faces an enormous transformational task, policy-makers and bureaucrats act under an incentive structure that is often highly unfavourable for industrial development. In the political realm, stability often relies on clientelism rather than decision-making based on evidence and merits; in the economy, rent-seeking is often more rewarding than productive investments, and Dutch disease effects further undermine the latter.

Still, there are options for economic diversification – from efficient import substitution, to agricultural processing, export of light manufactures and trade in tasks, to tourism. To exploit them effectively, sub-Saharan African countries need to define realistic and shared "transformation projects" and reform democratic institutions in tandem with the implementation of industrial policy.

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The paradox of US industrial policy: The developmental state in disguise

14

Robert H. Wade

The continental Europeans, most successfully the Germans, have long deployed the might of the State to boost their manufacturing base, using largely pragmatic arguments. The Anglo-Americans, in contrast, have for the past several decades embraced a consensus against such a role, at least at the level of principle. Their rationale has rested largely on ideology, especially the ideology of the more politically oriented branch of neoclassical economics known as neoliberalism.

Ever since the election of Margaret Thatcher in 1979 and Ronald Reagan in 1980, by which time Keynesian ideas were already sidelined, strong political and intellectual forces mobilized around neoliberal or market fundamentalist ideas, as expressed in the dictum that "[t]he free market is what works, and having the state help it is usually a contradiction in terms" (Kasperov, 2012). The simplest free market champions claim that hearty entrepreneurs like Bill Gates and Steve Jobs, backed by venture capitalists and generous philanthropists, can create the innovations needed for progress – provided the government stops interfering. As Michael Lind writes, "It would be easy to get a thousand PhD economists [trained in the Anglo tradition] to sign a manifesto insisting that we should ignore history whenever it conflicts with theory … about generic firms competing in abstract markets" (Lind, 2012).

This Anglo-American consensus has ensured that the phrases "industrial policy" and even "technology policy" and "innovation policy" are anathema in policy circles, synonymous with "pork barrel politics", "corporate welfare" and, worst of all, "picking winners". The United States presents a paradox, however. On one hand, public policy discourse has long been dominated by the "market fundamentalist" narrative, which draws acceptance from its smooth elision of "market forces" with such desirable values as "freedom", "democracy" and "meritocracy", and its equally smooth elision of "government intervention" with "the nanny state" and "economic sclerosis" and "the road to serfdom". On the other hand, the US government has in fact undertaken much more industrial policy than this narrative implies, from the founding of the Republic to today, including the promotion of what became major technological innovations ("general purpose technologies"). As a recent study of the biotechnology sector says of the recent period:

> The knowledge economy [in biotech] did not spontaneously emerge from the bottom up, but was prompted by a top-down stealth industrial policy; government and industry leaders simultaneously advocated government intervention to foster the development of the biotechnology industry and argued hypocritically that government should let the free market work (Vallas, Kleinmann and Biscotti, 2011).

What is more, much of the technology-intensive private sector in the United States has been *cutting* investment in basic technologies in order to focus on "value extraction", relying even more than in the past on public agencies for the basic research (Mazzucato, 2013).

This chapter explores the US paradox.[1] The first section examines the arguments used to justify the claim that the US government does not or should not try to boost certain industries except in occasional cases of "market failure". These arguments and the political forces that carry them set the deeply hostile context through which proponents of industrial policy have had to navigate. In response, proponents have tried to keep their programmes out of sight of the market fundamentalists massed in politics, the media, think tanks and universities. They have barely attempted to promulgate a narrative to counter the dominant market fundamentalist narrative. The most striking example is the proponents' failure to emphasize that a US government agency's programme spawned the Internet. The rate of return on the publicly financed part of this one innovation must be big enough to offset by far whatever alleged mistakes the government made elsewhere across the whole domain of industrial policy.

If the American government has in fact been much more active in promoting particular technologies and industries than is generally understood, it is important that this be more generally known, because the American government

[1] This chapter is one of several papers about industrial policy by the same author: for example, Wade (2004, 2010 and 2012).

both directly and indirectly, through organizations such as the World Bank and the World Trade Organization (WTO), has long told the rest of the world that, in the words of Nobel Laureate in Economics Gary Becker, "[t]he best industrial policy is none at all" (Becker, 1985); or in the words of John Williamson, "[l]ittle in the record of industrial policy suggests that the state is very good at 'picking winners'" (Williamson, 2012); or in the pithy words of Lawrence Summers, government "is a crappy VC" (venture capitalist).[2]

In late March 2012 Gene Sperling, director of the White House's National Economic Council, declared that a national manufacturing renaissance would be strongly in America's interest. His speech (Sperling, 2012) was notable for two reasons. First, it was the first time that a key figure in the Obama administration – or for that matter in any of the past several administrations – spoke positively of manufacturing and the need to mount industrial policies to help the sector. Second, almost no one paid attention to the speech; it disappeared without trace. Industrial policy remains a dangerous subject in America, because to express sympathy risks being classed as an incompetent or worse.

So, against this background of emphatic rejection of industrial policy, the second section of this chapter gives a brief history of US industrial policy going back to the first years of the Republic and continuing through the nineteenth and twentieth centuries. The third section describes the emergence of "network-building" industrial policy in the past two decades or so. Here we see a variant of the model of the "developmental state", although rather different from the East Asian variant (Wade, 2004). The fourth section gives some examples of current network building. The fifth section offers a broad assessment of their effectiveness. The sixth and concluding section assesses the advantages and disadvantages of the US approach and suggests two directions of reform.

It should be noted that the defence of industrial policy given here does not equate industrial activity with "making tangible objects". Rather, it uses the term "industrial policy" referring to the whole value chain involved in making things, including the services of the scientists and engineers who design and test the things – the medical pills, the automobiles, the smartphones, and the rest (whose actual manufacturing may be abroad). What differentiates industrial policy from other policy is that it is necessarily selective among industries, products and stages of the value chain.

[2] Quoted in Nocera (2011).

14.1 The rejection of US industrial policy: Ideological and political economy arguments

For the past three decades, the US government has espoused a *norm* of something close to laissez-faire in economic issues, more strongly than almost any other advanced capitalist country.[3] The laissez faire norm has been translated into programmes of deregulation, de-unionization, privatization, and free-trade agreements, which have carried neoliberal ideals into every corner of American life. Even universities, hospitals, churches and the Post Office compete to put themselves onto "sound market principles".[4]

The success of the conservative ideal in America[5] owes much to the fact that the Right has taken concerted intellectual work and ideological promulgation much more seriously than the Centre-left. Out of economics departments such as that of the University of Chicago and think tanks such as the American Enterprise Institute (founded in 1943), the Cato Institute, the Manhattan Institute and the Heritage Foundation (all founded in the 1970s) came intellectual justification for propositions such as: "freedom is only possible under laissez faire"; "governments are inherently corrupt and inefficient"; and "interference with market outcomes is bad for welfare" (Roemer, 2011).

Not even the Great Slump, which began in 2007 and continues at the time of writing, has altered the tide, contrary to the normal response to hard times – the normal response being to support more regulation and more social insurance. Indeed, the mass embrace of free-market theory and intensified distrust of government since 2007 is unique in the American history of hard times (Frank, 2012). In 2010 Friedrich von Hayek's polemic, *The Road to Serfdom*, was ranked at number 241 on the Amazon Best Sellers list – remarkable for a book published as long ago as 1944 (Farrant and McPhail, 2010).[6] By 2011 just 10 per cent of Americans said they trust government to do the right thing most of the time.[7] The

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[3] In contrast, US norms towards finance have been more ambivalent, and its norms towards social issues like abortion and same-sex marriage have been more interventionist than in many other capitalist economies.

[4] In this vein Jacquelyn Brechtel Clarkson, a New Orleans city councillor saw "nothing better than free enterprise and the free market to decide how this city is rebuilt" following the devastating floods there (quoted in the *Financial Times*, 10 January 2006).

[5] By 2010 roughly two people in America identified themselves as "conservatives" for every person who self-identified as "liberal" (in the American, not European, sense of "liberal").

[6] Hayek's argument was immediately taken up by leading American conservatives. General Douglas MacArthur, by then a civilian, gave a keynote address to the 1952 Republican Convention. He said that the Democratic Party "has become captive to the schemers and planners who have infiltrated its ranks of leadership to set the national course unerringly toward the socialistic regimentation of a totalitarian state".

[7] Brooks (2012), based on an October 2011 *New York Times*, CBS News poll.

central conviction of the other 90 per cent is that government is corrupt because it is captured by rent-seekers and predators.

Much of Americans' pervasive distrust of government stems from the perception that finance – Wall Street – has put the government over a barrel. A case in point for them is the TARP (Troubled Asset Relief Program), initiated after the Lehman Brothers collapse in late 2008 and designed by then Treasury Secretary Hank Paulson, former CEO of Goldman Sachs, and by Ben Bernanke, Chairman of the Federal Reserve Board. TARP was aimed almost entirely at saving large financial institutions and resuscitating Wall Street after its disastrous mistakes, *rather than keeping people in their homes and helping regional banks*. Incoming President Obama did not break with the programme or make plans to reduce the grip of the banks on American politics. He also did not replace the management of those banks in which the government was forced to take a controlling share, thereby confirming Simon Johnson's description of a "silent coup" (Frank, 2012).

By contrast, the Roosevelt administration of the 1930s presented itself as an agent for resuscitating the economy independently of Wall Street dictation, aggressively pursuing financial wrongdoers through the US Congress and the courts and bolstering organized labour as a source of countervailing power and influence. It used the Reconstruction Finance Corporation to spread public "bail-out" resources around the nation, pouring funds into small-town banks, agriculture, public works, education, and more. Roosevelt broke up the big banks with the Glass-Steagall Act and regulated those that remained with the new Securities and Exchange Commission. At the same time the administration promulgated a narrative to the American people as to why it was doing these things in their interest.

This time around, the perception that the government is an instrument of Wall Street (a major source of funding for both main political parties) has been fuelled by an extraordinary concentration of income at the top of the income hierarchy; to the point that the top 1 per cent of households received 95 per cent of the increase in national income in 2009–12 (Saez, 2013). Income concentration has provoked mass anger and even strengthened the hand of market fundamentalists who argue that a compliant government, as much as large financial firms themselves, was the real cause of the financial crisis.

The recent grip of market fundamentalism in US politics has reinforced the longer standing hostility to any idea of "industrial policy", the hostility spanning Congress, the executive branch (especially the Department of the Treasury), the media, think tanks, academic economics departments, and the public at large. This long-established near-consensus is that "industrial policy" is synonymous with distortionary government intervention that corrodes the values of an entrepreneurial culture, undermines the efficacy of market competition and stacks the wider incentive system in favour of one or another rent-seeking group ("Governments cannot pick winners but losers can pick governments").

The policy conclusion is straightforward. As Tim Leunig of the London School of Economics explains: "The government should be providing conditions that help all businesses – namely, effective infrastructure, a skilled workforce and better planning. We should make no attempt to pick winners – whether individual companies, specific sectors, or manufacturing as a whole" (Leunig, 2010). In this view, if any special help is given to industry, it should only be "functional" or "horizontal", such as subsidized credit for SMEs to offset possible failures of capital markets to supply such firms – and the credit must be equally available to SMEs in all sectors.

14.1.1 A more subtle rejection of US industrial policy

The preceding market fundamentalist argument could be described as "ideological", in the sense that it derives directly from the values and analysis of stylized firms in idealized markets. It readily generates universal prescriptions like "governments are corrupt and inefficient", "the [competitive] market is an efficient allocation system", "the laws of economics, like the laws of engineering, hold in all times and places".

There is also what could be called a political economy argument against industrial policy. It is based on an analysis of what works in a particular political setting rather than on an ideologically based presumption that industrial policy is everywhere bad. This argument comes from what is known as the "varieties of capitalism" literature. Peter Hall and David Soskice, two of its better known proponents, have no driving ideological agenda against "government" and in favour of "markets". They argue, rather, that the shape of State–market institutions in the United States is such that industrial policy is unlikely to be effective in improving on market outcomes, when judged by a national interest test.

Advanced capitalist economies, they argue, tend to cluster with little hybridity into one of two types at the national level: the "liberal market economy" (LME), exemplified by the United States and United Kingdom, and the "coordinated market economy" (CME), exemplified by Germany and Japan. Firms in LMEs coordinate their activities mainly through the institutions of markets and hierarchies, and they tend to invest in "switchable assets" (allowing rapid entry and exit). Firms in CMEs coordinate relatively more through institutions that support ongoing cooperation, encourage credible commitments and exchange of information, and "provide actors potentially able to cooperate with one another with a capacity for deliberation" (Hall and Soskice, 2001). Examples of such institutions include business associations, trade unions, cross-shareholding networks, and legal systems that facilitate information sharing.

Hall and Soskice and others in the "varieties of capitalism" school argue that industrial policy is more likely to be effective in CMEs than in LMEs because of the weakness of institutional support in the latter. For the United States, specifically, they argue that industrial policy is further hobbled by two fundamental political features: (1) strong separation of powers between the executive, legislature and judiciary; and (2) strong separation of powers between the federal, state and local levels. Similarly, Michael Mann argues that:

> There is no serious American industrial policy; this is left to the post-war powerhouses of the US economy, the large corporations. Much of this [industrial policy failure] is due to the radical separation of powers enshrined in the US constitution. A coordinated political economy cannot easily be run by a President and his cabinet, two Houses of Congress, a Supreme Court and fifty 'states' (which are also fragmented by the same separation of powers) – especially when they belong to different political parties (Mann, 1997).

In these conditions the government may practice what is called industrial policy – meaning, in practice, that vested interests capture the relevant parts of the state apparatus and sluice resources in their favour – but it will be uncoordinated and yield negative net welfare gains. It will be "pork barrel" or "crony capitalism". As Kevin Philips writes, industrial policy in a fragmented political structure like that of the United States is both "inevitable and ineffective" (Philips, 1992).

14.2 A brief history of the US developmental state

The two lines of argument just described agree on the conclusion that, regardless of whether the US government or any government "should" do industrial policy, it cannot be effective in the US political economy. However, the conclusion rests on the assumption that industrial policy means that centralized coordination agencies develop national "visions" and national programmes to develop (or "pick") specified industries, perhaps even extending to specified firms; in short, it rests on the assumption that industrial policy means "picking winners". This reflects a standard (and substantially wrong) understanding of East Asian and French industrial policy.

Recent research by Fred Block, Andrew Schrank and Josh Whitford, among others, presents a different picture (Block and Keller, 2011).[8] It finds that US governments – including state and city governments as well as the federal government – have undertaken much more industrial policy than the standard narrative says, with generally positive net effects according to a national interest test. But much of it has been hidden, for the reasons given earlier. Before discussing this recent research, a reinterpretation of the longer history of the US developmental state is in order.

14.2.1 The visible developmental state

As also in continental European countries, fighting wars and preparing to fight wars spurred American innovation and economic growth. Alexander Hamilton, the first Secretary of the Treasury, outlined a strategy for promoting American manufacturing in order both to catch up with Britain and provide the material base for a powerful military. Published in 1791, Hamilton's *Report on Manufactures* promoted the use of subsidies and tariffs. George Washington, the first President, supported the plan. Also, from the first years of the Republic, the government invested in technological expertise for military purposes, creating the Army Corps of Engineers in 1802 and putting army engineers to work building canals and lighthouses and improving river navigation. Later, Abraham Lincoln presided over what was by then called "The American System" for promoting economic growth, using high tariffs to protect strategic industries, federal land grants, government procurement to secure markets and subsidies to infrastructure development. All through the nineteenth and early twentieth centuries up to the 1930s, US industrialization proceeded behind average applied industrial tariffs exceeding 30 per cent, amongst the highest in the world and still justified by Hamilton's ideas (Kozul-Wright, 1995).

Lincoln launched the building of the transcontinental railway in the 1860s, probably the most ambitious civil engineering undertaking in world history to that time and critical to linking the established agro-industrial bloc and the emerging engineering bloc. State and federally supported research and development (R&D) was also critical, beginning in agriculture in the 1860s by building tight linkages between the education establishment and public servants dedicated to such areas such as animal husbandry, agricultural chemistry, forestry and mining. From the turn of the century, government procurement, standard

[8] I owe a broad-based debt to these chapters.

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setting, and the supply of appropriate capabilities, including more formal scientific training, boosted the growth of cutting-edge mass-market industries.

Early in the twentieth century, the federal government used airmail fees to subsidize the infant civil aviation industry. Government procurement helped establish the early aircraft industry and advanced chemical sector. The commitment to agricultural research and engineering training expanded significantly after the end of the First World War, through such initiatives as the Adam Act and public laboratories committed to applied experimentation and upgrading (Nelson and Wright, 1992). The government was also heavily involved in establishing the Radio Corporation of America (RCA), which sponsored radio and television networks.

Roosevelt's New Deal provided the context for a more concerted US industrial policy, involving efforts not only to ensure industrial recovery after the Great Depression but also to change the way that business behaved and to help increasingly large firms to operate more efficiently. Doing so involved new norms and institutions to administer prices, increase dialogue amongst the various stakeholders, provide public infrastructure and curtail the power of finance. These efforts were often contested, and their impacts were uneven.[9] Perhaps the most visible form of a conventional (and developmental) industrial policy was the Tennessee Valley Authority (TVA), established in May 1933. The TVA was conceived both as a development agency, mandated to raise living standards in the Tennessee River Valley, and as a construction and management agency mandated to build and operate dams and other structures along the Tennessee River, whose drainage basin over seven states covers some 40,900 square miles (or 105,930 square kilometres). The TVA was to function as, in Roosevelt's words, "a corporation clothed with the power of government but possessed of the flexibility and initiative of a private enterprise". Over the 12-year period spanning its inception in 1933 and the end of the Second World War in 1945, the TVA established its institutional framework, built broad-based local support for its programmes, and constructed a physical infrastructure that would serve as the backbone for its accomplishments. By triggering an increase in the rates of return to private investment in the southern US states, the infusion of public capital through the Tennessee Valley Authority provided a major impetus for the rapid post-war industrialization of the Southern economy (Bateman, Ros and Taylor, 2009).

In the run-up to the Second World War, the existing military–industrial complex was strengthened. (It is more accurately called the government–military–industrial complex.) In subsequent decades this complex launched a series of fundamental innovations, including the atomic bomb, the hydrogen bomb, missile

[9] See, for example, Blyth (2002) and Badger (2008).

technology, civilian nuclear power, computers, the transistor, preparatory work on the laser, and satellites. The dominant approach to selective industrial policy took the form of government support for "basic" research in a plethora of military laboratories. Hence the quip, "America has had three types of industrial policy: first, World War II, second, the Korean War, and third, the Vietnam War." The focus on "basic" and "military" avoided the ideological issues around industrial policy, because even market fundamentalists accepted that government *should* fund the development of new weapons and intelligence systems (Negoita, 2011).

Those opposed to state intervention tend to airbrush this extensive history away, claiming that, from the founding of the Republic to the start of the New Deal in the 1930s, the United States grew fast in the context of a State that limited its economic role to providing an institutional framework for markets. They further claim that the country then took a wrong turn at the time of the New Deal towards excessive state intervention.[10] The election of Ronald Reagan as President in 1980 did much to revive and bolster this simplistic narrative that "the government is the problem, not the solution".

14.3 The emergence of the network developmental state

The government simply assumed that "the market" would transform the results of military-related R&D more or less automatically into commercial innovations in civilian industry. The 1980s saw a growing realization in a narrow circle of scientists, business school academics and technology policy officials that military-related technologies were being carried into commercial applications only slowly and patchily, and that, partly for this reason, US industrialists were being outcompeted across a swathe of high-tech industry by Japanese and even German firms. Between basic research outputs and commercial products lurked the "valley of death", where potential products languished for want of private sector uptake (Mazzucato, 2013; Scott and Lodge, 1985).

In response, some parts of government such as the Defence Department, the Department of Energy and the National Institutes of Health became determined to generate and administer links between state labs, commercial labs, commercial

[10] Significantly, while some prominent Americans in the fledgling international organizations established at the end of the Second World War came from the New Deal tradition, the first cohorts of Americans in senior positions at the World Bank through the 1940s and 1950s tended to be strongly anti-State and anti-New Deal. The powerful first vice-president, Robert Garner, declared in his 1972 memoir, "Roosevelt ... did more harm to this country than anyone else in history". Quoted in Alacevich (2009).

firms, universities, and government agencies in order, first, to accelerate the move from publicly funded technological breakthroughs to commercial products and, second, to incentivize the private sector to develop latest-generation products that the public agencies themselves needed for their own work.

At just this time, in the 1980s, market fundamentalism resurged,[11] and any US industrial policy beyond the R end of military R&D faced hostile politics. But meanwhile the wider problems were becoming increasingly acute: the failure of military research to spill over into civilian uses "by itself" (by the market), growing Japanese and German competition, and shrinkage of the US trade surplus in technologically sophisticated products (which had helped to offset growing deficits for raw materials and basic manufactured goods). So government agencies began to actively push and prod firms in order to accelerate the D end of R&D for products and processes with civilian as well as military markets; but in a way that could be kept below the radar.

14.3.1 Network-building industrial policy

Government officials began to formulate the general strategy on the basis of growing awareness of the success, through the 1970s, of the US Defense Department's Defense Advanced Research Projects Agency (DARPA) in channelling vast flows of federal funds to Stanford University, the University of California at Berkeley and the Lawrence Livermore National Laboratory. Private spin-off firms then helped to turn nearby Silicon Valley into the planetary centre of innovation in computing. These public officials also drew inspiration from developments in biotechnology in the 1970s, notably the birth of Genentech in 1976, which showed how government agencies could help university-based scientists establish successful firms.

In the subsequent decades many government agencies, at national, state, and even city level, have funded R&D in selected sectors and used control of funding to build and sustain links among firms, scientists, engineers, venture capitalists, and universities – in a way that escapes the simple dichotomy between "picking winners" and "horizontal" industrial policy. The programmes are run by agencies *that themselves are relatively uncoordinated*. At the national level the agencies include DARPA, the National Institutes of Health (NIH), the National Institute of Standards and Technology (NIST), the Small Business Administration (SBA), the National Science Foundation (NSF), and more.

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[11] This coincided with the election of Ronald Reagan and the Republican majority in Congress.

For example, NIST organizes Manufacturing Extension Partnerships (MEPs) in specific geographical areas to provide manufacturing advice to local firms. The SBA makes Small Business Innovation Research (SBIR) grants. Federal agencies with large research budgets (such as NIH and the Department of Energy) are required to allocate 2.5 per cent of grants to the SBA, which in turn distributes about 5,000 awards to 1,500 small firms per year. These awards are especially important in bridging university and commerce; for example, in recent years more than two-thirds of the recipients have included an academic or former academic among their founders.

14.4 Examples of network creation and maintenance

14.4.1 Defense Advanced Research Projects Agency (DARPA) and SEMATECH

DARPA (from time to time the D for "Defense" has been dropped) was founded in 1958 in response to the launch of the Soviet Sputnik satellite. Since then it has been a leading stimulator of technological innovation in – among many things – computers, computer languages and semi-conductors. For example, DARPA was the earlier-mentioned agency which sponsored the research on how to build robust and dispersed computer networks, which led on to the "network of computer networks" we know as the Internet. Recently, DARPA has been stimulating research into a priority area where private R&D was lagging: optical interconnects in multicore microprocessors. Although tiny (about 250 staff, of whom 140 are technical) and focused on over-the-horizon research, DARPA still has to fend off "pork barrel", "picking winners" and "crony capitalism" attacks from market fundamentalists and techno-utopians arguing that philanthropists plus the 3 billion people coming online together constitute adequate self-organizing innovation systems.[12]

One of DARPA's many successes is SEMATECH (Semiconductor Manufacturing Technology), a not-for-profit consortium that performs R&D to advance chip manufacturing. DARPA and the semiconductor industry association prompted formation of the SEMATECH consortium in 1987 in response to the virtual disappearance of American companies able to make the equipment needed to make latest-generation semiconductors. The leading equipment

[12] This is the message of Diamandis and Kotler (2012).

makers by then were Japanese, who tended to hold back the latest-generation equipment for six months for "testing" by Japanese semiconductor makers, giving the latter a strong competitive advantage over American rivals. DARPA and the semiconductor industry association persuaded 14 American semiconductor makers to form a consortium to pool R&D and manufacturing capacities and re-enter the design and production of advanced semiconductor-making equipment. The Department of Defense (DARPA's parent) funded the first five years. In the early years the consortium was fragile, especially when the semiconductor price cycle was up and the companies were making good profits; then they hesitated to send top-notch people to work for the consortium. DARPA's stewardship (funding and close collaboration at the technical level, where its suggestions would be most appreciated) helped to overcome collaborators' fears of either "getting screwed" by other collaborators' non-reciprocity or having their collaborators "screw up" through incompetence. By 1994 SEMATECH was well-enough established that its board stopped further federal funding. It flourishes to this day.

14.4.2 Public venture capital funds, pioneered by the CIA

Since the late 1990s many US government agencies have established venture capital (VC) funds. Although inspired by Silicon Valley venture capitalists, the public funds are not for making money, but rather for enabling the agency to use financial leverage to induce the development and adaptation of commercially viable technologies for government agencies' needs. The funds take equity investments in (mainly) small and medium-sized technology companies and play a hands-on role in those firms' development, at the same time helping to strengthen existing inter-firm networks or creating new ones. By highlighting their co-partner role with private sector financiers and their dedication to market mechanisms, they are able to fend off attacks by market fundamentalists (Keller, 2011).

Surprisingly, the origin of the federal agencies' VC funds was a traditionally secretive and insular agency, the Central Intelligence Agency (CIA). In 1999 the CIA established a VC arm, called In-Q-Tel, in order to overcome the problem that conventional government procurement practices (established in a slower-moving technology era) meant that the agency had to procure from big companies, which themselves sourced many of their technologies from SMEs. The result was that the CIA often obtained technologies after a long delay, by which time they were no longer cutting-edge, and the products often did not match the agency's specific operational needs. With its own VC fund, the CIA could invest in nimble SMEs directly and get them to do its bidding.

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Over the 2000s the federal VC model proliferated. The Army and the Navy, for example, both established VC funds, non-military agencies, for example, the Department of Energy established several; and the National Aeronautics and Space Administration (NASA) participated with a private non-profit VC fund. Matthew Keller summarizes: "Public sector venture capital strategies rapidly became broadly accepted tools for spurring mission-oriented technical innovation and/or to transform government research into commercial products" (Keller, 2011, p. 126).

14.4.3 The hazards of visibility

About the most visible segment of the US Government's efforts to promote technological innovation was the Advanced Technology Program (ATP). The fate of the ATP illustrates what can happen when a hidden developmental state becomes visible in a polity gripped by market fundamentalism (Negoita, 2011).

The ATP was created by the National Institute of Standards and Technology (NIST), within the Department of Commerce, in 1988, in response to the fears of surging Japanese competition in high-tech. It could be thought of as a civilian counterpart to DARPA. To stimulate the early stages of development of advanced technologies that would not get private funding, it developed strong connections with industry and academia.

By many measures it was very successful. For example, firms whose R&D received ATP funding had a 50 per cent shorter research cycle time than firms that had applied to ATP for funding but did not get it – giving the lie to the accusation that taxpayers' money was being used to fund early-stage R&D that the firms would have done anyway. Second, participants in ATP-sponsored projects said that ATP participation generated a higher level of collaboration with other firms than would have occurred otherwise. Third, a slew of new products came out of ATP programmes: for example, small disc drives (which paved the way for multibillion dollar markets in consumer electronics, such as the iPod), also flat panel displays and plant-based biodegradable plastics.

Nevertheless, from 1994 on the ATP faced counteroffensives from market fundamentalists targeting it for extinction. They continually cut its budget, and finally in 2007 the Bush Administration and the Republican Congress killed it off.

14.5 Evaluation of network-building industrial policy

The foregoing is just a small part of the evidence that the US has practised industrial policy on a substantial scale, but not centrally coordinated and not derived from national plans. In the words of Schrank and Whitford (2009):

> The federal government has been pursuing industrial policy within decentralized political institutions for well over a generation... American industrial policies go beyond preservation of market competition, maintenance of macro stability, and provision of public goods to address firm-specific needs in a host of different ways and through a variety of different agencies.

In the words of another study: "Below the ideological surface, a powerful 'jerry-built' substrate has emerged of federal, state and local government innovation support programs each filling gaps in the other" (Etzkowitz et al., 2008). An official involved in these programmes said: "We definitely see the programs as a de facto industrial policy, but we cannot use that term, so we usually call it R&D policy."

Whereas the "varieties of capitalism" literature argues that the United States' strong separation of powers (between executive, legislature and judiciary, and between federal, state and local) handicaps industrial policy to the point where it is unlikely to be successful (see the Mann quote above), the argument can plausibly be turned on its head. The decentralized type of US industrial policy has economic *advantages*: it better fits *both* the United States' increasingly decentralized and networked production structure and its separation of powers. As previously vertically integrated firms have become increasingly de-integrated, smaller firms have mushroomed, scattered around the country. (By 2003, half of all PhDs employed by the private sector worked for firms with fewer than 500 employees. In addition, tens of thousands of PhD scientists and engineers are self-employed or own small businesses (Block, 2011)). As their share of production grows, so the economy's benefit from networks of smaller firms also grows. By being brought into innovation networks, they are more likely to compete on the high road (high skills, innovation) than on the low road (cheap wages). Moreover, decentralization – with programmes run by many agencies at different levels and locations – encourages more experimentation both in innovation itself and in the permutations of industrial policy (Schrank and Whitford, 2009).

But the question remains: If inter-firm networks bring gains (not everywhere, but in sectors where demand is uncertain or volatile, supply interdependencies high, and technical change fast), why presume that the helping hand of the State in generating and sustaining them brings net gains, on top of what would be achieved by networks formed autonomously by the firms themselves? The short answer is that state involvement can help to correct “network failure” (in contexts where network governance would be desirable, were it to obtain). Autonomous networks may fail (meaning absence of networks or fragile and short-lived ones) for at least two kinds of reasons.

One reason relates to the financing of innovation. In the general case production can be financed: (1) from sales, (2) from bank loans or other borrowings, or (3) from equity issues. Investment in innovation may be financed from sales by big, established firms but not by new, small firms; it can be financed only with difficulty from borrowings (debt) on the basis of prospective profits, because uncertainty is high. This leaves external equity as a major source of financing for innovation investment, especially for small new firms. But precisely because they are small and new, these firms may have difficulty raising equity finance. Hence, at the margin financing from public agencies (whether in the form of debt or equity), and public endorsement of the worth of the investment, can tip the balance for private financiers and accelerate the R&D process (Shapiro and Milberg, 2012).

The second merit of state stewardship comes from the fact that networks – where (often competing) firms pool knowledge and perhaps specializations, in a spirit of reciprocity – are vulnerable to Prisoner’s Dilemma incentives. Firms may try to gain from others without reciprocating, leading other firms to exit (saying “they screwed me”). Here the hand of the State can curb the incentives to defect. Likewise, the State can intervene in cases where firms want to exit because they think others are incompetent and not able to act reciprocally even though they want to (firms exit saying “they screwed up”).[13]

It is, however, difficult to evaluate the economic rate of return of scattered programmes of the US kind, especially by cost-benefit analysis, and these difficulties provide market fundamentalists with reasons to presume that they are a waste of taxpayers’ money compared with whatever the free market would have delivered. But several conclusions can be reached with confidence:

- The programmes have developed valuable products and processes. In addition to the evidence given earlier, US government network-building has recently helped US firms to secure the lead in globally important industries ranging from mobile telecommunications (as seen in Apple’s battering of RIM and Nokia) to hydraulic fracking (whose economic potential was transformed by public–private research projects backed by the Department of Energy).
- The programmes have been able to withdraw benefits from “losers”, at least in the civilian industrial sector (as distinct from agriculture and defence, where

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[13] The “screwed me” and “screwed up” distinction is made by Shrank and Whitford (2009 and 2011).

post-2008 increases in agricultural subsidies and the defence budget have had the consequence of forcing even more draconian cuts in non-defence public spending).

- Firm networks not encompassed in public network programmes have a higher rate of decline or breakup – which, on the face of it, argues for the value of public involvement. For example, Sherrie Human and Keith Provan report that, of the small firm networks (outside public programmes) they studied in the mid-1990s, more than 60 per cent had broken up by the time of their restudy in 1998 (Human and Provan, 2000). Maryann Feldman and Maryellen Kelley provide evidence that firms within *publicly sponsored networks* are more likely to sustain collaboration than those outside (Feldman and Kelley, 2001).

However, the case of solar photovoltaic (PV) energy systems illustrates that the success or failure of network industrial policy should not be judged only from the supply side.[14] As Schumpeter said, the technology pipeline consists of invention, innovation and diffusion, or, in later parlance, research, development and deployment. The US federal government played a vital role in making US-based networks of public and private actors the world's leading source of PV inventions and innovations, starting in the 1970s. But it mounted no corresponding federal programme to accelerate *deployment* of the innovations in public use; and state programmes (for example, subsidies and feed-in tariffs) have been bitty and widely varying from state to state. Germany, Japan and Spain all have raced ahead in installed capacity per capita. A recent report on national policies supporting solar PV deployment ranked the US fifth, behind Germany, France, Greece and Italy. The basic reason for the mismatch between R&D, on one hand, and deployment, on the other, may be that the United States has a more "locked-in" energy system, with stronger lobbies defending fossil fuel generation, than countries that have gone further with PV installation, Hence, politicians are willing to allocate funds for PV R&D but not for deployment, which might displace valued sources of campaign finance (the fossil fuel and the nuclear industries). Nevertheless, the relative failure of the United States to deploy PV technology does not detract from the success of network industrial policy in stimulating PV R&D.[15]

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[14] This paragraph is based on Knight (2011).

[15] The collapse of Solyndra, the California-based manufacturer of solar panels, in September 2011 prompted the standard sing-along refrain from the Right that "government cannot pick winners". The Department of Energy had given the company a $535 million federally guaranteed loan to help move an innovation to full-scale commercial development. However, the loan came on top of large amounts of private investment, and it was private investors who were "picking winners". The company collapsed because its internal management was a mess. See Joe Nocera, "Solar economics", above.

In short, judging the success – comparing gains against costs – of particular network industrial policy projects or the whole programme is inevitably difficult and open to dispute. But two points are clear. First, many network-building projects have produced large gains. Second, the presumption that the "free market" of private sector investors would have produced better results overall rests on ignorance of the gains obtained through government-nurtured inter-firm networks.

14.6 Conclusions

Michael Lind, author of *Land of Promise: An Economic History of the United States*, summarizes one of his main conclusions as follows:

> The most innovative entrepreneur in the 20th century was the US government. The federal government invented or developed nuclear energy, computers, the Internet and the jet engine. And it built the interstate highway system and completed the national electric grid, creating a continental market based on the technologies of the second industrial revolution. To be sure, the government has sometimes backed failures, usually in the fad-driven energy field ... But few private venture capitalists can match the remarkable record of success of Uncle Sam. Indeed, venture capitalists in IT and social networking have exploited and commercialized technologies from the transistor to the Internet that were originally developed by America's home-grown version of state capitalism (Lind, 2012).

Programmes such as the ones described above constitute the hidden "network developmental state", so hidden under free market varnish that most observers miss them.[16] Reviewing the history of US industrial policy since 1989, Fred Block remarks:

> What is most striking about this recent period is that, with the exception of the fights over ATP, there is a discrepancy between the growing importance of these federal initiatives and the absence of public debate or discussion about them ... [J]ournalists rarely report on these programs, few academics write about them, and most politicians ignore them (Block, 2011, p. 13).

[16] The phrase "hidden developmental state" comes from Block (2008).

Observers have also missed them partly because they tend to think that industrial policy means policy like those of East Asia and France, complete with national indicative plans and high profile national coordinating agencies.

This chapter has emphasized the overarching US political imperative, at least in recent years, to keep industrial policy programs substantially hidden, given the prevailing power of market-fundamentalist forces – or risk the fate of the Advanced Technology Program, which was terminated. Furthermore, the decentralized and network-building form of US policies may have net *economic* advantages (as well as political ones). These advantages include being a better fit with the emerging, more decentralized form of production structure, in which a growing proportion of total output comes from smaller, less vertically integrated firms. Other advantages of such policy decentralization include greater experimentation and avoidance of "group think".

Invisibility is no guarantee of success. And invisibility also inhibits three of the main traits of successful developmental states: institutional coordination, ideological coherence, and a bureaucratic esprit de corps (Devlin and Moguillansky, 2011). To make current US efforts more successful, reforms should be undertaken along two dimensions: communication and organizations. In terms of communication, efforts need to be made to construct a narrative about innovation, which would, on the one hand, inform taxpayers about the benefits brought by publicly funded innovation programmes and, on the other, weaken the equation of "the free market" with "freedom" and "defence of ordinary people against government control". The promulgation of this narrative should be complemented by efforts to organize "crowd-sourcing" forums where citizens can voice their opinions.

In terms of organizations, having a rich array of horizontal and vertical networks is necessary but not sufficient. Notwithstanding the political advantages of having no industrial policy centre, it would be desirable to coordinate the various federal agency programmes more than at present by establishing a central agency near the top of government (Newfield, 2011). Michael Porter, who used to deny the merit of national-level strategy, has since argued that: "Congress would benefit from a bipartisan joint planning group to coordinate an overall set of [development] priorities. More up or down votes on comprehensive legislative programs are needed to allow a shift to a coherent set of policies and away from lots of separate bills" (Porter, 2008).

Of course, such a coordinating body must make no mention of industrial policy in its name – better something neutral such as "Agency for Competitive Partnerships". But, while a coordinating body would be desirable, the resurgence of mass-movement market fundamentalism since 2008 augurs badly for any such proposal in the near future.

However, moves on the industrial policy front have to be complemented by measures to link productivity improvements with incomes, reversing their decoupling over the 2000s – the first time that the incomes of the large majority of Americans have stagnated or fallen during apparently good times. Continued slow growth of median incomes relative to productivity is a recipe for further financial crises and for a lost decade or two (Wade, 2012b).

One side benefit of the current research on US industrial policy discussed in this chapter is that, by showing how the US Government has practised vigorous (also relatively cheap and uncoordinated) industrial policy for decades, it is harder for economists (including those in international organizations such as the World Bank and the IMF) to lecture developing country governments not to venture into industrial policy on grounds that "having the state help [the free market] is usually a contradiction in terms" (Kasperov, 2012). The revelation that the US has long practised a form of industrial policy, often to good effect, opens space for a more pragmatic, less ideological consideration of how to do industrial policy well, rather than simply how to do it less.

In a developing country context, industrial policy has to be threaded through the "State–market" dilemma in a way that recognizes *both* sides: the risks of "state failure" are greater in developing countries – a fact that favours a bigger market role – and the risks of "non-existent markets" and "market failure" are also greater – which favours a more active role for smart government. The first step is to give up blanket dicta such as "the best industrial policy is none at all", "government failure is worse than market failure" and "all States are predatory". Perhaps the West's prolonged Great Slump may help to induce more caution about preaching and teaching such context-free ideas. Indeed, the World Bank's Finance and Private Sector Development vice presidency established a Competitive Industries Practice in 2013, which sponsored a public conference under the title "Making growth happen: Implementing policies for competitive industries" in October 2013. Several speakers argued in favour of industrial policy, using those very words. The conference may mark an early step in the emergence of a new development policy norm.

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The lesson from economic history is that industrial policy is vital for development. Designing and implementing an effective industrial policy in today's world economy is one of the greatest challenges for developing country policy-makers, especially in Africa. The ILO and UNCTAD are to be commended for bringing together in this volume both a diversity of approaches and a variety of country experiences. It is a valuable resource for policy-makers everywhere.

Dr Rob Davies, Minister of Trade and Industry, Republic of South Africa

This book helps connect the dots between economic theory, the role of capabilities, the lessons from history and the practical challenges of design and implementation of industrial policies. In so doing it provides an excellent policy roadmap for anyone interested in the challenge of promoting catch-up growth and productive transformation.

Ricardo Hausmann, Director, Center for International Development, Harvard University

This volume is a well-timed and comprehensive guide to how countries have used industrial policy to achieve structural transformation, raise productivity and create jobs. Crucially, the authors go beyond the sterile debate about whether governments can "pick winners" and instead draw on a variety of analytical approaches to draw lessons and principles for successful industrial strategies.

Ha-Joon Chang, University of Cambridge, author of *Economics: The User's Guide*

Building on a description and assessment of the contributions of different economic traditions (neoclassical, structural, institutional and evolutionary) to the analysis of policies in support of structural transformation and the generation of productive jobs, this book argues that industrial policy goes beyond targeting preferred economic activities, sectors and technologies. It also includes the challenge of accelerating learning and the creation of productive capabilities. This perspective encourages a broad and integrated approach to industrial policy. Only a coherent set of investment, trade, technology, education and training policies supported by macroeconomic, financial and labour market policies can adequately respond to the myriad challenges of learning and structural transformation faced by countries aiming at achieving development objectives.

The book contains analyses of national and sectoral experiences in Costa Rica, the Republic of Korea, India, Brazil, China, South Africa, sub-Saharan Africa and the United States. Practical lessons and fundamental principles for industrial policy design and implementation are distilled from the country case studies. Given the fact that many countries today engage in industrial policy, this collection of contributions on theory and practice can be helpful to policy-makers and practitioners in making industrial policy work for growth, jobs and development.

ISBN 978-92-2-128565-6

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