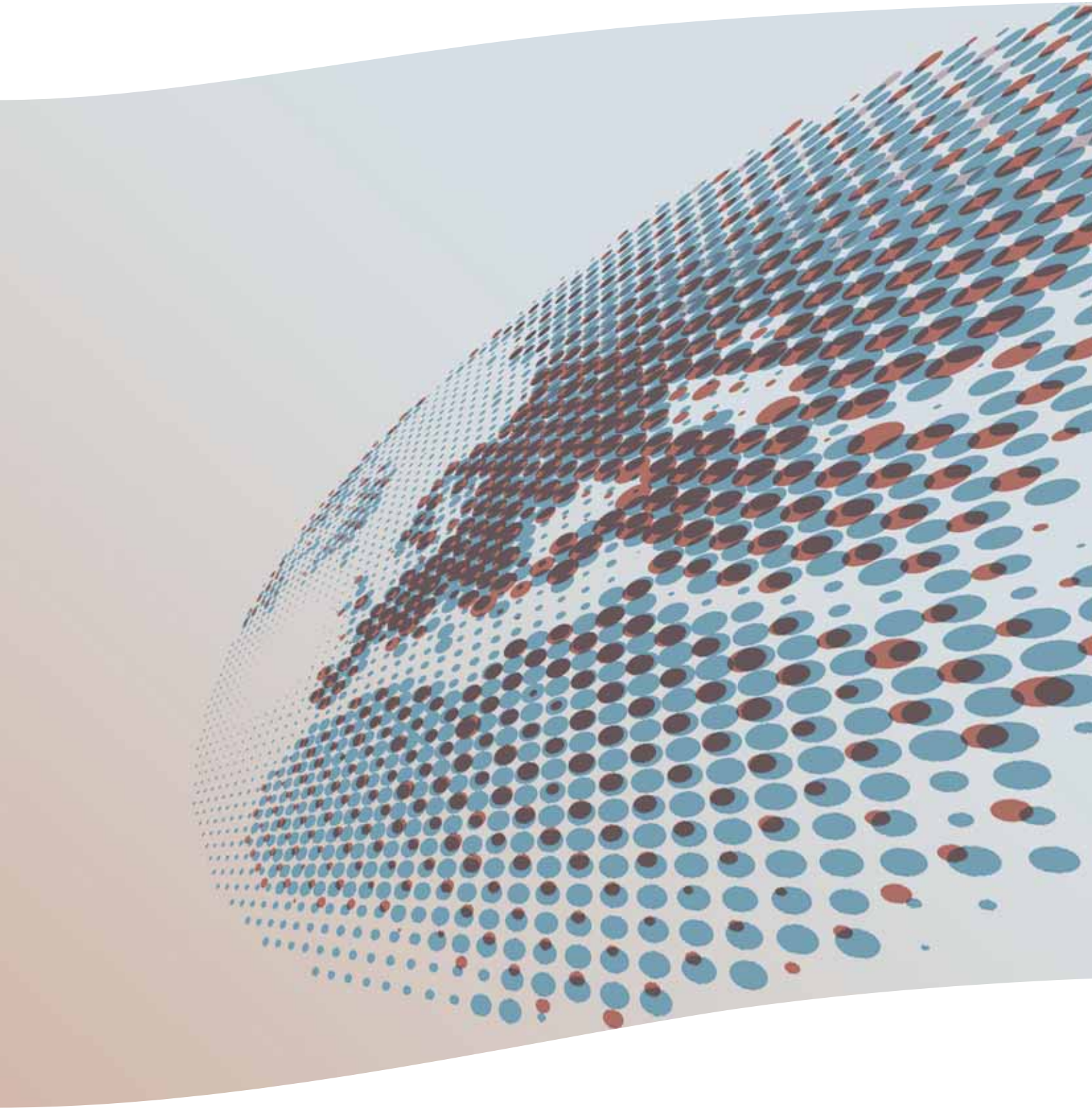
Industrial Development Report 2009

Breaking In and Moving Up: New Industrial Challenges for the Bottom Billion and the Middle-Income Countries



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

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UNIDO ID No.: 438

UN Sales No.: E.09.II.B.37

ISBN: 978-92-1-106445-2

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Foreword

The publication of the *Industrial Development Report 2009* comes at a time when developing countries are facing a number of severe challenges – continued high levels of poverty, volatile commodity and food prices, global economic slowdown triggered by the worst turbulences seen in international financial markets for more than a generation, and the threat of climate change with potentially irreversible consequences. Meanwhile, the trend towards globalization has caused dramatic shifts in the world economy, while the emergence of new industrial powers is redefining traditional patterns of production and trade.

One of the outstanding features of the process of globalization has been the rapid diffusion of industrial production from the developed to the developing countries, based on such developments as specialization in production by transnational corporations, the development of international supply chains and the liberalization of trade flows. This has allowed the production process to be disaggregated and the production of individual components and services to be outsourced, often to developing countries that enjoy competitive advantages in their production. Where this process has been successful, the resulting so-called "trade in tasks" has had a dramatic impact in promoting industrial and economic growth, reducing poverty and generating social progress.

Industrial development thus has a tremendous transformative potential. Yet the pattern of industrial development in developing countries has been highly uneven. The spectacular rise of the emerging economies, especially in East and South Asia, contrasts sharply with the industrial stagnation experienced by many middle-income countries and the continued industrial marginalization of Africa and least developed countries elsewhere in the world. The focus of this report is therefore on the potential developmental impact that industrial development could have on the low-income countries that have been left outside the expanding web of production and trade linkages brought about by globalization and on the slow-growing middle-income countries.

The arguments presented in this report rest on the hypothesis, derived from the experience of the globalization process, that successful industrial development depends on an evolving pattern of specialization: What you make matters! The dramatic shift in international trade and production from final products to tasks enables industrial stakeholders in developed and developing countries to share the manufacture of sophisticated products across all segments of manufacturing, from low- to high-technology products. It allows them to integrate into global markets through new niches that are created in the trade flows of tasks or components.

While previous reports in this series have emphasized technological differences between products, the present report broadens the concept of technology from "hard" to "soft" technologies, such as design and marketing. Contrary to some prevailing fears, the report finds that task-based production does not confine low-income countries to technologically less sophisticated products, but rather provides new exciting opportunities for the "bottom billion". Whether they take advantage of these new opportunities depends on policy choices. In this context, the report attempts to capture the implications of such policy choices and actions in a country-specific context and thereby to stimulate an informed debate on how to strengthen the role of manufacturing as a dynamic force of economic transformation. In doing so, it draws on an in-depth analysis of long-term time-series data as well as case study evidence.

The report recommends the consideration of a new United Nations category of "least developed manufacturing countries" that could be used by the World Trade Organization with respect to preferences for manufactures. These countries could also be offered

special support for the investments in infrastructure and institutions that they would need to reach the threshold of industrial competitiveness and achieve their effective integration into the globalized world economy.

No report on the current global industrial landscape can escape mention of the huge challenges of climate change. Even though this is not the main focus of the present report, reference is made to how countries can help address the environmental consequences of industrial growth. At its core, the global climate change debate is about technological solutions for mitigation and adaptation, and about how to ensure "carbon justice".

I am pleased to see that the report captures new and original insights from global surveys of pertinent issues and adds novelty to the interpretation of facts. It paints an optimistic picture about the "room at the bottom", unveiling practical avenues of advancement for low-income countries. The report also stresses the "pressure in the middle", highlighting the challenges facing slow-growing middle-income countries and recommending measures to escape that pressure. Thus, the twin challenges addressed here are to break in at the bottom and to move up in the middle.

It is my sincere belief that the information, analysis, inferences and policy implications contained in this report will whet the appetite of researchers, policy-makers and industrial stakeholders alike who look for evidence-based policy advocacy. For countries of the bottom billion and the slow-growing middle-income countries, it provides practical insights. It shows them how they can significantly enhance their economic growth prospects, and thereby raise the standard of living and human welfare of their populations, through the powerful mechanism of sustainable industrial development.

Kandeh K. Yumkella
Director-General, UNIDO

Acknowledgements

The *Industrial Development Report 2009* has been prepared under the overall guidance of Kandeh K. Yumkella, Director-General of the United Nations Industrial Development Organization (UNIDO).

Paul Collier, Oxford University, and John Page, the Brookings Institution, served as the main authors of the report.

The in-house UNIDO team was led by Jebamalai Vinanchiarachi, Principal Adviser to the Director-General of UNIDO, and comprised Ludovico Alcorta, Director of the Research and Statistics Branch, as well as Manuel Albaladejo, Michele Clara, Müge Dolun, Sarwar Hobohm and Anders Isaksson. Part B on the global manufacturing scene was written by Manuel Albaladejo, with substantive comments provided by Shyam Upadhyaya. Penelope Pacheco served as a UNIDO consultant for the preparation of part B. Relevant parts of the report were reviewed and amended by the respective technical branches of UNIDO. George Assaf contributed to the vetting process of the report.

International consultants involved in the preparation of background papers included Arne Bigsten, Mauro Caselli, Markus Eberhardt, Mulu Gebreeyesus, Adeel Malik, Rajah Rasiah, Justin Sandefur, Bilal Siddiqi, Måns Söderbom, Francis Teal and Jean-Louis Warnholz. The survey of dynamic industrial locations was coordinated by Rajah Rasiah with the assistance of national consultants: Boladale Abiola Adebowale (Nigeria), Abdusy Syakur Amin (Indonesia), Gonzalo Bernat (Argentina), Paulo Figueiredo (Brazil), Chandran Govindaraju (Malaysia), Kum Kim (Cambodia), Vadakkepat Padmanand (India), Sitthiroth Rashpone (Lao People's Democratic Republic), Lidia Vidal (Chile) and Xinxin Kong (China).

The report benefited from comments by Neil Foster, Rhys Jenkins, Torben Roepstorff and Mahendra Shah, who also attended an expert group meeting on the preliminary draft. The final draft benefited from substantive comments and suggestions by Wilfried Luetkenhorst, Chief of Cabinet, UNIDO.

Special thanks are due to Isher Ahluwalia for her peer review, comments and suggestions.

Research assistance was provided by Florian Kaulich, UNIDO consultant, and by Sayalee Karkare, Sahil Malhotra and Rovin Perappadan, UNIDO interns. Maria Fermie provided assistance in finalizing the manuscript for publication.

Explanatory notes

References to dollars ($) are to United States dollars, unless otherwise specified.

Country classifications by income levels are from World Bank (2008a). For reasons of analytical convenience based on time-series data, the countries referred to in this report are classified into five groups on the basis of their long-term growth performance and the initial level of income of 1975. Again for reasons of analytical convenience, the classification of countries mentioned in part A differs from that in part B.

The designation of least developed countries follows the United Nations definition, which is based on three criteria: Low income (an estimated gross domestic product per capita of less than $900 over a three-year average period), low human assets (measured by a composite index based on nutrition, health, school enrolment and literacy indicators) and high economic vulnerability (measured by a composite index based on indicators of instability of agricultural production and exports, inadequate diversification, economic smallness and remoteness). Of the 49 least developed countries, 33 are in sub-Saharan Africa.

Totals in tables may not add up precisely due to rounding.

The following abbreviations and acronyms appear in this publication:

AGOA	African Growth and Opportunity Act
CIP	competitive industrial performance
CKD	completely knocked down
EBA	Everything but Arms
EPZ	export processing zone
FDI	foreign direct investment
GDP	gross domestic product
ISIC	International Standard Industrial Classification
ISO	International Organization for Standardization
IT	information technology
ITES	IT-enabled services
LDCs	least developed countries
MDGs	Millenium Development Goals
MFA	Multi-Fibre Arrangement
MVA	manufacturing value added
NICs	newly industrializing countries
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
PPP	purchasing power parity
R&D	research and development
SAR	Special Administrative Region (Hong Kong, Macao)
SEZ	special economic zone
SITC	Standard International Trade Classification
TFP	total factor productivity
TNCs	transnational corporations
UN COMTRADE	United Nations Commodity Trade Statistics Database
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
WTO	World Trade Organization

Overview

Industrialization has been fundamental to economic development. Only in circumstances such as extraordinary abundance of land or resources have countries succeeded in developing without industrializing. Not only is industrialization the normal route to development, but as a result of the globalization of industry, the pace of development can be explosive. Twenty years ago, Qiaotou in China was a village. Today, it produces two thirds of the world's buttons.

This potential for explosive growth is distinctive to manufacturing. As manufacturing activity expands, instead of running up against shortages of land or resources that inevitably constrain the growth of agriculture or the extractive industries, it benefits from economies of scale: unit costs of production fall. Prior to globalization, although such cost reduction helped manufacturing to expand, the size of the domestic market constituted a constraining force. Especially in small low-income countries, the tiny market for manufactures limited the scope for reaping economies of scale. Now that markets are global, however, this constraint no longer exists. If a country can find a niche in the global market it can scale up almost without limit, as demonstrated by Qiaotou.

Yet finding and maintaining a niche is not easy. A large number of the world's poorest countries have yet to break into global industrial markets, while many middle-income countries that had found a niche are inceasingly challenged by new lower-income competitors and are in danger of de-industrializing. This report focuses in particular on these two categories of countries and sets out to outline the challenges they face. Although industrialization has been studied for decades, there is good reason to update the analysis. Recent changes in the global economy have substantially altered the opportunities for industrialization and recent academic research has, in turn, substantially changed our understanding of the process of industrialization.

Global change

One change in the global economy has been due to the inexorable rise in the proportion of manufacturing output that is internationally traded. This has been assisted both by the reduction in trade barriers and the fall in long-term transport costs. Trade has become so central to manufacturing that it is no longer realistic to think of industrialization as fundamentally an internal process.

An important consequence of the growth of trade in manufacturing is that the location of production has been shifting from developed to developing countries, a process that has gradually accelerated. However, this relocation has been highly concentrated. Asia, in particular China, has experienced explosive industrial growth, whereas in many middle-income countries industrialization has stagnated and Africa has remained marginalized.

Not only are manufactured products traded, but the process of production is increasingly broken down into tasks that are themselves traded. Production is becoming less vertically integrated and the old image of raw materials entering one end of a huge factory and coming out at the other end as a final product is less and less applicable. Potentially, trade in tasks is a lifeline for countries yet to industrialize because it simplifies getting started. Instead of needing to acquire the entire range of skills necessary to produce a product all at once, manufacturing can start with specialization in tasks most suited to the skills available.

A further change in the global economy of consequence for industrialization are periodic booms in the price of commodities. In low-income commodity-exporting countries, such booms can be a springboard for manufacturing, as illustrated by historical trends in Malaysia and Mauritius. However, they can also lead to rapid de-industrialization. In addition to their implications for manufacturing, commodity booms are, of course, of direct consequence for the extractive industries.

Changes in attitudes

The international community has embraced a broad definition of development, one that is embodied in the Millennium Development Goals (MDGs). Is industrialization development-friendly? Does it contribute to the MDGs and, in particular, to the overarching goal of poverty reduction? Unambiguously, sustained rapid industrial growth normally leads to a significant reduction in poverty and, conversely, poverty reduction is extraordinarily difficult in the context of stagnation. But beyond this, manufactured exports from developing countries are usually labour-intensive, which also has a potentially equalizing socio-economic impact. As labour-intensive manufacturing-based development proceeds it creates jobs and, in countries with strongly growing manufacturing sectors, such expansion can be spectacular. Ordinary people benefit both through opportunities for formal wage employment and through rising wages. Typically, formal wage jobs are more secure and better paid, and offer greater scope for skill accumulation than either self-employment or informal wage work. This may be particularly important for gender equity as labour-intensive manufacturing is a key source of wage employment for women. Where manufacturing does not develop, women have fewer opportunities to gain economic status.

Awareness of climate change is shifting attitudes to industrialization because of the damage caused by carbon emissions. This can easily turn into a misplaced hostility to continued industrialization in developing countries. While it is true that the world cannot afford its past industrialization path to be replicated on a global scale, this does not imply that continued industrialization is undesirable. On the contrary, not only does industrialization play a vital role in development, but climate change can sometimes make it even more essential. Much of African agriculture will inevitably be adversely affected by climatic deterioration, driven by past emissions of carbon. For Africa, the key priority is adaptation. Since climatic deterioration does not affect manufacturing, part of the process of adaptation is for Africa to accelerate its shift from agriculture to manufacturing. Here industrialization is part of the solution rather than part of the problem.

Even for the mitigation of carbon emissions, the pattern of industrialization is likely to be more important than its pace. There are large variations in carbon emissions between different industrial activities and between different technologies within an activity. The challenge is to offer incentives to firms that induce both changes in industrial composition and technology. There are strong reasons for building incentives and financing mechanisms that have a global reach, involving both developing countries and member countries of the Organisation for Economic Co-operation and Development (OECD). Some developing countries are already major industrial powers. Climate change is a global threat, and a condition for a globally efficient response is that the cost of reducing carbon emissions should be broadly equalized around the world. The shift of industry to developing countries could potentially reduce emissions. It is much easier for low-carbon technologies to be introduced when a plant is established, rather than retrofitting it. However, without proper incentives the shift could increase emissions, especially if firms relocate in order to escape regulation.

Another attitudinal change has been towards the exploitation of the world's natural resources. The commodity boom of the 1970s triggered a commercial scramble for resource extraction but left little legacy in terms of sustained development in resource-exporting countries. Academic research has led to a rethinking of why it has proved so difficult to harness resource wealth for development. Whereas 30 years ago the dominant explanation was macroeconomic, now it is recognized that political processes shaping governance are probably more important. Both societies in resource-rich countries and the international community are concerned that past mistakes should not be repeated and, reflecting this new understanding, there is a new focus on good governance.

Changes in understanding

Industrialization has been taking place for some 250 years and from its infancy economists, starting with Adam Smith, have been struggling to understand the process. Surprisingly, in view of how long this work has been going on, there have been several major advances in the recent past. Inevitably, the details of these advances are complex, but a simple way of summarizing them is that industrialization is now recognized to be "lumpy" in products, space and time.

Product range

One respect in which manufacturing is lumpy is in the range of products that are produced. What you make matters, and the products most appropriate for a country to manufacture change over time. Change is necessary but is likely to be evolutionary. It is difficult to make large leaps from one type of product to another. Evolution can be thought of as a process of increasing sophistication. Product sophistication should be understood broadly to include not just the hard technology used in the production process, but also the soft technology used in all the necessary ancillary stages, such as design, logistics and marketing. In this report, UNIDO finds that the developing countries which have been more successful have tended to increase the diversity and sophistication of the products they produce and export. However, now that manufacturing is dominated by trade, it is not necessary for every country to produce the same type of product. UNIDO finds that it is the successful low-income countries that have expanded their

market share in unsophisticated products and it is the successful middle-income countries that have moved vigorously up the ladder of product sophistication.

Location of production

A second respect in which manufacturing is lumpy is in the location of production. To reap economies of scale, manufacturing needs to be concentrated. This is most obvious at the plant level: the very idea of a plant is to bring machinery and workers together in a single location. However, it also applies to the location of firms engaged in the same activity. By clustering together, similar firms reduce each other's costs. Finally, economies of scale can also be generated by proximity to firms in other activities, such as can be found in large cities. These potent forces for agglomeration create tensions both within and between countries. Within countries, attempts to distribute manufacturing equitably between localities are liable to sacrifice efficiency and hence threaten viability. Between countries, those which already have concentrations of manufacturing are at a major advantage over those which have yet to industrialize.

Timing and threshold of competitiveness

The difficulties facing latecomers are highlighted by the final aspect of lumpiness, namely, time. Latecomers face a chicken-and-egg problem. Because they still do not have industrial agglomerations, they are unable to be competitive against countries that have. In effect, there is a threshold of competitiveness to be surmounted. Once that threshold is crossed, growth is explosive, because as the activity expands and the agglomeration grows, production costs fall. But until the threshold is crossed, industry is not competitive. It therefore stagnates or, if exposed to international competition, contracts. Industrial success in an activity thus tends to occur in a rush.

Implications of change for policies

These major global changes, and one's understanding of them, inevitably have implications for policies that are likely to be supportive of development. In this report, the primary focus is on two groups of developing countries that face particularly acute challenges in industrialization. Those are low-income countries that have yet to break into global markets for manufactures, and middle-income countries that are producing goods for which they face stiff competition from successful low-income producers.

Breaking in at the bottom

Firstly, consider the breaking-in problem. Since the problem is about surmounting a threshold below which industry is uncompetitive, there is an important role for public action, as purely market-driven processes will yield prolonged stagnation. Public action can potentially come both from governments of low-income countries themselves and from governments of developed countries. In fact, they play a complementary role.

Governments of low-income countries trying to break in can lower the costs of production for manufactured exports in various ways. Most directly, they can provide the infrastructure needed by manufacturing. The production process depends on power and water, and because trade in tasks is transport-intensive, modern manufacturing needs telecommunications, roads and ports. However, transport infrastructure is only one aspect of transport costs. Logistics can be disrupted by government-created delays or speeded by government-supplied infrastructure. Customs procedures, health checks and other inspection processes can be simplified and coordinated to ensure that international standards of efficiency are met.

Insights from the economics of spatial agglomeration can be used by policymakers to rethink special economic zones (SEZs). A good approach to SEZs is for governments to target infrastructure on a naturally favoured location, such as a port. Not only is this much cheaper than attempting to provide the infrastructure at many different locations, but it coordinates the location decisions of firms, creating clusters.

The economics of spatial agglomeration also have implications for regional policy. Industrial agglomeration occurs not just at the level of a single activity in a cluster, but also among mutually supporting industries in a city. In this report, UNIDO investigates economies of scale accruing from city size. The size of cities in areas divided into many small countries tends to be much smaller than if the same area were a single country. By keeping cities artificially small this political fragmentation raises the costs of manufacturing. This effect points to a new source of potential gains from regional integration, but to reap these gains, integration needs to permit subregional megacities. Megacities require a large hinterland, making it difficult for every small country to have one. Moreover, if each small country protects the local market, such megacities cannot emerge.

Governments of developed countries can support the process of breaking in through two distinct policies: Aid and trade. Aid for Trade has been a catch-all concept, but properly used, it can help to finance the critical infrastructure that SEZs need. Developed countries can use their trade policies to provide temporary privileged access to their markets in manufactures for countries that have yet to industrialize. Although this category of countries overlaps with the United Nations category of least developed countries (LDCs), the two categories are not coincident because some countries are above the income threshold for LDC status but have yet to industrialize, while others remain below the threshold but have already broken into global markets for manu-

factures. Accordingly, this report proposes that the United Nations consider redefining the category of LDCs, creating a new group of least developed manufacturing countries, thus making them eligible for privileged access for their manufactures.

Moving up in the middle

Those middle-income countries whose industry has been slow-growing face a different problem. Essentially, as their incomes have risen they have failed to press on with the process of increasing product sophistication in manufacturing and have therefore been squeezed by low-income producers. Addressing this problem is not straightforward. The simple policies, such as SEZs, are usually already in place. The key to product sophistication is knowledge. Hence, one spatial policy that may be useful in upgrading is to promote technical and university education in cities with export manufacturing clusters. Such knowledge agglomerations can generate technical and management knowledge that can be provided as a public good. A complementary approach is to encourage the entry and exit of firms since new firms bring new ideas. The birth and death rates for firms are affected by labour market regulations and bankruptcy laws and, potentially, firms in defined geographical areas can be subject to regulations that induce a higher turnover than in the rest of the economy. An advantage of such targeting is that it may substantially reduce political resistance because the overall regulatory regime does not need to be relaxed in order for manufactured exports to become more dynamic.

Harnessing the commodity booms

As regards the vagaries of commodity prices, the new concern with governance has already been reflected at the international level in the creation of the Extractive Industries Transparency Initiative. At the national level, the determination not to repeat the history of the 1970s is evidenced by the rapid adoption of the Initiative by 23 resource-exporting countries. In this report, UNIDO suggests how voluntary standards might be extended to cover critical economic decision points in harnessing resource extraction to sustained development. This is because good economic governance of commodity revenues involves more than honesty. Revenues provide an opportunity to invest in infrastructure and education that support manufacturing success. In contrast, spending that is honest yet targeted to the wrong sectors can end up inadvertently de-industrializing the country.

Conclusion

This report does not aspire to be a blueprint for action. Rather, it sets out to assist those responsible for designing or implementing policies towards industrialization with the basic tools to think afresh about the problems that constrain industrial development. Coincidental rapid changes in the global economy, in attitudes and in one's understanding of industrialization all make fresh thinking necessary.

Part A

Industrial structural change and new challenges: The policy space for breaking in and moving up

Section I
Structural changes in industry and the global economy

Chapter 1
Introduction

Over the past 30 years industrial growth has been accelerating in developing countries. The miracle economies of East Asia transformed themselves into industrial powerhouses within a generation, and the unprecedented pace of industrialization in China and India has lifted millions out of poverty. Exports of manufactures have been growing much more rapidly than the production of manufactures for many years, and developing countries are gaining a global market share. Industry seems to be making a historic absolute shift to the developing part of the world.

Yet despite such overwhelming evidence of manufacturing success in developing countries, a substantial part of the world remains at risk of failing to establish a vibrant, competitive industrial economy. Industrialization is not a single, linear process. It is not simply a matter of the gradual accumulation of machinery and technology. Industrialization is "lumpy" in products, space and time, and different developing countries experience radically different degrees of success in industrialization.

This report is about the countries that have been left behind. It is about the opportunities and constraints faced by two groups of countries: the poorest countries of the world—the countries of the bottom billion—and those middle-income countries striving to move up.[1] It addresses the challenge of breaking into global markets for countries that have not yet industrialized and of catching up with the more dynamic newly industrializing countries (NICs) for those which have succeeded in industrializing to some extent.

It is also a report about structural change. Paths to industrial development will differ, and as a country proceeds along a suitable path, the type of industries that drive the industrialization process will change radically. Unprecedented structural changes in the global economy are redefining industrial development. The growing significance of industrial clusters, the rapid increase in the proportion of manufacturing output that is traded internationally, the explosive growth of task-based manufacturing, the rise of China and India, and their consequences for the location of manufacturing and for commodity markets are changing the opportunities for industrialization—opening some avenues and closing off others. What are the implications of these structural changes for the future industrialization of developing countries?

This report is about those who have been left behind: the poorest countries of the world—the countries of the bottom billion—and those middle-income countries striving to catch up.

Section II focuses on three aspects of structural change in industry. As industrialization proceeds, what does it produce, where does it locate, and where is its output sold? The focus is predominantly on manufacturing industry, but the report also discusses mineral resource extraction, which is the other major component of industrialization in developing countries.

It is important to understand industrialization to ensure that economic policy responses are appropriate. Section III turns to the implications for policy. Because countries differ in their structural characteristics, strategies must differ according to opportunities and the need to evolve. Some aspects of economic strategy are not specific to a sector, but because endowments and geography also matter, sector-specific strategies—for example, in the management of resource-based industries—are also needed.

The remainder of this chapter addresses an essential prior question: Why bother with industrial development at all?

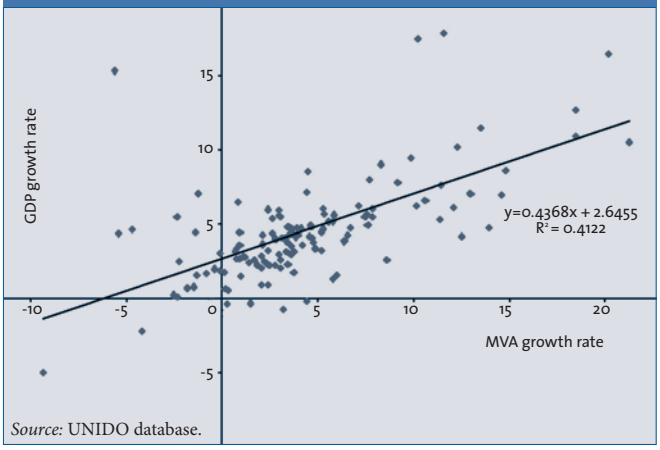
1 Collier (2007) defines the "bottom billion" as a group of around 60 countries with a total population of about one billion people that have diverged economically from the rest of the world at a rate of 5 per cent annually for the past 20 years. These countries have failed to grow and avoid economic stagnation. (See the tables in Annex I for country classification)

1.1. Industrialization, structural change and growth

Industrialization is integral to economic development. Scarcely any countries have developed without industrializing, and rapidly growing economies tend to have rapidly growing manufacturing sectors. Figure 1.1 is a scatter diagram for 131 developing countries between 2000 and 2005, showing the relationship between the growth in manufacturing value added (MVA), on the horizontal axis, and growth in gross domestic product (GDP), on the vertical axis. The scatter points represent individual countries. The regression line shows that more rapid growth in manufacturing is correlated with more rapid GDP growth. It is difficult to say whether the direction of the relationship runs from more rapid growth in manufacturing to faster GDP growth or in the opposite direction, but the prominent role played by technology on exports in manufacturing suggests that output growth is more likely driven by manufacturing growth than the opposite.

Industrialization is integral to economic development. Scarcely any countries have developed without industrializing, and rapidly growing economies tend to have rapidly growing manufacturing sectors.

Figure 1.1 Association between growth in manufacturing value added and growth in gross domestic product, 2000-2005 (Percentage)



Source: UNIDO database.

Why? A single theme—once an important subject in the study of economic development, but more recently neglected—provides the answer: structural change. Since the contributions of Barro (1991) and Mankiw, Romer and Weil (1992), the standard framework of empirical growth analysis has consisted of using aggregate data—such as the Penn World Tables (Heston, Summers and Aten, 2006)—and econometric techniques to account for income variation across countries and over time. Countries are assumed to differ in levels of income and rates of growth owing to things that can be measured—factor inputs and/or determinants of growth, such as policies or institutions—and those that cannot—a residual "total factor productivity" (TFP).[2] The search for drivers of growth has therefore become one in which researchers seek to identify even more variables that are correlated with variations in income and growth. At the last count, such variables were as numerous as the countries in the world for which data are available (Durlauf, Johnson and Temple, 2005).

Yet cross-country growth empirics rarely account for the differing structural composition of the economies studied (Temple and Wössmann, 2006). One of the "stylized facts" of development is that productivity levels differ significantly across sectors in low-income countries. Structural change—the shift of capital and labour from low-productivity to high-productivity sectors—is both a cause and consequence of long-term growth.[3]

An economy's aggregate TFP is a weighted sum of individual sector TFP levels. But economy-wide TFP growth is not simply the weighted sum of sectoral TFP growth rates. It also reflects all the changes in the structural composition in the economy.[4] Thus, an important "source" of economic growth is the benefit of moving labour from relatively unproductive to relatively more productive sectors. Indeed, the early models of economic development (Lewis, 1954; Fei and Ranis, 1964) were built on this stylized fact. Labour moving from low-productivity sectors, such as traditional agriculture and primary production, to higher-productivity activities in modern manufacturing (and modern agriculture) generated the surplus that spurred capital accumulation and growth.

Quite probably, in high-income countries little is lost by ignoring structural change. These countries are highly developed and have therefore already achieved substantial convergence in productivity levels across sectors. However, the structural differences between industrial giants, such as the United States of America, and many sub-Saharan African countries, whose economies are still to a large extent dominated by subsistence agriculture, have been glossed over in the recent empirical growth literature. This has led to policy inferences from growth empirics that tend to emphasize whole economy recipes for faster growth—better institutions, improved governance, openness to trade, and financial deepening. While these determinants of growth are undoubtedly relevant to economic success, they are largely devoid of structural content.

2 See, for example, Mankiw, Romer and Weil (1992); Young (1995); Hall and Jones (1999); Klenow and Rodriguez-Clare (1997); and Easterly and Levine (2001). Bosworth and Collins (2003) continue an earlier tradition of growth accounting but also use aggregate, economy-wide data.

3 Chenery (1986) examines the role of structural change at the aggregate level, while Foster, Haltiwanger and Krizan (2001) review a growing empirical micro-literature on the role of reallocation for aggregate productivity growth, in the context of both developed and developing countries.

4 A simple mathematical exercise can show that aggregate TFP changes if labour moves between sectors of a stylized economy (Lipsey and Carlaw, 2000, 2004). See also the discussion on structural change and bias in aggregate TFP estimation in Chen (1997) and in Durlauf and Johnson (1995).

Box 1.1 Industry: A "well-proven" route to growth

A recent report by the Department of Economic and Social Affairs of the United Nations Secretariat on industrial development for the twenty-first century articulates the primacy of industrial development in economic development. The report states:

> "Industrial development is not the only possible route to a developed country standard of living, but it is a well-proven one. It is for this reason that industrial development remains a high policy priority of governments in the developing world. While less vital to maintaining high incomes in developed countries, industry remains an important source of well-paying jobs, especially for those workers with less than a college education."
>
> "The past several decades have witnessed a major restructuring of the global economy, one in which more and more industrial output and employment is now located in emerging developing countries, while the developed countries have become ever more service-oriented economies. Globalization through increased trade and investment flows is driving this restructuring, along with technological and associated organizational change."
>
> "Industrialization is proving a potent force for economic growth in countries of Asia, most recently China and India. In the former at least, it has also been an important contributor to poverty reduction. In China, vast numbers of people have left agriculture to work in factories, as—in the past—did rural populations in the now industrialized world."

Source: United Nations. Department of Economic and Social Affairs (2007).

Research by UNIDO on why development levels differ has highlighted the role played by differences in productivity across countries. Hulten and Isaksson (2007) show that differences in the efficiency of production, as measured by relative levels of TFP, are the dominant factors accounting for the difference in development levels. They also find that the gap between rich and most poor countries is likely to persist under prevailing rates of saving and TFP growth. Other evidence (Isaksson, 2007) underscores the persistence of productivity levels. It has been very difficult for developing countries to catch up with the technology frontier, at least in the past 50 years. Overall, this evidence is in line with the notion that growth has lagged where countries have failed to shift capital and labour from low- to high-productivity sectors. It may also suggest that technological progress is faster in relatively sophisticated sectors.

Some additional support for the argument that manufacturing growth leads economic growth appears in Table 1.1. Countries are classified into five groups on the basis of their long-term growth performance between 1975 and 2005 and their initial level of income in 1975. Growth performance is measured by the relative frequency of "growth experiences" for each country in the sample. A "growth experience" is defined as a year in which aggregate GDP per capita growth for a country is above the median growth rate for the sample as a whole. Countries are classified as "fast growers" if more than half of their annual observations are growth experiences.[5]

The two-way classification yields five country groups:

- High-income countries, for example, the countries of the OECD
- Fast-growing middle-income countries, for example, Chile,[6] Malaysia,[6] the Republic of Korea,[7] Singapore[7] and Tunisia[8]
- Slow-growing middle-income countries, for example, Argentina[6], Colombia[8], Morocco[8] and South Africa[6]
- Fast-growing low-income countries, for example, Botswana[6], China,[8] Egypt[8], India,[8] Indonesia[8] and Thailand[8]
- Slow-growing low-income countries, for example, Democratic Republic of the Congo, Ghana, Nigeria, Senegal and the United Republic of Tanzania.

Some descriptive statistics are given for each of the country groups in Table 1.1. The country groupings are presented in Annex I. Table 1.1 shows the rate of MVA growth per worker in 1975-2000, MVA per capita in 1975 and 2005 and the associated growth rates.

Table 1.1 Fast- and slow-growing low- and middle-income countries, 1975-2005

Group median estimates	Low-income countries		Middle-income countries		Organisation for Economic Co-operation and Development
	Slow-growing	Fast-growing	Slow-growing	Fast-growing	
Aggregate economy[a]					
Constant 2000 US$					
GDP per capita in 1975	331	292	2,115	3,904	14,620
GDP per capita in 2005	321	626	2,262	6,056	25,940
GDP per capita growth per annum (percentage)	0.0	1.9	0.3	1.5	1.6
Constant 2005 PPP US$					
GDP per capita in 1980	1,090	1,250	5,292	9,435	20,836
GDP per capita in 2005	1,133	2,222	6,737	16,306	33,137
GDP per capita growth per annum (percentage)	0.0	1.9	1.0	1.8	1.6
Manufacturing value added					
MVA per worker growth per annum, 1975-2000 (percentage)	1.8	3.5	0.7	0.9	2.9
MVA per capita in 1975	19	32	224	273	2,210
MVA per capita in 2005	27	92	328	986	3,895
MVA per capita growth per annum (percentage)	1.1	3.5	0.6	4.2	1.9
Number of countries	20	20	31	29	19

Sources: Heston, Summers and Aten (2006) and UNIDO database.

a GDP per capita in constant 2000 dollars, taken from World Bank (2008a). For 1975, the median of 1974-1976 is taken and for 2005 the median of 2004-2006. World Development Indicators purchasing power parity (PPP) data only start in 1980 and are reported in constant 2005 dollars PPP.

5 Since data availability differs from country to country, the number of country-year observations varies.
6 Currently classified as an upper middle-income economy.
7 Currently classified as high-income economy
8 Currently classified as lower-middle-income economy.

Both measures of manufacturing productivity tell very similar stories. There are very large differences in productivity gains in manufacturing between fast-growing and slow-growing countries. In the fast-growing low-income countries, the rate of MVA growth per worker was about twice as fast in the slow growers, while it was more than three times as fast in per capita terms. In the middle-income countries, the differences were also striking: MVA per worker grew faster in the fast-growing countries than in the slow-growing countries, and MVA per capita grew seven times as fast. These large differences support the view that changes in manufacturing productivity are driving economy-wide growth, and not the other way around.

A final story of structural change and growth comes from the role played by manufacturing in East Asia's miracle. In 1965, the manufacturing sectors of East Asia and Latin America were of similar relative size, accounting for some 25 per cent of GDP. By 1980, the share of manufacturing had risen to almost 35 per cent of GDP in East Asia and stayed above 30 per cent into the 1990s. In Latin America, manufacturing remained stagnant at slightly above 25 per cent throughout the 1980s. The share of manufacturing in GDP in East Asia is now some 30 per cent, but manufacturing experienced a sharp decline in Latin America, falling to a low of some 18 per cent of GDP in 2000-2005. In sub-Saharan Africa, the region with the lowest long-term growth rate, the share of manufacturing in GDP has never exceeded 12 per cent. In South Asia and the Middle East and North Africa, the share of manufacturing in GDP hovered around 13 to 15 per cent for most of the time between 1965 and 2005.

In 1965, the manufacturing sectors of East Asia and Latin America were of similar relative size. By 1980, the share of manufacturing had risen to almost 35 per cent of GDP in East Asia. In Latin America, manufacturing remained stagnant at slightly above 25 per cent throughout the 1980s.

East Asia was the region in which the "flying geese pattern" of rising shares in manufacturing was first apparent, a term coined by Kaname Akamatsu (1962). That pattern has continued. Japan, the four original tigers—the Hong Kong Special Administrative Region (SAR) of China, the Republic of Korea, Singapore and Taiwan Province of China—and the second generation of NICs, Indonesia, Malaysia and Thailand, and recently China, all have shares of MVA in GDP that exceed the global average. Recently, Cambodia, the Lao People's Democratic Republic and Viet Nam have also achieved shares of MVA in GDP exceeding 20 per cent. It is very unlikely that the large difference in the economic structure between East Asia and other developing regions fails to account for part of its successful growth.

From the point of view of public policy it is important to note that, as changes in the economic structure lead the process of development, a broader array of policies—some directed at accelerating structural change—may be needed for development success. An emerging academic literature—which might be labelled "new structuralism"—takes up this argument and makes a compelling case that structural change can be a driver of development.[9] Not only does manufacturing appear to speed development, but its contribution appears to depend on its composition. Chapter 2 presents evidence that over a wide range of income the diversification of manufacturing raises productivity and that in small low-income countries manufacturing for export is particularly useful for productivity growth. In short, development economics is rediscovering that what you make matters for growth.

1.2. Is industrialization development-friendly?

Does industrialization contribute to the MDGs and, in particular, to the overarching goal of poverty reduction? Is it compatible with environmental sustainability?

Unambiguously, sustained rapid economic growth normally leads to major poverty reduction and, conversely, poverty reduction is extraordinarily difficult in the context of stagnation. Yet beyond this, both manufacturing and resource-based industrial development are likely to have radically different consequences for poverty. A disadvantage of resource extraction and sometimes of agriculture is the tendency towards an unequal distribution of income. Resource-rich economies are often unequal because of unequal ownership of the resources, whereas agricultural exporters are sometimes unequal because of large concentrations of land in the hands of a few families.

Manufactured exports are often labour-intensive and this is potentially equalizing. The effect may be particularly important for gender equity. Ross (2008) finds that labour-intensive manufacturing is a key source of wage employment for women. Where manufacturing does not develop, women have fewer opportunities to gain economic status and this in turn has adverse consequences for development. For example, women have less incentive to acquire education.

Ordinary people depend for their well-being primarily on two economic pillars—access to wage jobs and access to public social services. Manufacturing is better than resource extraction in generating opportunities for wage employment, but resource extraction is better than manufacturing in its potential to fund public services.

9 See, for example, Hausmann, Pritchett and Rodrik (2005), Rodrik, Subramanian and Trebbi (2004) and Rodrik (2006a, 2006b).

As labour-intensive manufacturing-based development proceeds, it creates jobs. On the supply side, this process is explosive: much of manufacturing benefits from economies of scale in production so that as an industry grows its costs fall. In the past, when demand was oriented principally to the domestic market, the explosive forces on the supply side were countered by the dampening forces on the demand side: as production expanded the market became saturated. Now that manufacturing is globally integrated, however, export orientation breaks the constraints previously caused by a limited domestic market. For all except the largest developing countries, the global market is vast relative to their production. The explosive forces on the supply side are no longer countered. The expansion of manufacturing wage jobs can therefore be spectacular. In turn, this gradually tightens the labour market. Ordinary people benefit both through opportunities for formal wage employment and through rising wages. Typically, formal wage jobs are more secure and offer more scope for skill accumulation than either self-employment or informal wage work.

Ordinary people benefit both through opportunities for formal wage employment and through rising wages. Typically, formal wage jobs are more secure and offer more scope for skill accumulation than either self-employment or informal wage work.

In contrast, resource-based development has little direct impact on the labour market. Hence, there is no automatic process that raises the incomes of ordinary people. Whether resource-based development generates jobs depends on how successfully the sector is integrated into the rest of the economy. There is often potential for the development of upstream industries, and resource booms usually lead to construction booms, which can potentially generate mass employment.

Box 1.2 Growth, poverty reduction and the Millennium Development Goals in Africa

Halving income poverty by 2015 requires a dramatic turnaround in the economies of sub-Saharan Africa, reversing the negative per capita income growth rates of -1.2 per cent in the 1980s and -0.4 per cent in the 1990s. UNIDO estimates show that the per capita growth rate needed in sub-Saharan Africa to halve income poverty is 3.8 per cent on average. Thirty sub-Saharan African countries need annual GDP per capita growth rates of 2 to 6 per cent to reach the income poverty reduction MDGs by 2015.

The poorest sub-Saharan African countries are those which face the greatest challenges in terms of required growth rates. They have been making the slowest progress towards the income poverty goal—when they have not actually been slipping away from it. In many sub-Saharan African countries, the MDG growth required greatly exceeds the best growth rates they have achieved in the recent past. The landlocked countries are farthest from the goal. As a group, they need to grow by 4.9 per cent annually, and six landlocked countries need to grow by more than 5 per cent (5.8 per cent, on average, if Malawi and Uganda are excluded). The required growth rate is lower for countries with oil or mining resources and coastal access.

Only a few countries are on track to reach the poverty reduction Goal: Benin, Cape Verde, Equatorial Guinea, Malawi and Uganda have reduced poverty to the point that their per capita GDP growth required is less than 2 per cent. Botswana Mauritania, Mozambique and South Africa also face attainable growth-rate requirements. If growth rates in other countries do not improve, it will take until 2066 for landlocked countries, 2055 for resource-abundant coastal countries and 2057 for coastal countries to achieve the poverty reduction Goal.

Closing the gap between actual growth and the growth required for achieving the MDGs must come from dynamic sources of growth. In order to achieve sustainable growth, sub-Saharan African countries need a period of accelerated structural change. Significant gains in agricultural productivity are possible with increased research and development, but a demographic transition and policies to create manufacturing and service jobs for the surplus labour released by agriculture will be needed to close the gap in growth and create the jobs needed to reduce poverty.

Source: UNIDO (2004).

Box 1.3 United Republic of Tanzania: Productive sector-led accelerated growth boosts poverty reduction

Sustained economic growth is critical to achieving progress in poverty reduction. The mechanisms through which the poor contribute to and participate in economic growth include the following:

- Increased incomes from the main sources of livelihood of the poor
- New income-generating opportunities for the poor
- Reduced vulnerability to shocks that affect the incomes of the poor
- Increased government revenue for pro-poor expenditures
- Increased private transfers and strengthened social safety nets

The recent economic success of the United Republic of Tanzania provides a dramatic illustration of the contribution of growth in productive activities to poverty reduction. GDP growth in the United Republic of Tanzania accelerated from 2.5 per cent during 1990-1994 to 6 per cent during 2000-2005. Growth in the service sector contributed 1.4 percentage points to the increase, industry 1.3 percentage points and agriculture 0.8 percentage points. A central element of the country's recent growth performance has been large inflows of private and public capital that were triggered by the reforms undertaken by the Government.

While the full effect of the recent acceleration in growth has not yet been captured in available poverty data, increases in household incomes have produced some striking changes. Poverty dropped from 28.1 per cent to 17.6 per cent in Dar es Salaam. Ownership of assets, such as improved housing, radios and bicycles, by the poor has increased. Expanded access to free primary education—made possible by increased public revenues and donor support—has clearly also benefited the poor.

Source: World Bank (2007a).

While the link from resource extraction to jobs is problematic, its link to public social services is more straightforward. Governments should normally be able to generate large revenues from resource-based development so that public services can readily be financed, but again, the availability of government funds is not a guarantee for improved public services.

Awareness of climate change is shifting attitudes to industrialization. This can easily turn into a misplaced hostility to continued industrialization in developing countries. While it is true that the world cannot afford its past industrialization path to be replicated on a global scale, this does not imply that continued industrialization is undesirable. On the contrary, not only does industrialization play a vital role in development, but the climate change taking place could make it even more essential.

Even for the mitigation of carbon emissions, the pattern of industrialization is likely to be more important than its pace. There are large variations in carbon emissions between different industrial activities and between different technologies within an activity. The challenge is to offer firms incentives that will induce changes in both industrial composition and technology.

There are strong reasons for building incentives and financing mechanisms that have a global reach, involving both developed and developing countries. Some developing countries are already major industrial powers. Climate change is a global threat, and a condition for a globally efficient response is that the cost of reducing carbon emissions should be broadly equalized around the world. The shift of industry to developing countries could potentially reduce emissions. It is much easier for low-carbon technologies to be introduced when a plant is established, rather than retrofitting it. However, without proper incentives the shift could increase emissions, especially if firms relocate in order to escape regulation.

Box 1.4 Climate change, industrialization and the bottom billion

A key concern regarding industrial growth in developing countries is the potential risk of higher carbon emissions and the acceleration of climate change. This concern is fuelled by the increasing public awareness in developed countries of the need for mitigation measures aimed at reducing carbon emissions. Undoubtedly, developing countries—especially those that have industrialized rapidly—will need to play a role in mitigation. But industrial development can also make a major contribution to adaptation to climate change that will inevitably occur due to past emissions of carbon.

Adaptation is imperative for countries of the bottom - billion. Without it, climate change will have major adverse economic effects. The most pressing need for adaptation is in Africa, where climate change is already under way. In Africa, climate change will have direct economic effects that are very different from those in developed countries. Africa can only make a marginal contribution to the mitigation agenda: its share of global carbon emissions is currently insignificant. But global warming will tend to benefit agriculture in the North, while seriously damaging agriculture in Africa. Agriculture, which is the most climate-sensitive economic activity, is much more important in Africa than in other regions and the largely rain-fed agriculture practiced in much of Africa is considerably more climate-sensitive than agriculture elsewhere.

Because climate change will reduce productivity in African agriculture, part of the African adaptation agenda will focus on agriculture. It is important to try to offset these productivity losses by encouraging farmers to switch to crops that are better suited to new climatic conditions and by developing crop varieties that are more resistant to climatic stress. However, a major implication of the looming deterioration in African agricultural productivity and the improvement of productivity in the North is that Africa's comparative advantage is shifting away from agriculture. An appropriate African adaptation to climate change is therefore to accelerate urbanization and industrialization. Africa will suffer less from the consequences of climatic shocks and deterioration if the share of its economy generated by activities that are not climate-sensitive increases. Hence, the policies that will help Africa industrialize are also a key part of Africa's appropriate response to the challenge of climate change.

Source: Collier, Conway and Venables (2008).

1.3. Industrial development and the bottom billion

Have the emerging economies of the South to some extent made it more difficult for latecomers to break into manufacturing? Would it matter if development through manufacturing was not feasible for the group of countries comprising the bottom billion? Can other sectors offer the same promise?

One important characteristic of such countries is that they are small. Owing to their small economic size, international trade is much more important for successful development than in larger economies. To see why trade is so vital, it is important to recognize just how small the typical country of the bottom billion is. In terms of population, the typical country has less than 20 million people. However, this greatly exaggerates economic size. Per capita income, even measured at purchasing power parity (PPP) prices, is less than $2,000 per year, so that the typical economy has a size of less than $40 billion and more often around $20 billion. To put this in perspective, the tiny European country of Luxembourg has an economy of around $40 billion. Luxembourg is successful because it is highly integrated into neighbouring economies.

The countries of the bottom billion are simply too small to reach prosperity by means of an inward-focused strategy. A viable strategy for integration into the global economy is essential if only to pay for the imports they need to avoid being confined to an excessively limited range of products and services. Potentially, an export strategy can offer more than the benefits of access to imports. It enables the economy to concentrate on activities with rising productivity. Of the various export possibilities, manufacturing, where it is feasible, appears to offer the surest route to development.

The revolution in Brazilian production is finally taking tropical agriculture into the range in which economies of scale may be significant. However, with this exception, tropical agriculture has not harnessed economies of scale. Two basic physical differences between agriculture and manufacturing limit agriculture's scope for economies of scale. Firstly, land is an essential input for agriculture but not for manufacturing and secondly, there are severe limits on the extent to which the growth of crops and livestock can be accelerated. There are no such limits for the production of manufactures.

For a growing number of countries in the bottom billion, the main alternative to agricultural exports is natural resource extraction. However, as discussed in Chapter 2, this has proved a highly problematic route to development. While in the long term the income level of resource-exporters is higher than that of other countries, there is clear evidence of the resource curse in production. An increase in the price of commodity exports triggers a brief phase of output growth, but this is usually followed by a long period of decline, with output ending up below its initial level. While the resource-extraction sector itself generates income, it often undermines the rest of the economy.

Export agriculture and resource extraction share another disadvantage relative to manufactured exports: they expose the economy to shocks. This is because the price of commodities is considerably more volatile than the price of manufactures, notwithstanding the impact of the recent financial crisis on the global demand for manufactured goods. Volatility in turn exposes the economy to risks. Investment in the domestic market will be discouraged by the risk that demand will drop owing to a decline in income triggered by a fall in export prices.

Over and above these general advantages of manufacturing relative to other sectors, there is evidence that, in the small countries of the bottom billion, manufactured exports are likely to offer more scope for long-term productivity growth than either agriculture or natural resources. Research commissioned for this report from Ethiopia finds that exporting firms raise the productivity of neighbouring firms. Of course, firms that are more productive tend to self-select into exporting, but Bigsten et al. (2004) find that, controlling for self-selection, African firms enhance their productivity by around 9 per cent per year if they export.

A possible explanation for why exporting is more beneficial in Africa is the radical difference in the size of the domestic market. In the small markets of Africa the market is not highly competitive, so a relatively efficient firm can afford to relax. Only when it is exposed to international competition will it have to struggle to keep up. In contrast, in the far larger market of China there is sufficient domestic competition so that exporting does not intensify pressure.

Finally, and most crucially, both agriculture and natural resource extraction depend on the availability of land, and land is in limited supply. But development based on manufacturing exports can continue and indeed accelerate, leading the society to prosperity. In contrast, even if development based on agricultural exports or resource extraction is initially successful, it may hit natural limits well before prosperity is reached.

Section II
Global structural change: Implications for industrial development

Chapter 2
Understanding structural change: Products, tasks and natural resources

This chapter examines how three aspects of industrial structure in developing countries influence their opportunities for growth. Firstly, it looks at two important elements of the industrial structure related to products: diversity and sophistication. Recent research suggests that more advanced economies have more diverse industrial sectors, and economies that export more sophisticated products—in terms of technology, organization, quality, design and logistics—grow faster. The chapter presents new evidence that diversity and product sophistication in manufacturing are closely linked to faster economic growth in both low- and middle-income countries.

Recent research suggests that more advanced economies have more diverse industrial sectors, and economies that export more sophisticated products grow faster.

The analysis then turns from products to "tasks". Task-based production—specialization in some stages of a value chain rather than in final products—may make it possible for countries that have not yet succeeded in industrializing to break into global markets. Yet critics have suggested that "tasks" may be less technologically sophisticated than final products, trapping countries in more narrow and less sophisticated production structures. The chapter compares the sophistication of product- and task-based manufacturing and finds no evidence that task-based production is less technologically sophisticated than production of final products.

Finally, the chapter looks at the potential and risks of natural resource extraction. Historical evidence shows that commodity booms offer a huge opportunity for countries that possess valuable natural resources. However, the same evidence shows that after two decades the typical resource-extracting economy actually produces less than it would have done in the absence of a commodity boom. The chapter focuses on three structural aspects of resource-rich economies—"Dutch disease", construction booms and links to industry—that largely determine whether resource-rich economies succeed in transforming commodity booms into sustained increases in production.

2.1. What you make matters

Two new "stylized facts" regarding industrial production, exports and economic development have emerged from recent empirical work. Put simply, the first is that there is a U-shaped relationship between specialization in production and exports and per capita income. As incomes rise, countries become more diversified, in terms of their production and export structures. New product lines are introduced and new activities are taken up within existing sectors, until countries reach high levels of income. The second is that countries that produce exports that are mainly produced by countries with higher income levels tend to grow faster.

A. Diversity in production matters for growth

The pioneering study in this field is by Imbs and Wacziarg (2003), who find that poor countries and—to a lesser degree—rich countries tend to specialize in the production of a fairly narrow range of activities. Across a wide range of incomes, however, the diversity of what a country produces increases with the level of per capita income. Importantly from the point of view of industrial development, Imbs and Wacziarg (2003) find that the same U-shaped pattern holds within the industrial sector. This suggests that the relationship between specialization in production and income is not solely a product of structural change between primary production and manufacturing. Diversification within the manufacturing sector also takes place as development proceeds.

The relationship between specialization in production and income is not solely a product of structural change between primary production and manufacturing. Diversification within the manufacturing sector also takes place as development proceeds.

Other recent studies indicate that the same U-shaped relationship holds for export diversification (Klinger and Lederman, 2004; Carrère, Strauss-Kahn and Cadot, 2007). The study by Carrère, Strauss-Kahn and Cadot is of particular interest. Using data from 159 countries (including 121 developing countries) between 1988 and 2004, they calculate measures of export concentration, the number of active exports and the number of new exports (defined as products exported for two years after not having been exported for at least the previous two years). They find a strong U-shaped relationship between export concentration and per capita income. As per capita incomes rise, exports diversify within existing product lines and through the introduction of new products. Finally, at OECD countries' levels of income, some export lines close down and exports become more concentrated, owing in large part to increases in the market share of existing exports.

Why should industrial diversity matter for development? One reason is that more diverse economies may be better able to take advantage of export opportunities in global markets as they emerge. In the studies summarized above, the turning point for increasing concentration of production occurs at a lower level of per capita income ($16,500 at constant 2000 dollars at PPP) than the turning point for exports (some $22,500). Industrial diversification appears to lead to export diversification. This is consistent with the idea that economies build industrial competence in new activities and then enter global markets.

Another reason may be that a wide range of industrial activities provides a broad basis for the entry and exit of firms. There is substantial evidence that productivity differs significantly across firms in developing countries even within the same sector. Higher-productivity sectors are the result of the entry and/or expansion of higher-productivity firms. A broad industrial base may facilitate the creation or expansion of more productive firms and ease the exit of less productive ones.[10] Thus, the fact that industrial diversity and export diversity appear to be closely related to each other may reflect the fact that diverse industrial structures facilitate the growth of globally competitive firms in an economy.

B. Technology, product sophistication and growth

While the notion that diversity in industrial production and exports is important for growth is relatively new, the idea that the technological sophistication of what a country produces and exports matters for its development is not. Traditionally, economists have viewed changes in the technological complexity of manufacturing as an outcome of "moving up the production ladder" from relatively simple mass manufacturing activities, such as textiles or footwear, to increasingly more complex production processes, such as metal-mechanical, chemical or electronics industries. This section looks at the changing technological structure of industry in low- and middle-income countries, measured in this narrow sense.

There is, at present, a mass of empirical literature that documents the close association between mastery of technology and development.[11] It argues that because more technologically complex industries involve increasing returns to scale and the potential for further learning, the shift from low-technology to more advanced manufacturing activities is the main vehicle for productivity change in an economy. Manufacturing is also a major source of innovation. Research and development (R&D) by private industrial enterprises has grown in importance since the nineteenth century and now accounts for the bulk of innovative activities in advanced countries. Moreover, formal R&D is only part of the technology development process. A significant part takes place in engineering, production, procurement and quality management. Thus, increasing technological sophistication in manufacturing is a major source of dynamic comparative advantage.

In this model of "narrow" technological advance, moving up the ladder of process technology is both a cause and a consequence of rising income levels. Technological learning spurs productivity growth and increases real wages, which in turn causes firms to exit low-technology, labour-intensive activities and enter

10 Hausmann and Rodrik (2005) refer to this process as "self-discovery"—firms getting better in what they are most competent at doing.

11 For a summary, see UNIDO (2002).

more capital-intensive, technologically sophisticated sectors. Because these sectors have stronger learning effects, and possibly more spillovers to the rest of the economy in terms of skills development and knowledge, they strengthen growth further.

While there is considerable intuitive appeal in measuring technology in terms of its physical complexity, recent research (Hausman, Hwang and Rodrik, 2007; Rodrik, 2006a) has taken a somewhat broader view of technological sophistication. Rodrik and colleagues constructed an index of the degree of sophistication of exports based on the per capita incomes of countries that produce them. This index (PRODY) measures the per capita income level associated with an export by computing the weighted average of the incomes of countries that export the product. The weights are the revealed comparative advantage of each country in each commodity (normalized to one). If mostly high-income countries have revealed comparative advantage in an export, the PRODY index income level is high. It is low for products mainly exported by low-income countries.[12]

Rodrik (2006a) argues that the PRODY index reflects the overall productivity levels of countries that most intensively export the product. Productivity levels in high-income countries reflect some "narrow" aspects of technological sophistication, such as capital intensity or process complexity, but they also embody "broad" aspects, such as superior market knowledge, design and logistics. The approach therefore attempts to classify products according to the outcomes of structural changes they embody rather than the process technology they use.

There is a strong, positive relationship between the level of sophistication of a country's export structure, as measured by weighted average of the sophistication of each of its exports, and subsequent growth.

The most important result of this work is the finding that there is a strong, positive relationship between the level of sophistication of a country's export structure, as measured by weighted average of the sophistication of each of its exports, and subsequent growth.[13] Why should producing exports that embody levels of productivity above an economy's level of income drive growth? One interpretation would be similar to that above. As the manufacturing base in developing countries shifts from low-technology to higher-technology activities, now measured in this broader sense, income levels rise, largely as a result of knowledge-based spillovers to the rest of the economy.

An alternative interpretation is that sophisticated exports—those embodying high income levels—reflect the presence of highly globally competitive firms in an economy. If a firm in a low- or middle-income country can enter the market for exports produced mainly by high-income country competitors, firm-level productivity should equal or exceed that of its high-income competitors. A country with a large number of such globally competitive firms will experience rapid productivity change within manufacturing and more rapid growth.

2.2. Industrial sophistication, structure and growth

To what extent does the result that countries that produce more diverse and sophisticated exports grow faster carry over to the industrial sector as a whole? This section presents new estimates of sophistication in manufacturing production—whether for export or domestic sale—based on the per capita income of countries that intensively produce different manufactured goods. Using measures of industry-level sophistication an overall measure of the level of sophistication of each country's manufacturing sector is obtained. The two-way classification (introduced in Chapter 1) of countries based on their initial level of income in 1975 and their long-term growth performance is used to explore the relationship between industrial sophistication, structure and growth. There are distinct differences between the patterns of structural change and sophistication in fast- and slow-growing countries. The results suggest that broadening the industrial base and moving up the product sophistication ladder are important drivers of growth.

A. Measuring product sophistication in industry

Here a new measure of the degree of sophistication of a manufacturing activity or product, P-soph, is introduced. If a product's P-soph index is high, it indicates that it is produced primarily by high-income countries. A lower value indicates that low-income countries are more intensively engaged in production in the sector. More precisely, P-soph is the weighted average of GDP per capita of all countries producing the good, where the weights are the "production intensities" of the sector in each country (normalized to 1).[14]

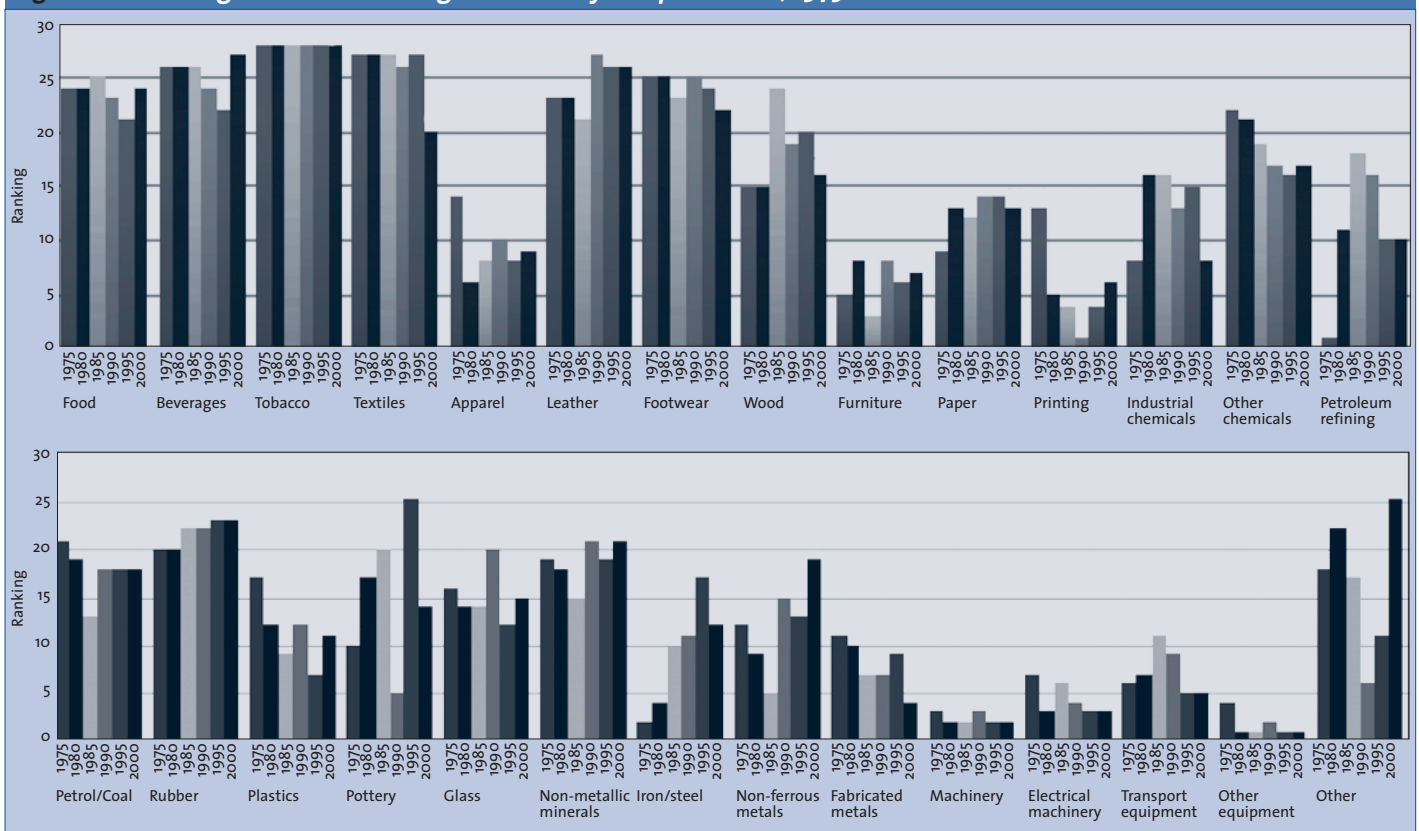
Figure 2.1 shows the rankings of manufacturing activities (at the International Standard Industrial Classification (ISIC) three-digit level) by their P-soph

12 PRODY represents the income level associated with a particular product: $PRODY_k = \Sigma_j \frac{(x_{jk}/X_j)}{\Sigma_j(x_{jk}/X_j)} Y_j$ where Y_j is the per capita GDP of country j, x_{jk}/X_j is the value-added share of the commodity in the country's overall export basket and $\Sigma_j(x_{jk}/X_j)$ aggregates the value shares across all countries exporting the good.

13 Hausmann, Hwang, and Rodrik (2007) argue forcefully that their econometric evidence points to the relationship running from greater complexity to growth. The relationship is robust to a number of specifications and treatments for two-way causality.

14 Production intensity is measured by the ratio of the value-added share of the sector in a country's total manufacturing relative to the sector's value-added share in world manufacturing. This approach is analogous to the use of revealed comparative advantage by Hausmann, Hwang and Rodrik (2007).

Figure 2.1 Ranking of manufacturing activities by *P-soph* indices, 1975-2000



Source: Eberhardt and Teal (2007).

indices for selected years between 1975 and 2000.[15] A ranking of 1 indicates the sector associated with the highest weighted average per capita income of the countries producing it. A ranking of 28 is the sector associated with the lowest average per capita income. Sectors with low rankings are classified as sophisticated and those with high rankings as unsophisticated. The ranking of manufacturing activities according to product sophistication generally accords with the narrower classification of industrial activities into high-, medium- and low-technology categories by process technology, but it also offers a few surprises. Fabricated metals, machinery, electrical machinery, transport equipment and other equipment, all traditionally classified as medium- and high-technology products, are intensively produced by high-income countries. At the other extreme, food products, beverages, tobacco, textiles, leather and footwear are regarded as low-end, mass manufacturing activities and are produced intensively by low-income countries.

The income-based measure picks up some of the organizational quality, design and logistic aspects of production and marketing. Higher-income countries often excel in these areas.

Apparel and furniture, however, two sectors that are classified as low-technology, are intensively produced by higher-income countries. This contrast holds a key to the difference between "sophistication" and "technology". Technology encompasses primarily the "hardware" aspects of the production process. The income-based measure used in this report also picks up some of the organizational quality, design and logistic aspects of production and marketing. High-income countries often excel in these areas, making them competitive in the production and sale of "technologically" simple but organizationally complex products. Chapter 5 discusses the increasing importance of time and proximity to the customer base in industries subject to short cycle times and changing fashions. Apparel and furniture are two such industries, where design is a sophisticated attribute. This aspect of product sophistication is captured by the income-based measure but not by a purely technology-based one.[16]

There are some interesting changes in the relative positions of sectors between 1975 and 2000. Iron and steel manufacturing moves from a ranking of 2 to a ranking of 12, largely reflecting the major increase in production in the sector by middle-income countries. Similar, although less dramatic, increases in rank occur in non-ferrous metals, rubber, petroleum refining, paper and wood products. Other chemicals, fabricated metals, and plastics move in the opposite direction. They were produced more intensively by high-income countries in 2000 than in 1975.

15 Ranks, rather than the actual values for P-soph are used, since the index increases over time in all sectors as global per capita GDP increases. This makes cross-sector, cross-time comparisons in levels problematic.

16 In constructing the technology index used in this and other Industrial Development Reports, this limitation was recognized and to some extent addressed at the individual product level (see UNIDO (2002)). At the sector level, the income-based measure appears to capture more of the variation in organizational and logistical sophistication, however.

B. How countries differ in industrial sophistication

The P-soph index classifies each industry according to its sophistication. It can be used to construct a second index, which classifies each country according to the overall composition of its industries. This index, which is called C-soph, measures the overall sophistication of manufacturing in each country.[17] If a country's C-soph value is high, it indicates that its manufacturing sector has a composition that is typically associated with high-income countries. A lower value indicates that the manufacturing sector is more typical for low-income countries.

Figure 2.2 plots the relationship between the sophistication of the manufacturing sector (on the vertical axis) and each country's level of development represented by GDP per capita (on the horizontal axis) for selected years between 1975 and 2000. The regression line indicates the cross-section "average" level of manufacturing sophistication associated with a given level of development. The index, by the nature of its construction, shows a high positive correlation with aggregate per capita income levels. Richer countries produce more "sophisticated" goods according to this measure than poorer countries and therefore tend to cluster in the upper right-hand corner of each panel. Countries substantially above or below the regression line are of considerable interest. Positive outliers produce goods more typical for countries with higher levels of income. Countries below the regression line produce goods that are less sophisticated than would be predicted by their levels of income.

Box 2.1 "Taytu—Made in Ethiopia": Sophisticated leather products

Not all footwear is unsophisticated, not even that produced by low-income countries. UNIDO has provided technical assistance to the Ethiopian leather industry over the past two decades based on a value-chain approach, involving institutions and major players. Rather than competing in the segments of mass production and low prices, the strategy encouraged Ethiopian manufacturers to enter "niche markets" for ethnic products using traditional Ethiopian materials and techniques. The task, therefore, was that of designing and producing a collection of goods, such as bags and fashion accessories, to be sold in that niche market. Technical assistance concentrated on two areas:

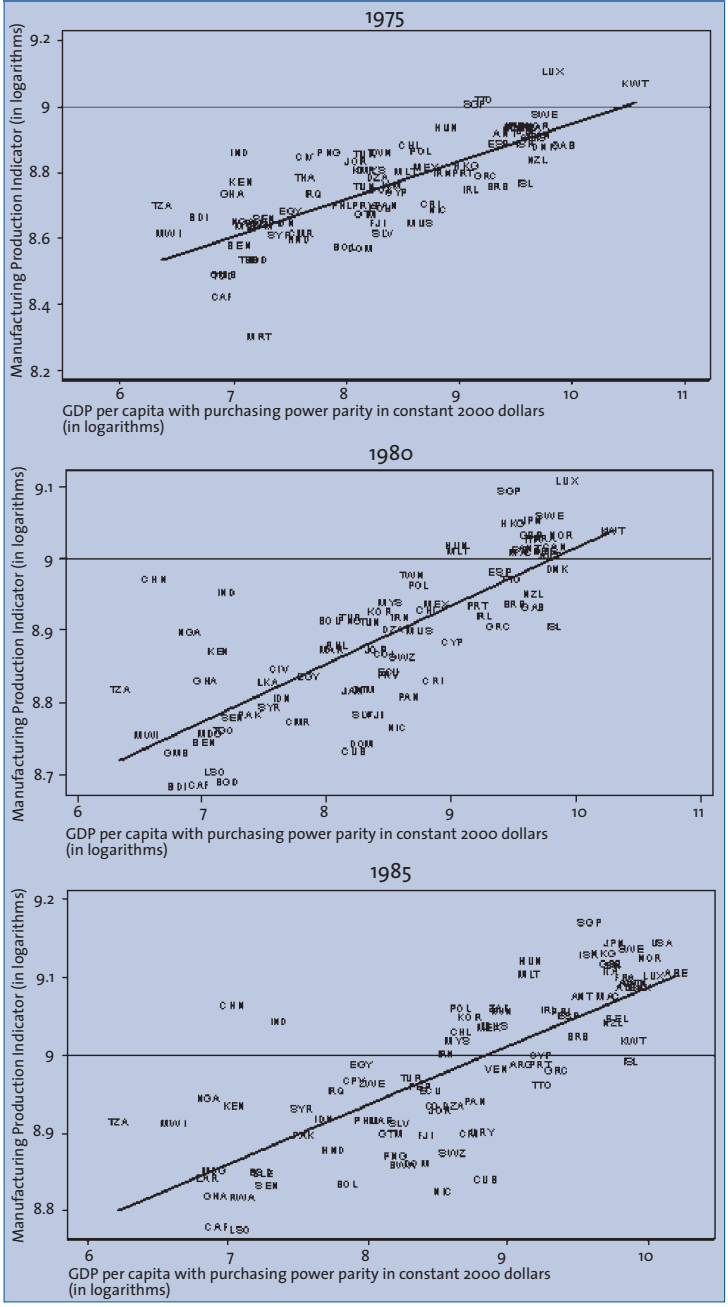
- *Image-building*, which is a long and expensive process that requires investment in two broad areas, promotion and product development.
- *Production of accessories*, which can easily enter the niches of high quality and fashion, offering possibilities of building the image of "Made in Ethiopia" through up-market shops and boutiques.

The policy framework for the development of the sector was designed by UNIDO in 2005 on behalf of the Ministry of Trade and Industry of Ethiopia and all key stakeholders. According to this strategy, known as the "top-down (pull)" approach, the leather products (that is, footwear, leather goods and garments) would develop in such a way that they would "pull" the tanning sector to produce better quality and increase the quantity of finished leather.

"Taytu—Made in Ethiopia" products—from the name selected by the Ethiopian manufacturers—have been promoted specifically in target areas, such as the European Union, the United States and Japan, where niche markets are more developed. This strategy has served not only to enhance the image of the Ethiopian leather industry as a supplier of quality leather goods and fashion accessories, but has also enhanced Ethiopia's image in more general terms on the international scene.

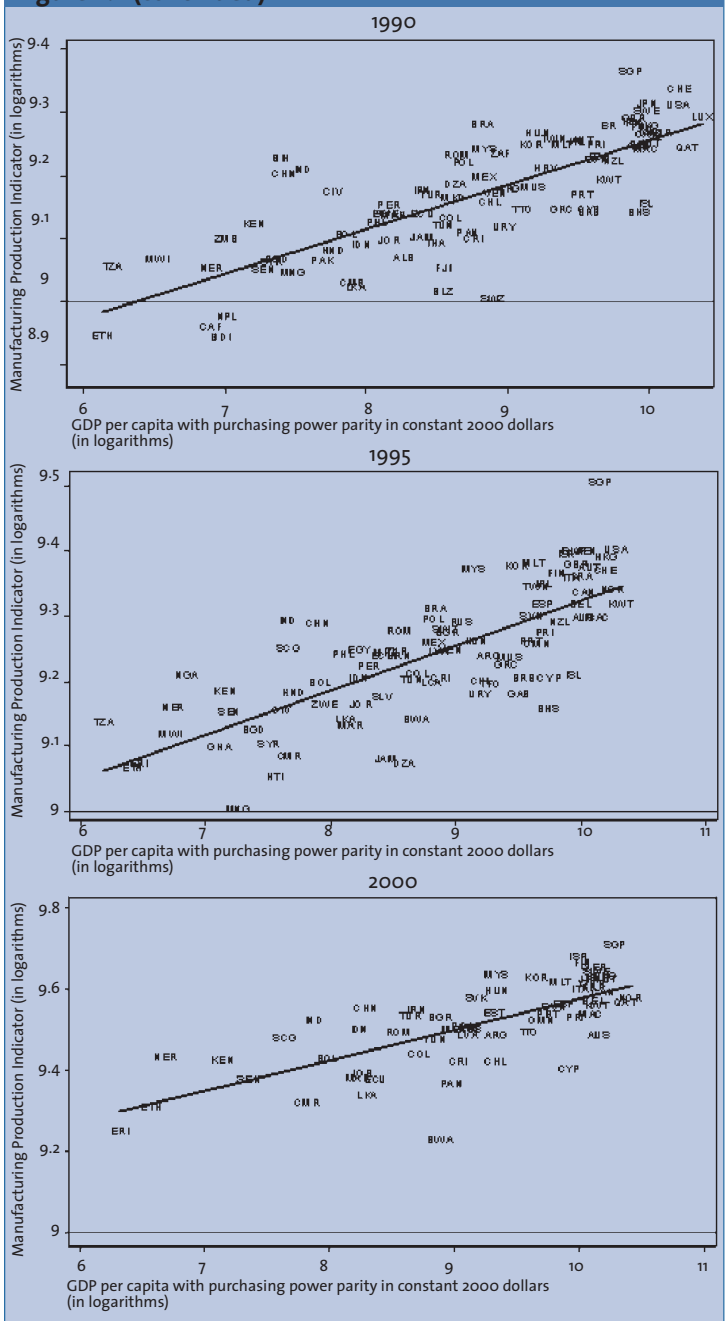
Source: UNIDO.

Figure 2.2 Relationship between per capita income and manufacturing sophistication, 1975-2000, selected years



17 C-soph is the weighted average of each country's P-soph indices, where the weights are the share of MVA of each sector.

Figure 2.2 (continued)



Source: Eberhardt and Teal (2007), calculated from UNIDO data.

Moving across the figures, the period 1975-2000 traces the path of economic development and manufacturing sophistication for individual countries. As expected, the OECD countries cluster around the regression line in the upper right of each graph. The paths taken by such successful industrializing economies as Hong Kong SAR (HKG), Malaysia (MYS), the Republic of Korea (KOR) and Singapore (SGP) in these figures (up and to the right) also hold no surprises. However, they reflect somewhat different trajectories of growth and manufacturing sophistication.

Both Hong Kong SAR and Singapore had manufacturing sectors that even in 1975 were relatively sophisticated for their level of income. As incomes grew, this relative sophistication was maintained. In contrast, the Republic of Korea has kept more closely to the "predicted" development path, as suggested by the regression line. Its rapid growth in income was accompanied by changes in the industrial structure that closely matched those predicted by the global data. Malaysia has shown both rising income and increasing manufacturing sophistication. This is particularly interesting because it is a rare instance of successful industrialization in a resource-rich country. In 1975, its product mix in manufacturing was almost similar to what would have been predicted, given its level of income. However, by 1995, it had developed a manufacturing structure that was significantly more sophisticated than would have been predicted.

As a group, fast-growing middle-income countries were more likely to be situated above the regression line in the early years, ahead of their development level in terms of manufacturing production mix. In contrast, the slow-growing middle-income countries generally had indices of manufacturing sophistication below the regression line. Their manufacturing structures were less sophisticated than would have been predicted from their income levels.

Box 2.2 Newly industrializing countries and super-exporters of labour-intensive products

The different patterns of structural change in manufacturing are dramatically visible in a comparison between countries that ventured in the 1980s into higher value-added forms of production, such as Malaysia, the Republic of Korea, and Singapore and countries that continued to export low-technology, unsophisticated products through "cut, make and trim" operations. The latter emerged as "super-exporters" of garments, but did not experience the type of structural transformation that occurred in the manufacturing sector in the first- and second-generation NICs.

Malaysia, the Republic of Korea and Singapore began the 1980s with production structures that were relatively sophisticated for their level of income and maintained their positive "sophistication gap" as incomes rose. During this transition, resources were deployed towards R&D, innovation and high-quality technical education by firms responding to appropriate incentives.

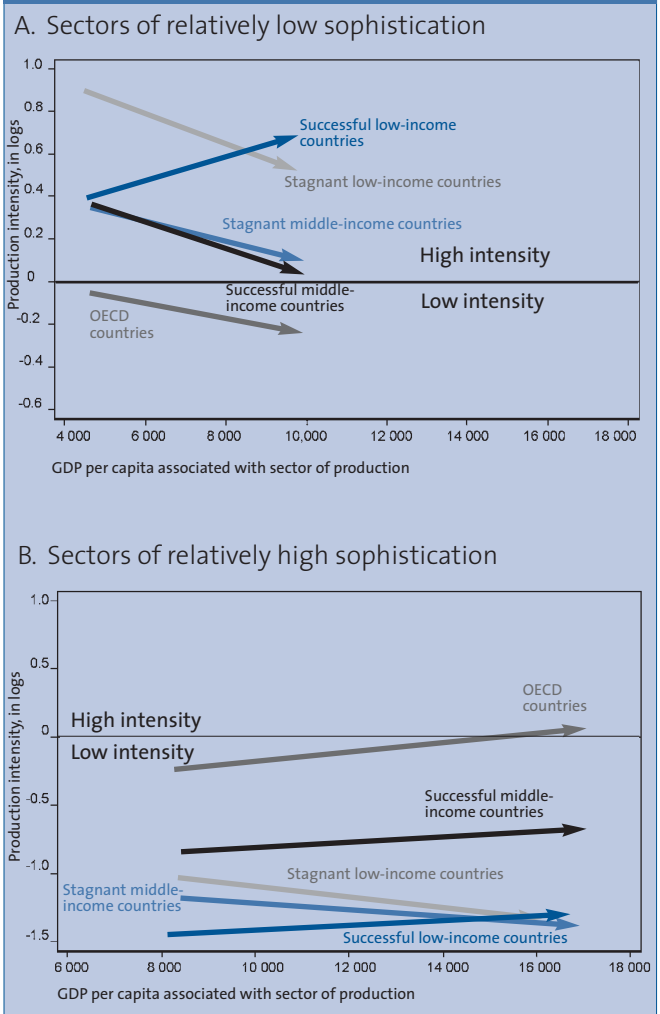
The "super-exporters" began the 1980s with production structures that were relatively unsophisticated for their level of income. Only Mauritius—the most successful of these—made the transition, to a level of production sophistication that was appropriate to its level of income. The other "super-exporters, in contrast, began with production structures that were quite unsophisticated for their income level and remained below the levels of sophistication that would have been predicted from their growing incomes. The inability to transform export success into structural change in manufacturing may provide an explanation for the growing income gap between super-exporters and the NICs.

Source: UNIDO.

China and India (currently classified as lower middle-income countries) stand out in the sample. In 1980, both economies had structures of manufacturing production that were significantly more sophisticated than those associated with their level of per capita income. China's rapid income growth is apparent in the figure. China and India are exceptional. In contrast to the fast-growing middle-income countries, the other fast-growing low-income countries changed production structures in line with their increasing levels of income. They remained distributed around the regression line as they moved upward to the right from 1975 to 2000.

For the slow-growing low-income countries there is little systematic change in either income or manufacturing sophistication. The African countries in the sample, for the most part, show little growth and little industrial dynamism. However, this is not true for all African countries. Kenya and the United Republic of Tanzania maintained production structures that were more sophisticated than their predicted income levels.

Figure 2.3 Production intensity by level of sophistication



Note: The vertical axis represents the logarithm of production intensity, such that a value of zero indicates world average intensity. A value of 0.5 is equivalent to 165 per cent of world average, while a value of -0.5 equates to 61 per cent of world average intensity. The horizontal axis is the P-soph index for productive sectors, which attaches a representative income value to each of the 28 manufacturing sectors.

Source: Eberhardt and Teal (2007), calculated from UNIDO data.

C. Industrial sophistication, structural change and economic growth

Information on growth performance, structural change and product sophistication can be combined to test whether fast-growing developing countries differ systematically from slow-growing developing countries in industrial diversity and sophistication. Figure 2.3 shows how two stylized classes of industrial activity—low-sophistication products and high-sophistication products—have evolved between 1975 and 2000 in each of the country categories. Manufacturing activities are classified as "sophisticated" if they have a *P-soph* index value of $13,500 or above for the period after 1995 (regardless of their *P-soph* values in the earlier periods). Unsophisticated (low-technology) activities are classified as those with *P-soph* values below $10,000 in 1995. The presentation focuses on the extremes of the range, omitting those activities with *P-soph* values between $10,000 and $13,500 in 1995 which are considered "intermediate" in terms of sophistication.

The average production intensity for the country product group is plotted along the vertical axis. Production intensity indicates whether a country's production in a sector is more or less concentrated than the world average. A value of 0—marked by the horizontal line—indicates that the average production intensity for the product-country group is equal to the global average. Changes in production intensity, therefore, indicate whether an economy is entering or leaving a sector, relative to the evolving structure of global production. The starting point of each arrow in the figure marks the average production intensity for the country product group between 1975 and 1981. The tip of the arrow marks the average production intensity between 1995 and 2000.

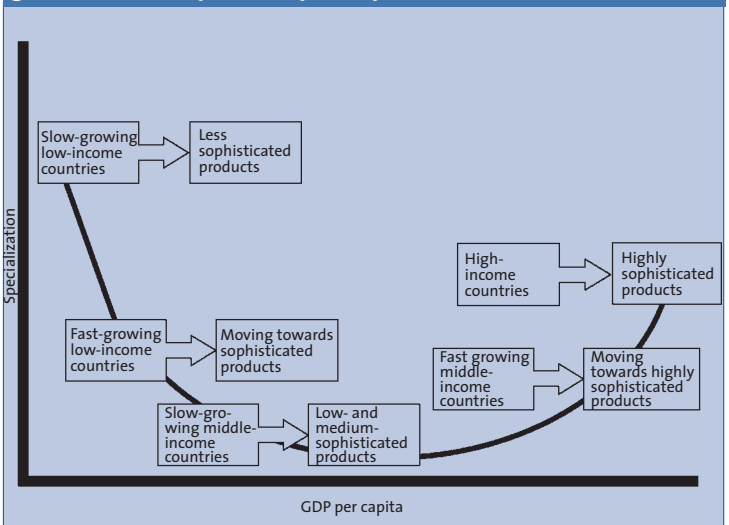
The results provide new support for the "new structuralist" view that what a country manufactures matters for growth. Both diversity and sophistication in industry are drivers of faster growth. The results are summarized schematically in Figure 2.4, which gives a representation of the transition paths taken by each of the groups of countries.

Fast-growing low-income countries diversified their manufacturing base and raised their level of product sophistication, increasing production intensity in both low- and high-sophistication products. The fast-

growing middle-income countries shifted strongly in the direction of more sophisticated products and reduced their production intensity of lower-sophistication products to about the world average. At the same time, middle-income fast growers increased the intensity of production of highly sophisticated goods to about 60 per cent of the global average, driven by a substantial increase in the intensity of machinery production. They also maintained a strong orientation towards production of electrical machinery.

The slow-growing low- and middle-income countries, in contrast, moved in the opposite direction. Production intensities narrowed towards the low to mid-range of product sophistication, as they exited sectors of high sophistication. Slow-growing middle-income countries lagged behind their more successful middle-income rivals in such sectors as machinery and electrical machinery.

Figure 2.4 U-shaped specialization, industrial diversity and gross domestic product per capita



Source: UNIDO.

2.3 From products to tasks

Up to this point, the discussion has focused primarily on final products. Now the concept of task-based production is introduced. This concept arises from the growing share of intermediate goods and components in international trade in manufactures, a theme treated in Chapter 4.

A. Task-based production: The concept

In some manufacturing activities, a production process that eventually produces a product can be decomposed into a series of steps, or tasks. Each task is distinct. It may (a) require distinct skills; (b) use labour and capital in different proportions; (c) require distinct inputs; and (d) have distinct consequences for the local environment. Although there may be a logical sequence in which tasks are performed in order to produce the product, this sequence need not correspond to any of the rankings of the tasks according to their features, such as their skill, capital or input intensity. For a final product with a production structure that can be decomposed into four stages, tasks 1 and 3 may be skill-intensive, whereas tasks 2 and 4 are not; tasks 3 and 4 may be capital-intensive, whereas tasks 1 and 2 are not. Tasks 1 and 4 may need proximity to material inputs, whereas tasks 2 and 3 do not.

The locations in which these tasks can be performed differ according to their factor endowments, proximity to inputs and tolerance for environmental disturbance. As with tasks, locations can be ranked according to their characteristics. In general, no single location will dominate other locations on all characteristics and, therefore, no single location will be best-suited to all four tasks. Quite possibly, a different location might be best-suited to each task.

Since the tasks at some stage need to be brought together to complete the product, there is a tension between the transport costs arising from cross-hauling of tasks and the benefits from task specialization in different locations. Similarly, there are costs arising from communications and control among stages of the production process. The information technology (IT) revolution has substantially lowered the costs of coordination between stages of the production process in many industries. Thus it is possible to carry out tasks that formerly needed to be done in one location in several geographically dispersed places.

The term for the production system in which all four tasks are performed in the same location is "vertical integration". Vertical integration used to be regarded as necessary for efficient production and as many steps as possible were brought together in the same location.

Raw materials would go in at one end of the factory and the finished product would come out of the other end. It is evident that such an integrated production process offers some productivity advantages. For example, the product does not have to be moved far between steps and the same management team can control all the steps so that they align.

Many countries may be manufacturing the same product, each working on a different step in the process. Economists term the phenomenon "trade in tasks", business schools refer to it as "value chains", and the media refer to it as "offshoring".

However, integrated production also generates a few disadvantages. The first is that the potential differences in the comparative advantage of locations for tasks are lost. A further potential disadvantage is that the optimal scale of production for a single task may be so large that if all tasks are performed in the same city, the resulting conurbation encounters congestion costs.

It may be that key economies of scale occur at the level of each step, or task, rather than at the level of the entire product. It may be highly efficient to have all firms manufacturing windscreens located in the same city, yet be inefficient to have all the firms that manufacture the myriad of parts that go into a vehicle located in the same city.

Crucially, as transport and coordination costs fall among stages of production, it may no longer be efficient for the production of different steps or tasks to continue to be located in the same country. Many countries may be manufacturing the same product, but each working on a different step in the process and with each specialized in its own task. Whereas economists term the phenomenon "trade in tasks", business schools refer to it as "value chains", and the media refer to it as "offshoring". All these terms nevertheless refer to the same concept of unbundling the production process into steps that are located in different countries.

As seen above, there is strong evidence that fast-growing low- and middle-income countries were propelled by structural changes that increased the breadth and sophistication of their manufacturing production. Task-based production could potentially pull in the opposite direction, encouraging countries to specialize in a narrower range of industrial production. For countries that have failed to industrialize, this is not a fatal flaw; to engage in some industry producing to international standards is more diverse than not engaging in any industry. But a common concern with trade in tasks and outsourcing is that it may also reinforce poor countries' specialization in low-technology, unsophisticated industrial processes. The evidence presented above suggests that a narrow production base and little dynamism in the production of highly sophisticated products characterize slow-growing developing countries. If tasks are unsophisticated, they may fail to spur growth in the late industrializing countries that seek to use task-based production as an industrial development strategy.

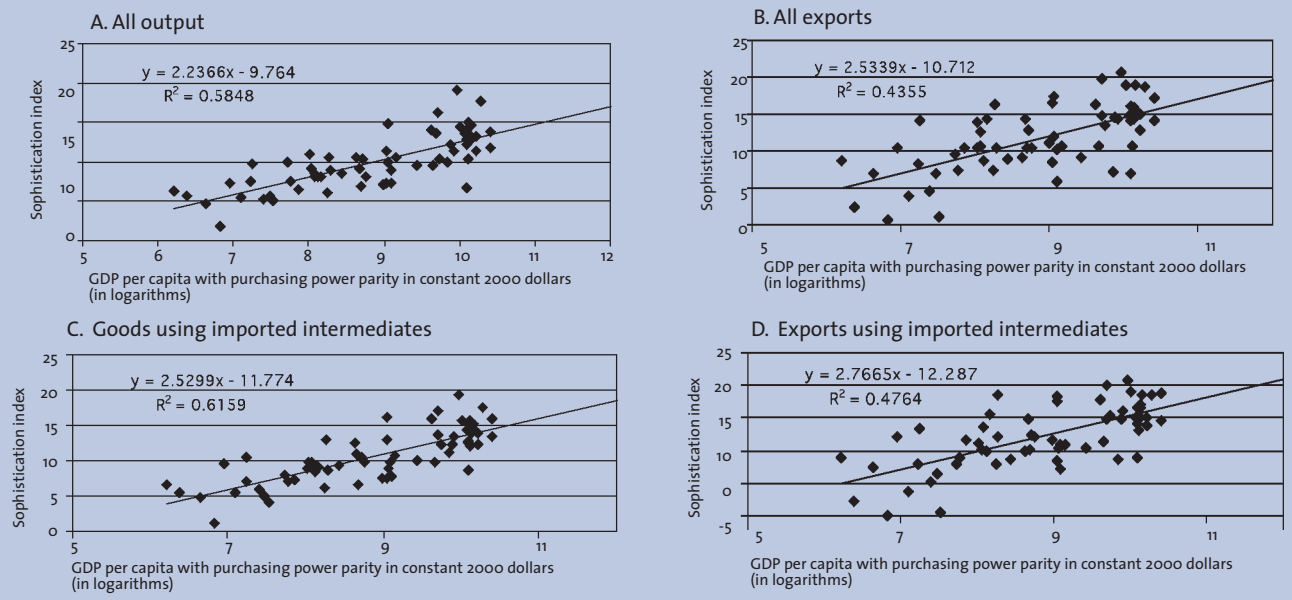
B. Are tasks less technologically sophisticated than products?

Whether task-based production is less sophisticated than other manufacturing activities in developing countries can be tested by comparing the sophistication of countries' total manufacturing production with the sophistication of their trade in tasks, using the measures of production sophistication employed earlier. This classification gives a ranking from 1 to 28 for each of the three-digit ISIC industries. This time the ranking is inverted so that the higher numbers represent greater sophistication. Taking a weighted average of this ranking across industries, where the weights are the volume of production in a given industry and year, gives the average sophistication rank of a country.

Parts A and B of Figure 2.5 establish a benchmark for the typical relationship between the sophistication of a country's manufacturing and its level of income by regressing the sophistication of total manufacturing production for 64 countries on the logarithm of their GDP per capita (using average 2000 PPP dollar values for 1996-2000).[18] As mentioned above, average product sophistication at the country level rises with per capita income. The slope of the line is given by the regression coefficient on GDP per capita. The coefficient is positive and significant, with a value of 2.24, suggesting that one per cent increase in GDP per capita is associated with an increase of the sophistication index by 2.24 points.

18 The 64 economies are those for which measures of task-based trade are constructed in Chapter 4.

Figure 2.5 Sophistication of manufacturing by GDP per capita



Source: Sandefur and Siddiqi (2007).

Turning to task-based production, parts C and D of Figure 2.5 repeat the analysis of parts A and B, but now the focus is not on the entire manufacturing sector but only on those goods produced using imported intermediate inputs. Parts C and D focus on the "purest" form of trade in tasks, consisting of goods that are not only produced using imported inputs but also those destined for export. The most striking result of this comparison is the similarity in the slopes of all three relationships. The sophistication of goods produced using imported intermediate inputs, including those which are then exported, rises with the level of per capita income just as with manufacturing as a whole. In terms of the regression coefficients, again both are significant and positive. Moreover, the coefficient estimates are strikingly (and statistically) similar to the values for overall manufacturing (2.52 and 2.76).

Thus, there is no indication here that trade in tasks contributes to greater specialization by poor countries in less sophisticated activities. Indeed, tasks, like products, are produced by countries at all income levels, and higher-income countries tend to specialize in the production of more sophisticated tasks. It is therefore possible for low- and medium-income countries to move up the sophistication gradient in tasks, just as in products.

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2.4. Resource extraction and industrial development

Commodity booms have repeatedly offered a huge opportunity for countries that possess valuable natural resources. Many of these countries are currently very poor and the revenues generated from the boom are their best chance for transformative development. However, such opportunities have often not been seized in the past. Sometimes valuable resources have not been exploited because the conditions necessary for their cost-effective extraction were not met. More often, resources have been extracted but the resulting revenues have either bypassed the country or not been used effectively for sustained development.

A. Why worry about extractive resources?

The extraction of finite reserves of natural resources is intrinsically unsustainable, since at some stage the resources will run out. Where, as shown in section 2.1, the sustainability of development through manufacturing largely depends on evolution *within the industry*, the sustainability of development through resource depletion depends on the unsustainable surplus from resource extraction being converted into other sources of income. One way in which income can be diversified is by building up financial assets abroad. For example, countries that have enormously valuable natural resources are likely to have high living standards on a sustainable basis by simply replacing some of the extracted resources with financial assets held abroad. But this may bypass the rest of the domestic economy. Indeed, if the natural resources are sufficiently valuable, the non-resource parts of the economy could even collapse and yet leave total GDP higher. If this happens society does not advance from being a *rentier* economy—one that lives on rents from natural or financial wealth—to becoming a *productive* economy. If a *rentier* society is sufficiently rich it may well be able to provide its citizens with high incomes on a sustainable basis, just as a billionaire can ensure that his descendents need never work. But, just as many billionaires realize that it is good to *earn* a living, so all societies sensibly aspire to be productive. Resource extraction should make a society more productive.

Just as many billionaires realize that it is good to earn a living, so all societies sensibly aspire to be productive. Resource extraction should make a society more productive.

Three new studies suggest both the potential and the risks of resource extraction. Alexeev and Conrad (2008) show that in the long run countries that have extracted valuable natural resources have significantly higher levels of income than other countries. This answers some concerns about the "resource curse". For example, to date, resource wealth has tended to make countries better off. However, this may be only because they live well from resource rents rather than becoming productive. The consequences of resource extraction for national production are investigated by Collier and Goderis (2007). They estimate the short- and long-term effects of an increase in the world price of a country's commodity exports, based on global experience since 1960. Their analysis is not concerned with forecasting commodity prices, but rather simulates the effects of a price increase that is then sustained. Since this is broadly the central market expectation of what will happen to world commodity prices in the medium to long term once the effects of the current financial and economic crises have been overcome, the analysis is particularly pertinent. Their focus is on the growth of production rather than the growth of income. Production and income may diverge. For example, in recent years Nigerian oil output has declined, whereas income from oil has increased because the decline in the number of barrels extracted has been more than offset by the increase in world prices.

After two decades the typical resource-extracting economy is actually producing less than it would have done in the absence of the boom. This is the "resource curse".

Collier and Goderis (2007) are concerned with not only the output of the resource extraction sector but that of the rest of the economy, all valued at a constant set of relative prices. Their question is essentially whether a commodity boom helps an economy to produce more output. They find that for the first few years following an increase in the price of commodity exports output does indeed increase relative to what it would otherwise have been. After two decades the typical resource-extracting economy is actually producing less than it would have done in the absence of the boom.

Collier and Goderis (2007) simulate the recent booms for the typical African commodity exporters and find that, if global history repeats itself, after two decades output will be around 25 per cent lower than it would have been without the booms. This is the resource curse. If society is fortunate, its income may nevertheless rise because the extracted resources themselves generate a large income, but people are much less productive. This decline in production is astonishing, since the influx of revenues from a sustained commodity boom is an opportunity to enhance output through investment. Indeed, the key finding of Collier and Goderis (2007) is that although a decline in production is the norm, it is by no means inevitable. Some societies have succeeded in harnessing commodity booms for sustained increases in production, while others have not. The consequences for production depend on choices. In order to understand

what choices are important it is crucial to consider how resource extraction affects production across the economy.

B. Depletion, savings and investment

Resource extraction depletes a natural asset. Hence, for the increase in income to be sustainable, this depletion must be offset by the accumulation of some other asset. The basic calculation as to whether to leave natural assets in the ground or to extract them and replace them is a form of portfolio decision. Like any portfolio decision it depends on likely risks and expected returns. One helpful guide is Hotelling's rule that over the long term the world price of depleting commodities is likely to rise at around the world rate of interest. If many commodity producers held such expectations and left resources unextracted, this would force their current price up to a level at which it was worth extracting them. Conversely, if commodity prices were expected to rise even slower than world interest rates then it would make sense to extract them as rapidly as possible. This would drive their current price down to a level at which accelerated extraction no longer looked profitable.

Hotelling's rule has two important implications for resource-extracting developing countries. One is that since keeping assets in the ground is likely to offer approximately the same return as global financial assets, it is sensible to diversify risk. For example, a country that has large assets in the form of copper but little other wealth may be wise to diversify its asset portfolio out of copper by encouraging extraction and using some of the revenues to acquire other non-copper assets. The other implication is that countries that find it difficult to borrow on world capital markets owing, for example, to perceptions of political risk, may have returns on domestic investment that are well above world interest rates.

In this case, returns on domestic investment are likely to exceed returns on leaving the commodities unextracted. An important part of development strategy for such countries would therefore be to accelerate the extraction of the commodity and to use a larger part of the proceeds to accumulate domestic investment.

Highly successful resource-rich societies, such as Kuwait and Norway, may be a somewhat misleading model for low-income resource-extracting countries. These societies have indeed correctly understood the vital role of replacing extracted commodity assets with other assets. However, because they already have abundant domestic capital, they have sensibly chosen to acquire foreign financial assets. This is based on a judgement that the returns on global financial assets are likely to exceed those on further domestic investment given that they are already capital-abundant. While this is likely to be the right decision for Kuwait and Norway, it is less likely to be correct for the typical low-income resource extractor, since such countries are capital-scarce. However, there is usually a reason for capital scarcity. It may be that the society finds it difficult, for various reasons, to invest productively. Hence, although a country that finds it difficult to attract foreign capital may be so short of capital that returns are high, it may instead simply lack good investment opportunities. Using the proceeds of resource extraction to augment domestic investment is only sensible if society is able to rectify all impediments to productive investment simultaneously.

C. Links from resource extraction to the rest of the economy

If the central challenge for a low-income resource-extracting country is to accumulate assets in the non-extractive part of the economy, is there any guide as to where investments should be made?

"Dutch disease"

A conventional part of economic analysis is the concept of the "Dutch disease". This is an analysis of how resource extraction is likely to change relative prices within the economy and hence shift profitable opportunities. The key idea is that whereas resource extraction raises incomes, and hence the demand for all products, it only directly increases the supply of products that can be imported. For example, Nigeria's oil exports generate a dollar income that can, ultimately, only be used to purchase goods, services or assets from abroad. Nigeria's oil radically augments the country's capacity to import. Yet Nigerians want to consume not only products that can be made abroad, but also goods and services that can only be produced domestically.

The term is somewhat confusing since these goods and services are traded domestically, but not internationally. The key point of the Dutch disease is that some of the income from resource extraction increases the demand for non-tradables. This drives up their price relative to goods that can be internationally traded. In response to this change in relative prices, production within the economy tends to shift from goods that can be internationally traded to the production of those that cannot. The shift of production out of tradable goods is the phenomenon known as Dutch disease. It is termed Dutch disease because the first economy where this was noted was the Netherlands in the 1960s. In response to revenues accrued from its gas exports, resources in the country's economy tended to shift out of manufacturing, which is an internationally tradable activity, into services, which are less tradable. During the oil boom of the 1970s and early 1980s, Nigeria experienced an extreme case of Dutch disease as its non-oil export activities, such as groundnuts and cocoa, suffered a severe decline.

Box 2.3 The impact of "Dutch disease" depends on choices

Despite the impact of "Dutch disease", an absolute decline in tradable activities is far from inevitable. For example, at the same time that Nigeria had its first oil boom, so did Indonesia. The two economies were quite similar, large agricultural exporters. Yet in Indonesia, agricultural exports expanded rather than contracted. Indeed, Indonesia broke into the global market in cocoa just as Nigeria was being squeezed out of it. Hence, Dutch disease depends on choices. If society uses the revenues from resource extraction to increase domestic investment, output of tradable goods can increase, as was the case in Indonesia. In turn, by using a large part of the revenues for investment instead of consumption, society is able to moderate the increase in demand for non-tradable consumer goods and services that would otherwise fuel Dutch disease. Hence, prudent investment dampens Dutch disease both by augmenting supply and moderating demand.

Source: UNIDO.

Manufactures are internationally tradable goods. Hence, they will inevitably be affected by Dutch disease, just as manufacturing in the Netherlands was adversely affected in the 1960s. However, both Indonesia and more spectacularly Malaysia demonstrate that it is entirely possible to expand industrial production in a resource-exporting economy. The key is that manufacturing will expand or contract depending on whether it is internationally competitive. This depends not just on the exchange rate, which becomes less competitive as a result of resource exports, but on the availability of infrastructure and skills. Astutely used, revenues from resource exports can sufficiently enhance infrastructure and skills, and this more than offsets the exchange rate effect, enabling manufacturing production to expand.

Manufactures are internationally tradable goods. Hence, they will inevitably be affected by Dutch disease. However, both Indonesia and more spectacularly Malaysia demonstrate that it is entirely possible to expand industrial production in a resource-exporting economy.

In the 1980s, Indonesia and Malaysia registered levels of manufacturing sophistication that were close to those predicted in accordance with their level of per capita income. In 1990, Malaysia's level of industrial sophistication had increased quite substantially relative to its level of income, and Indonesia had a production structure that was marginally less sophisticated than predicted by its rising income level. By 2000, Malaysia's production structure was highly sophisticated relative to its level of income; indeed its associated income level was similar to that of an OECD country. Indonesia's industrial structure had also increased in sophistication relative to its level of income.

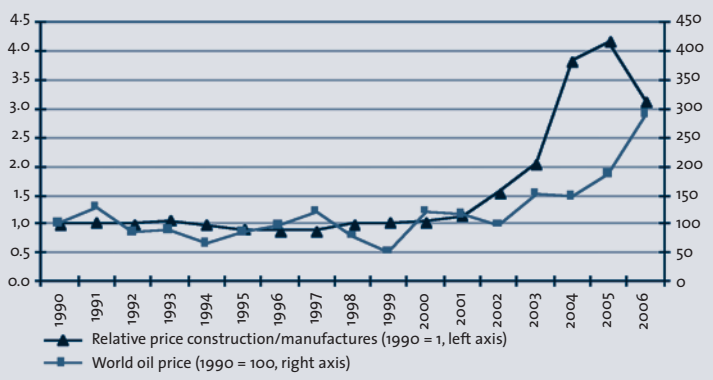
Construction booms

While an increase in domestic investment moderates the demand for consumer goods, it increases the demand for capital goods. Capital goods include equipment, such as machinery, and structures, such as buildings and roads. Equipment and structures are complementary: machines need buildings, vehicles need roads. Whereas equipment is internationally tradable, structures must be produced within the economy, that is, structures tend to be non-tradable. The sector that produces structures is the construction sector. Hence, a strategy of using resource revenues for investment typically gives rise to a construction boom.

Potentially, the construction sector becomes a bottleneck that can frustrate the conversion of savings from resource revenues into productive investment. If costs rise drastically in the construction sector then, although expenditure on investment goes up, the actual amount of investment, in terms such as kilometres of roads built, does not. Further, if the quantity of structures cannot be increased, this tends to reduce the productivity of investment in equipment. For example, the number of vehicles can readily be increased by using oil revenues to pay for imported vehicles, but without extra roads this leads to traffic jams.

The problem of sharp increases in construction prices fuelled by commodity booms is illustrated in Figure 2.6. Referring to the recent experience of Nigeria, two price indices are shown. One relates to the world price of oil, Nigeria's key export. The other relates to the unit cost of construction services, which is measured as the national accounts deflator for the construction sector relative to that for manufacturing. As the figure

Figure 2.6 World oil price and the relative price of construction in Nigeria, 1990-2006



Sources: United Nations, Energy Information Administration of the United States of America, and IMF International Financial Statistics, various issues.

shows, the unit cost of construction has increased dramatically during the recent oil boom, even though it was previously stable. Between 2001 and 2005, it increased fourfold relative to unit costs in manufacturing. This example underlines the difficulty of transforming such savings into public investment without dissipating part of it in extra costs.

Not only does the construction sector provide a critical link between resource revenues and effective investment, it also potentially provides a key link from resource revenues to the labour market. Construction can employ young people. Again, this transmission depends on the capacity of the construction sector to expand output. An increase in costs and prices does not generate jobs.

Links to industry

Recall from the discussion of manufacturing that the old model of development through vertical integration is now giving way to a radically different model of production and trade in tasks. It can now be argued that extractive industries are again likely to be distinctive. In some respects, it may be appropriate for countries with a large extractive sector to encourage vertical integration with related activities.

The economic fundamentals that determine whether vertical integration or trade in tasks is the more appropriate model are common regardless of the sector. If the necessary adjacent steps in a production process can readily be standardized, and if transport costs are low, then geographical proximity affords little advantage. As manufacturing production has become increasingly standardized, with more parts produced to common international specifications, and as transport costs have fallen, trade in tasks has replaced vertical integration.

The output of extractive industries is the ultimate internationally standardized product. Copper produced by a mine in Latin America is identical to copper produced in Zambia. An implication is that downstream integration from commodity extraction is often likely to fail. Yet to date such downstream activities have often been the main focus of government attempts to broaden the economy from its extractive industries base.

Although downstream activities of extractive industries gain little advantage from geographical proximity, this is not the case for upstream activities, supplying inputs to the sector. In extractive industries, production processes can never be fully standardized internationally. There is an irreducible element of local idiosyncrasy. Because those sites where it was easy to detect the location of commodities are already occupied, the expansion of extractive production depends on extending to unfamiliar geological conditions. Hence, many of the technological challenges faced in making extractive production more efficient require locally tailored solutions rather than the simple application of standardized international practices. In addition to these geological challenges, extractive industries are inserted into rural communities. Since rural societies are highly idiosyncratic, solutions must necessarily be locally tailored. Thus, the extractive industries are likely to require goods and services that are context-specific as inputs, and locally based suppliers will thus have an advantage over global suppliers because their costs of local knowledge are bound to be lower.

Further, many of these inputs will be needed on an unpredictable basis. It is not possible to predict with precision what geological challenges will be encountered as the mine progresses, nor what social challenges will be generated. Unpredictable needs for inputs create a premium on proximity of supply because long-distance supply involves unavoidable time costs. Hence, both because of the idiosyncratic nature of the input and the unpredictability of the need for it, local suppliers are likely to have an advantage over global suppliers.

Against this background, the resource-extraction company is likely to be international, so initially its networks will include international suppliers of its inputs. Further, while the production of the inputs has an element of locally-specific knowledge it will also require activity-specific knowledge that is not available locally, precisely because the extractive activity is new. Hence, initially the extractive industry is likely to rely upon the international supply of its inputs of goods and services. Only over time can local firms develop the skills necessary to meet the demand coming from the extractive industry.

2.5. Conclusions

This chapter explored in more detail the theme introduced in Chapter 1 that what countries manufacture matters for their development. In that chapter, it was argued that there was persuasive evidence that industry and industrial development are important drivers of growth in low- and middle-income countries. This chapter reviewed the new, but also compelling arguments that countries with a broad production base and more sophisticated industrial (and export) structures grow faster. The evidence in this chapter supports that view.

Firstly, the analysis of the relationship between product sophistication, production intensity and growth strongly supports the "new structuralist" view that what a country manufactures matters for growth. Diversifying production and moving up the product sophistication ladder appear to be important drivers of development in both low- and middle-income countries. Fast-growing

countries have increasingly diversified their production structures and moved in the direction of higher sophistication of production. Fast-growing low- and middle-income countries only differed with respect to the role of low-sophistication sectors where, as would be expected, fast-growing low-income countries have increased production intensities, while fast-growing middle-income countries are exiting low-sophistication products. Slow-growing low- and middle-income countries have much in common, but little in common with their fast-growing counterparts. Production intensities narrowed towards the mid-range of product sophistication.

Secondly, task-based production does not appear to limit the scope for industrial development and growth for countries that enter global production chains. Task-based production may be a lifeline for low-income countries that would like to develop through manufactured exports but have failed to do so. Getting started by undertaking a single task is far less daunting than breaking into the global market for an entire product. A common concern with task-based production, however, is that it may reinforce poor countries' specialization in low-technology, unsophisticated sectors. Testing this assertion using measures of product sophistication found that there was no evidence that task-based production contributed to greater specialization by poor countries in less sophisticated activities.

Thirdly, commodity booms present a remarkable opportunity for resource-exporting countries, but history is not very encouraging. In the short run, such booms almost inevitably enhance prosperity, but converting the additional income into sustained development is highly dependent on policy choices. At the macroeconomic level, the key choices concern assets. As an asset is being depleted there is a need to replace it with other assets. Yet success also depends on other key sectors:

- The performance of the construction sector is likely to be critical both for the generation of employment and for effective investment.
- There may also be opportunities to develop other productive sectors, especially upstream, using the revenues derived from resource extraction.

Chapter 3
Understanding structural change: The location of manufacturing production

The traditional trade theory—and indeed the theory of the firm—begins with three critical assumptions that make geography irrelevant to the choice of location for most industries. These are constant returns to scale, full and costless information and the absence of externalities. In a world of constant returns, production is highly divisible, and there are no penalties associated with setting up a small plant to serve a local market. With full and costless information, it is not important to be physically close to purchasers or suppliers. In the absence of externalities, there is little to be gained by being in close proximity with other producers, and possibly something to be lost to increased competition by locating near firms in the same industry. While these assumptions used to be standard, they are now recognized as seriously misleading. In the real world of industry and international trade, firms locate in industrial clusters and in cities. The relevance of that phenomenon for trade and industrial development has only recently been rediscovered as part of the "new economic geography" (Krugman, 1991; Fujita, Krugman and Venables, 1999).

This chapter looks at the role of agglomeration in industrial development. Firstly, the chapter briefly reviews the literature on the formation of industrial clusters and their relevance for industrial development. An industrial cluster is a collection of firms in a specific geographical location.[19] Most of the evidence comes from developed countries. This chapter attempts to add to the evidence on developing countries both through new quantitative analysis of firm data and through case studies of selected clusters in low- and middle-income countries. The final section of the chapter turns from clusters to cities, and discusses the importance of city size for industrial development.

3.1. Agglomerations and industrial clusters

Agglomeration economies arise from "economies of size" that are external to the firm but internal to a group of firms concentrated in a specific geographical location. Marshall (1920) argued that the proximity of firms in similar or related activities can lead to a number of localized external economies. Among the advantages he identified were access to a pool of specialized workers, quick access to supplies of inputs and access to knowledge relevant for the firm. The newer literature on agglomeration emphasizes knowledge and pecuniary externalities.

Recent work on agglomeration externalities suggests that they can be present in a number of different circumstances:

- Externalities that arise from the presence of a large number of firms *in the same industry* in a specific location
- Externalities that arise from the presence of a large number of *closely related industries*—including suppliers and purchasers—in a specific location
- Externalities that arise from the presence of a large number of firms *in unrelated industries* in the same location

To a great extent, the first two types of agglomeration conform to the popular view of an "industrial cluster". The third type is more closely related to urbanization. All three forms of agglomeration offer advantages to firms located close to each other, but they may act on production costs and productivity in different ways.

A. Clusters and industrial development

What role do agglomeration economies play in industrial development? Unfortunately, most of the evidence on the economic impact of agglomeration has been drawn from advanced industrialized countries and a few middle-income countries. This means that there is a reasonably clear view of the impact of industrial con-

19 Sonobe and Otsuka (2006) define a cluster as "the geographical concentration or localization of enterprises producing similar or closely related goods in a small area". Porter (1990) defines it as a "geographical concentration of interconnected companies and institutions in a particular field".

centration on manufacturing performance in more advanced economies, but it is difficult to see how much of this evidence carries over to lower-income settings. This section reviews the empirical literature on agglomeration in high- and middle-income countries.

Clustering among firms in the same industry is driven by common needs for inputs and access to markets, industry-specific knowledge flows and the need for specialized skills. One potential advantage of clustering is information spillovers, such as the sharing of technological or marketing knowledge. Another type of knowledge that may spread more easily within an agglomeration of similar firms is knowledge of improved management techniques. Learning effects may be easier to achieve when firms are located together. When firms in the same industry are located close to each other, it is easier to monitor what the neighbours do and learn from their successes and mistakes, and competitive pressures may lead to innovation and increase productivity (Porter, 1990). Clusters may also attract traders and reduce the costs for firms to market their goods.

When firms in the same industry are located near one another, it is easier to monitor what neighbours do and to learn from their successes and mistakes.

For some activities, proximity of suppliers to their customers lowers transportation and transaction costs significantly. Proximity to input suppliers and customers may allow closely related firms, including backward- and forward-linked industries, to realize economies of scale and resolve coordination problems. Close proximity between suppliers and purchasers may also help to ensure timely delivery, lower inventory costs and enhance quality. Co-location may facilitate sharing of indivisible goods and facilities, such as infrastructure, and joint actions by producers, including advocacy and advertising, and private-public partnerships.

Proximity of closely related industries can also generate pecuniary externalities. Of these, the most frequently identified is a "thick" labour market (Glaeser et al., 1992). Workers with skills specialized in a sector will be attracted to areas where employment in the sector is high, relative to the total labour force. The density of employment reduces search costs and provides a measure of insurance against unemployment. Similarly, firms will be attracted to areas where there are a large number of workers (or managers) with skills relevant to their industry. Location in a large labour market makes it easier to find specialized labour, such as designers, engineers and consultants (Sonobe and Otsuka, 2006).

Table 3.1 Econometric evidence on industrial clusters and firm performance

United States of America and Europe	Morocco and the Republic of Korea
Agglomeration effects strongly encourage firm entry and employment growth: Glaeser et al. (1992); Ellison and Glaeser (1997); Henderson (1997); Combes (2000).	Heavy and transport industries (metals, chemicals and transport equipment) are concentrated in specialized locations. Light industries (food and textiles) are more dispersed: Henderson, Shalizi and Venables (2001).
Own-sector externalities are much stronger than those generated by other sectors: Henderson (1997); Desmet and Fafchamps (2005).	Diversity of the agglomeration raises productivity for high-technology industries, but not in more standardized, light industries (food, textiles, and apparel): Henderson, Lee and Lee (2001).
Clustering seems to be more pronounced in high-technology, high-skill industries than in medium and light industries. Electrical and electronic equipment and transport equipment tend to be more concentrated than metal products, machinery and equipment: Henderson (1997).	Agglomeration variables affect employment growth and firm entry in Morocco, but they do not directly raise firm-level productivity: Fafchamps (2004).

Source: Compiled by UNIDO from the sources mentioned in the table.

The econometric literature on high-income countries provides persuasive evidence of the existence of agglomeration economies (Table 3.1). Econometric evidence for middle-income countries is much scarcer, but tends to support the broad results found for developed countries. There is evidence of economies of scale arising from the spatial concentration of industrial production. There is very little econometric evidence of agglomeration economies for low-income countries. High-quality census data on manufacturing firms are typically not available for poor countries and survey data rarely contain enough information to analyse cluster effects.

B. Clusters and productivity in a low-income setting: The case of Ethiopia

In a background study for this report, Bigsten, Gebreeyesus and Söderbom (2008), drawing on the literature from developed countries to analyse two sources of agglomeration effects in Ethiopia, test the effect of location near other firms in the same industry and of location among firms in unrelated industries. They measure clustering of closely related industries by the number of establishments and total employment in the industry in a given location. They capture multi-industry agglomeration by the number of establishments and total employment of all industries in the same location. They also use two measures of industrial diversification and include other determinants of firm performance, such as exporting and investment.

Their main result is that, in Ethiopia, locating near firms belonging to different industrial subsectors raises productivity at the firm level. Over 10 per cent increase in the number of establishments in a firm's location is associated with a productivity gain of some 1 per cent. Clustering with other firms in the same sector, on the other hand, has a negative impact on productivity, although it has a positive impact on firm growth. This suggests that there are positive effects of clustering with closely related firms in Ethiopia, but through channels other than direct increases in productivity. They also found that a high concentration of exporters in a location raises the productivity of all firms in the cluster—exporters and non-exporters alike.

The agglomeration of firms belonging to different industrial subsectors has a positive impact on productivity at the firm level in Ethiopia. A 12 per cent increase in the number of establishments in a firm's location is associated with a productivity gain of about one per cent.

While these results are a bit surprising, they cannot be generalized. In high- and middle-income countries, the productivity effects for firms located near closely related firms—cluster effects—are highest for light, traditional industries, and diminish for more technology-intensive forms of industrial production, while the benefits of location near unrelated industries appear to rise with the level of technological sophistication. The findings for Ethiopia are the reverse. Being close to many unrelated firms raises productivity, even in Ethiopia's low-technology industries, while being located close to similar firms appears to lower it but to be positively related to growth.

Perhaps this result reflects different sources of agglomeration externalities in a low-income environment. At low levels of industrial development, knowledge and information spillovers may be more closely related to the creation of general manufacturing competence than industry-specific technological advances. The notion of thick labour markets may need to be modified to encompass workers with general industrial skills and habits in an environment in which less than 10 per cent of the labour force is engaged in formal sector employment. Screening of entrepreneurs and managers for the purposes of contract enforcement and reliability need not be sector-specific. And entrepreneurs from neighbouring but diverse industries may be better able to work together to influence government decisions on such critical inputs as infrastructure to raise productivity.

The negative impact on productivity of being located close to similar firms may have more to do with competition than technology. Internal transport costs in Ethiopia are high and most outputs are sold locally. One possibility is that as the number of own-sector firms in the same locality increases, so does the level of competition. In the short run, competition may drive down the value of output so rapidly that firms may be unable to adjust fully to improve their productivity. The fact that locating near firms in the same sector spurs growth is consistent with Porter's (1990) views on the role of competition in promoting longer-term innovation and growth.

The finding that a higher export orientation of a cluster tends to raise the productivity of all firms, including those which do not export, is an important one. It may offer a new insight into "learning by exporting" in low-income countries. One of the unresolved issues in the literature on trade and growth is the question of whether firms improve their productivity through exporting or whether productive firms tend to export. Either case results in a positive correlation between the export orientation of the firm and its productivity level.

In the case of Ethiopia's industrial clusters, however, the presence of firms in the cluster that export is correlated not only with higher productivity in those firms but with the productivity of all firms. Every additional exporter in an industrial cluster is associated with a productivity gain for the representative firm of some 3 per cent, suggesting that exporting may have quantitatively important local spillover effects.

3.2. Clusters and industrial development: Evidence from ten industrial locations

Ten surveys of dynamic industrial locations in developing countries were commissioned for this report. Each of the clusters comprises closely related firms that produce exported products and their suppliers. The location of, and the principal products from, each cluster are shown in Table 3.2. The clusters span a range of product groups from high technology (electrical and electronic apparatus), mass manufacturing (leather and footwear), processed agricultural goods (salmon culture and processing). They also span a range of income levels across countries from upper middle-income countries (Brazil and Malaysia) to low-income countries (Cambodia and Nigeria).

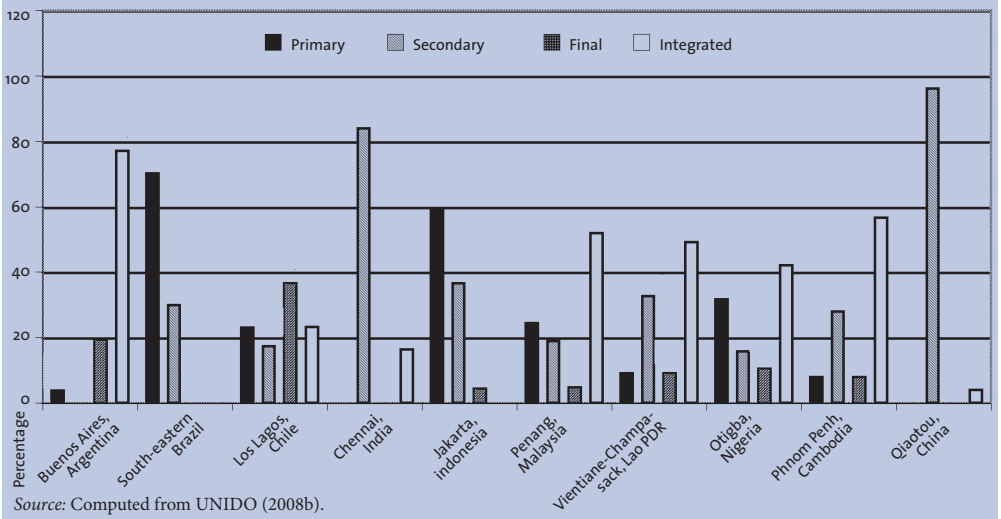
In this section, the results of these surveys are used to give a picture of the evolution of each industrial cluster and examine some of the forces behind agglomeration and industrial performance. The focus here is on the broad trends in exports, employment and skills development. The surveys cannot identify the productivity effects of agglomeration economies on firms, although the very rapid export growth of some clusters,

Table 3.2 Selected dynamic industrial locations, 2000-2006

Country	Industrial location	Product	Average annual growth rate of exports (percentage) National	Average annual growth rate of exports (percentage) Local	Number of surveyed firms	Principal drivers of exports
Argentina	Buenos Aires	Automotives	11.7	15.3	50	Global integration of domestic subsidiaries of automotive assemblers and component manufacturers into the value chains of transnational corporations (TNCs)
Brazil	South-eastern Brazil[a]	Pulp and paper	11.6	13.4	13	Operational advantage of proximity to high-quality raw materials
Cambodia	Phnom Penh	Garments	12.5	24.1	87	TNCs taking advantage of preferential access to developed markets
Chile	Los Lagos	Salmon	11.1	18.6	50	Adoption and adaptation of best practices in salmon culture and processing
China	Qiaotou	Buttons	12.0	12.4	100	Entrepreneurs connecting and upgrading in global value chains
India	Chennai	Leather	6.3	6.8	100	Institutional and policy direction and support for technological upgrading and environmental compliance
Indonesia	Jakarta[b]	Automotives	11.7	11.7	94	Domestic capability-building from specialization in the production of selected automotive parts (modules) in the transnational production networks and appropriate incentives
Lao People's Democratic Republic	Vientiane-Champasack[c]	Agricultural and wood products	5.5	5.6	100	Proximity to raw materials and preferential market access
Malaysia	Penang	Electrical goods and electronics	4.6	6.7	100	TNCs taking advantage of attractive financial incentives and excellent basic infrastructure
Nigeria	Otigba	Computers and components	10.0	23.3	30	Pool of educated entrepreneurs

Source: UNIDO (2008b).
a This location includes the states of Minas Gerais, Espírito Santo, São Paulo, Paraná and Santa Catarina.
b This location includes Jakarta and the neighbouring communities of Bekasi, Karawang and Purwakarta.
c This location includes the provinces of Vientiane and Champasack.

Figure 3.1 Production stages, selected locations, 2006 (Percentage)



Source: Computed from UNIDO (2008b).

both absolutely and relative to the national averages, suggests that they may be substantial.[20] The next section examines the case histories of three of the clusters—salmon in Chile, buttons in China and electronics in Malaysia—for anecdotal evidence of agglomeration externalities.

20 As in many econometric studies, however, the issue of selection bias remains unresolved here. More productive firms may choose to locate in the clusters, increasing both the productivity and exports of the average firm, rather than agglomeration economies lowering costs and boosting exports.

A. Structure of production

The industrial clusters in the sample illustrate many of the evolving trends in industrial development. Production processes range from fully integrated production of final goods for export or sale on the domestic market to specialization in a single stage of production within a value chain. Figure 3.1 shows the different stages of production undertaken by firms in the ten locations surveyed, based on the UNIDO classification used for the survey.

The industrial clusters in the sample illustrate many of the evolving trends in manufacturing. Production processes range from fully integrated production of final goods for export or sale on the domestic market to specialization in a single stage of production within a global value chain.

Integrated production processes dominate the industrial clusters of Buenos Aires, Penang and Phnom Penh, where 50 per cent or more of all firms surveyed were engaged in vertically integrated production. In Buenos Aires, automotive firms were very highly specialized in integrated activities (77 per cent) followed by final assembly. The high degree of integrated operations is explained by transnational corporations engaged in secondary and final assembly operations. There is a high degree of export intensity of production (64.5 per cent) among firms in the Buenos Aires cluster.

Most electronics firms in Penang were specialized in integrated activities followed by component manufacturing for export. Over 80 per cent of output is exported. The high level of integrated operations is explained by the integration of several stages of production and assembly within the same, usually transnational, enterprise. For example, Seagate engages in component manufacturing and completely knocked down (CKD) assembly, while Dell manufactures CKD motherboards and assembles computers.

Garment manufacturing in Phnom Penh is dominated by integrated operations for export: 99.7 per cent of output is exported. Firms in Phnom Penh manufacture garments, but they are not involved in marketing and logistics.

The clusters in Los Lagos, Vientiane-Champasack and Otigba are characterized by a fairly even distribution of firms across various stages of production. These clusters comprise both firms producing final products and their suppliers. In Los Lagos, firms are evenly spread among all stages of production, although the main salmon exporters have increasingly turned to integrated operations to provide a higher level of coordination between the supply of salmon and final processing. The cluster is strongly export-oriented, with over 80 per cent of output exported.

Integrated operations are also predominant among the agricultural and wood product firms in Vientiane-Champasack. The export orientation of the cluster is moderate: 42 per cent of output is exported. The small share of primary processing firms is explained by significant plant-level economies of scale in these industries. The computer and component cluster in Otigba has a high proportion of integrated activities (42 per cent). Integrated firms are very small, however, with a mean employment rate of eight in 2007, and the export intensity of the cluster is low (35.2 per cent).

The industrial clusters in south-eastern Brazil, Chennai, Jakarta and Qiaotou, are all dominated by the early stages of manufacturing. The pulp and paper firms in south-eastern Brazil are mainly specialized in primary and secondary processing. Paper is processed into its final form by firms in other locations in Brazil and the export orientation is correspondingly low (27.1 per cent).

Most leather firms in Chennai are engaged in secondary processing for export. These firms process leather from locally produced and imported hides. About 16 per cent of the firms in the cluster are integrated exporters who undertake both finishing of leather and the production of final leather goods. The export orientation of the cluster is high (88 per cent).

In contrast to Buenos Aires, none of the automotive firms in Jakarta are engaged in integrated operations. Most firms undertake component assembly, while the rest produce CKD parts or assemble vehicles. The structure of the cluster strongly reflects the task-based strategy of its transnational corporations to allocate different stages of production to different locations in Asia and trade in tasks regionally. The export orientation of the cluster as a whole, however, is low.

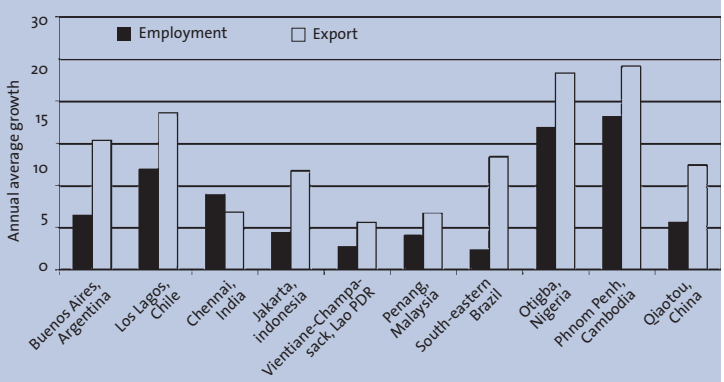
The firms in Qiaotou that produce buttons are overwhelmingly (96.1 per cent) engaged in secondary processing, with a handful specialized in integrated activities. The buttons are either sold to firms manufacturing garments in China or exported.

B. Clusters and export dynamism

As indicated in Figure 3.2, exports recorded strong growth in all ten locations. The annual average rate of export growth reached double-digit figures in Buenos Aires, Jakarta, Los Lagos, Otigba, Phnom Penh, Qiaotou and south-eastern Brazil. Exports from nine of the ten locations surveyed grew faster than the national export growth rates for the same product categories. In Indonesia, Jakarta's growth rate of automotive sector exports was the same as the national average, due largely to the fact that Jakarta accounts for 80 per cent of Indonesia's overall automotive exports.

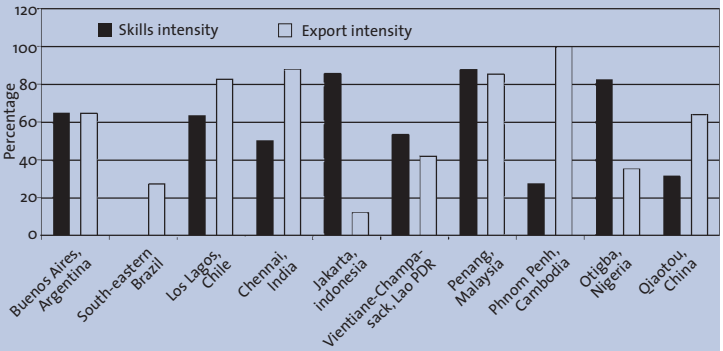
The export dynamism of each industrial cluster has different origins. The external trading environment was significant for the Buenos Aires, Jakarta, Phnom Penh and Vientiane clusters. Preferential access to developed country markets for low value-added, "cut, make and trim" activities helped drive garment export growth in Phnom Penh. Phnom Penh specialized in the finishing aspects of garment-making and had the highest export intensity levels of any cluster. Similarly, preferential

Figure 3.2 Export and employment growth, selected locations, 2000-2006 (Percentage)



Source: Computed from UNIDO (2008b).

Figure 3.3 Firm-level export-intensity of output and skill intensity, selected locations, 2000-2006 (Percentage)



Source: Computed from UNIDO (2008b).

access and proximity to raw materials drove exports from the Vientiane agricultural and wood products cluster.

A shift from serving limited, protected domestic markets to a regional export orientation provided increased scope for output growth in Buenos Aires and Jakarta, and allowed producers to realize plant-level economies of scale and engage in trade in components. The automotive clusters in both countries had already developed a relatively strong technological base under import-substitution policies that, combined with lower unit production costs, allowed them to enter export markets. Automotive exports from Buenos Aires and Jakarta grew by 15 and 12 per cent, respectively, during 2000-2006.

Indirect exports were important in the case of China's button cluster. About a third of Qiaotou's button production was sold to export-oriented garment firms operating in China. The remaining two thirds were directly exported.

Improved technological capabilities were largely responsible for the dynamism of exports in Brazil and Chile. Extensive technological capability-building helped expand the export intensity of production in the pulp and paper cluster of south-eastern Brazil from 31.7 per cent in 2000 to 53.8 per cent 2006. The active role of the Fundación Chile in adapting and disseminating best practices in salmon culture and processing were central to the success of the Los Lagos cluster.

C. Clusters and skills

One of the pecuniary externalities often associated with industrial clusters is a thick labour market for critical skills. The skill intensity of the firms surveyed in most locations was fairly high.[21] Penang's electrical-electronics, Jakarta's automotive and Otigba's computer clusters had the highest percentage of skilled labour in the workforce—over 80 per cent (Figure 3.3). In Penang, technological upgrading by transnational corporations supplying global markets was pivotal in raising skill requirements. In Jakarta's automotive cluster, which has a much lower export orientation, high wages, relative to other industries, were the main drivers of skill improvements. Long production experience in both locations contributed to the formation of a pool of skilled workers. In Otigba, in contrast, the formation of the computer cluster appears in part to have been the outcome of the spatial concentration of a traditionally entrepreneurial community with high educational levels; the cluster was the outcome of a thick labour market rather than the other way around.

The skill intensities of the automotive firms in the Buenos Aires cluster, salmon firms in Los Lagos, agricultural processing and wood firms in Vientiane-Champasack and leather firms in Chennai ranged between 50 per cent and 64 per cent in 2006 (Figure 3.3). Skill intensity levels were lowest in Phnom Penh and Qiaotou, which are both highly export-oriented clusters dominated by low-end manufacturing activities.

21 Skill intensity is measured by the sum of managers, professionals, technical, clerical and supervisory personnel and skilled production workers divided by the total labour force.

3.3. Industrial clusters and externalities: Some evidence from Chile, China and Malaysia

The case studies of the salmon cluster in Chile, the button cluster in China and the electronics cluster in Malaysia offer some evidence of how knowledge-based and pecuniary externalities affect firms in these diverse agglomerations. They provide anecdotal support for the presence of knowledge transfers among firms, productivity gains arising from close supplier-customer relationships, realization of plant-level economies of scale and the development of a thick labour market.

A. Los Lagos, Chile: A low-technology, knowledge-based cluster

The Los Lagos region is the central salmon farming and processing location in Chile. It accounted for 75 per cent of national production in 2006. Exports of Chilean salmon grew dramatically, from 206 tons in 2000 to 387 tons in 2006, putting Chile alongside Norway as a major supplier of the world's farmed salmon.

Experiments to cultivate salmon started at the turn of the twentieth century (TechnoPress and SalmonChile, 2003). However, commercial cultivation of salmon only began in the early 1980s, when a small group of private entrepreneurs took advantage of regional and national government support and foreign technical and financial assistance to launch salmon cultivation projects. What began as mere salmon farms in the 1980s in the region of Los Lagos evolved into a complete manufacturing cluster. By the end of the 1990s, suppliers of feed meal, nets, boats, processing equipment and machinery and other components had located in Los Lagos.

Geography and external markets played a significant role in the formation of the salmon cluster. Chile's long coastline and abundant fresh water rivers and lakes are ideally suited to the two-phase culturing of salmon. Export markets provided the scale and scope for rapid growth and productivity change.

The main driver of productivity improvements in the cluster has been diffusion of production knowledge across firms. A public-private partnership, the Fundación Chile, has led the effort to identify, adopt and adapt global best practices in salmon farming.

The main driver of productivity improvements in the cluster has been the diffusion of production knowledge across firms. A public-private partnership, the Fundación Chile, has led the effort to identify, adopt and adapt global best practices in salmon farming, including incubation and control of pests and diseases. Quality standards imposed by large, international buyers have driven the acquisition of International Organization for Standardization (ISO) 14001 certification and adoption of other good environmental practices in aquaculture. Close horizontal links between salmon firms, suppliers and the Fundación Chile have made a strong flow of information and knowledge among firms possible.

The cluster also provided the minimum efficient scale for the development of new knowledge and the provision of common services. As the industry matured, a strong focus on research evolved. Both the public and private sectors encouraged and financed problem-solving research in salmon-related technologies by local and national universities. Firms have coordinated their efforts to source technical assistance from leading aquaculture research institutions in Canada, Norway, Scotland and United Kingdom of Great Britain and Northern Ireland. An important service provider, Hatfield, which started as a technical advisor, diversified its operations as the cluster grew, consolidating businesses, acting as a technological bridge between suppliers and purchasers, and providing a broad range of business development services (TechnoPress and SalmonChile, 2003).

The development of Chile's salmon cluster illustrates the significance of a cluster for investment in and diffusion of knowledge. It also sounds a cautionary note against linking knowledge externalities too closely to "high-technology" industrial processes. Food products, such as processed salmon, are quite knowledge-intensive owing to the complexity of logistics and the environmental and phytosanitary standards involved. Salmon farming and processing in Chile is an information-intensive activity that has benefited from the spatial concentration of firms.

B. Qiaotou, China: Buttoning up trade in tasks

Qiaotou accounted for 65 per cent of the world's production of buttons in 2006. Its history is a remarkable story of how entrepreneurs who used to purchase imported buttons from Guangzhou for sale in Zhejiang province chose to manufacture them locally beginning in 1985. The cluster began as the product of private initiative, public policy and industrial outsourcing. The region's long history of entrepreneurship helped provide the dynamism necessary for the creation of new firms. Strong institutional support from the provincial government and city councils sustained the early stages of development, but "outsourcing"—the redeployment of low-end button manufacturing by Italian firms—provided the initial momentum for the emergence of button manufacturing in Qiaotou.

The button cluster has evolved from simply producing low value-added buttons using foreign designs, materials and machinery into an integrated complex of

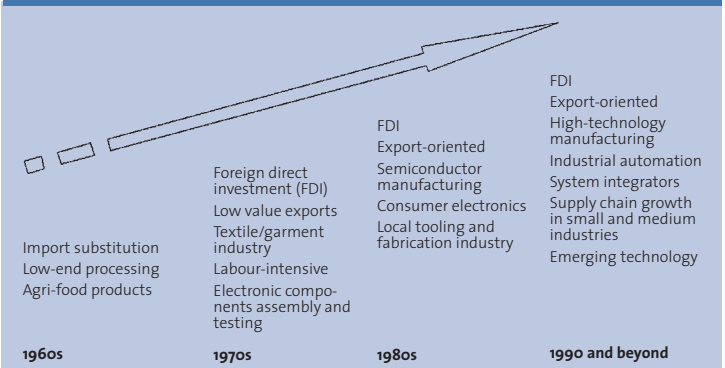
backward- and forward-linked industries. By 2007, firms in Qiaotou had expanded operations dramatically into the fabrication and manufacture of button-making machinery and equipment, manufacture of button materials, and development of innovative designs.

Knowledge spillovers appear to have played an important role in Qiaotou. Initial technological training was provided by material and machinery suppliers from Italy. As the cluster evolved, however, technical support from a Government-sponsored R&D centre in Zhejiang Province increased the flow of information to firms, and strong collaboration between suppliers, customers and final manufacturers in the cluster helped to increase the flow of knowledge among them. Formal manufacturers' networks also initiated training programmes to increase the skill level of the labour force, thus internalizing to the cluster the benefits of creating non-firm-specific human capital.

Knowledge spillovers have played an important role in Qiaotou. As the cluster evolved, technical support from the Government increased the flow of information to firms, and strong collaboration between suppliers, customers and final manufacturers in the cluster helped to increase the flow of knowledge.

Qiaotou provides an example of the benefits of agglomeration of closely related firms. Its initial momentum derived from the outsourcing of simple button manufacturing from a high-wage economy. Proximity to downstream purchasers was an important driver of cluster formation. A significant portion of buttons produced in Qiaotou is exported only after they are stitched onto garments by other firms in China. Local investments in knowledge, close links between suppliers and customers and formal organizations of firms in the cluster for the purpose of solving coordination problems generated substantial knowledge spillovers. The large number of button manufacturers in the locality also provided the scale of market to allow producers of machinery and equipment and intermediate inputs to achieve plant-level economies of scale.

Figure 3.4 Penang's industrialization journey



Source: UNIDO (2008b).

C. Penang, Malaysia: An export-processing zone grows up

Penang is the largest of the three major regional electrical-electronics clusters in Malaysia. It was Malaysia's first export processing zone (EPZ), opened by the Government in 1972 to attract foreign electrical goods and electronics firms. The electrical-electronics industry has been the leading source of MVA, employment and exports in Penang since 1980.

Penang began as an "artificial agglomeration". It was the outcome of activist Government policies designed to attract international investors. A formal clustering policy was adopted in Malaysia with the introduction of the Second Industrial Master Plan in 1996. The cluster approach was designed so as to develop greater linkages and complementarities between transnational investors and local industries.

In Penang, excellent basic infrastructure—good transport services, power supply, water supply and telecommunications—was combined with superior provision of social services, such as public health facilities and schools, to make the region attractive to skilled workers and managers. Institutional reforms were also introduced to improve the performance of the security and customs services within the EPZ. Drawn by these investments and financial incentives, Japanese, European and giant North American firms, such as Hitachi, Sony, Siemens, Advanced Micro Devices, Hewlett Packard, Intel, National Semiconductor, and Seagate, moved to Penang. The agglomeration of these flagship firms helped stimulate the development of local supplier firms.

Penang has benefited particularly from the development of public and public-private organizations aimed at solving coordination problems for firms in the cluster. Strong networks exist between firms and basic infrastructure organizations, such as the Penang Development Corporation. Producers' organizations, such as the Free Trade Association of Penang and chambers of commerce, also figure prominently in promoting the exchange of information among firms.

Penang's manufacturing structure is moving towards higher value-added activities (Figure 3.4). Over time transnational corporations in the cluster have moved from low to high value-added activities and have been replaced in the value chain by local firms. In the 1980s, local firms were mainly involved in assembly. By the 1990s, some had diversified into other activities and become global players. Even small and medium industries are directly involved in exports (Ariffin and Figueiredo, 2004). Complementary industries, such as

Penang has benefited particularly from the development of public and public-private organizations aimed at solving coordination problems for firms in the cluster.

machine tools and plastics, have also developed. The technological development of local firms stimulated the transformation of flagship firms, such as Intel, Motorola, Advanced Micro Devices, Fairchild, Hewlett Packard and Dell, into designing activities.

There is evidence of substantial cohesion and information exchange among firms in the electronics cluster. Supplier, distributor and customer relationships are stronger within the electronics cluster than for other firms in the same geographical zone. The Penang Development Corporation has helped to nurture linkages in advanced electronics, advanced materials, environmental engineering, high-technology and high value-added components with potential suppliers and distributors (Rasiah, 1994).

Labour market externalities are potentially large. The electronics cluster in Penang employs more engineers and managers than other manufacturing subsectors in Penang (Rasiah, 2002). The Penang Skills Development Centre has played an important role in providing firm-oriented skill training, adding to the thickness of the labour market. Tailor-made educational programmes (based specifically on industrial requirements) have been effective in reducing the gap between education providers and the industry. Firms without internal training centres (unlike Komag, Intel and others that have their own colleges and universities) are currently relying on these tailor-made programmes (Rasiah, 2007). Many industry managers, however, stress the need for local institutions (especially local universities) to upgrade their educational content based on industry needs.

Penang's electrical-electronics cluster has clearly been the most successful of the ten agglomerations studied, in terms of the evolution of its industrial structure. Pecuniary externalities arising from infrastructure and the labour market, combined with knowledge spillovers from foreign-owned firms to large local firms and finally to smaller local firms, have resulted in the development of a very dense supplier-user network and considerable production-sharing.

However, the increasing technological sophistication of the cluster seems to have created a coordination problem that may inhibit further technological upgrading. Not surprisingly, surveys reveal that decisions by large firms to produce more sophisticated products and to outsource some of their existing production within the cluster influence the decisions of smaller local firms to invest in technological upgrading. Smaller local firms are only willing to invest in new technologies and products after outsourcing contracts are secured. Large firms, for their part, are reluctant to transfer their product lines and do so only when they are convinced that local firms are technologically capable of producing the products.

3.4. Cities and industrial development

Big cities generate powerful agglomeration economies (Holmes and Stevens, 2002; Rosenthal and Strange, 2003). Globally, a firm operating in a city of 10 million people has unit costs some 40 per cent lower than if it operated in a city of only 100,000 people (Collier and Venables, 2008a). In one of the few studies of city size and productivity for developing countries, the World Bank (2006) finds significant correlation between manufacturing productivity and city size in China.

The agglomeration economies from city size come in part from the greater scope for clustering discussed above. However, the economies of scale from a large city are more extensive. For example, markets for key inputs are less likely to be monopolized. Monopoly in an input is disastrous for all firms downstream because they can be subject to the "hold-up" problem: if they invest, the returns can be captured by the monopolist. Vigorous local competition based on shared technologies among firms in the same industries also fosters growth (Porter, 1990).

Common skills and services (accounting, finance, law, science) and knowledge spillovers that are not specific to individual production technologies—derived, for example, from the presence of a large number of highly educated, creative professionals—are also important (Henderson, 1997; Jacobs, 1969; Nakamura, 1985). Jacobs (1969), for example, argues that urban diversity fosters cross-fertilization of ideas and that the industrial diversity found in cities helps productivity via the exchange of information and pecuniary externalities. In low-income countries, there may also be better information within an urban area, about which entrepreneurs can be trusted, facilitating informal contract enforcement and cooperation (McCormick, 1999).

Many of these "urbanization economies" appear to be more closely related to a city's economic size than to its population. For example, Collier and Venables (2008a) find that the relative price of capital goods is significantly lower, the larger the economic size. Local competition depends on purchasing power, and urban amenities affect the location decision of professionals and skilled workers. But, while economies of scale in urban areas are probable in terms of economic mass, the congestion costs arising from urban agglomerations appear to be more closely related to population.

As with clusters, most of the evidence on the relationship between city size and productivity is based on the population size of cities in developed countries. Among developed countries, differences in per capita income are relatively small so that differences in the population of cities are a reasonable approximation to differences in their economic size. However, this is not the case when analysing developing countries. Here, it is potentially important to distinguish between the population of a city and its economic size: potentially, predominant economies of scale could arise from either people or economic activity.

This report extends the analysis of the agglomeration economies generated by cities to developing countries. Based on a series of comparable World Bank surveys of some 10,000 manufacturing firms in 18 developing countries of Africa, Asia and Latin America, it attempts to control for differences in productivity arising directly from firm characteristics, such as their capital stock, while introducing characteristics of the cities in which firms are located.

Evidence indicates that all the productivity benefits of urban location in developing countries arise from the economic size of a city. Controlling for the economic size, the pure effect of extra people is negative.

Evidence indicates that all the productivity benefits of urban location in developing countries arise from the economic size of a city. Controlling for economic size, the pure effect of extra people is negative. Presumably, this comes from a congestion effect: many of the costs of congestion arise from people rather than from an economic activity itself. One implication of this result is that a low-income city of 10 million people does not offer the same agglomeration economies as a high-income city of similar size.

However, a more disturbing and less expected result follows from the two opposing effects of adding extra people to a city. Extra people bring extra income, and so they augment the economic size of the city and this raises manufacturing productivity. But extra people also contribute to congestion and this lowers manufacturing productivity. The evidence also points to the fact that below a threshold level of per capita income, the favourable economic size effect of extra people is insufficient to offset the additional congestion costs that they generate. The threshold is some $1,700 per capita, measured in 2000 PPP dollars.

This asymmetry has important implications for countries of the bottom billion. Few countries are significantly below this level of income, but many low-income countries are either a little below or a little above it. In effect, at this level of per capita income, increasing the population of a city does not appear to enhance manufacturing productivity. In contrast, above this level of income, manufacturing firms are more productive in more populous cities, although, as discussed above, this is likely to reflect the additional income from increased population, rather than the impact of more people per se. Because there is also a strong correlation between country and city population—large cities are generally located in large countries—small low-income countries may be at a particular disadvantage in manufacturing, where they lack both the numbers and the means to realize urbanization economies.

Small, low-income countries may be at a particular disadvantage in manufacturing, where they lack both the numbers and the means to realize urbanization economies.

To an extent that cannot be determined, the trend to trade in tasks may reduce the disadvantage of small cities, just as it reduces the disadvantage of latecomers. By specializing in a single task, the range of inputs is reduced and thus the minimum size of the city needed for efficiency may be smaller than that required for vertically integrated production.

3.5. Conclusions

In Chapter 2, the focus was on what goods are produced: the level of sophistication and the degree of product diversification. In this chapter, the focus has been on where production takes place. Especially where manufacturing jobs are scarce and so at a premium, there is an understandable desire to spread them equitably around a country. Unfortunately, there is a tension between such a distribution and manufacturing efficiency.

Productivity is higher if manufacturing firms cluster together. A truly dramatic illustration of this gain in efficiency comes from the case study of the cluster of button producers at Qiaotou. Over two decades the cluster has grown to account for around two thirds of global production of this niche product. The economies of scale in buttons are, in large part, not a matter of hard technology, but of product sophistication, including design and marketing. Buttons are one small input into the consumer product of garments, but they have been a sufficient niche for Qiaotou to prosper.

The sources of agglomeration economies and their relative importance appear to differ with the level of sophistication of the product manufactured. Generally speaking, firms in less sophisticated industries seem to derive greater benefits from locating near closely related

firms, while firms in sophisticated industries may prosper more from an agglomeration of diverse firms. The econometric evidence for Ethiopia, however, suggests that in countries of the bottom billion, even firms producing unsophisticated products may benefit from locating close to diverse manufacturing enterprises.

Agglomeration economies may also differ with the level of income of the countries and cities in which the cluster is located. Rich urban economies provide a powerful boost to the productivity of firms located there. The economic size of a city is mainly responsible for the productivity gains arising from urban locations. Below a threshold level of income—one that is close to that of the average bottom billion country—adding people to a city lowers productivity so congestion costs more than offset the productivity gains from added income. In poor countries with cities of small economic size, as in Ethiopia, the size of an industrial cluster may be more important for productivity gains than the size of the urban area within which it is located.

In the case of low-income countries, location near exporters may benefit firms that do not export. This new evidence from Ethiopia, if validated by further research in other settings, offers added support to the view that "learning by exporting" is important for industrial development in low-income countries and may spill over to firms in the same geographical location.

Each of these considerations suggests that the role of geography in industrial development differs from country to country and that policies designed to exploit agglomerations therefore will also need to be tailor-made to individual circumstances.

Chapter 4

Understanding structural change: The growing role of manufactured exports

World markets are changing the opportunities for industrialization in low- and middle-income countries, opening some paths to industrialization and closing off others. It is no longer realistic to think of a country's industrialization as an internal process. It is now shaped by the way each country's industry integrates into the global economy through trade.

This chapter addresses the challenges and opportunities offered to developing country manufacturing by the global economy. Section 4.1 begins by highlighting some of the evidence presented in part B of the growing role of developing countries in global manufacturing trade and the increasing technological complexity of the products they export. It then turns to the sources of export dynamism, decomposing export growth into demand, production and export orientation. The most important insight is the significant role played by the rising propensity to export across all regions and most products. This is, of course, the counterpart to the much faster growth of manufactured exports than manufacturing output worldwide. Lastly, it looks at the impact of China and India on the markets for manufactured exports from other developing countries.

World markets are reshaping the opportunities for industrialization in low- and middle-income countries, opening some paths to industrialization and closing off others.

Section 4.2 returns to the income-based concept of product sophistication introduced in Chapter 2. New evidence shows that fast-growing developing countries are increasingly exporting more sophisticated goods. This is true whether export sophistication is measured by technological level or by the weighted average of the GDP per capita of all countries exporting the good. When export and production structures are compared, fast-growing low- and middle-income countries have coherent patterns of structural change in production and exports. Diversification in production appears to lead diversification of exports, while the increasing sophistication of exports and production spurs growth.

The final section provides some evidence on the importance of trade in tasks. Imported intermediates rose from 12 per cent of total global manufacturing output in 1986-1990 to 18 per cent in 1996-2000. In contrast to the popular notion of outsourcing as a developed country phenomenon, the data show that reliance on imported intermediate inputs has grown across all regions and income categories. Indeed, East and South Asia are the global leaders in trade in tasks. It is also found that worldwide exports use a substantially higher and growing share of imported intermediate inputs when compared with production for the domestic market.

4.1. Manufactured exports and the developing countries

Trade in manufactures has boomed over the past several decades. Exports of manufactures by developing countries reached nearly $2.5 trillion in 2005, up from $1.4 trillion in 2000.

A. Developing countries in global manufacturing trade

As vividly illustrated in part B, developing countries are catching up with the high-income countries in all categories of manufactured exports. Manufactured exports from all developing regions, except Latin America, grew faster than the world average and faster than exports from developed countries. Between 2000 and 2005, developing countries gained a world market share in both simple (resource-based and low-technology) and complex (medium- and high-technology) manufactures (part B, Figure 10.6).

The rapid growth in developing country exports of manufactures was triggered primarily by the very rapid growth of South-South trade.

The rapid growth in exports of manufactures by developing countries was triggered primarily by the very rapid growth of South-South trade. Trade in

manufactures within the developing world grew at an average annual rate of 16 per cent between 2000 and 2005. While global manufactured trade continues to be concentrated within the developed world, South-South trade has increased its share in world trade by four percentage points over a five-year period (see part B, Figure 10.8), currently accounting for 14.5 per cent of global trade. Developing-to-developed country trade roughly maintained its share of global trade in manufactured goods, growing at some 10 per cent per year. Even though trade between developed and developing countries and between high-income countries grew at a slower pace, it was still quite rapid at 8 per cent per year.[22]

The growing complexity of exports from developing countries can be captured in part by two ratios: the share of manufactured exports in total exports, and the share of medium- and high-technology exports in total manufactured exports. As shown in part B, most regions increased both the share of manufactured exports in total exports and the share of complex exports between 2000 and 2005. East Asia has, by far, the most complex export structure among developing regions, contributing to the high-technology boom in South-South trade. This reflects the trend towards task-based production. Latin America's export structure remains fairly complex, but has not increased significantly in complexity in the past five years. South Asia's very high share of manufactured exports consists primarily of low-technology manufactures. Besides India, there has been little or no increase in complex manufactured exports from the region. Sub-Saharan Africa's growing export complexity is due to South Africa's dominant role. The Middle East and North Africa—perhaps as a result of the oil boom—was the only region to experience a fall in the complexity of exports between 2000 and 2005.

B. Sources of export dynamism

The evolving pattern of global trade in manufactures reflects three important trends. Firstly, despite the recent commodity boom, trade in manufactures continued to grow much more rapidly than manufacturing output. Secondly, developing countries are capturing an increasing share of the global market for manufactured exports and, thirdly, East Asia dominates the success story in developing country manufactured exports. A simple shift-share decomposition, using data on manufacturing production and exports, throws some light on the drivers of these changes.

For a country or a region, the growth of exports can be decomposed into three parts:

Growth in exports = Growth in global demand
+ Geographic shift in production
+ Change in export propensity

where for each product exported by the country:

- The growth in global demand is given by the rate of increase in world output of the product.
- The geographical shift in production is given by the difference between the rate of growth of output of the product in each country and the rate of growth of world output of the product.
- The change in export propensity is given by the difference between the growth rate of exports from each country and the growth rate of production.

Thus, export growth of any product is decomposed into the sum of three trends: a global trend, growth of demand for the product; a geographical trend, shifts in the location of global production; and a market trend, the change in export orientation.

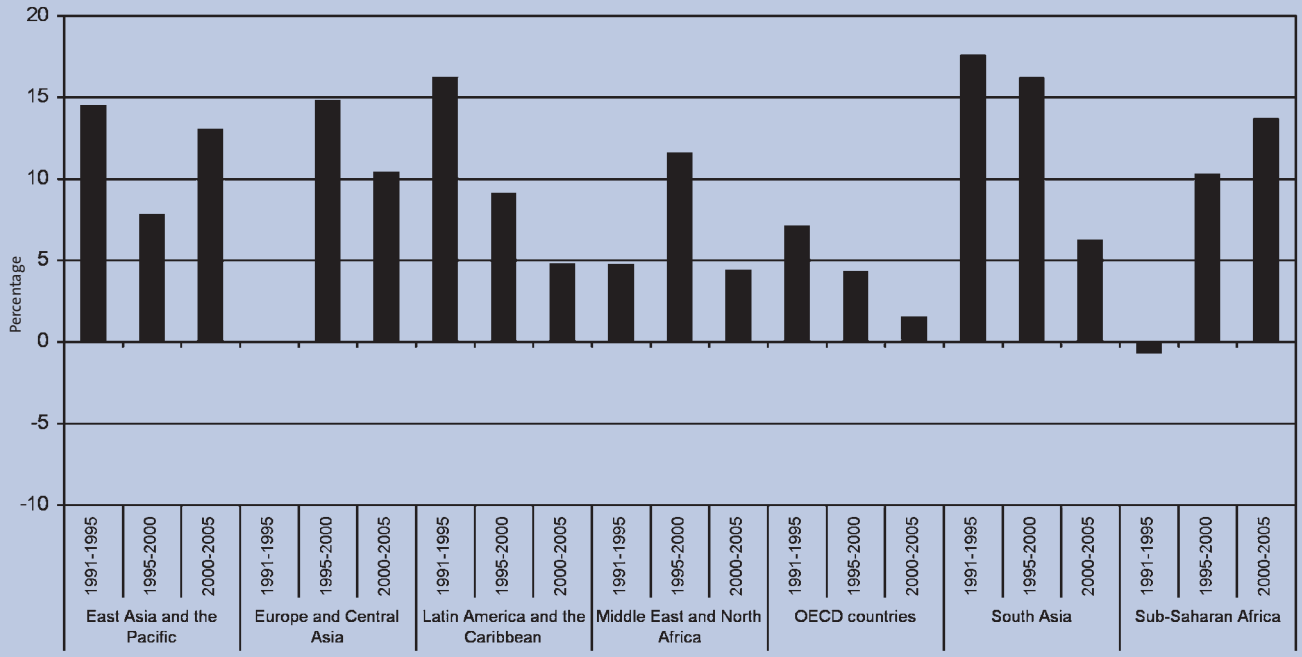
Figure 4.1a applies this decomposition to changes in total export performance in six developing regions and the OECD countries between 1991 and 2005. Together, East Asia and South Asia led global manufacturing export growth for the entire 15-year period, but other developing regions also experienced periods of rapid growth: Latin America in the early 1990s, Europe and Central Asia and the Middle East and North Africa in 1995-2000, and Africa after 2000. The OECD countries were the only ones to experience continuously declining export growth.

Overall what is striking about the decomposition are the major roles played in each region by changes in export propensity and the location of production (Figure 4.1b). Increases in global demand play a modest role in export growth, although one that becomes more pronounced in 2000-2005. East Asia's rapid export growth primarily reflects the global shift in industrial production towards countries in the region, especially in 1991-1995 and 2000-2005. Indeed, East Asia's export propensity declined somewhat after 2000 as firms began to serve rapidly growing internal markets. South Asia shows quite a different pattern. A major increase in export propensity took place in 1991-1995, while a rapid geographical shift in production, supported by a continuing rapid shift in trade orientation towards exports, accounted for the largest share of export growth in 1995-2000. By 2000-2005, the region's continued modest export growth was primarily supported by rising global demand.

East Asia's rapid export growth primarily reflects the global shift in industrial production towards countries in the region.

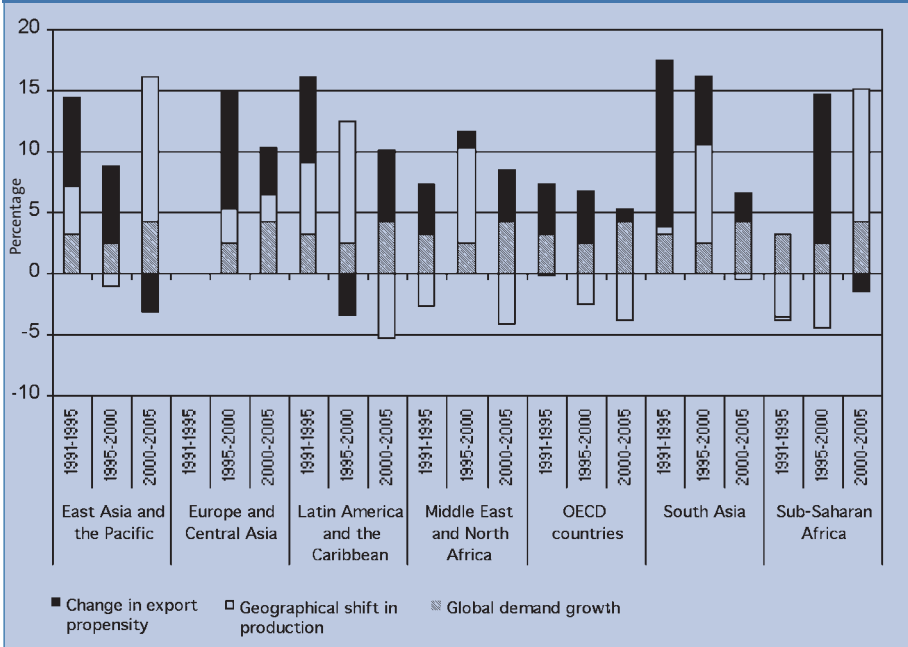
1 For a fuller exposition see part B.

Figure 4.1 a. Growth in manufactured exports, by region, 1991-2005 (Percentage)



Sources: UN COMTRADE; UNIDO database.

Figure 4.1 b. Sources of growth in manufactured exports, by region, 1991-2005 (Percentage)



Sources: UN COMTRADE; UNIDO database.

Both the OECD countries and Latin America lost ground in global production of manufactures after 1995. In the OECD countries this shift was offset by an increase in export orientation up to 2000, while in Latin America export orientation grew rapidly in the early 1990s, fell in the second half of the decade and rose again after 2000. In both cases, export growth was sustained to an extent by growth in global demand.

The "de-industrialization" of sub-Saharan Africa from an already very small base revealed by these decompositions is particularly worrying. The 1990s were marked by a shift in manufacturing production capacity out of Africa. Between 1991 and 1995, this shift was sufficiently large to offset global demand growth and, combined with a fall in export propensity, resulted in a decline in manufactured exports. Between 1995 and 2000, a rapid rise in export propensity more than offset a further decline in production, and Africa's manufactured exports grew at about the same pace as in other parts of the developing world. Between 2000 and 2005, Africa

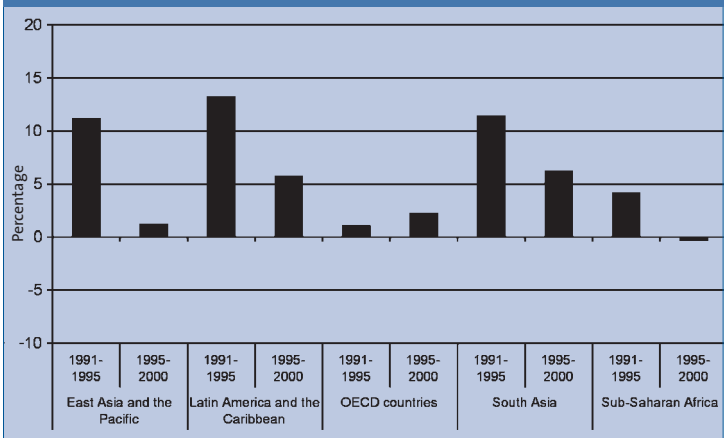
recorded one of the highest rates of manufactured export growth in the world, driven by a large geographical shift in production towards Africa. The production shift, however, was the consequence of the industrial recovery mainly in South Africa.

Figures 4.2 and 4.3 apply the shift-share decomposition to export growth in two low-technology sectors, textiles and apparel. Because consistent output data are not available at the sector level after 2000 the analysis is confined to the decade of the 1990s, but it illustrates at the sector level many of the global trends outlined above. Perhaps the most surprising result of the decomposition for textiles is the marginal role played by global demand. Between 1991 and 1995 global demand of textiles grew minimally, and after 1995 it actually declined (Figure 4.2b). Increases in exports were driven in the cases of East Asia, Latin America and the Caribbean, and sub-Saharan Africa by increasing export propensity. But in the cases of Latin America and Africa, the increase in propensity to export was largely offset by shifts in textile manufacturing capacity away from both regions, especially before 1995. In South Asia, a geographical shift in production boosted textile exports in both periods.

Figure 4.3b shows the sources of growth in apparel exports. A fall in global demand reduced exports of apparel across the board in 1995-2000. Not surprisingly, relocation of production reduced export growth in garments for East Asia and the OECD countries, but a major surprise is the very large geographical shift away from textile production in Africa between 1991 and 1995. The production shift was more than offset by a dramatic rise in export orientation during the same period, but the region's export dynamism in apparel was not maintained in 1995-2000. Despite further increases in export orientation, production capacity in garment manufacturing continued to move away from Africa.

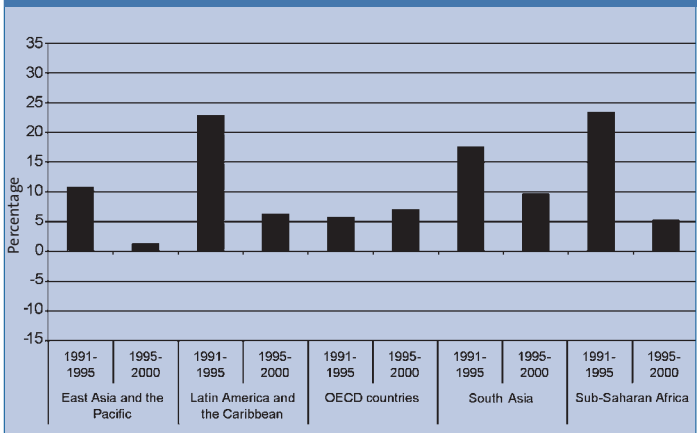
South Asia, which even prior to 1991 had very strong garment exports owing to the dominant role of Bangladesh, increased them further, largely through re-

Figure 4.2 a. Growth in textile exports, by region, 1991-2000 (Percentage)



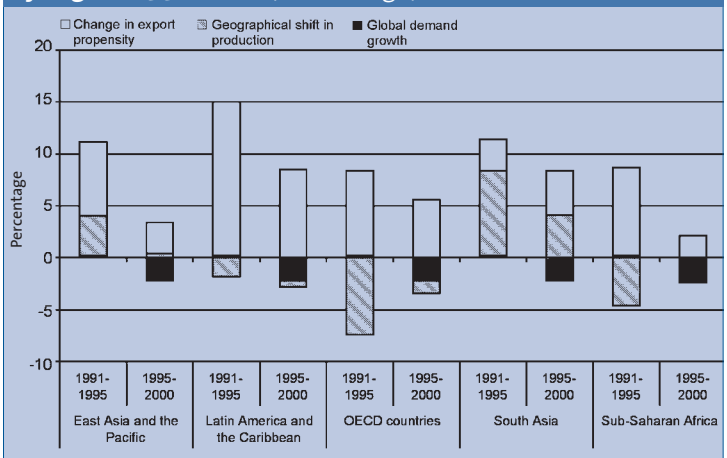
Sources: UN COMTRADE; UNIDO database.

Figure 4.3 a. Growth in apparel exports, by region, 1991-2000 (Percentage)



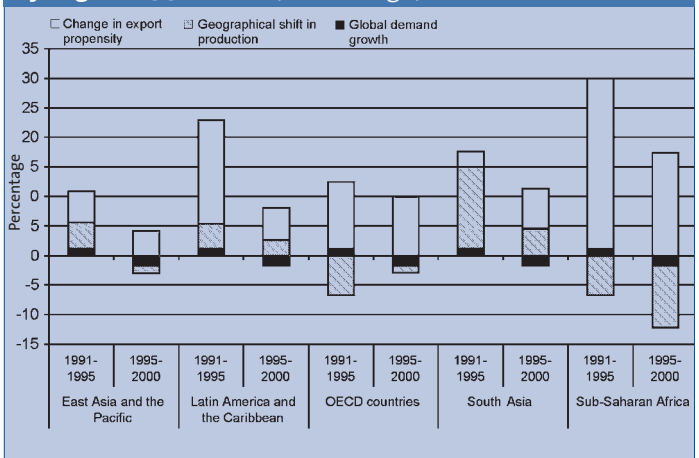
Sources: UN COMTRADE; UNIDO database.

Figure 4.2 b. Sources of growth in textiles exports, by region, 1991-2000 (Percentage)



Sources: UN COMTRADE; UNIDO database.

Figure 4.3 b. Sources of growth in apparel exports, by region, 1991-2000 (Percentage)



Sources: UN COMTRADE; UNIDO database.

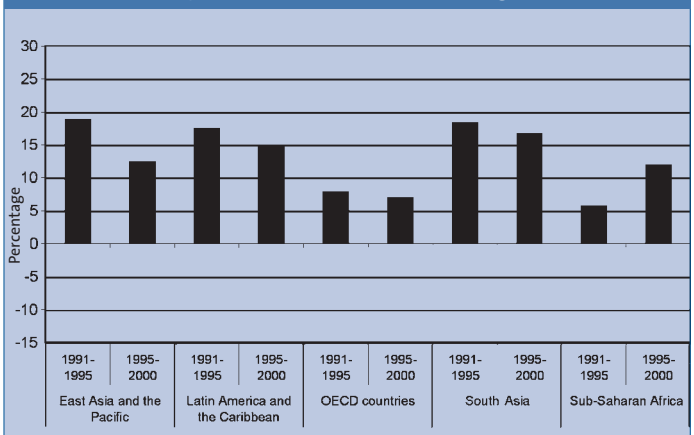
location of apparel manufacturing capacity to the region between 1991 and 1995. After 1995, garment export growth in South Asia was due largely to further increases in the propensity to export, although global production capacity also continued to shift towards the region.

Turning to higher technology sectors, Figures 4.4 and 4.5 a and b give a similar shift-share analysis for machinery and equipment and electrical machinery, respectively. The first striking result is the sharp shift in global production away from Latin America and Africa among low- and middle-income manufacturers towards South and East Asia. In the case of Latin America this is strongly offset by a rise in export propensity, in particular after 1995. It is also notable that, unlike the case of textiles and apparel, there is a shift in global production towards the OECD countries in machinery and equipment as well as electrical machinery between 1995 and 2000.

Perhaps the most important insight from the analysis of the sources of export growth is the significant role played by the rising propensity to export across regions and products. This is, of course, the counterpart to the much faster growth of manufactured exports than manufacturing output world wide, and it played a particularly important role in spurring the export dynamism of developing countries in the early 1990s. There was also an important long-run shift in global manufacturing capacity away from the OECD countries and Latin America towards East and South Asia. Despite an increase in export orientation, Latin America suffered a major loss in its share of global manufacturing production both in general and in labour-intensive, low-technology manufactures after 2000.

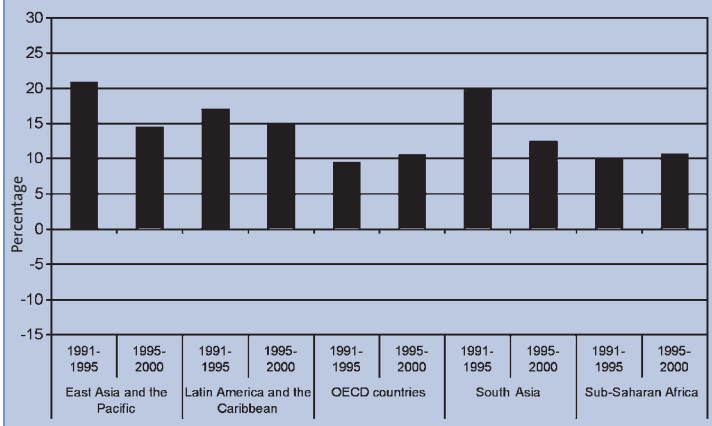
Perhaps the most important insight from the analysis of the sources of export growth is the significant role played by the rising propensity to export across regions and products.

Figure 4.4 a. Growth in machinery and equipment exports, by region, 1991-2000 (Percentage)



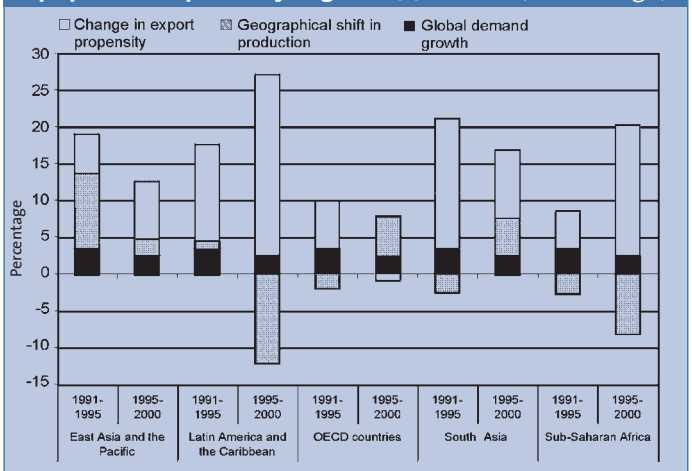
Sources: UN COMTRADE; UNIDO database.

Figure 4.5 a. Growth in electrical machinery exports, by region, 1991-2000 (Percentage)



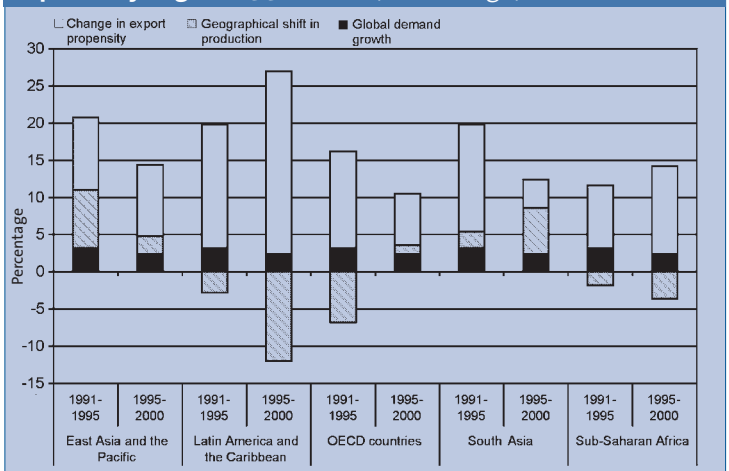
Sources: UN COMTRADE; UNIDO database.

Figure 4.4 b. Sources of growth in machinery and equipment exports, by region, 1991-2000 (Percentage)



Sources: UN COMTRADE; UNIDO database.

Figure 4.5 b. Sources of growth in electrical machinery exports, by region, 1991-2000 (Percentage)



Sources: UN COMTRADE; UNIDO database.

C. The China and India factor

The rapid rise of China and India is an economic phenomenon of a scale without historical precedent. Constituting one third of the world's population, their astounding growth in GDP is of enormous consequence not just for their own citizens but for all other countries. Although the aggregate GDP stories are now similar for both countries, China is by far the more important manufacturer. The growth of China and India as manufacturing powerhouses is rapidly reshaping the opportunities in global markets. The consequences for others of this success in manufacturing are the focus of this section.

The rapid rise of China and India is an economic phenomenon of a scale without historical precedent.

Given the size and special positioning of China and India, it is important to isolate their experience from the group of fast-growing countries in deriving generalizations for this group to see if these generalizations hold for others.

China's industrialization and growth record is in a class by itself. The evolution of China's manufacturing sector and the strategy to attain scale, competitiveness and a wide range of products is quite a story to tell. The growth of manufactured exports from China has been phenomenal. India has done very well over the past 25 years, but growth has been driven largely by the service sector, and it is only in the past ten years or so that Indian manufacturing has come into its own. While its performance is not comparable with the record set by China, there are features about India's growth performance that are worth highlighting.

The growth resurgence in India has been dominantly led by private investment. Pharmaceuticals and automotive components were the first two sectors to make inroads into global markets. Textiles and steel are also being restructured with a view to attaining global competitiveness, and the process of restructuring and rejuvenation is spreading across other sectors. Indian private companies are developing into transnationals and are engaged in acquisitions of foreign firms to improve their strategic position in world markets. The degrees of diversification and sophistication of the product range make Indian manufacturing well poised to exploit opportunities offered by the expansion of domestic as well as external demand. Increasingly, IT is being used in the Indian manufacturing sector to improve the productivity of its operations. However, there are challenges to be overcome. The challenge posed by infrastructure, including energy, shortages to industrial growth has been around for quite some time.

The closure of opportunities for new entry is, by nature, more difficult to detect. After all, low-income countries that were not exporting manufactures prior to the rise of China might not have been able to do so even had China not been so successful. However, the continuing marginalization of sub-Saharan Africa in manufacturing despite marked improvements in policy environments is, at least potentially, attributable to the intense competition to low-income producers.

The second massive change in market opportunities resulting from Chinese and Indian growth is its powerful impact in the markets for energy, raw materials and food. The surge in prices of these commodities in 2007-2008 was widely regarded as a structural change, and may well resume when the effects of the current financial crisis have been overcome. Such a resurgence of resource-based manufacturing would open major new opportunities for producers in resource industries and for industrial agriculture. For the resource-rich and land-abundant economies, such commodity booms constitute an unparalleled opportunity for transformation.

However, while a rise in the prices of primary commodities could provide an opportunity for their producers, it would pose a problem for other industrial producers who depend on these inputs either in the production process or to feed their workforce. For example, a background study comparing Ghanaian and East Asian manufacturing undertaken for this report (Teal and Baptist, 2008) finds that material inputs per unit of value added are considerably higher in Ghana. Further, the lower the level of income, the higher the share of food consumption in household budgets. Hence, a sharp increase in food prices would squeeze the industrial workforce hardest in the lowest-income producers.

While a rise in the prices of primary commodities could provide an opportunity for their producers, it would pose a problem for other industrial producers who depend upon these inputs either in the production process or to feed their workforce.

The other effects are consequences of the fact that because China and India are growing so fast they are themselves changing. They are rushing through stages of development that were previously thought to take many decades. The market consequence therefore is that as their industry develops it is likely to enter territory previously the preserve of higher-income countries.

This tendency is reinforced because, as discussed below, both China and India are exporting manufactured products of surprisingly high levels of sophistication given their level of income. Many of the products that they currently export compete directly with middle-income rather than low-income producers. The squeeze on middle-income manufacturing countries is considered further in Chapter 5.

The final, and most speculative, market consequence is that as China continues its extraordinary growth it may possibly begin to vacate territory appropriate for first entry into industrialization. Whether there will be "room at the bottom" for new low-income entrants is also taken up in Chapter 5.

4.2. Export sophistication, structural change and growth

As seen above, developing countries are exporting increasingly more medium- and high-technology products in terms of their process technologies. This section returns to the broader concept of product sophistication introduced in Chapter 2. It is important to know how sophisticated the exports of developing countries are and whether, as with production, export sophistication is associated with faster growth.

Why should producing exports that embody levels of productivity above an economy's level of income drive growth? One interpretation would be that as the manufacturing base in developing countries shifts from low-sophistication to higher-sophistication activities, income levels rise, owing largely to knowledge-based spillovers to the rest of the economy. An alternative, but complementary, interpretation is that sophisticated exports—those embodying high income levels—reflect the presence of globally competitive firms in a country. If a firm in a low- or middle-income country can enter the market for exports produced mainly by competitors in high-income countries, its firm-level productivity must equal or exceed that of its high-income competitors. A country with a large number of such globally competitive firms will experience rapid productivity change within manufacturing and more rapid growth.

A. Measuring export sophistication

As mentioned in Chapter 2, a measure of the degree of sophistication of manufactured exports is given by the weighted average of GDP per capita of all countries exporting the good. In this case, however, the weights are the "export intensity" of the sector in each country (Hausmann, Hwang and Rodrik, 2007). A lower value indicates that low-income countries export more intensively in the sector. Figure 4.6 shows the rankings of manufacturing activities (at the ISIC three-digit level) by their export sophistication indices for selected years between 1975 and 2000. A ranking of 1 indicates the export sector associated with the highest weighted average per capita income. A ranking of 28 is the sector with the lowest income level. Over the entire 25-year period, six sectors stand out consistently as highly sophisticated—paper and paper products, fabricated metals, machinery, electrical machinery, transport and other equipment. Richer countries are intensive exporters of these products. Poor countries intensively export food, tobacco, textiles, apparel, leather, wood and furniture.

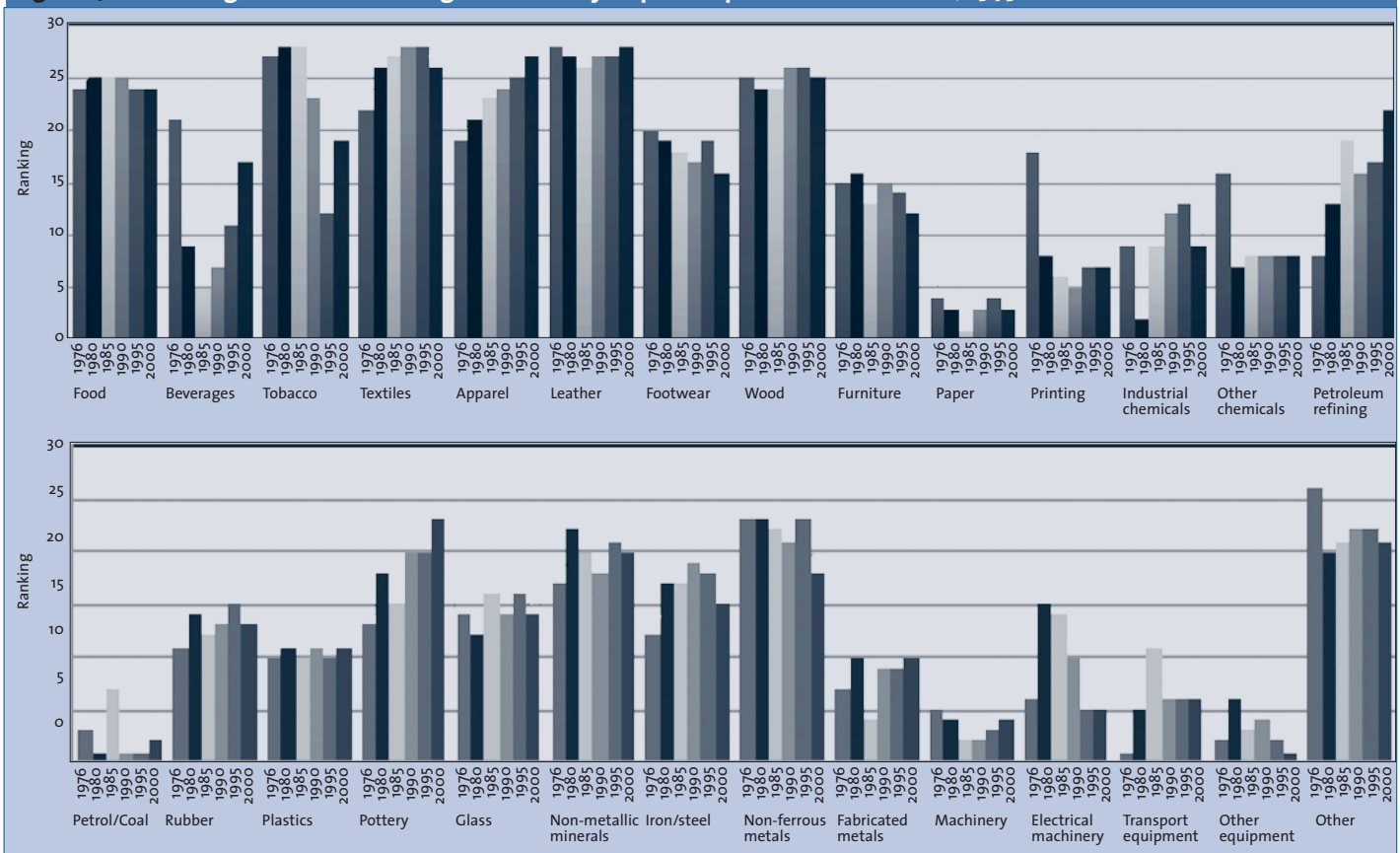
Changes over time in the rankings of export sophistication mirror some of the trends in global trade. Textiles, apparel, petroleum refining and pottery drop consistently towards the bottom of the rankings between 1975 and 2000, reflecting the structural shift in exports of these products from developed to developing countries. Food, leather and wood products consistently rank as unsophisticated exports. Footwear and furniture show increasing export sophistication. Exports of these products have become more concentrated in countries with higher per capita incomes since 1975. Furniture is unique in the sense that despite its relatively simple process technology it is growing increasingly sophisticated in terms of both the production- and export-weighted measures.

There is a close but by no means perfect relationship between production and export sophistication in manufacturing. A number of highly sophisticated sectors—fabricated metals, machinery, electrical machinery, transport and other equipment—are ranked very similarly by both indices. Paper and paper products, however, which rank as a mid-level sector in terms of its manufacturing production sophistication, rank very high in terms of export sophistication. Non-industrial chemicals show a similar pattern, with higher export sophistication than production sophistication. Richer countries are intensive exporters but not intensive producers of these products.

Over the entire 25-year period, six sectors stand out consistently as highly sophisticated sectors—paper and paper products, fabricated metals, machinery, electrical machinery, transport and other equipment. Richer countries are intensive exporters of these products.

Chapter 2 found that apparel is more sophisticated, in terms of its production-weighted measure, than one would expect in terms of its technology, but it ranks as unsophisticated in terms of its export-weighted measure; footwear is the opposite. The results for footwear and furniture may be due to a phenomenon discussed in the next section, intra-industry trade. Not all shoes or sofas are the same. Some developed countries intensively export high-fashion shoes and high-style furniture and import versions of the same items of lower style and quality. In apparel, the higher production intensity of developed countries may reflect the residual

Figure 4.6 Ranking of manufacturing activities by export sophistication indices, 1975-2000



Source: Eberhardt and Teal (2007).

effects of quotas and the impact of short product cycle times.

B. Country patterns of export sophistication

By weighting each sector's export sophistication level by its share in a country's total exports, an overall measure of export sophistication for each country can be calculated. Figure 4.7 shows the relationship between per capita income and export sophistication for individual countries between 1976 and 2003 in the same way as the relationship between income and product sophistication, shown in Chapter 2.

By nature of how it is constructed, this measure of export sophistication—like the one of product sophistication—is highly correlated with income per capita. Richer countries tend to be concentrated in the upper right part of each panel and poorer countries in the lower left. The regression line shows the relationship between export sophistication and per capita income for all countries in the sample. By moving across the panels of the figure it is possible to trace changes in income and export sophistication over time for each country.

Successful developing country exporters have taken multiple paths in terms of the sophistication of their exports. China had an export structure that as early as 1976 was quite sophisticated for its level of income.

Malaysia—a resource-rich country—began its industrial transition in 1976 with a manufactured export structure that was substantially less sophisticated than the level predicted by its income per capita. By 2003 it had achieved one of the most sophisticated export structures among developing countries.

Successful developing country exporters have taken multiple paths in terms of the sophistication of their exports. China had an export structure that, as early as 1976, was quite sophisticated for its level of income, and it increased in relative sophistication as per capita income grew. India, on the other hand, began with a level of export sophistication more consistent with its income level and remained much closer to the export sophistication level predicted by its growing income. The Republic of Korea, like India, began in 1976 with an export structure that was close to that predicted by its income level. By 1995, however, it had upgraded its export structure to a level of sophistication that was substantially above the predicted value.

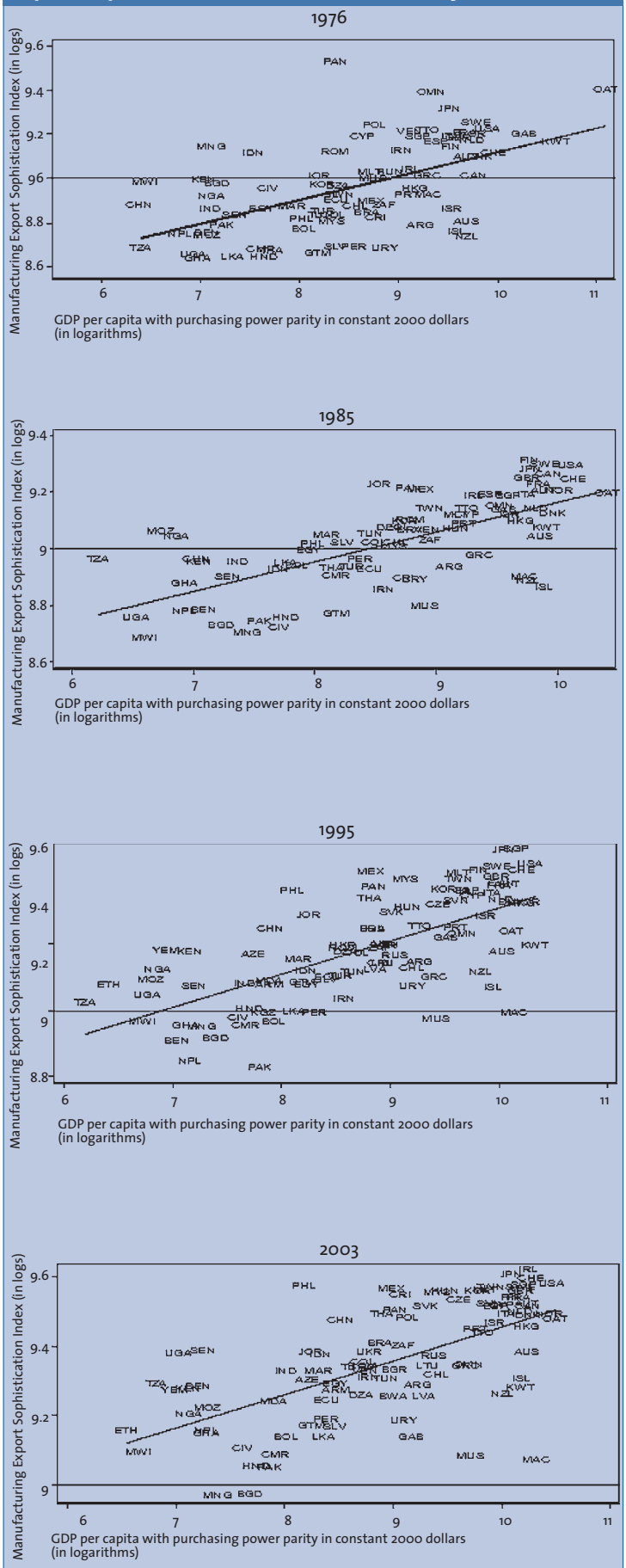
Malaysia—a resource-rich country—began its industrial transition in 1976 with a manufactured export structure that was substantially less sophisticated than the level predicted by its income per capita. By 2003, it had achieved one of the most sophisticated export structures among developing countries, well above the level predicted, based on its income. Singapore moved in a very similar fashion. Argentina and Brazil—two middle-income countries with approximately the same level of income—display strikingly different levels of export sophistication.

Among the low-income countries, Bangladesh is notable for its very low level of export sophistication, both absolutely and relative to its level of income. This reflects its heavy concentration in the exports of garments. In contrast, Ethiopia, Mozambique, Senegal and the United Republic of Tanzania, all low-income African countries, had levels of export sophistication that exceeded their predicted levels over most of the period.

C. Export sophistication, structural change and growth

Figure 4.8 is similar to Figure 2.5 in Chapter 2. It shows how two stylized classes of export activity—sophisticated and unsophisticated exports—have evolved in terms of export intensity for each of the five country groups. Manufactured exports are classified as "sophisticated" if they have an index value of $13,500 or above after 1995. Unsophisticated activities are classified as

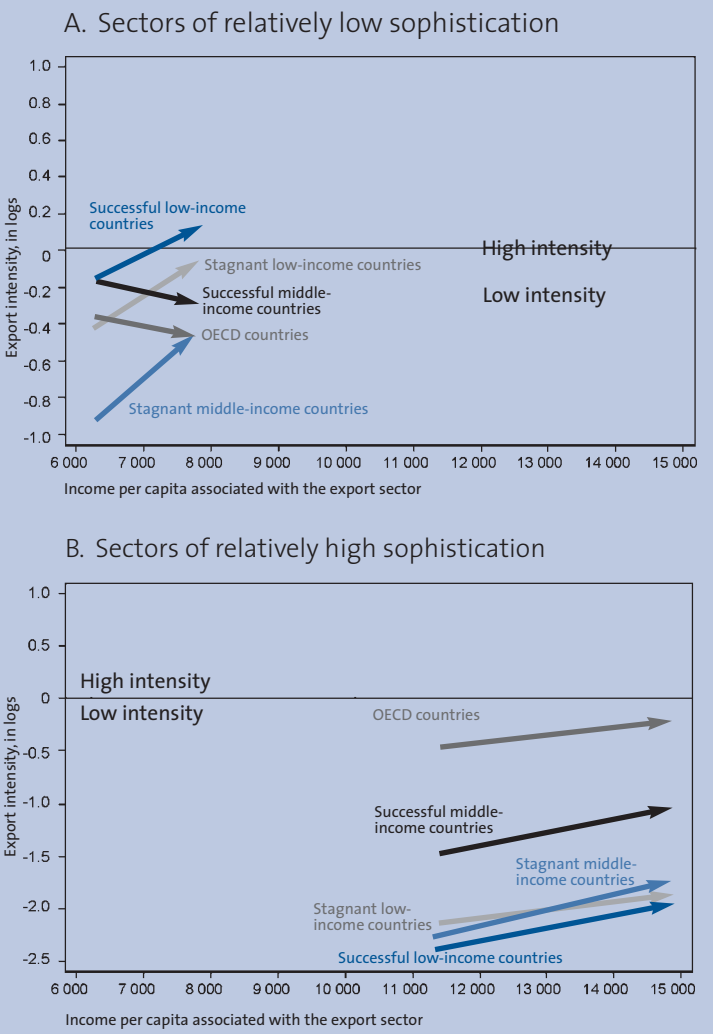
Figure 4.7 Relationship between per capita income and export sophistication, 1976-2003, selected years



Source: Eberhardt and Teal (2007), calculated from Nicita and Olarreaga (2007).

those with values below $10,000 in 1995. The average export intensity for each group is plotted along the vertical axis. Export intensity indicates whether a country's exports in a sector are more or less concentrated than the world average.[23] The beginning point of each arrow in the figure marks the average export intensity for the country group in 1975-1981, while the tip of the arrow marks the average intensity in 1995-2000.

Figure 4.8 Export sophistication and structural change



The vertical axis represents the logarithm of export intensity, an indicator of export structure which is computed as the share of a country's exports in a specific sector out of total manufactured exports divided by the global average share of exports in total manufactured exports for the same sector.

This measure is also referred to as 'Revealed Comparative Advantage'. Given the logarithmic scale, a value of zero indicates world average intensity and positive (negative) values indicate a higher (lower) concentration of exports than world average in the sector under analysis.

Source: Eberhardt and Teal (2007), calculated from Nicita and Olarreaga (2007).

Reflecting the structural changes in global trade, all the developing country groups increased their intensity of exports in more sophisticated products, largely at the expense of (the omitted category of) medium-sophistication exports. Fast-growing middle- and low-income countries increased the intensity of high-sophistication exports more rapidly than other groups of countries, and the fast-growing middle-income countries showed a slight convergence towards the export intensity of OECD countries in highly sophisticated products. OECD countries and fast-growing middle-income countries had declining intensities of exports of low-sophistication products.

Fast-growing middle- and low-income countries increased the intensity of high-sophistication exports more rapidly than other groups of countries, and they show slight convergence towards the export intensity of OECD countries.

The fast-growing low-income countries increased their already high export intensity in low-sophistication sectors to well above the global average. Slow-growing low- and middle-income countries also increased their export intensity in low-sophistication products. While the increase in export intensity of low-sophistication products might well be appropriate for low-income countries, for middle-income countries it suggests that they may be failing to move up the ladder of export sophistication consistent with their level of income. These are countries that, given their wage levels and basic industrial competence, would have been expected to make inroads into more sophisticated exports. Instead they appear to be competing with low-income countries for space at the bottom of the export sophistication ladder.

The relationship between changes in export sophistication and growth is clearest for middle-income countries; here the contrast between structural changes in exports in fast and slow growers is easily seen. Greater export sophistication was leading growth in the fast-growing middle-income countries. Fast growers were exiting traditional, low-sophistication export sectors and entering more highly sophisticated sectors. Surprisingly, for their level of income and industrial competence, slow-growing middle-income countries sharply increased the intensity of their exports of low-sophistication products, while showing little export dynamism in highly sophisticated products.

23 This measure of export intensity was originally developed as a measure of revealed comparative advantage.

Fast-growing developing countries, whether low-income or middle-income, had more in common with each other than with their slower growing counterparts. Both groups of fast growers showed increasing sophistication of production and exports.

The relationship between export sophistication and growth is different for low-income countries. Both fast- and slow-growing low-income countries had roughly similar patterns of structural change, mainly featuring rising intensity of low-sophistication exports, but fast-growing low-income countries had, on average, a higher export intensity in low-sophistication products. In effect, they were more heavily exploiting their international advantage in these products. They also experienced some increase in the intensity of exports of high-sophistication products. Slow-growing low-income countries, in contrast, had the slowest growth in the intensity of high-technology exports, lending some support to the argument that lack of dynamism in more sophisticated exports retards growth.

When structural changes in export sophistication are compared with those for product sophistication, mentioned in Chapter 2, fast-growing developing countries, whether low- or middle-income, are revealed to have more in common with each other than with their slow-growing counterparts. Firstly, both low- and middle-income fast growers had increasing sophistication in production and exports. Secondly, both groups increasingly diversified their production and export structures. Thirdly, fast-growing countries had coherently evolving production and export structures. Export and production intensities moved in the same direction within each group, although the directions of change differed between low- and middle-income fast growers in low-sophistication sectors. Over 25 years, as would be expected, fast-growing low-income countries increased production and export intensities in low-sophistication sectors, while fast-growing middle-income countries exited production and exports of low-sophistication products.

4.3. Trade in tasks

Intra-industry trade is now half of global trade, up from 25 per cent in the 1960s. The share of trade within industrial sectors has increased in overall terms and for all categories of goods.

Intra-industry trade currently accounts for half of global trade, up from 25 per cent in the 1960s. The share of trade within industrial sectors has increased in overall terms and for all categories of goods. This explosion in intra-industry trade is driven by two very distinct processes. The first is exchange of similar final products, reflecting consumers' search for variety and product differentiation, often due to branding. For example, Japan exports the Toyota Lexus and imports Mercedes, and the United Kingdom and France trade in types (and brands) of mustard and mineral water.

The second form of intra-industry trade is "trade in tasks". As discussed in Chapter 2, one of the major trends in global manufacturing is fragmentation of production into geographically dispersed, discrete tasks. Chapter 2 argued that task-based production offered the potential for developing countries that had not yet succeeded in breaking into global markets for products, like the slow-growing low- and middle-income countries just discussed, to enter global production chains through exporting tasks. But how significant is trade in tasks?

A. Measuring trade in tasks

Data on trade in tasks are currently limited. Trade statistics are generally not well adapted to measuring trade in stages of production. This means that estimates of the volume of task-based trade depend on indirect measures, using input-output tables. One way to measure trade in tasks is by estimating the share of imported intermediate inputs in total production and in total intermediate inputs (Grossman and Rossi-Hansberg, 2006a, 2006b). This provides a sense of the importance of outsourcing of production. But to understand the role of developing countries in trade in tasks it is important to look at the exports of manufactured intermediate goods. Thus, accounting for trade in tasks attempts to measure the importance of intermediate goods in several types of manufacturing production and trade.

First, a typology of trade flows is developed whereby intermediate goods are classified by: (a) whether they are imported or sourced domestically; (b) whether the output used to produce is exported or sold domestically; and (c) whether the output that they produce is sold as a final product or an intermediate input.

These three dimensions divide total manufacturing output for a country (and/or an industry) into eight

A typology of manufacturing output

Domestic intermediate inputs	For domestic sale	As intermediate inputs	=	Category 1
		As final goods	=	Category 2
	For export	As intermediate inputs	=	Category 3
		As final goods	=	Category 4
Imported intermediate inputs	For domestic sale	As intermediate inputs	=	Category 5
		As final goods	=	Category 6
	For export	As intermediate inputs	=	Category 7
		As final goods	=	Category 8

Source: Sandefur and Siddiqi (2007).

mutually exclusive categories by type of good and destination. Categories 1 and 2 are purely domestic transactions using local inputs to produce locally sold output. Category 3 consists of exports of intermediate products that are intensive in the use of domestically produced inputs. Category 4 is the traditional focus of most trade textbooks, the export of final goods using local inputs. Categories 5 and 6 are what many commentators refer to as outsourcing, using imported intermediate inputs to serve the domestic market.

Categories 7 and 8 are the developing-country side of outsourcing, task-based production. These activities use imported intermediate inputs to produce exports, either for final sale or as intermediate inputs into further stages of manufacturing. For instance, a maquiladora in northern Mexico may import intermediate inputs from the United States or elsewhere, assemble the imported parts and export its products to the United States, either as inputs (category 7) or final goods (category 8).

Using an input-output matrix for the manufacturing sector and national accounts data, imported intermediate inputs as a share of total output and as a share of total intermediate inputs in each of the eight product-destination categories above for 74 countries (of which 32 are middle-income countries and 14 are low-income countries) are estimated for three time periods: 1986-1990, 1991-1995 and 1996-2000.[24]

Because measures of import intensity rely on input-output tables from just one point in time, any growth in trade in tasks reflects production shifts towards industries that rely on inputs from upstream suppliers with greater import content and/or on increases in import content by upstream industries. This excludes two potentially important sources of growth of trade in tasks. Firstly, an economy or an industry, as a whole, may shift towards production technologies that are more intensive in imported inputs or, secondly, a similar shift in production technology may occur, but solely among exporters. For this reason, estimates of task-based trade are likely to be very low.

24 A necessary assumption for this calculation to be valid is that exporting firms use an identical share of imported intermediate inputs to the rest of the economy. This is referred to by the OECD as the "proportionality assumption" and is widely used for calculating trade statistics. Data are presented as average values for each period.

B. Trade in tasks and the developing countries

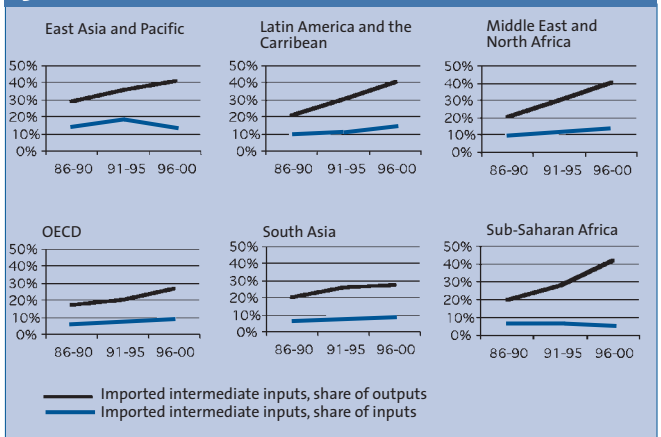
The growth of trade in tasks has been impressive. Between 1986 and 1990, imported intermediate inputs constituted 12 per cent of total global manufacturing output in the sample and 26 per cent of total intermediate inputs. Between 1996 and 2000, these figures had risen to 18 per cent and 44 per cent, respectively.

The growth of trade in tasks has been impressive. In 1986-1990 imported intermediates constituted 26 per cent of total intermediate inputs. By 2000, this figure had risen to 44 per cent.

The top panel of Figure 4.9 shows the evolution of two measures of trade in tasks for each of the six regions: East Asia and the Pacific, Latin America and the Caribbean, Middle East and North Africa, OECD countries, South Asia and sub-Saharan Africa. The OECD pattern confirms the much discussed move towards outsourcing by developed countries. Imported intermediate inputs rise both as a share of total output and, more sharply, as a share of intermediate inputs, especially in the 1990s.

Because the popular picture of trade in tasks is of firms in developed countries outsourcing intermediate inputs from developing-country suppliers, one might expect to see a lopsided pattern reflected in the aggregate data—high and increasing shares of imported intermediate inputs in the OECD countries, but few changes in developing countries. Instead, reflecting the explosive growth of South-South trade, the evidence suggests that reliance on imported intermediate inputs has grown across all regions. Indeed, this measure of outsourcing shows the lowest levels and slowest growth in OECD countries.

Figure 4.9 Trade in tasks, all sectors, by region, 1986-2000



Source: Sandefur and Siddiqi (2007).

The popular picture of trade in tasks is of developed country firms outsourcing intermediate inputs from developing-country suppliers. Instead, reliance on imported intermediate inputs has grown across all regions. Indeed, this measure of outsourcing shows the lowest levels and slowest growth in the OECD countries.

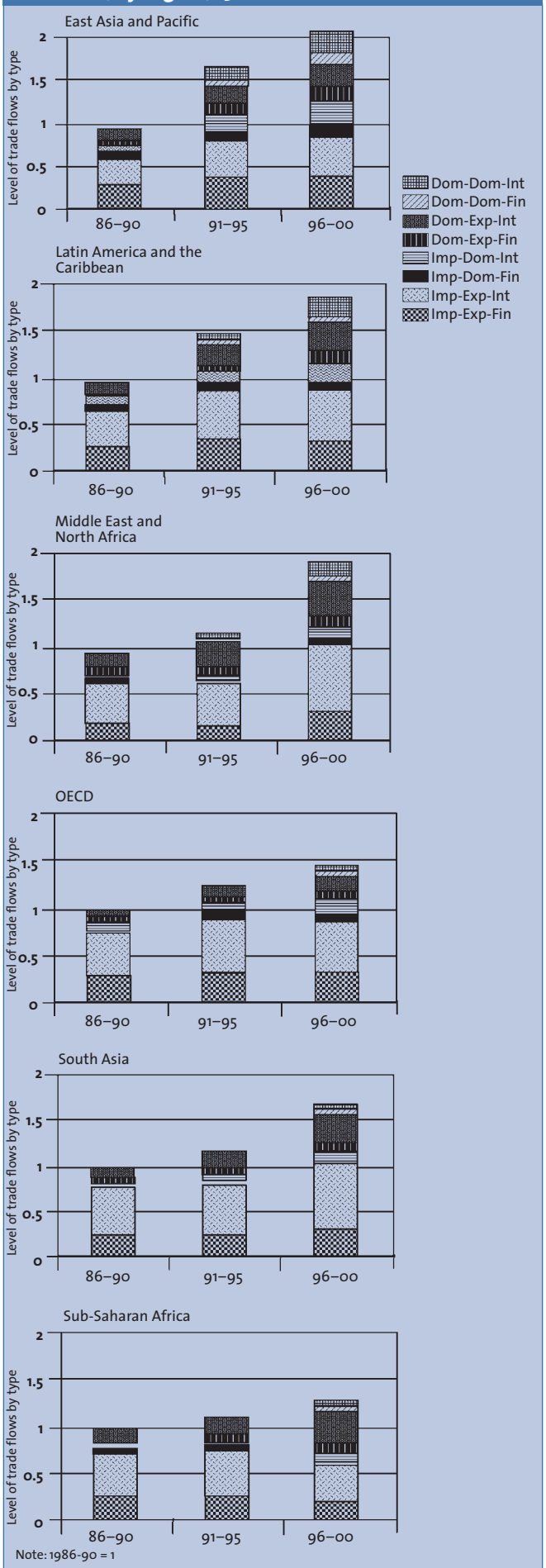
Between 1986 and 1990, East Asia registered the highest levels of trade in tasks by both measures. However, while imported intermediate inputs continued to rise as a share of total intermediate inputs, they declined as a share of total output in manufacturing, after the mid-1990s. In fact, despite robust manufacturing growth, total use of intermediate inputs—domestically-produced and imported—declined in the East Asian countries in the sample. East Asia appears to have experienced an increasing reliance on imported inputs within industries, but a structural shift towards industries that used fewer intermediate inputs. Although it cannot be captured using this method of estimation, this decline in the use of intermediate inputs probably also reflects rising efficiency in the use of intermediate goods.

An obvious consequence of the belief that industries in developed countries are increasingly outsourcing inputs from developing countries is that exports of intermediate inputs from low- and middle-income countries should be rising. Figure 4.10 divides total manufacturing output into the eight categories detailed above and shows the evolution of each category over time for each region. The categories associated with trade in tasks—in particular categories 7 and 8—have had a disproportionate role in both the output and export growth of emerging countries.

C. Are exports more intensive in trade in tasks?

As pointed out above, one of the limitations of the way in which the volume of trade in tasks estimated is that, it is difficult to distinguish whether firms producing goods for export rely more heavily on imported intermediate inputs than those supplying the domestic market. Thinking of trade in terms of tasks and a dispersed production network, one might suspect the answer is yes. If a given country's firm signs a contract with a United States firm to assemble goods for which there is little or no demand in the country, it is unlikely that many of the intermediate inputs will be available domestically. This section attempts to find the answer to this question by estimating intermediate input usage for export production and products sold in the domestic market.

Figure 4.10 Composition of exports of intermediates, all sectors, by region, 1986-2000



Note: 1986-90 = 1

Source: Sandefur and Siddiqi, 2007.

Due to the lack of within-country data that distinguishes between firms that are exporting and those selling domestically, the statistical approach relies on cross-country, sector and time-series variation in export propensities and intermediate input usage to estimate the demand for imported intermediate inputs separately for export and domestic production. The results, expressed as the share of imported intermediate inputs in exports and in production for domestic sale, are reported in Table 4.1.

Table 4.1 Share of imported intermediates for domestic sale and export, 1986-2000

	1986-1990		1991-1995		1996-2000	
	Domestic inputs	Imported inputs	Domestic inputs	Imported inputs	Domestic inputs	Imported inputs
Production for domestic sale	0.67	0.33	0.61	0.39	0.58	0.42
Production for export	0.33	0.67	0.25	0.75	0.22	0.78

Source: Sandefur and Siddiqi (2007).

Box 4.1 Trade in tasks: Mexico's maquiladora sector

Mexico's maquiladora system of in-bond processing consists of assembly of imported inputs for re-export, mainly to the United States. It has made Mexican and United States industrial production tightly bound to each other, especially since the North American Free Trade Agreement was launched in 1994. In 2005, over 85 per cent of Mexican exports were imported by the United States and Mexico bought 86 per cent of its total imports from the United States. Fifty-five per cent of non-oil Mexican exports were from maquiladoras. Most maquiladoras—85 of the top 100—are owned by United States or Japanese firms, taking advantage of the low cost and high quality of labour, and the clustering of industries. Agglomeration economies and proximity to the United States market have led to a high concentration of maquiladoras in five northern Mexican states (Baja California, Chihuahua, Coahuila, Sonora, Tamaulipas). The extent to which the maquiladora sector depends on task-based production is reflected in the fact that maquiladoras contribute 48.3 per cent to manufacturing production, but only 18.8 per cent to value added.

Since the rise of China's manufacturing sector, the Mexican maquiladora sector has had to adjust. For example, the entire textile industry has disappeared, because foreign firms relocated in an attempt to keep costs competitive. Within Mexico, firms have been forced to upgrade their products in the value chain of electrical and electronic goods (such as large flat-screen televisions), because other electronic products (such as printed circuit boards for personal computers and mobile telephones) are becoming highly price-sensitive, forcing firms to move to low-wage countries.

Source: Instituto Nacional de Estadística y Geografica, México (online).

Exports use a substantially higher share of imported intermediate inputs than production for the domestic market, a ratio of about 2:1. Moreover, the import intensity of export production appears to be rising over time, from about 67 per cent in 1986-1990 to 78 per cent in 1996-2000. There is a similar, although less sharp, rise in the import intensity of domestic production—from 33 to 42 per cent—over the same period.

Exports use a substantially higher share of imported intermediate inputs than production for the domestic market: a ratio of about 2:1. Moreover, the import intensity of export production appears to be rising over time.

4.4. Conclusions

The rapid growth in manufacturing of developing countries is, in large part, a consequence of the opportunities offered by the explosive growth of manufactured exports. This chapter examined three important structural trends in the global market for industrial products that will shape the opportunities for industrial development in low- and middle-income countries.

Developing countries continue to expand their share in global markets for manufactured goods. Since 2000, low- and middle-income countries have continued to capture a market share in both simple and complex manufactured goods, and much of the growth of trade in manufactures has come from South-South trade among developing countries themselves. East Asia has dominated both the growth of manufactured goods trade by developing countries and South-South trade. At the opposite extreme, Latin America has experienced little growth in manufactured exports since the turn of the century, and Africa continues to risk marginalization.

While decomposing export growth into demand, production and export orientation, the most important insight is the significant role played by the rising propensity to export across all regions and most products. This is, of course, the counterpart to the much faster growth of manufactured exports than manufacturing output worldwide. Given its already high export orientation, East Asia's rapid export growth primarily reflects the global shift in industrial production towards countries in the region, especially before 1995. South Asia shows quite a different pattern. A major increase in export propensity takes place between 1990 and 1995. The OECD countries, Latin America and Africa lost their shares in the global production of manufactures. This was offset to an extent by growth in

global demand, and after 1995 by a substantial increase in export orientation.

China and India offer both major challenges to other developing country producers and opportunities. Their size and the unprecedented pace of structural change taking place in their economies will undoubtedly shape market opportunities, especially for low-income countries trying to break into manufactured exports and for middle-income countries, such as those in Latin America, that are losing ground in export markets.

Fast-growing developing countries are increasingly exporting more sophisticated goods. This is true whether export sophistication is measured by the technological level or by the weighted average of GDP per capita of all countries exporting the good. Successful developing country exporters have taken multiple paths, in terms of the increasing sophistication of their exports. China, for example, had an export structure that as early as 1976 was quite sophisticated for its level of income, and it increased in relative sophistication as per capita income grew, while India began with a level of export sophistication more consistent with its income level and has remained much closer to the export sophistication level predicted by its growing income.

Export structure matters for growth. Fast-growing middle-income countries increased the intensity of sophisticated exports at a highly rapid pace globally, as they exited low-sophistication export activities. Fast-growing low-income countries rapidly intensified their exports of low-sophistication manufactures and experienced some increase in the intensity of exports of high-sophistication products. Slow-growing economies—whether low- or middle-income—had little export dynamism in sophisticated products. Surprisingly for their level of income and industrial competence, slow-growing middle-income countries sharply increased the intensity of their exports of low-sophistication products, while slow-growing low-income countries experienced the least growth in the intensity of high-sophistication exports.

The growth of trade in tasks has been impressive. Imported intermediate inputs in total global manufacturing output and in total intermediate inputs rose significantly between 1986 and 2000. While the popular picture of trade in tasks is of developed country firms outsourcing intermediate inputs from developing-country suppliers, reliance on imported intermediate inputs has grown across all regions and income categories. Indeed, use of imported intermediate inputs in production—the classic definition of outsourcing—is the lowest, with the slowest growth in OECD countries. Instead trade in tasks has had its strongest impact on the output and export growth of emerging countries in East and South Asia. Exports use a substantially higher share of imported intermediate inputs than production for the domestic market—a ratio of about 2:1—and the import intensity of export production appears to be rising globally over time.

Chapter 5
Implications for industrial development

The preceding four chapters described the key structural changes taking place in industrial production, production locations and markets that are shaping the opportunities and challenges faced by developing countries as they seek to industrialize. This chapter looks at the implications of those trends for the two groups of countries that emerge from that analysis as particularly at risk: low-income countries that have so far failed to break into global markets for manufactured exports—countries of the bottom billion—and slow-growing middle-income countries that are increasingly losing ground in global markets for industrial goods.

5.1. Room at the bottom?

The forces that have driven the explosion of global trade in manufactured goods include low transport costs, reliance upon inputs that are either easy to transport or are ubiquitous, and a production process that is subject to economies of scale.

Three major forces have driven the explosion of global trade in manufactured goods as documented in Chapter 4: falling long-term transport costs, reliance on inputs that are either easy to transport or are ubiquitous, and a production process that is subject to economies of scale and agglomeration. Together, these three characteristics have two dramatic implications.

The first is that the globally efficient geographical distribution of manufacturing is likely to be concentrated in a few places, rather than evenly distributed since the low cost of transporting output enables economies of scale to be reaped. Hence, if the location of manufacturing is globally efficient, many places will not produce manufactures. Of course, while the global allocation of manufacturing is unlikely to be fully efficient, competition between firms constantly tends to shift the allocation towards efficiency. The actual distribution of industrial activity will differ from the fully efficient distribution, partly because of lags in response to change and partly because periodic government interventions may offset market forces. However, the globally efficient allocation will drive both change and the policy response.

Secondly, three aspects between them fix the location of activity. The first is that although transport costs are low, they differ between locations, making some locations better than others. The second is that the ubiquitous input, labour, is more expensive in some locations than others. Hence, other factors being equal, production will gravitate to where labour is cheap. While these two aspects exclude some places as manufacturing locations, they still leave many places as candidates. It is the third aspect that is crucial: because of agglomeration economies, it is very difficult to establish new manufacturing locations. As a result, those locations where manufacturing is already established are advantaged.

The reason why it is difficult to start a new manufacturing location is that many of the economies of agglomeration are external to the individual firm. Firms must therefore cluster together in order to reap agglomeration economies. If all these interdependent firms relocated together at the same time, they would take these economies of scale with them, but, except in highly unusual circumstances, there is no coordination process that can organize such a mass relocation. Each firm takes its own decision on whether to relocate, treating the current location of other firms as a given. As a result, it is hard to start new manufacturing locations because the first firms to locate there would lack the economies that are only generated by a cluster. Conversely, established manufacturing locations have an inbuilt advantage: costs are reduced simply because of the existence of many firms.

In combination, economies of scale, low transport costs and the difficulty facing new locations imply that the globally efficient allocation of manufacturing will be concentrated in those relatively few locations where it is already concentrated.

In combination, economies of scale, low transport costs and the difficulty facing new locations imply that the globally efficient allocation of manufacturing will be concentrated in those relatively few

locations where it is already concentrated. These locations need have no intrinsic advantage other than that they already have manufacturing. This simple model of agglomeration economies has one further powerful implication. Once a new location has succeeded in entering the market, its growth can be explosive. This is because as each new firm is added to a cluster, costs fall. The new entrant finds itself in a virtuous circle in which growth lowers costs.

A. Explosive break-in thanks to a cheap labour advantage

The emergence of East Asia as a powerful force in global manufacturing has shown that it is possible for new entrants to succeed. However, rather than refuting the above model of industrial location, the East Asian success story calibrates what is necessary before new entrants can overcome the advantage of existing manufacturing locations.

East Asia broke into global manufacturing on a large scale only around 1980. By that time the gap in per capita incomes, and hence wages, between China and the OECD countries had widened enormously. In effect, it required this huge advantage in labour costs before China was able to become competitive in manufactures.

Box 5.1 Why did manufacturing go to East Asia?

In the 1970s and 1980s, East Asia was not the only region with cheap labour. Both Africa and South Asia had similarly low levels of income. Why then did manufacturing go to East Asia but not to other regions? The model of cluster economies provides an explanation as to why manufacturing did not relocate to all three. Once one location started to attract firms, it was more profitable for other firms to go there as well rather than to pioneer a new location in a different region. The East Asian advantage may initially have been quite modest: it takes only a small initial difference to produce cumulative divergence.

Perhaps the initial difference was not some intrinsic advantage of East Asia, but the disadvantages of Africa and South Asia during the 1980s. Much of Africa was then in a phase of exchange rate overvaluation following the commodity booms of the 1970s, while South Asia was still enthralled by the Soviet model of inward-focused industrialization and so had high trade barriers. Global manufacturing is a highly competitive business with narrow margins: Both exchange rate overvaluation and protection would preclude exporting. While during the 1990s both Africa and South Asia reformed their economies out of these policies, by then East Asia was already benefiting from the economies of scale of clusters.

Source: UNIDO.

One reason why the wage gap needed to be so wide is that even for labour-intensive manufactures labour costs are only a small component of total costs. A country could thus only break into markets in which its non-labour costs were not too much higher than those in OECD countries. Once China broke in, its growth was explosive. The virtuous circle between industrial growth and lower costs, arising from agglomeration economies, helped to propel its manufactured exports across an increasingly wide range of products.

The remarkable story of the East Asian success may appear to suggest that Africa and South Asia, other low-wage regions, can also break into manufactures. New entrants to manufacturing are no longer merely competing with the high-wage OECD countries, as China was when it broke into the market. They are competing with other countries that have economies of scale that make it competitive against new entrants.

B. Breaking in at the bottom?

While development through manufactured exports may be attractive, is it still feasible? There may be no room for new entrants into global manufacturing because East Asia is firmly established, able to reap economies of scale from its clusters while still having low wages. The remaining low-income regions of Africa and South Asia would not be competitive and would therefore not be able to break into manufacturing. Fortunately, there are three reasons for thinking that the future is less bleak than this suggests—rising costs in China, trade in tasks and supporting policies in developed countries.

Rising costs in China

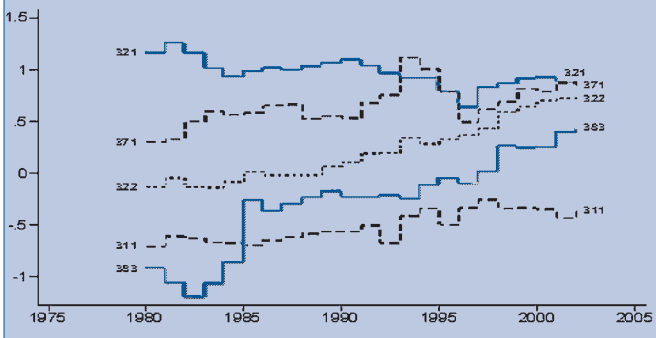
The Chinese economy has been growing so rapidly that it is likely to encounter rising costs in manufacturing production. One source of rising costs will be the labour market, which will inevitably tighten. Over the medium to long term, real wages will increase either through an appreciation of the currency or through a rapid increase in nominal wage rates. Wage increases will be influenced by the enormous labour force that remains in rural areas, but even in these areas incomes are rising, and the urban labour market is segmented to a degree that still shields existing workers from the full competition of new migrants (Knight and Song, 2005). In the 1970s, the Republic of Korea had a somewhat similar growth phase to that currently experienced by China. Real wages rose by up to 20 per cent per year. Even if Chinese real wages rise by only some 7 per cent per year, which seems modest given the growth of GDP, they are likely to double over the next decade.

As the Chinese coastal cities expand beyond a certain point they are likely to encounter diseconomies

of congestion: the infrastructure costs of offsetting congestion are themselves enormous. The alternative for Chinese manufacturers would be to move their production to the interior. However, this increases transport costs for exporting. Even if current cost comparisons favour China, firms may explore relocation to countries where costs are likely to be low for a longer period. China can play a major role in facilitating the participation of low-income countries in the shift from products to tasks in a mutually beneficial South-South cooperation framework.

Figure 5.1 shows the path of production intensities in five sectors between 1980 and 2003. China began its industrial transformation with intensities below the world average in three sectors—food, apparel and electrical machinery—and above the global average in two sectors—iron and steel and textiles. Of the three lower-sophistication (and lower-technology) sectors, textiles has declined in intensity of production although it has remained above the world average. Food manufacturing increased modestly, while apparel increased dramatically in production intensity. In iron and steel and electrical machinery, production intensity increased more rapidly than in the lower-sophistication sectors, signalling a structural shift in industry towards higher-sophistication products.

Figure 5.1 Production intensity[a] in five industrial sectors in China, 1980-2003



Source: Eberhardt and Teal (2007), calculated from Nicita and Olarreaga (2007).

a Mean estimate, weighted by the size of the country-sector (workforce). ISIC sectors: 311 food; 321 textiles; 322 apparel; 371 iron and steel; and 383 electrical machinery.

Box 5.2 Breaking in at the bottom: Cambodia's manufacturing success

Cambodia is one of the 49 countries categorized by the United Nations as least developed. In recent years, the country's economic performance has been outstanding; From 1995 to 2005 its average GDP growth rate was amounted to 12 per cent per annum. During the same period, its MVA growth was the fastest among developing countries, at 39.5 per cent per annum. Cambodia has been very successful in attracting large inflows of foreign direct investment (FDI). Net FDI inflows rose from $74 million in 2003 to $381 million in 2005.

The bulk of these flows go into the garment industry. During 1995-2005, the average growth rate of garment exports was 17.8 per cent per annum, the highest in the world. The impact of FDI and exports of garments on Cambodia's economy has been dramatic. The garment industry accounted for 72 per cent of MVA, 71 per cent of total manufactured exports and 15 per cent of GDP in 2004/2005.

The flexible characteristics of garment manufacturing, preferential market access as an LDC under the World Trade Organization and the Generalized System of Preferences, and cheap labour are the main factors that have attracted FDI, in particular from China. Chinese investment in garment manufacturing in Cambodia amounted to 40 per cent of total FDI in 2000-2005.

The rapid expansion of the garment industry has generated jobs and foreign exchange and has increased the potential for technological learning, but to date there has been limited development of the technological capabilities of firms.

Source: UNCTAD (2007).

Trade in tasks

The second reason for optimism is the trend in favour of trade in tasks, discussed in Chapters 2 and 4. For countries of the bottom billion, trade in tasks is a potential lifeline. Manifestly, the extremely limited industrialization in countries of the bottom billion to date demonstrates that establishing vertically integrated industries has not been viable. In particular, sub-Saharan Africa, excluding South Africa, has been losing its already tiny share of global manufacturing. It is considerably more feasible to specialize in a single task rather than in an entire range of tasks needed to produce a product. Further, a country can choose from among the different tasks one for which it is best suited. At present, as the evidence in Chapter 4 shows, trade in tasks tends to be concentrated in East Asia where international networks of integrated production have developed. The challenge facing the bottom billion is to insert themselves into these networked production processes. The recent growth of African manufactured exports of 13 per cent per year suggests that parts of Africa are not radically uncompetitive, in terms of labour and transport costs. The shift to trade in tasks can potentially alleviate

The extremely limited industrialization in the bottom billion, to date, demonstrates that establishing vertically integrated industries has not been viable. In particular, sub-Saharan Africa excluding South Africa has been losing its already tiny share of global manufacturing.

the key remaining disadvantage of not having established enough industrial clusters.

Orienting an industrial strategy to benefit from trade in tasks requires a substantial rethinking of the desirability of vertical integration. In the past, policymakers have expressed concern that task-based production may trap low-income countries in low-sophistication assembly activities and provide less scope for moving up the product sophistication ladder. The evidence in Chapter 2 and the history of the industrial cluster in Penang suggests that this is not the case: countries have the scope to upgrade the diversity and sophistication of task-based production to the same extent as in vertically integrated production. As the Chinese button and Malaysian electronics clusters show, once a particular task is well established, upstream tasks may become viable and develop naturally.

Supportive policies in developed countries

The third reason for optimism is that, if indeed trade in tasks brings countries of the bottom billion within reach of becoming globally competitive, there is scope for developed countries to be supportive through their trade and aid policies. Even if used to the best advantage, these policies are not sufficiently potent to conjure up competitive advantage, but they nevertheless have the potential to push countries over the threshold of competitiveness. These issues are taken up in Chapter 8.

C. Leveraging agro-industries

One important sector where countries of the bottom billion have the potential to seize opportunities for industrial development is agro-industries. Population growth and, more importantly, dietary changes that will result from broad-based economic development in China, India and other fast-growing low- and middle-income countries will change the patterns of consumption, production and trade for agro-industrial products. Demand could be twice the current requirements by 2050.

Developing countries have not increased their share of global agricultural trade since the 1980s, but the composition of that trade has changed dramatically. Traditional tropical commodities first gave way to non-traditional exports of fruits and vegetables, fish products and beverages directed primarily to developed countries. For many producers of traditional tropical crops, changing tastes and growing awareness of environmental concerns in the developed economies led to the emergence of niche products and special quality strategies, such as fair trade, organic and sustainable products. The recent explosion of growth in large developing countries, such as China and India, is now leading to a surge in animal protein exports by middle-income developing countries, adding to the growth in South-South trade. While trade in agro-industrial products has been a boon for a number of middle-income countries, it is putting increasing pressure on low-income countries, threatening their ability to develop their own domestic agro-industrial base.

Agro-industry—post-harvest activities involved in the transformation, preservation and preparation of agricultural products for intermediate or final consumption—is a major source of manufacturing employment and income in developing countries, especially those which still depend largely on agricultural production. Including informal activities, agro-processing accounts for more than 50 per cent of total MVA in low-income countries, declining to 36 per cent and 32 per cent for lower middle-income countries and upper middle-income countries, respectively.[25] World Bank (2007d) places agro-industry's contribution to total manufacturing at 61 per cent in agriculture-based countries, 42 per cent in countries in the process of structural transformation and 37 per cent in urbanized developing countries. In middle-income developing countries, agribusiness, more broadly defined, accounts for more than a third of GDP.

The food and beverages processing sector is a major employer at all levels of development. The sector is the leading employer (13 per cent) in the manufacturing sector of the countries of the European Union and the third most important in the United States (9 per cent). According to the International Labour Organization, on average, 60 per cent of workers in food and beverages in developing countries are employed in the informal economy, while employment in the formal food and beverages sector is estimated at 22 million. The non-traditional sector (horticulture, fruits and fish products), one of the most dynamic in terms of exports from developing countries, is characterized by high levels of female employment, a percentage that can range from 50 per cent to as much as 80-90 per cent. Gender stereotypes, however, tend to relegate women to the lower-paid, labour-intensive segments of food and beverages preparation and/or processing.

Given its decentralization and strong presence in rural areas, agro-industry can be decisive in promoting socially inclusive growth, in particular through the creation of off-farm employment. Experiences in Brazil, Chile, Kenya, Mexico, South Africa and Thailand have demonstrated the potential of agro-based small and medium enterprises to generate employment, increase farm and rural non-farm incomes, and raise the living

25 According to the UNIDO Industrial Statistics Database and the latest available data for selected countries, agro-processing value added as a percentage of GDP is calculated at 4.3 per cent for low-income countries and 5 per cent for lower and upper middle-income countries. Given the importance of the informal sector, however, these figures grossly underestimate the real picture.

standard of the rural poor. In those parts of Africa, where poor rural public services have resulted in dysfunctional agricultural input and output markets and a general breakdown in the delivery of agricultural services to small-scale farmers, local agro-enterprises are increasingly filling crucial institutional gaps.

Whether the agricultural and food industries in the countries of the bottom billion can respond to the substantial increase in demand for food and food products over the next 20 to 30 years will depend to a large extent on the increased application of existing technologies as well as the development and exploitation of new and innovative technologies. The structure of agribusiness has changed significantly and its performance has been highly dynamic, driven by rapid technological, organizational and institutional innovations. This suggests that, while agro-industrial-based development can be an important element of breaking in at the bottom for the slow-growing low-income countries, it will face many of the same policy and structural challenges faced by industrial development in general.

5.2. Pressure in the middle

Structural changes in the global economy—the rapid growth of manufactured exports from developing countries, the explosion of trade in tasks, and the very rapid increase in industrial sophistication of the fast-growing middle-income countries—are also putting intense pressure on the slow-growing middle-income countries.

Since 1975, the slow-growing middle-income countries have lost employment shares and production intensity in manufacturing industries that ranged from decidedly unsophisticated products, such as footwear, to relatively sophisticated ones, such as fabricated metals. As shown in Chapters 2 and 4, the production base of the slow-growing middle-income countries is narrowing and they are lagging in the production and export of more highly sophisticated industrial products. More than two thirds of the slow-growing middle-income countries appear in the bottom half of the competitive industrial performance (CIP) index, mentioned in Chapter 11, and only 9 slow-growing middle-income countries improved their rankings between 2000 and 2005. The next two sections look in detail at the nature of the pressure on these countries.

The slow-growing middle-income countries lost ground in manufacturing industries that ranged from decidedly unsophisticated products, such as footwear,to relatively sophisticated ones, such as fabricated metals.

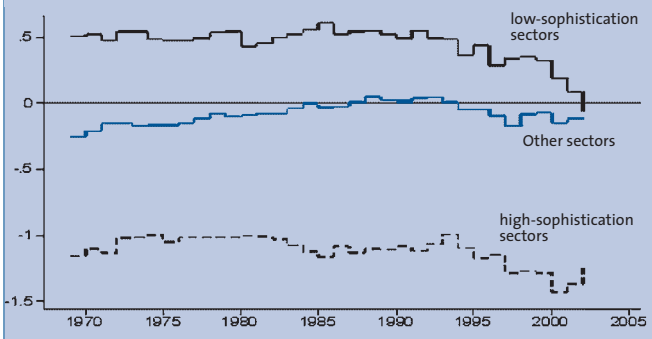
A. A narrowing production base

Chapter 2 finds clear evidence that middle-income countries that produce more diverse and more sophisticated products tend to grow faster. This process of structural change might actually foster more rapid economy-wide growth by providing greater opportunities for the entry of dynamic firms into new sectors. The slow-growing middle-income countries stand out for how little their production structures have changed over the past 30 years and for the fact that such changes that have taken place have probably retarded their growth.

Figure 5.2 shows the evolution of the structure of production in the slow-growing middle-income countries. Zero on the graph represents the global average intensity of production in each of the three product categories, low, medium and high sophistication. The slow-growing middle-income countries exceeded the global average intensity in low-sophistication sectors in 1970, were just about at the global average in medium-sophistication sectors and, as expected, fell far below the global average intensity in high-sophistication products. This pattern was remarkably stable until 1990 when the intensity of production in both low-sophistication and high-sophistication products started to erode. Rather than broadening, the production base in the slow-growing middle-income countries has been narrowing, more towards a specialization in middle-level goods.

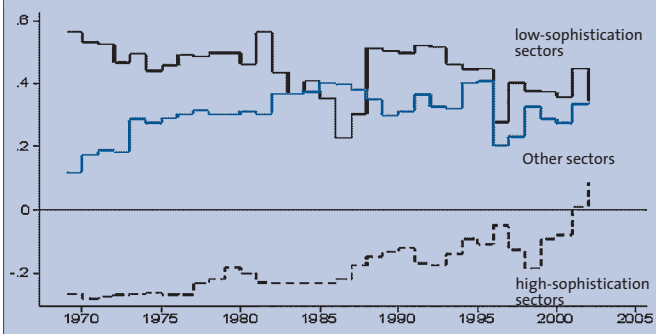
The contrast with the fast-growing middle-income countries is striking (Figure 5.3). In these countries, substantial structural change took place between 1970 and 2003. Starting from a lower base, high-technology sectors moved to equal the global norm. Medium-technology activities also increased in intensity and low-technology activities declined in fast-growing middle-income countries, and both diversified their production base and moved up the scale in terms of product sophistication. The slow growers did not.

Figure 5.2 Production intensity[a] in slow-growing middle-income countries, 1970-2003



Source: Eberhardt and Teal (2007), calculated from Nicita and Olarreaga (2007).
a Mean estimate, weighted by the size of the country-sector (workforce).

Figure 5.3 Production intensity[a] in fast-growing middle-income countries, 1970-2003



Source: Eberhardt and Teal (2007), calculated fromNicita and Olarreaga (2007).
a Mean estimate, weighted by the size of the country-sector (workforce).

Box 5.3 How do slow-growing middle-income countries compare with China and India?

China and India are exerting intense pressure on slow-growing middle-income countries. Both these countries and the slow-growing middle-income countries show declining intensities of low-technology manufacturing. The major difference is that China and India have markedly higher shares of high-technology manufacturing activities in their industrial base. The differences in structure, however, are most pronounced in medium-technology products. Both countries significantly increased the intensity of their production in medium-sophistication sectors, especially after 1980, making inroads into the stage of production that was becoming the area of specialization of the middle-income slow growers. In short, the slow-growing middle-income countries were losing their global production share to better performing middle-income countries in high- and medium-sophistication products, to China and India in medium-sophistication sectors, and globally in unsophisticated products.

Source: Eberhardt and Teal (2007).

B. Exports under stress

As noted in Chapter 4, there is evidence of a strong, positive relationship between the sophistication level of a country's overall export basket and its subsequent rate of growth. Between 1976 and 2003, the production base in slow-growing middle-income countries was becoming shallower in low-sophistication goods and their exports were becoming more highly concentrated in them. A more detailed examination of the exports of the slow growers shows an even more worrying pattern: there was virtually no change in the export intensity of any of the three categories of goods after 1990, and the intensities of medium and high sophistication exports are well below global averages (Figure 5.4). Because these intensities can be interpreted as revealed comparative advantage, they signal a worrying lack of export dynamism in the slow-growing middle-income countries. Since 1990, this group of countries has failed to move toward revealed comparative advantage in any product group.

This lack of export dynamism is striking when compared with fast-growing middle-income countries. Figure 5.5 shows the evolution of revealed comparative advantage for the fast-growing middle-income coun-

Box 5.4 Pressure in the middle: Manufacturing export formance in selected Latin American countries

Manufactured exports have played a key role in integrating seven Latin American countries (Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras, Mexico and Nicaragua) into the global trading system. They have created employment, attracted foreign investment and earned considerable foreign exchange. Special fiscal regimes, such as free trade zones and in-bond processing, and trade agreements, such as the WTO Agreement on Textile and Clothing, the Dominican Republic—Central America Free Trade Agreement and the North American Free Trade Agreement, led to dynamic growth of exports to the United States in the 1990s.

Currently, these countries are experiencing a strong challenge from Asia. China's industrial expansion has put increasing pressure on exports from these seven countries in the American market. Between 2000 and 2006, Costa Rica, the Dominican Republic, El Salvador, Guatemala, Honduras and Mexico lost their market share to China in the United States, and China displaced Latin America as the main supplier of clothing and electronics.

Part of the growing pressure is due to the decline of preferences. A number of agreements giving preferential access to the United States market have recently lapsed, exposing the countries concerned to greater competition from Asia. Part of the loss of competitiveness is due to a growing skill and knowledge gap with Asia. However, Latin American countries lag behind their Asian competitors in the number of engineers, technicians and professionals per capita and spend a smaller share of their income on innovation. For example, in 2005, China spent 1.3 per cent of its GDP on R&D, three times the amount spent by Mexico.

Source: United Nations. Economic Commission for Latin America and the Caribbean (2008).

tries. Rising from an equally low starting position, the fast-growing middle-income countries steadily increased their relative market share in medium and high sophistication exports over the entire period 1976-2003. Beginning in 1990, the fast-growing middle income countries also reduced their export intensity of low sophistication products. In the fast-growing middle-income countries the export base was becoming more diverse, more competitive and more sophisticated. In the slow-growing middle-income countries after 1995 it was not.

The comparison with China and India may be even more telling. The differences in trade performance are perhaps clearest to the prospects of the slow-growing middle-income countries in high-technology exports. While China and India are still at levels of export intensity below the international average, their revealed comparative advantage has been rising. In stark contrast, the export intensity of the slow-growing middle-income countries has stagnated over the past 15 years.

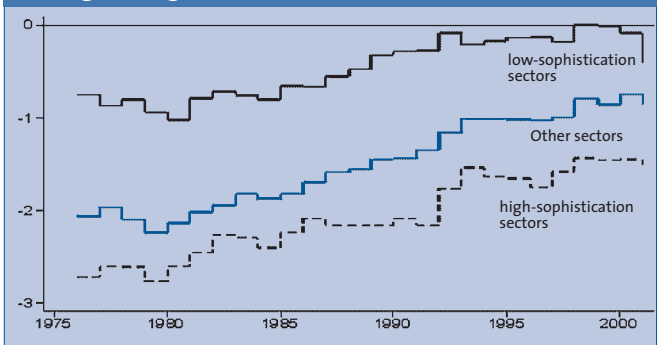
Part of the pressure on the poorly performing middle arises from the explosive growth in trade in tasks. The slow-growing middle-income countries simply have not kept pace with the more dynamic developing countries and OECD countries in trade in tasks. Failure to move decisively towards trade in tasks explains at least part of the increasing concentration of production and exports in the slow-growing middle-income countries. Dynamic low-income countries have picked up the bulk of trade in tasks in low-sophistication intermediate goods, while the fast-growing middle- and high-income countries have made inroads in the high-technology sectors. China and India are highly active in both.

C. Escaping the pressure

Can the slow-growing middle-income countries escape the pressure in the middle? Possibly, but it will not be easy. The failure of the slow-growing middle-income countries has been their inability to adapt to rapid change in the global marketplace. The ability to shift production and export structures quickly to serve changing global demands is an important ingredient of competitiveness. Countries that become aware of and adapt to new market demands show readiness to compete, but building the capacity to respond to changing demand patterns is not easy. For countries in the middle, industrial development is path-dependent both in terms of capabilities and space.

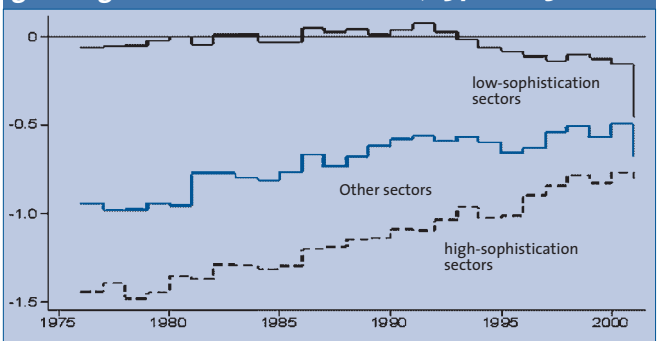
The failure of the slow-growing middle-income countries has been their inability to adapt to rapid change in the global marketplace.

Figure 5.4 Export intensity[a] by product group in slow-growing middle-income countries, 1976-2003



Source: Eberhardt and Teal (2007), calculated from Nicita and Olarreaga (2007).
a Mean estimate, weighted by the size of the country-sector (workforce).

Figure 5.5 Export intensity[a] by product group in fast-growing middle-income countries, 1976-2003



Source: Eberhardt and Teal (2007), calculated from Nicita and Olarreaga (2007).
a Mean estimate, weighted by the size of the country-sector (workforce).

Production and export structures are the outcome of accumulated skills and technological capabilities developed by slow, incremental learning processes. Such structures are difficult to change quickly. If technology and skills are not readily transferable, it may take decades to build competitive strength in new sectors. Indeed, the rigidity of the production and export structures in the slow-growing middle-income countries are the main obstacles to their ability to compete in a changing global environment.

As mentioned earlier, in middle-income countries cluster economies are important. This confers powerful advantages on the fast-growing middle-income countries—and on such low-income fast growers as China and India—where spatial concentrations of closely related firms have already developed. Overcoming the cost disadvantages posed by lack of agglomerations in new industries will not be an easy task.

The good news is that pressure on the middle is not uniform. The fast-growing middle-income countries have adapted to the changing global market place and have also succeeded in competing in the production and export of more sophisticated products. And, while there

is clear evidence of an increase in production specialization in the slow-growing middle-income countries since 1995, it is true that their levels of industrial competency and industrial agglomerations are far greater than most low-income countries. This base of industrial competence can perhaps be tapped to support the growth of dynamic new export sectors.

The capacity to adapt was illustrated by the performance of the Buenos Aires automotive cluster. When national policies and the corporate strategies of the cluster's transnational investors shifted from serving a limited and slow-growing local market to export orientation and regional trade in tasks, the skills and technological capacities of firms in the cluster were already well developed. This base of manufacturing capability allowed a very rapid expansion of exports and employment in the sector.

Box 5.5 Opportunities from commodity and construction booms

High commodity prices open up significant export windows to countries with strong agricultural and mineral sectors. The recent worldwide boom in the construction sector, and the high demand of China and India for oil, mineral and agro-based products offered enormous opportunities for countries to benefit from shifting patterns of demand. For those slow-growing middle-income countries which are naturally resource-abundant, the challenge is to use resource revenues to support a broader process of economic diversification, as was done by Chile and Malaysia. For other slow-growing middle-income countries, recurrent construction booms may offer an opportunity to break into this rapidly growing market segment.

Source: UNIDO.

Time is emerging as a critical factor shaping the global distribution of trade in tasks. In industries subject to short cycle times or uncertain demand—such as fashion and consumer electronics—time emerges as an important determinant of industrial location. Firms are driven to locate close to customers and suppliers (Harrigan and Venables, 2006). Proximity to markets reduces search costs in supplier-buyer networks. It also reduces the costs of producer-consumer interaction on product specifications, quality control and timing. Significantly, these proximity effects are not very important for highly standardized goods but are important for more customized products of the sort that can be produced by middle-income countries (Rauch, 1999).

With short cycle times, shorter transport times may outweigh higher wage costs, leading to "reverse outsourcing", as industries locate closer to customers. There is some recent evidence of relocation of production of apparel for the United States market from Asia to Mexico and the Caribbean (Evans and Harrigan, 2005). Another recent study found that for each day of ocean travel that a country was distant from an importer, the probability of sourcing an import from that country fell by 1 per cent (Hummels, 2007). Middle-income countries located close to major markets for short-cycle products may be able to use the time-wage trade off to break into export markets in tasks that were formerly closed to them owing to their relatively high industrial wage levels.

5.3. Conclusions

The structural changes described in Chapters 2-4 have created two distinct groups of countries that risk marginalization in industrial development and trade. The first are the countries of the bottom billion. The second are the middle-income countries that have failed to sustain production and export dynamism, and are consequently growing slowly.

For countries of the bottom billion, getting on the bottom rung of the global industrial ladder will prove difficult. The emergence of East Asia as a powerful force in global manufacturing has shown that it is possible for new entrants to succeed. However, there may be little room for new entrants into global manufacturing because East Asia is firmly established and able to reap economies of scale from its clusters while still having low wages. China has established large clusters of manufacturing, and its wage levels are still far below those of OECD countries.

There are three reasons for thinking that the future is less bleak than this suggests: rising costs in China, trade in tasks and supportive policies by the developed countries. The Chinese economy is growing so rapidly that it is likely to encounter rising costs in manufacturing production. One source of rising costs will be the labour market, which will inevitably tighten. Further, Chinese manufacturing faces other sources of rising costs, such as urban congestion and environmental pressure. Even if current cost comparisons favour China, firms may explore relocation to countries in which costs are likely to be low for a longer horizon. The second reason for optimism is the trend in trade in tasks. At present, trade in tasks tends to be concentrated in East Asia, where international networks of integrated production have developed. The challenge facing the countries of the bottom billion is to insert themselves into these networked production processes. The third reason for optimism is that, if indeed trade in tasks brings some of the countries of the bottom billion within reach of becoming globally competitive, there is scope for developed countries to be supportive through their trade and aid policies.

The slow-growing middle-income countries face a different, but equally daunting, challenge. Since 1975, they have lost employment and production shares in global manufacturing and they stand out for how little their production structures have changed over the past 30 years. Indeed, the few changes that have taken place have probably retarded their growth. The slow-growing middle-income countries lost their global production share to better performing middle-income countries in high- and medium-sophistication products, to China and India in medium-sophistication sectors, and globally in unsophisticated products. Since 1990, they have shown virtually no export dynamism.

The failure of the slow-growing middle-income countries has been their inability to adapt to rapid change in the global marketplace. The failure to move decisively towards trade in tasks explains at least part of the increasing concentration of production and exports in the slow-growing middle-income countries. Dynamic low-income countries have picked up the bulk of trade in tasks in low-sophistication intermediate goods, while the fast-growing middle- and high-income countries have made inroads in the high-technology sectors.

Two global trends—the prospects for an eventual recovery of the recent resource boom and the growing importance of time in trade—offer opportunities to relieve pressure on the middle. The slow-growing middle-income countries have an industrial competence base, thanks to their more diversified and spatially dense industrial structures. They also have the opportunity to learn from their fast-growing middle-income counterparts. Whether they succeed in reversing the trend towards specialization in the production of mid-range products and are able to restore export dynamism will depend to a large extent on the policy choices they make. The next chapter turns to policy choices.

Section III
What policies are appropriate?

Chapter 6
Industrial and trade policies for manufacturing in developing countries

This chapter focuses on how governments of developing countries that are not rich in natural resources can promote industrialization. It is mainly concerned with how the two groups of countries that have been identified as running the highest risk of marginalization in global manufacturing—the countries of the bottom billion and the slow-growing middle-income countries—can accelerate their industrial growth. The report takes up the special case of resource exporters in the next chapter.

There is extensive literature on the investment climate in developing countries and the need for reductions in the cost of doing business.[26] This is, of course, central to the success of any industrialization strategy. Policies and institutions matter. Private investors shun high-risk, high-cost environments. Many of the countries that have failed to industrialize, and many of those under increasing pressure, have an unfinished agenda of economy-wide reforms that will need to be pursued if they are to gain ground in attracting both domestic and foreign investors.

The analysis in the preceding three chapters strongly suggests, however, that, while necessary, an improved business climate may not be sufficient to spark dynamic industrial growth. This chapter focuses mainly on other aspects of public policy towards industry, those arising from the structural analysis. Costs of production can be reduced and opportunities for trade enhanced by appropriate infrastructure; this is the theme of section 6.1. However, as discussed in Chapter 3, costs also depend on whether firms are clustered together: agglomerations reduce costs and limit entry of latecomers. Hence, a second dimension of policy to promote manufacturing is spurring the coordination of location decisions. Section 6.2 takes up policies to promote industrial clustering. One striking contrast between China and India, on the one hand, and latecomers to manufacturing, on the other, is their size. Because many latecomers are very small countries, the regional coordination of policy to promote manufacturing assumes much greater importance. To date, however, regional integration schemes among countries of the bottom billion have fallen short of the depth needed to achieve competitive advantage in industry. The types of integration needed are discussed in section 6.3.

6.1. Infrastructure for industry and trade

Investments in infrastructure are an important complement to industrialization. This section takes a broad look at the infrastructure challenges faced by low- and middle-income countries in the course of industrialization and offers some suggestions for policy initiatives to strengthen the role of infrastructure in industrial development. Firstly, section A addresses the issue of closing the infrastructure gap in low-income countries, then section B looks at the special case of trade logistics.

26 See, for example World Bank (2004) or Schwab and Porter (2008).

Box 6.1 New thinking about the role of the State

Opportunities stemming from the rapidly changing global industrial landscape provide no guarantees for economic prosperity. Formulating the responses needed to convert opportunities into sources of wealth creation is a process that requires both the private and public sectors. The recently published report of the independent Commission on Growth and Development (World Bank, 2008b)—chaired by Nobel Prize-winning economist Michael Spence—argues that government and the private sector both have critical roles to play in boosting growth in developing countries.

In the past, economists believed the developing world was full of market failures and the only way in which poor countries could escape the poverty traps was through forceful government intervention. Later, economists started to believe government failure was, by far, the bigger evil, and that the best thing that governments could do was to give up any pretence of steering the economy. Reality has not been kind to either set of ideas. Import substitution, planning and State ownership produced some successes, but where they got entrenched and ossified over time, they led to colossal failures and crises. Economic liberalization and opening up benefited export activities, financial interests and skilled workers, but more often than not they resulted in economy-wide growth rates (in output and productivity) that fell far short of those expected.

Few people seriously believe any more that State planning and public investment can alone act as the driving forces of economic development. Even economists of the left share a healthy respect for the power of market forces and private initiative. At the same time, it is increasingly recognized that developing societies need to embed private initiative in a framework of public action that encourages restructuring, diversification and technological dynamism beyond what market forces on their own would generate. Perhaps not surprisingly, this recognition is now particularly evident in those parts of the world where market-oriented reforms were taken the farthest and the disappointment with the outcome is correspondingly the greatest.

The world is now confronted with a rare historic opportunity. The softening of convictions on both sides presents an opening to fashion an agenda for economic policies and public actions that take an intelligent intermediate stand between the two extremes cited above. Market forces and private entrepreneurship must continue to be in the driver's seat of this agenda, but governments must also perform a strategic and coordinating role in the productive sphere beyond simply ensuring property rights, contract enforcement and macroeconomic stability.

Source: World Bank (2008b) and UNIDO (2004).

A. Closing the infrastructure gap in low-income countries

Industry depends on infrastructure. Surveys of business in low-income countries consistently rank lack of access to, and poor quality of, infrastructure as one of the major constraints to private investment in manufacturing.

Industry depends on infrastructure. Surveys of business in low-income countries consistently rank lack of access to, and poor quality of, infrastructure as one of the major constraints to private investment in manufacturing.[27] Power supply, water, transport and communications infrastructure are of particular relevance for industrial development. With the exception of cellular telecommunications, low-income countries lack most forms of infrastructure. Africa, especially, lags badly behind other regions in terms of the quality and coverage of its basic infrastructure, but South Asia also suffers from an infrastructure gap with the rest of the developing world (World Bank, 2007b).

As argued in the next section, part of the effort to close the infrastructure gap in low-income countries can be addressed by focusing investments on limited geographical areas, such as EPZs, but this spatial concentration of investment cannot support broader, economy-wide growth in manufacturing, nor is it necessarily appropriate for fast-growing low-income countries, where industrial clusters are as likely to form outside EPZs as in them. Closing the broader infrastructure gap in low-income countries will need three related policy initiatives—changing the priorities of public expenditures, using the private sector, and dealing with donors.

Changing public expenditures

Fast-growing low- and middle-income countries spend a great deal on infrastructure. In China, Thailand and Viet Nam, total (public plus private) infrastructure investment exceeds 7 per cent of GDP. For the other fast-growing countries in Asia, infrastructure investment is between 5 and 7 per cent of national income. In Chile and Colombia, the total infrastructure investment rate is some 5 to 6 per cent of GDP, and India invests some 4 to 5 per cent of its GDP in infrastructure. While data are very scarce, evidence suggests that in most low-income countries the total investment rate in infrastructure hovers around 2 to 3 per cent of GDP (World Bank, 2008b).

Low-income countries—except perhaps the resource-rich countries—are invariably fiscally constrained. This means that any increases in the allocation

27 See, for example, the World Bank's Doing Business reports.

of the budget to infrastructure must come at the expense of other important claims, such as the human development objectives embodied in the MDGs.

Changing public expenditure priorities to increase the share of the budget devoted to infrastructure investments is urgently needed in most low-income countries. However, it will be difficult to implement both domestically, because it involves stark trade-offs between growth and social development objectives, and internationally, because—at least until very recently—the donor community had little interest in supporting investments in infrastructure.

Reallocation is important, but given the magnitude of their infrastructure deficit, low-income countries will need to raise more public and private resources to invest in infrastructure. Raising more public resources for infrastructure investment depends on increasing tax efforts, focusing on the future and improving quality. Tax efforts in many low-income countries fall below international norms. Thus, there is substantial scope for raising additional revenue, often without increasing tax rates, by better tax administration. If improvements in tax administration are linked to rising public expenditures in infrastructure, there is a possibility of mobilizing support from the business community for the reform effort. Road funds are an example of this sort of earmarking and have often proved successful.

Often claims on the budget sacrifice the long term for the short run. Wages and salaries are, by far, the largest component of public expenditure in most low-income countries. The lack of good governance also takes its toll. Compressing these current expenditures to provide space for investment is both possible and desirable in many countries.

Finally, the quality of investment is important. At the broadest level, it is important to ensure that investment outcomes in infrastructure are consistent with investment efforts. If the relative price of capital goods—in particular construction services—is well above global norms, investment efforts in building infrastructure are eroded by high unit costs. Once infrastructure is built, quality of service, including adequate maintenance, is critical.

Using the private sector

The role of the private sector in infrastructure in low-income countries is a subject fraught with ideology, mythology and controversy. The plain truth is that low-income countries will find it impossible to meet their infrastructure needs without private investment, and they will be unlikely to meet the desired quality of service standards without private participation. Allowing new competition into infrastructure provision, thereby breaking public monopolies, may be important and politically less difficult than complete privatization. For example, mobile telephone services are sometimes still a public monopoly although there are no technological barriers to having multiple providers. In fast-growing low- and middle-income countries, private investment in infrastructure is approximately half of total infrastructure investment.

Box 6.2 The extent of private sector investment in infrastructure in Africa

Among low-income countries, Africa has been slow to mobilize the private sector for the provision and financing of infrastructure. The Infrastructure Consortium for Africa recently reported an upward trend in private infrastructure investment in Africa, from $4 billion in 2004 to $6 billion in 2006. Compared with the continent's estimated investment requirement of nearly $20 billion per year, however, private investment remains insufficient. Most private flows (84 per cent) have gone to telecommunications and energy. Better progress seems to be taking place in the private operation of infrastructure. Concessions have been awarded to operate and rehabilitate many African ports and railways and some power distribution enterprises, but financial commitments by the concessionaire companies are often small.

Source: World Bank (2007b).

Dealing with donors

For many countries of the bottom billion—especially in Africa—the donor community forms an important interest group that influences the composition of public expenditure. Until recently, donors and, in particular, bilateral aid agencies focused almost exclusively on the human development objectives represented by the MDGs. Early "Poverty Reduction Strategy Papers", the centrepiece of the aid architecture in low-income countries, seldom focused on growth, industrial development and infrastructure. Under the debt relief initiative for highly indebted low-income countries, those countries receiving debt relief were required to increase budgetary provisions for education and health. Budget increases for investment in physical infrastructure were generally not allowed.

The second generation of Poverty Reduction Strategy Papers places greater emphasis on growth and investment in physical infrastructure, but many donors remain reluctant to provide development assistance for infrastructure projects. Even where bilateral donors have supported such investments, they tend to be in "poverty-reducing" infrastructure, such as rural roads and irrigation.

Clearly, low-income countries interested in competing globally will need to reach new understanding with their development partners on the relevance of basic infrastructure to growth and poverty reduction. There are some encouraging signs of movement in this direction. Japan has consistently supported infrastructure in low-income countries and, more recently, the United Kingdom's Department for International Development has launched a growth initiative. Never-

theless, the volume of aid to low-income countries has not kept pace with either the new interest in growth or the commitments made by the Group of Eight at their meeting in Gleneagles in 2005 to double their development assistance to low-income countries. Without more aid, the slow-growing low-income countries will find it difficult to meet their infrastructure needs, even if donors are convinced of their merit. This topic is discussed in Chapter 8.

B. Meeting the challenge of trade logistics

Trade logistics are an important determinant of global competitiveness. As seen in Chapters 3 and 4, declining transport costs, agglomeration and economies of scale have interacted to produce the far-reaching changes in trade flows observed in the past 30 years. Popular wisdom ascribes the fall in transport costs to declining international costs of freight. While this is true, it is only a part of the trade logistics story.

Falling long-term transport costs have reduced trade costs. Freight costs have halved since the mid-1970s, driven by investments in transport infrastructure, better use of capacity and technological progress (Krueger, 2006). The most significant reductions in freight rates have been witnessed in road and air transport, however. Ocean freight rates have declined relatively little since the 1980s.

As international transport costs have declined, other aspects of "trade logistics" costs—customs, port handling, internal transport and distribution—have gained increasing importance.

As international transport costs have declined, other aspects of "trade logistics" costs—customs, port handling, internal transport and distribution—have gained increasing importance. For example, containerization has reduced the cost of transit on ocean shipping legs, but increased the fixed costs of port handling facilities and generated substantial port-level economies of scale. These other elements of "trade friction"—the difference between the free-on-board and delivery price of an export, expressed as the equivalent of an ad valorem tax—now make up a larger share of the cost of delivering an export to the customer than transport costs. In developed countries, transport costs increase the delivery cost of traded goods by some 20 per cent of their total value. At the border, trade costs raise delivery costs by 45 per cent (Anderson and Van Wincoop, 2004). In developing countries, the cost penalties associated with trade friction are even larger.

Trade in tasks has amplified the importance of trade logistics. Increases in the logistics costs for intermediates raise the cost of the final product, and in task-based production, high shares of intermediates in final output mean that the effect of changes in transport costs is magnified. Countries at the final stages in the production chain of a task-traded good are unlikely to be competitive if their own trade logistics costs on imported intermediates are high. Moreover, countries hoping to enter upstream in a global value chain cannot afford to have high trade friction costs for their exports. Beyond cost, timeliness and the predictability and reliability of supply chains are increasingly important in a world of just-in-time production-sharing.

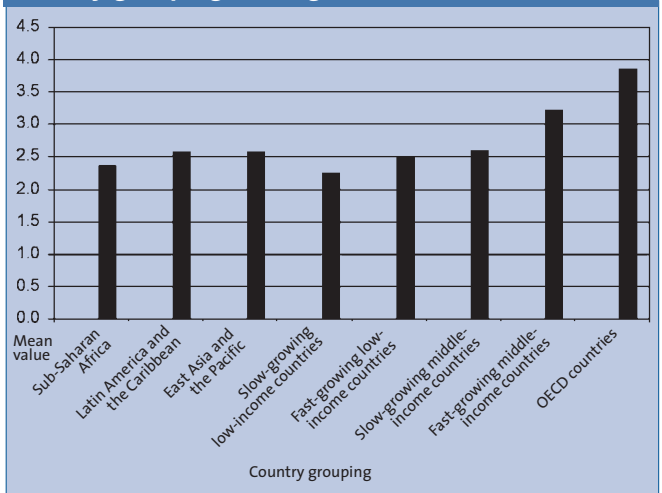
Trade logistics and export success

The World Bank (2007c) has recently developed a logistics performance index that provides an assessment of the trade logistics performance of 150 countries. In the words of the World Bank:

> "Drawing on the first-hand knowledge of logistics professionals worldwide, it provides a comprehensive picture of supply chain performance—from customs procedures, logistics costs, and infrastructure quality to the ability to track and trace shipments, timeliness in reaching destination, and the competence of the domestic logistics industry."

The logistics performance index shows significant differences in mean logistics performance across regions and country groupings. Not surprisingly, OECD countries and fast-growing middle-income countries head the league table of logistics performance. At the other extreme are slow-growing low-income and sub-Saharan-African countries (Figure 6.1).

Figure 6.1 Mean logistics performance index, country grouping and region, 2007



Source: Mean values computed from World Bank (2007c).

Table 6.1 shows significant differences among developing countries at similar income levels. Malaysia (27), Chile (32) and Turkey (34) score well among fast-growing middle-income countries. China (30), Thailand (31) and India (39) rank high among fast-growing low-income countries.

Table 6.1 Logistics performance index, 2007

Country or territory	Rank	Score	Country or territory	Rank	Score	Country or territory	Rank	Score
Singapore	1	4.19	Romania	51	2.91	Senegal	101	2.37
Netherlands	2	4.18	Jordan	52	2.89	Côte d'Ivoire	102	2.36
Germany	3	4.10	Viet Nam	53	2.89	Kyrgyzstan	103	2.36
Sweden	4	4.08	Panama	54	2.89	Ethiopia	104	2.33
Austria	5	4.06	Bulgaria	55	2.87	Liberia	105	2.31
Japan	6	4.02	Mexico	56	2.87	Republic of Moldova	106	2.31
Switzerland	7	4.02	Sao Tome and Principe	57	2.86	Bolivia	107	2.31
Hong Kong Special Administrative Region of China	8	4.00	Lithuania	58	2.78	Lesotho	108	2.30
United Kingdom of Great Britain and Northern Ireland	9	3.99	Peru	59	2.77	Mali	109	2.29
Canada	10	3.92	Tunisia	60	2.76	Mozambique	110	2.29
Ireland	11	3.91	Brazil	61	2.75	Azerbaijan	111	2.29
Belgium	12	3.89	Guinea	62	2.71	Yemen	112	2.29
Denmark	13	3.86	Croatia	63	2.71	Burundi	113	2.29
United States of America	14	3.84	Sudan	64	2.71	Zimbabwe	114	2.29
Finland	15	3.82	Philippines	65	2.69	Serbia and Montenegro	115	2.28
Norway	16	3.81	El Salvador	66	2.66	Guinea-Bissau	116	2.28
Australia	17	3.79	Mauritania	67	2.63	Lao People's Democratic Republic	117	2.25
France	18	3.78	Pakistan	68	2.62	Jamaica	118	2.25
New Zealand	19	3.75	Venezuela (Bolivarian Republic of)	69	2.62	Togo	119	2.25
United Arab Emirates	20	3.73	Ecuador	70	2.60	Madagascar	120	2.24
Taiwan Province of China	21	3.64	Paraguay	71	2.57	Burkina Faso	121	2.24
Italy	22	3.58	Costa Rica	72	2.55	Nicaragua	122	2.21
Luxembourg	23	3.54	Ukraine	73	2.55	Haiti	123	2.21
South Africa	24	3.53	Belarus	74	2.53	Eritrea	124	2.19
Republic of Korea	25	3.52	Guatemala	75	2.53	Ghana	125	2.16
Spain	26	3.52	Kenya	76	2.52	Namibia	126	2.16
Malaysia	27	3.48	Gambia	77	2.52	Somalia	127	2.16
Portugal	28	3.38	Iran (Islamic Republic of)	78	2.51	Bhutan	128	2.16
Greece	29	3.36	Uruguay	79	2.51	Uzbekistan	129	2.16
China	30	3.32	Honduras	80	2.50	Nepal	130	2.14
Thailand	31	3.31	Cambodia	81	2.50	Armenia	131	2.14
Chile	32	3.25	Colombia	82	2.50	Mauritius	132	2.13
Israel	33	3.21	Uganda	83	2.49	Kazakhstan	133	2.12
Turkey	34	3.15	Cameroon	84	2.49	Gabon	134	2.10
Hungary	35	3.15	Comoros	85	2.48	Syrian Arab Republic	135	2.09
Bahrain	36	3.15	Angola	86	2.48	Mongolia	136	2.08
Slovenia	37	3.14	Bangladesh	87	2.47	United Republic of Tanzania	137	2.08
Czech Republic	38	3.13	Bosnia and Herzegovina	88	2.46	Solomon Islands	138	2.08
India	39	3.07	Benin	89	2.45	Albania	139	2.08
Poland	40	3.04	The former Yugoslav Republic of Macedonia	90	2.43	Algeria	140	2.06
Saudi Arabia	41	3.02	Malawi	91	2.42	Guyana	141	2.06
Latvia	42	3.02	Sri Lanka	92	2.40	Chad	142	1.98
Indonesia	43	3.01	Nigeria	93	2.40	Niger	143	1.97
Kuwait	44	2.99	Morocco	94	2.38	Sierra Leone	144	1.95
Argentina	45	2.98	Papua New Guinea	95	2.38	Djibouti	145	1.94
Qatar	46	2.98	Dominican Republic	96	2.38	Tajikistan	146	1.93
Estonia	47	2.96	Egypt	97	2.37	Myanmar	147	1.86
Oman	48	2.92	Lebanon	98	2.37	Rwanda	148	1.77
Cyprus	49	2.92	Russian Federation	99	2.37	Timor-Leste	149	1.71
Slovakia	50	2.92	Zambia	100	2.37	Afghanistan	150	1.21

Source: World Bank (2007c).

Landlocked low-income countries, especially in Africa, score the worst. They suffer from high transport costs and delays, and depend on the performance of other countries for access to markets. They also have limited access to competitive markets for logistics services. Significant differences occur even among landlocked countries in Africa. In East Africa, Uganda, Malawi and Zambia are, in order, among the top 15 performers from the 39 sub-Saharan African countries. Each is served by a fairly efficient logistics industry operating in a reasonably competitive environment. Landlocked countries in West Africa score lower on the index, owing largely to lack of competition and excessive regulation of service providers.

There is a strong correlation between success in trade logistics and industrial competitiveness. The rank correlation between country scores on the CIP index developed in Chapter 11 and the logistics performance index is 0.87, significant at the 95 per cent level. Better trade logistics are thus shown to be strongly associated with competitive industrial performance.

Improving trade logistics

While infrastructure is important for trade logistics, interviews with importers and exporters conducted to construct the logistics performance index suggest that, in particular in middle-income countries, institutions and the regulatory environment are equally important. The surveys indicate that for countries in the best three quintiles of the ranking—largely upper- and middle-income countries—constraints imposed by communications and IT infrastructure are the least binding. Physical infrastructure related to trade is viewed as a mild to moderate constraint.

While infrastructure is important for trade logistics, interviews with importers and exporters suggest that, in particular in middle-income countries, institutions and the regulatory environment are equally important.

Customs itself is also not regarded as a significant factor for the better performing quintiles, but ranks as a mild to moderate concern for countries in the bottom two quintiles of the performance distribution. Other border procedures, on the other hand, emerge as a significant constraint in virtually all developing countries. Respondents noted that even where countries had implemented a customs modernization programme, the coordination of border procedures between customs and other agencies (responsible, say, for health and safety standards) remained an important constraint.

These surveys indicate that trade logistics reforms in middle-income and fast-growing low-income countries need to move beyond the traditional "trade facilitation" agenda focused on trade-related infrastructure and IT in customs. There are strong synergies between infrastructure improvements and reforms to customs, border management and transport regulations. Reform of logistics service markets and improved coordination of public agencies active in border control emerge high on the agenda for reform in the view of the logistics industry (World Bank, 2007c). For landlocked countries, both the physical and institutional constraints to efficient logistics are compounded by the need to depend on neighbouring countries for access to markets. Effective regional integration arrangements that focus on lowering trade friction for member countries, especially landlocked countries, are essential for enabling those countries to compete in the global market.

C. The transformative role of information technology

IT and IT-enabled services (ITES) have played a very special role in the resurgence of the Indian economy. When wide-ranging economic reforms were introduced in the 1990s, opening the Indian economy to foreign trade and investment, these sectors were the first to respond to opportunities presented by the external economic environment. Export revenues of IT and ITES increased by 32 per cent per annum during the periods 2001-2002 and 2006-2007. India currently accounts for 65 per cent of the global market in offshore IT and 46 per cent in ITES. These services include IT software and technology-related services, R&D and engineering services, consulting services, system integration, application development and maintenance, traditional IT outsourcing and horizontal services, such as finance accounting, administration and so on.

Initially, IT and ITES growth was spurred almost entirely by global demand, with relatively little penetration into the domestic economy, which meant that while IT contributed directly to the growth of GDP and also to employment, it did little to improve productivity domestically. More recently, there is evidence that this sector is making inroads into the Indian economy as domestic firms seek cost-cutting and productivity-enhancing solutions to attain global competitiveness. Many service providers have emerged that focus solely on the domestic market, encouraged by the combination of declining prices of computers and increasingly affordable access to the internet. The business process outsourcing demand in the domestic market has grown very rapidly, albeit from a low base, recording a compound growth rate of over 50 per cent per annum over the past five years.

Financial services, manufacturing, telecommunications, other infrastructure, retail and even government are key sectors driving domestic demand for IT. In sectors such as pharmaceuticals and biotechnology, the increase in IT spending as a percentage of revenue was almost fivefold, from 0.15 to 0.72, while the automobiles

and automotive-components sectors recorded a more than threefold increase in their IT spending as a percentage of revenue, from 0.11 to 0.39.

A recent survey of 158 (small, medium and large) firms in the automotive-components industry by the National Association of Software and Service Companies reveals that there is tremendous scope for the adoption of IT and its alignment with critical business processes in the small and medium sector of this industry. In the small-scale sector, increasing emphasis is being placed on enterprise resource planning, the full benefits of which will accrue when the shop-floor is linked to the back-office systems. The reliability of electricity supply is an important consideration in a small-scale unit's decision to adopt IT in its business process.

The nature of IT services in India is changing from deployment and maintenance-related services to more integration- and consulting-related services. Increasingly, the corporate sector in India is adopting total IT outsourcing solutions and custom software development. Some examples provided in the National Association of Software and Service Companies' Review include the wireless telephone company Idea Cellular Ltd. (which has entered into a ten-year business transformation outsourcing arrangement to integrate, innovate and transform its business processes and IT infrastructure), the real estate company DLF Ltd. (to transform and manage its IT infrastructure), the Central Board of Direct Taxes (a five-year service agreement to modernize its IT infrastructure), and Delhi International Airport (to modernize business processes to meet the demand of burgeoning air traffic).

An important factor driving the manufacturing sector towards IT in India is the introduction of e-governance to reduce costs and increase the transparency of doing business with government. A National e-Governance Action Plan has evolved, which lays out a comprehensive agenda for modernizing the business-to-government and citizen-to-government interface. The modernization of the business-to-government processes includes the compulsory e-filing of tax returns for firms with a turnover of more than 4 million Indian rupees, the compulsory electronic payment of income tax through commercial banks, a facility for e-filing of income tax returns for individuals, and a simplification of the application process for permanent account numbers through the use of IT. The growing use of value added tax is also stimulating the manufacturing sector to adopt IT processes in managing their sales accounts. State governments are also facilitating payments of utility bills and obtaining certificates of land title electronically. It is also proposed to create a unique corporate identification number (CIN) in government-to-business domains, which will be used by all departments for the identification of a business entity. This number already functions as a unique identifier of a company, and all available services from the Ministry of Corporate Affairs, including filing of documents, registration of companies and access to corporate information, are provided through a secure portal with the help of secured electronic filing through e-forms.

The expanded use of IT in business is being supported by enlarging the infrastructure of e-governance being put in place by the Government of India. A fibre-optic network to provide broad-band connectivity to the block level is being established as the backbone. It is proposed to open 100,000 common service centres in villages, which will provide Internet connectivity, including access to e-governance services through kiosks, and will be operated by private individuals who will charge a fee for their use.

A significant development in the Indian economy in the past ten years has been a proliferation in the captive industrial R&D centres of transnational corporations. Initially, these may have been lured by the IT prowess of Bangalore, but are in fact engaged in hard-core research for the industrial sector, for example, research in applied materials, light-emitting diodes (LED) for energy conservation and so on. There are 750 such R&D centres in and around Bangalore, and these building blocks of innovation provide a strong knowledge base for Indian manufacturing that will have a sustained long-term impact on the productivity of the Indian manufacturing sector.

6.2. Supporting industrial agglomerations

Dynamic industrial clusters have been important drivers of industrial development and export growth in a wide range of low- and middle-income countries. A natural question that arises from this is whether governments can spur industrial growth and improve competitiveness through public policies specifically aimed at influencing industrial location.

The idea of spatial industrial policies may be particularly attractive for slow-growing low- and middle-income countries. These countries are coming under increasing pressure from the bottom, as the fast-growing low-income countries rapidly increase their shares of global production and exports of low-technology manufactured goods, and from the top, as the fast-growing middle-income countries move into production and export of high-technology manufactures. For lagging low-income countries—such as those in Africa—the relevant question is whether supporting industrial agglomerations can help them break into global markets. For the slow-growing middle-income countries—such as those in Latin America—it is whether industrial clusters can help improve the productivity of industry and stop the

erosion of their relative position in global manufacturing trade.

Agglomerations are the outcome of decisions by individual firms to locate close to each other. Locating close to other industrial producers raises the productivity of firms through such mechanisms as knowledge and pecuniary externalities, economies of scale and better coordination. The formation of cities or the spatial concentration of closely related industries is a response to these economic incentives. This suggests that policymakers need to be very careful not to distort these incentives when designing spatial policies to promote industrial development. Agglomeration is a market-driven process. Public policies need to work with the market, not against it.

Agglomerations are the outcome of decisions by individual firms to locate near each other. Agglomeration is a market-driven process and public policies need to work with the market, not against it.

Governments in developing countries, however, are already engaged in designing and implementing policies that affect industrial location. The most basic of these are public expenditure policies that affect the location of physical infrastructure. It was also seen that in each of the ten dynamic industrial clusters studied in Chapter 3 some government action contributed to the formation or growth of the cluster. The nature of public engagement in the clusters varied considerably, ranging from a very prominent investment and coordination role played by the national and local governments in Malaysia's electrical-electronics cluster, through a knowledge-based public-private partnership in Chile's salmon cluster, to policy and institutional direction in India's leather cluster. The proliferation of SEZs worldwide is also a form of spatial industrial policy. The question for developing countries is not whether spatial industrial policies are necessary, but what types of policies are most appropriate. The next two sections first explore the role of SEZs as instruments for fostering industrial agglomerations and then set out some suggestions for spatial industrial policies in low- and middle-income countries, some of which involve the use of SEZs as instruments.

A. Special economic zones

SEZs—the most common example of which are EPZs—combine trade and spatial policies. The early motivation for SEZs was to provide a so-called "free trade environment" for exporters and to attract outward-oriented foreign investors. Most of the literature on them, therefore, has focused on their role as a substitute for, or complement to, trade liberalization. The spatial dimension of SEZs was recognized only recently with the rediscovery of economic geography.

In assessing the spatial dimensions of SEZs, it is important not to confuse their potential role in industrial development with trade policy objectives. It is possible to have a free trade environment for exporters without having them located close to each other, through such mechanisms as bonded warehouses, duty draw-back and temporary admissions schemes, or comprehensive trade liberalization. It is also possible to encourage industrial agglomerations without providing a special trade regime.

Box 6.3 Export processing zones and export promotion: A mixed record

The debate on the merits of EPZs as tools for export promotion and trade policy reform has gone on for at least three decades. The consensus view is, in the words of Jenkins, Esquivel and Larraín (1998):

"EPZs are a second-best policy, whose welfare implications are often ambiguous ... In developing countries with relatively high levels of unemployment, EPZs might represent an efficient mechanism for reducing the economic and social burden of large pools of unemployed people."

Most cost-benefit analyses of the performance of EPZs (Jayanthakumaran, 2003; Warr, 1987, 1989, 1993) conclude that they are of marginal value as export promotion tools. From the point of view of spatial industrial policy, the main drawback to these studies is the lack of adequate data on agglomeration economies.

Source: UNIDO.

SEZs encompass a much wider range of agglomerations than just EPZs. In the broadest sense, they are any specific geographical areas that are granted a separate trade and incentive regime. They may encompass, for example, free trade zones, industrial estates, free ports, urban enterprise zones and a few business incubators or industrial clusters. The emphasis here is not so much on the title given to such agglomerations, but rather on the nature of the regulatory or incentive regime that is established in them.

Special economic zones and industrial development

When analysts examined the industrial development aspects of SEZs, they tended to focus on linkages, knowledge and skills. Johansson (1994) was an early proponent of the view that they could offer externalities from knowledge transfers. He argues that locating near successful transnational and local exporting firms offers other local firms:

- Opportunities to develop the "capacity to package" technical, marketing and managerial knowledge for exports
- Access to international distribution channels that they are unable to develop on their own

- Reputational links to established transnational corporations with wide international business dealings that facilitate entry into international markets

These insights are strongly supported by the case study histories of the extremely export-oriented clusters in Cambodia, Chile, China and Malaysia. Fostering linkages was very much the philosophy behind the public policies underpinning Penang's EPZ.

The labour markets of SEZs appear to boost skill formation. Madani (1999), in her review of the EPZ literature, argues that EPZs have contributed to the development of human capital, through skill acquisition by workers and through the development of local managerial and supervisory skills. She also notes that EPZs typically employ a large proportion of female workers. Thus they play an important role in women's economic empowerment by bringing women into the formal labour market. Once again the case studies of dynamic industrial clusters find similar evidence of skill formation.

This evidence suggests that successful SEZs may be more relevant as spatial tools for industrial development than as tools of trade policy reform. Here, the main benefit of an SEZ as a tool of spatial industrial policy is that it provides a clear focus for government investments and institutional reforms designed to encourage the location of firms in a specific geographical area. An EPZ is further subject to an efficiency test. Firms located in the agglomeration must be able to export. This straightforward performance criterion is important because the export rule acts as a screening device to limit the entry of inefficient firms in the cluster and to identify spatial policies that run counter to market incentives.

An EPZ provides a clear focus for government investments and institutional reforms designed to encourage the location of firms in a specific geographical area. It is also subject to an efficiency test. Firms located in the agglomeration must be able to export.

Spatial thinking about SEZs started in the wrong direction. Policymakers tended to want the zones to be geographically dispersed and isolated from the rest of the industrial economy. Many early SEZs were designed explicitly to promote decentralized industrial development—away from urban centres—to encourage job creation in rural areas and to reduce rural-urban migration. SEZs attracted few firms into such environments. "Closed" zones—physically separated from the rest of the economy to facilitate enforcement of the free trade regime—failed to deliver the benefits of indirect learning by exporting. Now, the consensus is to locate SEZs near or in urban industrial areas and close to airports and sea ports. Such locations offer thicker labour markets and better infrastructure, and may also facilitate spillover effects.

What makes a special economic zone successful?

SEZs are big business. In 2006, 66 million workers were employed in 3,500 EPZs worldwide (Table 6.2). The number of countries in which such zones are located grew from 25 in 1975 to 130 in 2006, and employment in the zones nearly tripled in less than a decade.

Table 6.2 Export-processing zones, selected years

Year	1975	1986	1997	2002	2006
Number of countries with EPZs	25	47	93	116	130
Number of EPZs	79	176	845	3,000	3,500
Employment (millions)	n.a.	n.a.	22.5	43	66
of which China	n.a.	n.a.	18	30	40

Source: ILO database on EPZs, 2007.
Note: n.a. means not available.

Despite their rapid growth, many of the 3,500 EPZs around the world are dysfunctional. They fail to attract a sufficient number of firms to realize cluster economies and, in many cases, offer excessive subsidies to the few firms that they succeed in attracting. From case studies of the success and failure of SEZs, three elements emerge as critical to their success: infrastructure, management and institutions.

Many of the 3,500 EPZs around the world are dysfunctional. They fail to attract a sufficient number of firms to realize cluster economies and, in many cases, they offer excessive subsidies to the few firms that they succeed in attracting.

A steady supply of electricity and water and excellent international communications capacity are keys to attracting investors. In the majority of successful SEZs, governments invested in the improvement of roads, ports and airports near the zone location. Infrastructure played a critical role in attracting major transnational corporations to the cluster of Penang. The Dominican Republic developed excellent air, sea and road transport infrastructure in support of its EPZs. Mauritius also has excellent port and airport facilities, and China has invested heavily in basic infrastructure in its SEZs.

The success of the Penang cluster is a reminder that the concept of infrastructure must be broad enough to include critical social services in health and education. These facilitate the development of a thick labour market and attract foreign (and domestic) investors to locate in the zone. In some cases, governments have underwritten part of the cost of labour training.

Management of SEZs must respond to the needs of enterprises that locate there. Often, especially in low-income countries, SEZs have been designed and run by bureaucrats who have no experience in business. Delays are common and service levels are low, leading to client frustration and losses. Communication between clients and public managers is often strained and, in some cases, the lack of governance further erodes business confidence. There are some exceptions. Singapore used EPZs in its early industrial development and managed them and much of its economy successfully. EPZ management in Mauritius is essentially public, but managers have made a point of listening and responding to the requirements of their clients. The Chamber of Commerce has also played a key role in communications between EPZ clients and zone management.

In the Dominican Republic—and in much of Central America and the Caribbean—SEZ management is private and has responded well in terms of providing facilities and services. In general, where the public sector has a poor track record of providing facilities and services, governments should turn to private management, either through concessions for the development and management of the SEZ, as in the Dominican Republic, or by contracting out management.

Whatever the form of management, governments set the legal and administrative framework for a zone and usually provide services, such as customs and regulatory oversight. Hence, governance matters. The case study literature on SEZs is unanimous that effective public institutions are critical to success. Efficient bureaucratic services, such as customs, are essential. Surveys also indicate that a clear and transparent legal and regulatory structure, a stable policy framework and non-preferential treatment of investors matter a great deal to decisions taken to locate in a zone.

B. Spatial policies for industrial development

Chapter 3 presented evidence that the nature of agglomeration economies apparently changes with the level of development and technological sophistication of an industry. Firms in low-income countries seem to benefit strongly from being located near other unrelated firms but, as in the case of Ethiopia, may not benefit from proximity to firms in the same sector. In middle-income countries, there is evidence of positive cluster effects arising mainly from proximity to closely related firms. Generalized "urbanization" externalities from unrelated activities may predominate in middle- and high-income countries. Higher-technology activities seem to have stronger tendencies to agglomerate than lower-technology activities, and may thus benefit more from proximity to unrelated firms. In low- and medium-technology activities, there is good evidence, at least in middle- and high-income countries, indicating that locating to closely related firms raises productivity.

Since the nature of agglomeration economies seemingly changes with levels of development and technical sophistication of production, it is very likely that the types of policy needed to promote industrial agglomerations and their benefits will change as well. However, since the evidence on the sources of agglomeration economies in developing countries is quite slim, especially in low-income countries, efforts to support existing clusters or to create specific new types of agglomeration may not yield the anticipated results. Recognizing that risk, it is still useful to try to set out the range of spatial industrial policies that may be appropriate for the four categories of countries described in Chapters 2 and 4: fast- and slow-growing low- and middle-income countries.

Since the nature of agglomeration economies seemingly changes with levels of development and the technical sophistication of production, it is very likely that the types of policy needed to promote industrial agglomerations and their benefits will change as well.

Spatial policies in low-income countries

Can clusters help low-income slow growers? The limited evidence suggests the answer is yes, provided they are linked to exports. The slow-growing low-income countries may be those in which export-oriented SEZs offer the greatest potential benefits. The econometric evidence from Ethiopia and the case studies of dynamic low-income industrial clusters both suggest that, at low levels of industrialization, firms may benefit substantially from locating near other manufacturing enterprises, regardless of what they produce. This is a market-driven phenomenon and by itself not an argument for policy intervention. In fact, the most important policy tool to help realize these externalities may be to get rid of urban zoning and land use policies that make it costly or impossible for firms to locate close to each other.

However, given the low level of industrial export dynamism in slow-growing low-income countries, linking export promotion and spatial policies through effective SEZs may offer substantial benefits. This may be equally true for clusters that already exist in those countries, as well as for the creation of new agglomerations. Locations where the right mix of infrastructure, management and institutions is provided can attract international and domestic investors for exports. Concentrating limited public investment resources in these places may provide the threshold level of physical and social infrastructure needed to overcome investors' more general concerns with the investment climate in the country.

Given the low level of industrial export dynamism in slow-growing low-income countries, linking export promotion and spatial policies may offer substantial benefits. Concentrating limited public investment resources in SEZs may provide the threshold level of physical and social infrastructure needed to overcome investors' more general concerns with the investment climate in the country.

At low levels of industrial development, the thick labour market externalities and spillovers arising from improvements in general manufacturing competence can boost productivity and export competitiveness among firms in a cluster. The evidence also seems to show that all firms in a cluster, whether they export directly or not, benefit from the presence of exporters.

The critical public investment question is how much should be invested in the physical and human capital of a given location and how much of the costs should be recovered. The case study literature reviewed above suggests that concentrating investment on high-quality infrastructure in a limited physical area is crucial. It also suggests that improving social services to levels above national standards is highly desirable.

It is possible to subsidize firms in a cluster excessively. This occurs mainly through low levels of cost recovery on infrastructure and other public services, rent subsidies and tax holidays. Fostering an SEZ, be it in the form of creating an EPZ or a business incubator or investing in an existing industrial cluster, raises the risk that governments may impute too many benefits to spillovers and subsidize firms in the SEZ beyond the levels needed to compensate for externalities. Because very little is known about the magnitude of the agglomeration economies that may accrue from an SEZ, governments should be careful not to over-emphasize them in cost-benefit calculations. Any public subsidies should be based on the quantifiable impact of the zone on employment and output. The export rule, while useful, is no substitute for careful cost-benefit analysis of any proposed public expenditures.

Finally, governments should be careful not to over-emphasize vertical integration and the creation of backward and forward linkages with domestic industry. In a world of task-based production, industrial success can come as readily from expanding horizontally as from integrating vertically. The case studies suggest that the co-location of foreign and domestic firms engaged in the same stage of production may also offer important opportunities for technology- and management-based spillovers. This was certainly the case in the button cluster in Qiaotou, China.

EPZs are likely to be less relevant to industrial development among the low-income fast growers: more generalized trade policy, institutional and governance reforms offer greater prospects for continued industrial development and product diversification.

Setting up EPZs is likely to be less relevant to industrial development among fast-growing low-income countries. Many of them already have successfully functioning clusters, and more generalized trade policy and institutional and governance reforms offer greater prospects for continued industrial development and product diversification. In many low-income countries, industrial transformation and the emergence of clusters are already under way without significant interventions by governments. This again suggests that if any policy interventions are needed, they should, as much as possible, support an already existing and voluntary process driven by location choices of individual firms.

There is, however, still a role for public policy to support these clusters, centred largely on the generation of knowledge and provision of common services. In the salmon cluster in Chile, the button cluster in China, and the leather cluster in India, common services and public support for R&D relevant to the industry helped a great deal to reinforce the benefits of agglomeration. Public-private partnerships aimed, for example, at upgrading infrastructure are an excellent example of this process, which was observed in the three clusters.

Spatial policies in middle-income countries

In fast-growing middle-income countries, the costs of maintaining a separate trade and incentive regime for specific geographical areas may exceed the benefits. As clusters spontaneously emerge and as generalized urban economies grow in importance for firms, the benefits of EPZs or industrial zones will diminish rapidly and the risk of excessively subsidizing their occupants will increase.

The case studies of dynamic industrial clusters in fast-growing middle-income countries—electrical and electronics manufacturing in Malaysia and salmon in Chile—indicate that knowledge spillovers and coordination mechanisms are the primary sources of cluster externalities. That suggests that the types of public and public-private partnerships in knowledge generation and dissemination—aimed primarily at overcoming indivisibilities and appropriability problems—seen in Penang and Los Lagos may be particularly effective in supporting the further development of clusters. Similarly, the role of government agencies and public-private engagement in addressing coordination problems appears to have been a key to the dynamic growth of both clusters.

Box 6.4 Nicaragua: Milking a public-private partnership

The dairy cluster of Chontales is located in the central region of Nicaragua, east of Managua. The growth of the local industry has been driven by the activity of the Alianza Amerrisque, an apex body of eight cooperatives representing over 700 small milk-producing and processing units that was established in 2000 within the framework of a UNIDO cluster support programme. Initially, the aim of the project was to support joint local activities to upgrade production and processing capacity, standard compliance and joint marketing.

However, a number of problems affected the growth of the cluster. Among these, constraints in the supply of energy and poor infrastructure were seriously undermining the efforts of local milk producers to improve milk storage and processing activities. Acting as the impartial broker, the UNIDO project triggered an active dialogue between the private sector (Alianza) and a range of public sector institutions. Starting at the local level, representatives of the Alianza promoted the revitalization of committees for municipal development, while at the district level representatives of cluster producers participated in the Council for Local Development. In this way, the Alianza increased the number of projects and funding for private sector development oriented towards the dairy sector.

To engage more effectively with national institutions and policymakers, the members of Alianza established a more formal and comprehensive public-private committee, the Dairy Cluster Commission. Through this Commission, cluster stakeholders succeeded in bringing to the attention of ministries and the National Energy Commission the bottlenecks caused by lack of energy supply and infrastructure. The intense lobbying by the cluster was met by a Government-sponsored initiative to build 337 kilometres of new energy lines, in order to ensure a steady energy supply to cluster producers. Within the framework of the infrastructural improvements, energy supply was also extended to local communities and, within them, to schools located along the cooperatives' supply network. A plan for the rehabilitation of 271 kilometres of roads is currently being discussed. This will facilitate milk delivery from storage centres of the cooperatives to the processing units.

With support from various ministries, Alianza also participated in international negotiations for the Central American Free Trade Agreement.

Source: UNIDO.

The slow-growing middle-income countries are perhaps the most difficult group for which to make suggestions for effective spatial industrial policies. They are being squeezed from two directions. The fast-growing low-income countries are crowding them out of global markets in the low- and middle-technology range, and they are losing ground to their fast-growing middle-income counterparts and OECD countries in more sophisticated products and exports. To reverse that trend they need to accelerate productivity growth in the middle-technology range of industrial exports, precisely the group in which both cluster and urban externalities are present.

Two policy innovations linked to geography may be relevant: firstly, governments should partner with the private sector and invest heavily in the quality of technical and university education in areas where existing outward-oriented agglomerations exist and, as in the cases of Chile and Malaysia, in generating specific practical technical and management knowledge provided as a public good. Secondly, to encourage the entry and exit of firms, enterprises in the designated clusters should be subject to a substantially liberalized regulatory framework. Deregulation should apply to any area of national or regional economic policy—such as labour market regulations or bankruptcy laws—that restricts entry or exit. Basic worker, shareholder and environmental protection should remain in place. To gain these benefits, firms locating in the area would have to pass an export test.

Obviously, investments in information and regulatory reforms could be carried out on an economy-wide basis, and new agglomerations of firms would emerge naturally. The fact that such reforms have not been implemented in the great majority of the slow-growing middle-income countries suggests that the benefits to incumbents in the education system, labour market and enterprise sector are sufficiently large to prevent general reform efforts. A spatially concentrated approach to reform might gain sufficient support to overcome incumbent opposition. If successful, it would also have the benefit of spurring the growth of an export-oriented agglomeration.

6.3. Regional policies

For many years, views on regional policies were restricted to ideas that offered little insight into a practical agenda for regional integration. Recently there have been two advances, each of which has the potential for policy application, but they have yet to be absorbed in policy discussion. One, developed by Venables (2003), concerns the distinctive distributional implications of regional trade agreements among low-income countries. The other, building on a mass of scholarship on the geography of economies of scale in industry explores the relevance of regional integration to city size and its implications for industrial competitiveness (Collier and Venables, 2008a).

A. The political economy of divergence

For many years, the model for regional integration among low-income countries was taken to be the European Union. Not only has the European Union enabled its members to reap economies of scale, but in the process relatively less developed countries have benefited the most. There has been a clear tendency towards economic convergence, with Ireland and Portugal growing more rapidly than its richest members. Because of these benign distributional consequences, the politics of integration have reinforced the economics.

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While over the past 50 years the European Union has progressively deepened its integration, among low-income countries integration has had radically less political success. This is certainly not for want of regional schemes. Why has the politics of these schemes been so unsuccessful in contrast to that of Europe? Venables (2003) provides a possible, although disturbing, explanation. He shows that the basic economic forces of trade generate convergence if the integration scheme is between high- and middle-income countries, but divergence if it is between low- and middle-income countries. Before elaborating on this apparent paradox, it is important to consider its consequences for South-South integration schemes.

Why do South-South integration schemes tend to generate divergence whereas North-North schemes generate convergence? Because trade depends on difference. Countries with the highest potential to gain from global trade are those at the extremes of the distribution of endowments. In the absence of a regional integration scheme, a rich country stands to benefit more from global trade than a middle-income country. South-South regional integration tends to favour middle-income countries relative to countries at the global extreme. Yet at present the middle-income countries are the better off members of the scheme and those at the extreme are the low-income labour-abundant countries: hence divergence. The challenge is to foster South-South cooperation in a mutually beneficial win-win scenario.

If regional integration emphasizes cooperation in transport and power infrastructure rather than just providing trade privileges, there is a better possibility that the politics will work. However, even the economies of scale are likely to concentrate economic activity in countries involved in regional integration. Credible arrangements to allow this concentration to occur while providing offsetting benefits to those countries from which activity shifts are likely to require deep political integration.

If regional integration emphasizes cooperation in transport and power infrastructure rather than just providing trade privileges, there is a better possibility that the politics will work.

B. City scale, country scale and regional integration

Big cities generate powerful economies of scale. The unit costs of a firm operating in a city of 10 million people are some 40 per cent lower than one operating in a city of only 100,000 people. But big cities develop in big countries. There are, of course, a few exceptions, but overwhelmingly city size is correlated with country size. Collier and Venables (2008a) draw out the implications for regional political integration: it must be sufficiently deep for the united territory to function economically as if it were a single country.

The consequences of political union for the size of cities can be predicted quite well because there are strong global regularities between city size, city rank and country size. If two identical countries were merged, the size of their largest city would increase by 75 per cent. A comparison of India and sub-Saharan Africa brings home the point. India's population is larger than that of sub-Saharan Africa as a whole, yet it is a single country whereas Africa is divided into 47 independent political units. India has two cities of over 20 million people. Africa's biggest city is Lagos, with 10 million people and it is indeed located in Africa's most populous country. The more typical African capital city, such as Nairobi, has a population of only around three million.

Collier and Venables (2008a) simulate a merger of 10 countries, in each of which is a city the size of Nairobi. Such political integration increases the size of the largest city to an astonishing 19 million and the gains of the largest city are not at the expense of others. On the contrary, because the territory is now 10 times as large it can support several other large cities. Overall six out of 10 cities end up becoming larger than when each country was separate, some of them very much larger. Yet not all 10 cities gain: four end up shrinking as some of their economic activity relocates to larger cities to benefit from economies of scale. The least fortunate city shrinks by a third, to around two million.

Because the union enables so many more people to work in large cities, it sharply increases their productivity. Indeed, since the combined population of the 10 cities virtually doubles, from 30 million to 56 million, as many of the people in mega-cities will have moved

from small towns or villages, they experience massive increases in productivity, such as the 40 per cent gain noted earlier. Hence, this sort of regional integration generates dramatic gains. Yet, as demonstrated by the absolute decline in four of the 10 cities, these large gains are not universal.

Whether the losses of some cities can be tolerated in the interest of the huge overall gains depends on the depth of political integration. If the inhabitants of the united territory come to define their core identity in terms of membership of the united territory rather than of its initially distinct components, they are better placed to accept that some cities lose. They are also better able to compensate through income redistribution to weaker regions.

What is the implication of the above analysis for regional integration? It is surely that small low-income countries are at a massive disadvantage with regard to industrialization. The problem is not primarily that the domestic market for the output of the industry is small. That can be overcome by focusing on the external market, as indeed African manufacturing is now beginning to do. The core problem is that small country size implies a small market from which to purchase all the myriad of inputs and skills that a firm needs.

To an extent that cannot be determined, the trend to trade in tasks may reduce the disadvantage of small cities, just as it reduces the disadvantage of latecomers. By specializing in a single task, the range of inputs is reduced and so the minimum size of a city needed for efficiency may be much smaller than that required for vertically integrated production.

To an extent that cannot be determined, the trend to trade in tasks may reduce the disadvantage of small cities. By specializing in a single task, the range of inputs is reduced and so the minimum size of a city needed for efficiency may be much smaller.

However, small low-income countries may be considerably smaller than they appear. In the above discussion, city size was measured in terms of population. However, as discussed in Chapter 3, at least for manufacturing it appears likely that key economies of scale accrue not in people but in units of economic activity. A city of one million people in a middle-income country where per capita income is $5,000 has the same economic mass as a city of 10 million people in a country where per capita income is only $500.

More worrying, as found in Chapter 3, is the fact that, whereas positive agglomeration economies are probably determined by economic mass, the congestion costs arising from urban agglomerations appear to be more closely related to population. In this eventuality, the middle-income city of one million people will reap more benefits from size than the low-income mega-city. A final implication of that analysis is that the benefits of city size appear to increase with income. As countries of the bottom billion develop, their political fragmentation and its consequent drastic limit on city size will become increasingly costly.

Hence, for industrialization, regional integration is indeed likely to matter, especially in regions, such as Africa, that are divided into many small countries. Yet the form of integration may need to be considerably deeper than the trade arrangements (Yang and Gupta, 2005).

6.4. Conclusions

This chapter focused mainly on policies to improve industrial competitiveness in two groups of countries that are currently challenged by global industrial change: countries at the bottom of the world economy that are excluded and middle-income countries whose markets are being squeezed. In these countries, industrial development policies must address the infrastructure gap, trade logistics, spatial industrial location and regional integration.

Closing the infrastructure gap in low-income countries will need three closely related policy initiatives: Changing public expenditure priorities to increase the share of the budget devoted to infrastructure investments and improving the quality of investment and service delivery; encouraging private investment and operation; and reaching new understandings with development partners on the relevance of basic infrastructure to growth and poverty reduction.

Trade logistics are an important determinant of global competitiveness. Trade logistics reforms in middle-income countries need to move beyond the traditional "trade facilitation" agenda focused on trade-related infrastructure and IT in customs to reforms of institutions and markets. In low-income countries, infrastructure deficiencies interact with poor public institutions and lack of competition and competence among service providers to create a vicious circle of constraints. Breaking that circle may be easier in a limited physical environment, such as an EPZ, than attempting to do it for the economy as a whole.

The idea of using spatial industrial policies may be particularly attractive for slow-growing low- and middle-income countries. For lagging low-income countries—such as those often found in Africa—the relevant question is whether promoting industrial agglomerations can help them break into global markets. For the slow-growing middle-income countries—such as

many in Latin America—it is whether industrial clusters can help improve the productivity of industry and stop the erosion of their relative position in global manufacturing production and trade.

Agglomerations are the outcome of decisions by individual firms to locate close to each other. This suggests that policymakers need to be very careful not to distort the incentives when designing spatial policies to promote industrial development. Agglomeration is a market-driven process, and public policies need to work with the market, not against it.

SEZs can combine trade and spatial policies in a way that may make them uniquely suited to supporting industrial agglomerations in countries of the bottom billion. Given the low level of industrial export dynamism in slow-growing low-income countries, linking export promotion and spatial policies through an SEZ offers substantial potential benefits. Yet, many SEZs around the world are dysfunctional. They fail to attract a sufficient number of firms to realize cluster economies and, in many cases, they offer excessive subsidies to the few firms that they succeed in attracting. Good infrastructure, management and institutions are the key determinants of success.

The main benefit of an export-oriented SEZ, as a tool of spatial industrial policy, is that it provides a clear focus for government investments and institutional reforms designed to encourage the location of firms in a specific locality. It is also subject to an efficiency test. Firms located in the cluster must be able to export. Concentrating limited public investment resources in those zones may provide the threshold level of physical and social infrastructure needed to overcome investors' more general concerns with the investment climate in the country. In fast-growing low-income countries, continued improvements in economy-wide policies and institutions, combined with support to existing agglomerations, are likely to yield better results than efforts to create new industrial clusters.

In the slow-growing middle-income countries, a strategy that combines public investments in information and coordination with deregulation in existing industrial agglomerations may help to boost productivity and competitiveness. Obviously, investments in information and regulatory reforms could be carried out on an economy-wide basis, but the fact is that such reforms have not been implemented in the vast majority of slow-growing middle-income countries. A spatially concentrated approach to reform might gain sufficient support to overcome incumbent opposition. If successful, it would also have the benefit of spurring the growth of new activities within the agglomeration.

For many years, views on regional policies were restricted to ideas that offered little insight into the practical agenda for regional integration. Small low-income countries are at a huge disadvantage where industrialization is concerned. The problem is not primarily that the domestic market for the output of the industry is small. That can be overcome by focusing on the external market. The core problem is that small country size implies a small market from which to purchase the myriad of inputs and skills that a firm needs.

Hence, for the industrialization of the countries of the bottom billion, regional integration is indeed likely to matter, especially in regions, such as Africa, that are divided into many small countries. Integration may need to be considerably deeper than the trade arrangements. In the end, a form of integration that allows the free movement of goods, capital and people across borders, making them irrelevant to the formation of cities and industrial agglomerations, is likely to be necessary.

Chapter 7
Industrial and trade policies for resource-rich countries

Potentially, revenues from resource exports constitute an unparalleled opportunity for development. Policies towards industrialization are part of the process of harnessing that opportunity. Most directly, resource extraction is an industrial process, which can easily be mismanaged. Inevitably, in resource-rich countries it is the key industry. Thus government policies are critical. This is the subject of section 7.1.

Resource extraction is an industrial process, and one that can easily be mismanaged. Inevitably, in resource-rich economies this is the key industry so that government policies towards it are critical.

However, beyond the direct importance of the extractive industry to the industrial development of resource-rich countries, the revenues from, and characteristics of, resource extraction can be used to spur other forms of industrialization. Three such opportunities are considered. Section 7.2 focuses on two industries closely linked to the minerals sector. These are knowledge-based activities that provide inputs into resource extraction. The construction sector constitutes a key industry that often determines the degree to which savings financed by resource revenues are transformed into increases in investment. Finally, section 7.3 returns to the manufacturing sector as there are sometimes good reasons for using resource revenues to foster manufacturing.

7.1. Managing the resource-extraction industry

Extractive activities indeed constitute industrial activities. As with any industry, they transform a set of physical inputs into a physical output. However, extractive industries differ from manufacturing in two fundamental respects: rents and volatility. In turn, these highly distinctive features imply the need for distinctive policies, both on the part of governments and the international community.

A. Rents and their implications for policy

The revenues of a manufacturing firm are divided into profits and wages, the former reflect the return on capital and risk, the latter the return on labour. The revenues of a resource-extraction company include a further component, namely, economic rent. The economic rent comes from ownership of the entitlement to extract the natural resource. It is the surplus beyond the payments needed to attract labour and capital to the enterprise. In effect, rents are money for nothing. In the accounts of a resource-extraction company, both profit and rent are combined into a single entity, surplus over operating costs. However, it is important to recognize that whereas for a manufacturing firm in a competitive environment all the surplus over operating cost is a return on capital and risk, for a resource-extraction company some of the return is rent.

Rents are created and protected by the right to exclude. This is most clearly demonstrated where such rights do not exist or are not enforceable, as in the alluvial diamonds industry. In this industry, in the absence of enforced exclusion, workers crowd to diamond fields in search of diamonds until their returns are no higher than the returns from other types of labour. In this case, rents are entirely dissipated: there are too many workers in the activity. Each extra worker reduces the productivity of existing workers. The economy would be better organized if workers were engaged in other sectors as well.

Thus, rents evaporate unless protected by rights. Ultimately, the right to exclude is conferred by government and so the rents should accrue to government. Typically, governments charge resource-extraction companies for the right to exclude through some combination of initial payments, such as signature bonuses and royalty payments on the flow of resources extracted. Such dis-

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tinctive taxation is necessary. A tax on a dollar of the operating surplus of a manufacturing firm falls entirely on the return on capital and risk. If the same tax is levied on a dollar of the operating surplus of a resource-extraction company, some of which falls on rent, this implies that capital and risk in resource extraction are getting off more lightly than manufacturing. The rate of taxation appropriate for capital and risk-taking should take into account incentive problems. As rewards are taxed, less will be forthcoming and so tax revenues come at the cost of allocative inefficiency. In contrast, the taxation of rents does not create adverse incentive problems. Rents are money for doing nothing and so taxing them does not cause inefficiency. On the contrary, as the example of alluvial diamonds demonstrates, by taxing rents, the government can reduce inefficiency because it reduces rent-seeking.

Whereas rent-seeking in alluvial diamonds is highly visible, with too many people crowding in to search for them, the more common form of rent-seeking in resource extraction is done by firms and takes the form of lobbying.

The foremost aspect of government policy towards the resource-extraction industry is fiscal: governments should tax rents in return for the right to exclude. Not only will this generate revenue for governments, but failure to tax will lead to the diversion of economic efforts in rent-seeking.

The taxation and control of access to natural resources requires institutions. Since these institutions limit private access to rents, they themselves can come under pressure.

The taxation and control of access to natural resources requires institutions. Since these institutions limit private access to rents, they themselves can come under pressure. The activity of undermining these institutions has been termed "rent-mining" (Ross, 2001). Institutions that limit private access to rents provide checks and balances. Political scientists have produced measures of checks and balances that can be compared both between countries and over time. Collier and Hoeffler (2008) investigate the interconnections between the ability to harness natural resource exports for development and the strength of checks and balances based on global data for the period 1970-2003. They find that checks and balances are uniquely beneficial in resource-rich countries: the stronger the checks and balances, the larger the contribution of a given amount of resource exports to the growth of the economy.

Ideally, resource-rich countries would have stronger checks and balances than other countries. In fact, the opposite is the case. Collier and Hoeffler (2008) find that resource rents gradually weaken checks and balances, a process that continues for at least 25 years.

There is further evidence that governance is particularly important in resource-rich countries. Collier and Goderis (2007) find that although in the short term high commodity prices are good for the growth of commodity exporters, in the longer run they are usually detrimental: this is the production side of the resource curse. Crucially, they find that these adverse long-term effects depend on the level of governance, as measured by political scientists and rating agencies. Above a threshold level of governance there is no resource curse. On the contrary, those resource-exporting countries with good governance grow more rapidly in the long as well as short run. These are countries, such as Australia, Botswana, Canada and Norway, which have succeeded in harnessing resource exports for sustained development. Unfortunately, during 1963-2003 the critical level of governance required to avoid the resource curse was above the level prevailing in many of countries of the bottom billion (Collier and Goderis, 2007).

Checks and balances are uniquely beneficial in resource-rich countries: the stronger the checks and balances, the larger the contribution of a given amount of resource exports to the growth of the economy.

The terms "checks and balances" and "governance" essentially relate to the processes by which public decisions are taken and the means by which those taking such decisions are held accountable. However, not all such decisions matter equally for harnessing resource riches. If governance standards need to be raised in resource-rich countries, it is particularly useful to know which decision processes are critical.

B. Policy responses to volatility

Resource extraction is subject to volatility primarily because the prices of its outputs are highly volatile and have been so for over a century. Not only does the resource-extraction sector have to cope with volatility, in resource-rich countries the shocks are sufficiently large to have major consequences for the rest of the economy. An important policy issue is how this adverse transmission to the rest of the economy can be softened.

Since shocks are, by nature, unpredictable, it is difficult for governments to respond to large shocks with the speed and scale that would be necessary to make a macroeconomic difference. Hence, the key options for domestic policy are likely to be structural rather than responsive. Structural policies are those which were already in place prior to the shock and stay in place during it.

Box 7.1 Five key decisions for transforming resource exports into sustained development

Whether resource exports can be transformed into sustained development depends on five key decisions:

Decision 1. Negotiating the resource-extraction contract

The first critical decision is how the sale of resource-extraction rights should be conducted. Though the government is usually the monopoly seller of a country's resources, it has two major disadvantages: it has less information as to the likely value of extraction rights, and it has a more severe "agency" problem in determining deals. Auctions are potentially the solution to the problem of information asymmetry as well as the agency problem. Auctions would need to meet certain specified standards, monitored through a process of international certification.

Decision 2. Design features of the contract

The second critical decision concerns the specification of rights that the governments propose to sell. Extraction rights have three key dimensions: their duration, the tax regime that will be applied and, most importantly, the credibility of these commitments. The conventional solution to this problem has been to encourage governments to offer long-term contracts. The features of the contract could be designed to pave the way for the expansion of the sector.

Decision 3. Transparency in revenues

The third critical decision is the degree of scrutiny of revenues. Until the Extractive Industries Transparency Initiative was launched in 2002, revenues paid to governments by resource-extraction companies were usually confidential. This lack of disclosure has given rise to two abuses: companies can potentially make payments not fully compliant with tax regimes, while government officials can improperly divert those payments away from the budget. However, once payments are made public, companies are potentially exposed to a greater degree of scrutiny and are more likely to be voluntarily compliant. Likewise, the scrutiny of governments by citizens is also made possible by openness of information.

Decision 4. The aggregate savings decision

By far the most important decision concerns the proportion of resource revenues that should be saved. There are two distinct time frames that need to be taken into account in reaching this decision. The long-term time frame concerns depletion: to maintain the overall value of assets, some of the resource depletion should be offset by an accumulation of other assets. The medium-term time frame concerns the usually volatile price cycle of the commodity. There are good reasons why a government might try to smooth its expenditures rather than simply let expenditure track these extreme fluctuations in revenue.

Decision 5. The public investment decision

Having determined the proportion of resource revenues to be saved, the government must then decide which assets to acquire. Specifically, it must decide how much of the savings should be held abroad and, for the savings invested domestically, which investments should be chosen. The selection of public investment projects depends not just on macroeconomic considerations about absorptive capacity, but also on microeconomic concerns determined by national priorities and the quality of proposed investments to achieve them. For a project to be satisfactory it should meet two criteria: honesty and efficiency. Hence, these aspects need to be assessed prior to approval. This was, in essence, the decision process that enabled Botswana to convert diamond revenues into world-beating growth.

Source: Collier (2008).

What types of structural policy are appropriate? Collier and Goderis (2009) analyse a range of structural policies to determine which are most important for reducing the transmission of an adverse shock to the rest of the economy. Consistent with other researchers, they find that exchange rate flexibility reduces the transmission of shocks. This is, in some respects, better thought of as a responsive policy than a structural policy: exchange rate flexibility means that the exchange rate changes in response to shocks. It is also a structural policy, however, if policymakers pre-commit themselves to a flexible exchange rate regime prior to the shock.

Collier and Goderis (2009a) also find that structural policies that concern the regulation of firms determine the extent to which a commodity shock is transmitted to the rest of the economy. The more difficult it is to open and close a business, the more severe is the transmission of the shock.

Since resource-exporting countries have most to gain from easy entry and exit of firms, it might be expected that their governments would tend to adopt lighter regulation than countries without resource exports. In fact, the opposite is the case: the larger the benefit of enabling firms to quickly start or shut down a business, the slower are the actual procedures.

Measures to strengthen the overall ability of a resource-rich country to improve checks and balances, such as those outlined above, can help by creating an environment that is less tolerant of all forms of rent-seeking. In addition, resource-rich countries can work directly to increase scrutiny of, and accountability for, the regulatory environment. One such way would be through publicizing evidence on the costs and benefits of the regulatory regimes that other governments have adopted.

7.2. Policies for knowledge services and construction

Two key sectors strongly related to the extractive industries are knowledge and construction. Knowledge-based services offer considerable scope for diversification and development. Construction is the critical sector that determines the extent to which investment efforts in a resource-rich country are translated into investment outcomes. Both sectors can benefit from effective government policies.

A. Knowledge for extractive industries

Recall that, unlike manufacturing, resource extraction is, to an extent, idiosyncratic, with particular problems associated with location-specific geology. No two mining projects can be identical. This creates scope for

specialist knowledge of these localized features so that local firms have a comparative advantage.

The classic example of this process of specialist knowledge is oil extraction off the coast of Norway. Evidently, at the time oil was discovered, Norway had no expertise whatsoever in the oil industry. However, the Government of Norway invested heavily over many years in building expertise. It established a national oil company in partnership with foreign companies in order to gain industry-wide knowledge from them. It also invested in specialist departments within its universities, which gradually built up both industry-wide and locally-specific knowledge on deep-sea, cold-water exploration. Now Norway's knowledge-based oil service industry is a major source of income in its own right. A similar, but much longer-established, cluster of expertise is centred on the oil industry in Texas.

Both Africa and Central Asia are seen as challenging environments for resource extraction. Global service companies are therefore more likely to charge very high prices, creating an opening for local companies to provide service inputs into resource-based industries. As the key input here is knowledge, the key government assistance is likely to be through geology and engineering departments of universities.

The new areas of natural resource extraction, namely, Central Africa and Central Asia, are not areas with a comparative advantage in globally applicable knowledge. They have few universities and the entire tertiary education sector has been underfunded for many years. It is clearly neither efficient nor feasible for each country in the region to develop expertise. A more promising strategy would be to develop a few region-wide centres of excellence in mining engineering and geology. For example, Makerere University, in Uganda, has a long tradition of serving as a regional hub for East Africa and is close to a wide range of mineral discoveries. Similarly, Southern Africa is an obvious candidate for a centre of expertise on gold mining technology and west Nigeria for a centre on oil technology.

B. Supporting the construction sector

The other non-manufacturing industry closely linked to resource extraction is construction. The link is not primarily because construction is an input to resource extraction. Rather, as discussed in Chapter 2, commodity booms generate revenue booms and, if properly used, sharply increase savings and public investment. This investment in turn usually sparks a construction boom.

In the circumstances of a boom in the construction sector, government policy towards the sector can be very important. The ability of the construction sector to respond to the increase in demand by increasing supply is critical for economic development since it determines the macroeconomic transmission from the increase in savings to the increase in the volume of investment. If the construction sector faces bottlenecks in production making it unable to increase supply, then the surge in demand will instead force up costs and prices.

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If costs and prices are forced up, although the country increases its savings it fails to achieve extra investment and is therefore unable to harness the resource boom for sustained growth. Higher prices in the construction sector reflect higher marginal costs of production and so the extra savings are in part dissipated in these additional costs. However, higher prices also generate higher profits since they apply to all outputs of the construction sector, which would have been produced anyway even if prices were lower. These extra profits are analogous to windfall rents and therefore tend to produce similar rent-seeking behaviour, with lobbyists trying to gain construction contracts from politicians. Hence, the extra savings are also in part dissipated into rent-seeking.

The reason why construction prices tend to rise sharply in response to increases in demand is that the sector encounters bottlenecks. Some of these bottlenecks can readily be addressed by government intervention. The first step is for the government to learn more from the construction sector about the bottlenecks it is currently facing. The Government of Botswana provides a good example of how this can be done. The Government had a classic problem of how to transform savings from resource revenues derived from diamonds into public investment. Realizing that the construction sector was encountering bottlenecks, it operated an annual plan within its overall five-year development plan, which focused specifically on the construction sector. Each year construction firms were called in and the feasibility of Government construction plans was discussed, and bottlenecks were identified and addressed.

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What are the likely bottlenecks? Construction requires land, material inputs, skills, organization and finance. Each can potentially prevent expansion of output. Sometimes urban land rights become confused and this can delay construction projects. Similarly, planning permission may be slow. Clearly, these are stages in construction that only a good government can ensure that they do not become bottlenecks, a useful benchmark being the time taken to perform similar steps in other countries.

Construction requires material inputs. Depending on the distance of the construction site from a port, some of these inputs may be internationally non-tradable. Even where there is a proximate port, the ability to import can become a bottleneck, whether because of policy restrictions on imports, procedural restrictions such as customs, or the malfunctioning of the port. In this case, some combination of economizing on the use of the input and prioritizing an increase in its local production will be appropriate. If, for example, cement is expensive, it is important to redesign projects so as to economize on its use. If the problem is the port, then port rehabilitation should become a priority.

Construction also requires skills. While with appropriate technologies many unskilled workers can be employed, there are complementarities between skilled and unskilled workers. Many of these skills are mundane, such as those of bricklayers, welders, electricians and plumbers. Nevertheless, without them the construction sector will not be able to expand. Precisely because the skills are mundane, the cost of importing them is high, relative to the cost of local training. There have been cases when countries have had to fly in semi-skilled workers from neighbouring countries or even regions. With planning, their skills could have been acquired locally. Governments can allocate resources to a technical college specializing in construction skills. Again, the issue is one of giving early priority to potential bottlenecks. If skills are likely to become a bottleneck, training colleges in these skills should be established ideally before the onset of the commodity boom.

The speed with which the construction sector can expand without severely driving up prices determines the pace at which public investment expenditure can sensibly be increased.

The speed with which the construction sector can expand without severely driving up prices determines the pace at which public investment expenditure can sensibly be increased. Hence, the government needs a rapid flow of information from the construction sector not only to ease emerging bottlenecks but also to determine the composition of its budget. Savings that cannot be spent on public investment without driving up prices can be held abroad until the bottlenecks have been overcome.

7.3. Policies for supporting manufacturing

The export of natural resources tends to make the development of manufacturing more difficult because of the Dutch disease (see Chapter 2, section 2.4.C). In simple terms, the economy is already able to finance its need for imports by means of its resource exports. Thus it does not need to devote further resources either to less remunerative ways of financing imports through the export of manufactures or to reduce imports through the production of manufactures for the home market. The foreign exchange market reflects this lack of need for additional exports: foreign currency becomes insufficiently valuable in terms of domestic currency to make manufacturing profitable. This is usually referred to as real exchange rate appreciation.

However, at some stage non-renewable resources will be fully depleted and the economy will need an alternative export sector. Since manufacturing is path-dependent, it is much easier to maintain a cluster of manufacturing firms than to start one. If the resource discovery is not sufficiently large to be long-lasting, the government may reasonably decide that it is worth devoting resources to assisting its manufacturing sector rather than allowing it to shrivel as a result of real exchange rate appreciation.

One strategy for countering the effect of real exchange rate appreciation is to make public investments in activities that lower the costs of producing manufactured exports. For example, the government might create an EPZ with good energy and port infrastructure. The government can also minimize real exchange rate appreciation by increasing the import content of its spending. For example, spending on infrastructure and pharmaceuticals have a higher import content than spending on education. This also puts less pressure on demand for goods and services that can only be produced domestically.

At some stage non-renewable resources will be fully depleted and the economy will then need an alternative export sector. Since, manufacturing is path-dependent, it is much easier to maintain a cluster of manufacturing firms than to start one.

Malaysia is an example of a developing country that has successfully harnessed resource exports for export-oriented manufactures. The case study of the Penang EPZ, which has evolved into a major industrial cluster, describes how critical government policies are in achieving success in manufacturing. At the core of Government intervention was the provision within the EPZ of excellent infrastructure, financed out of its resource revenues. However, Government policies went well beyond this. Attention was also paid to social infrastructure in the locality of the zone, thereby ensuring that it would be an attractive place for highly skilled workers to live in. This, in turn, eased the recruitment problem facing firms that chose to set up in the zone. Finally, the Government significantly improved the regulatory framework and the customs regime. In effect, the EPZ became a good governance zone. In combination, these policies succeeded in attracting a high inflow of FDI per capita, demonstrating that it is possible to offset real appreciation.

Several countries will need to transit out of resource exporting as a result of depletion. Cameroon has already depleted most of its oil reserves and may therefore need to switch to agricultural or manufactured exports. Considering its excellent coastal position, it might reasonably give priority to using part of the remaining revenue flow to build up a viable manufacturing base.

South Africa has embarked on transition to a more diversified industrial sector. With a rising population and a depleting resource base that has been mined for many decades, the current policy accent is on economic diversification.

South Africa's long coastal lines and excellent ports could be more effectively used, with further modernization of infrastructure, for accelerating the pace of industrial diversification. The Government's top priority is to involve a large number of small and medium enterprises in the diversification process. Given South Africa's regional leadership, the country's success in industrial diversification will have spillover effects in neighbouring countries.

7.4. Conclusions

Commodity booms provide the best opportunity for transformative development that some low-income countries have ever had. Whether the opportunity is seized depends on policy choices.

The first set of choices concerns the resource-extraction industry. Policy choices determine whether the industry generates appropriate revenues and whether those revenues are used to sustain development. Extractive industries are distinctive: they generate rents and expose the rest of the economy to shocks. Both these features call for distinctive action from governments and the international community.

The domestic policies that are appropriate for resource management are to build strong institutions that capture resource rents for the public, combined with checks and balances to enforce accountability. The economic institutions in resource-rich countries should evolve in the appropriate direction in order for the governments to capture rents and use them for fostering sustainable economic development.

Managing volatility successfully depends on reducing regulatory control in labour and product markets. Paradoxically, resource-rich countries that have the most to gain from light regulation are among the world's most highly regulated. The political economy of rent-seeking is again likely to be blamed, and therefore measures to strengthen scrutiny of the regulatory regime are necessary.

The second set of choices concerns the transmission of opportunities to other sectors, upstream to knowledge-based support activities and downstream to the construction sector. Each of these offers considerable scope for government intervention. Since no two mining projects can be identical, specialist knowledge of localized features gives local firms a comparative advantage. Appropriate policies can help to offset coordination and information failures and promote the growth of domestic industry. The ability of the construction sector to respond to the increase in demand by increasing supply is critical for economic development since it determines the macroeconomic transmission from the increase in savings to the increase in the volume of investment. In the circumstances of a construction boom, government policy towards the sector can be very important. Identifying key constraints, anticipating skill needs and filling them, designing projects and programmes around emerging construction bottlenecks and, ultimately, postponing investments, if necessary, are all means by which investment outcomes can be aligned with investment efforts in construction.

The third set of choices directly concerns the manufacturing sector. The export of natural resources tends to make the development of manufacturing more difficult because of the Dutch disease effect. However, at some stage the non-renewable resources will be fully depleted and the country will then need an alternative export sector. Manufacturing is path-dependent: it is much easier to maintain a cluster of manufacturing firms than to start one. Yet the success of Malaysia resoundingly demonstrates that de-industrialization through Dutch disease is not the inevitable fate of a resource-rich country. Investments to offset the impact of Dutch disease—through infrastructure and skills—offer an important path towards an alternative export sector for those resource-rich countries concerned with the depletion of their natural resource base.

Chapter 8
Policy imperatives for developed countries

This chapter explores why it remains important for developed countries to promote the further industrialization of developing countries. It then turns to some specific recommendations for policy action by developed countries, ranging from trade policies, through capacity-building, to international standards and codes for resource extraction.

8.1. Why promote industrialization in poor countries?

One reason why developed countries should support industrialization in developing countries is because it is in their own interest. Industrial products from developing countries have helped to raise living standards in developed countries. The shift of industry to developing countries over the past 10 years made it a "nice" decade. In economic parlance "nice" stands for "non-inflationary continuous expansion". The influx of cheap manufactured products from developing countries was the foundation of that unprecedented period of prosperity in developed countries. That the "nice" decade has ended is due more to failings in financial markets of the developed countries than to continuing industrial expansion in developing countries.

A second reason is that the income gap between developed and developing countries, which widened during the past two centuries and has at last begun to narrow, remains unacceptably wide. Even China and India remain lower middle-income countries. The reconvergence of income of the world's societies is a process that should be recognized as welcome—whether for moral or pragmatic reasons—and it needs to continue for some decades. The industrialization of developing countries is at the heart of this long process.

8.2. Trade policies to promote industrialization in developing countries

Trade policies offer developed countries an opportunity to support industrialization in developing countries. They can be used to pump-prime the process of industrialization in countries of the bottom billion in a way that may be decisive. If the strategy works, it has the potential to develop new low-cost suppliers to global markets and transform millions of lives in some of the most impoverished and slow-growing countries in the world.

The economies of scale that underpin modern industrialization have powerful implications. Industrialization is "lumpy" in geographical space, in product space and in time. The lumpiness in geographical space is manifested in the strong tendency of firms in the same industry to cluster and the even stronger tendency of economic activity to concentrate in big cities. The lumpiness in product space is so powerful that it tends to evade notice; most of the myriad of possible variations of product characteristics simply do not exist. Were every possible variation to be produced, each would be very expensive. However, it is the lumpiness in time that is critical to this argument: once an economy crosses over the threshold of competitiveness, its industrial expansion can be explosive, as demonstrated by China.

The existence of such a threshold implies that, for countries below it, marginal efforts to improve competitiveness are likely to fail. What is needed is a concerted and coordinated effort to raise a country above the threshold. However, the most astonishing implication is that this effort need only be temporary. For pump-priming industrialization, temporary efforts are all that are needed to produce permanent success. The explanation is that once an industry is pushed over the threshold, the explosive process of expansion sets in and rapidly reduces costs. And even when this temporary advantage ceases, the industry continues to remain competitive.

The recent experience of Bangladesh shows both the limits and the potential for such a pump-priming policy. The country's apparel industry was pump-primed by the MFA. The industry expanded rapidly,

creating some 2.5 million jobs. As shown in part B, Bangladesh accounts for a significant share of manufacturing in the LDCs. With the end of the MFA, the industry suffered a sharp contraction. Two aspects are important. One is that although the sector contracted it did not collapse: Bangladesh currently has many more jobs in the industrial sector, which would not have been the case if the activity had not been pump-primed into existence. The other is that considerable scope remains for increasing the attractiveness of the country's policy environment for export manufacturing.

The MFA also helped to pump-prime the apparel industry in Mauritius. Here the story is rather different. With supportive policies from the Government, the industry has been able to upgrade its quality and, while still affected by the end of the MFA, it has helped to propel the Mauritian economy into the skills and infrastructure of a middle-income country, which is thus no longer critically dependent on trade preferences.

The end of the MFA need not mark the end of trade preferences for new entrants to manufacturing. Both the United States and the European Union introduced new preferences in 2001. The American scheme, the African Growth and Opportunity Act (AGOA), however, differed from the European scheme, Everything but Arms (EBA), in two key respects. Its coverage of countries was different. It was confined to Africa and included several countries, such as Ghana and Kenya, that are among the least developed in terms of manufacturing industry. In contrast, EBA was confined to the officially classified LDCs of Africa.

The other respect in which the schemes differed was in their rules of origin. EBA based its rules on the traditional industrial policy model of encouraging vertical integration. It therefore required a very high share of inputs to be produced within each African country. In contrast, AGOA was better attuned to the new model of trade in tasks, at least in one product line, garments. Here it substantially lowered the required home country content.

The two schemes produced very different results. The United States' bilateral trade with sub-Saharan Africa increased by 115 per cent since the inception of AGOA, according to the 2006 Comprehensive Report on AGOA submitted to the United States Congress. Imports of the United States from sub-Saharan African countries under AGOA totalled $38.1 billion in 2005, up 44 per cent over 2004, thanks largely to oil; but several non-oil sectors also experienced increases, including footwear, toys, sportswear, fruits, nuts and cut flowers. In Kenya and Madagascar, the impact of AGOA was very apparent. In Madagascar, half of those employed by the sample firms in the Africa Foreign Investor Survey undertaken by UNIDO (UNIDO, 2005) were employed by 14 AGOA companies. In Kenya, 30 per cent were employed by AGOA companies.

Collier and Venables (2007) compare the efficacy of the two schemes. They show that AGOA increased exports of African garments to the United States sevenfold in only five years. Kenya was one of the substantial beneficiaries. In contrast, during the same period of the operation of EBA, African exports of garments to Europe actually declined in absolute terms. The impact of the EBA initiative has been confined to a few additional sectors beyond those already responding to the preferences granted under the Cotonou Agreement between the European Union and the African, Caribbean and Pacific Group of States.

This strong evidence has important implications. Firstly, it supports the superiority of the trade-in-tasks approach to breaking in at the bottom over the vertical integration approach. Secondly, it suggests that the United Nations classification of LDCs may need to be redefined.

Countries such as Ghana and Kenya, although not LDCs, lack powerful clusters of manufacturing and would definitely benefit from pump-priming through trade preferences. There is thus a case for a concerted OECD-wide approach to use trade preferences to pump-prime these "least developed manufacturing countries" into global markets. At present, different OECD countries have different schemes. Indeed, the very multiplicity of schemes is a needless source of complexity. One approach would be for the United Nations to distinguish a separate class of "least developed manufacturing

Box 8.1 Market access is necessary, but not sufficient for export dynamism in Africa

While the African Growth and Opportunity Act (AGOA) and Everything but Arms (EBA) schemes clearly showed a significant potential to spur employment-generating investment in Africa, the Africa Foreign Investor Survey undertaken by UNIDO in 2005 shows that their impact so far has been limited to a few countries. The survey covered 3,484 investors in 15 countries of sub-Saharan Africa. Only a small proportion of firms questioned remarked that their location decision was based on seeking the benefits of AGOA agreements for easy access to markets. The survey also shows that AGOA had at that time not yet stimulated new FDI in most African countries, especially in West Africa. Even in countries where AGOA has spurred investment, the amounts are small and AGOA-related exports account for less than 1 per cent of total exports of the sample.

The fact that most countries in the region have failed to reap significant benefits from trading opportunities in expanding markets and concessionary schemes, such as the AGOA and EBA, suggests that market access can improve, but will not completely solve Africa's lack of export dynamism. Moreover, a lack of capacity to ensure the necessary quantity and quality of supply, an inability to prove compliance of potential export products with international standards, and problems with integration into the multilateral trading system also limit exports.

Source: UNIDO.

countries", which could be used by members of the World Trade Organization (WTO) for devising a common preferential scheme to reduce trade restrictions that concern manufactures. Another approach would be for WTO to call for a common treatment of all countries within a regional trade agreement, so that in a group with a preponderance of LDC members, others would also benefit from preferences.

Finally, it is important to note a particularly attractive aspect of such a policy: if it does not work, there are relatively few costs. In terms of risk and reward, compared with most development assistance projects, adopting more strategic trade preferences is surely attractive.

8.3. Capacity-building for trade

While strategic use of trade preferences can provide the necessary push for least developed manufacturing countries that are sufficiently close to the threshold, many LDCs are ill-equipped to take advantage of the opportunities provided by trade preferences. Weak infrastructure, lack of productive capacities and the inability to meet product specifications and increasingly stringent requirements in terms of quality, safety, health and the environment play strongly against their successful integration into global markets. They lack the capacity to produce goods that can compete in terms of quantity, quality, timely delivery and price in export markets.

The case histories of dynamic industrial clusters show that public support for initiatives to improve productivity and technology, strengthen export consortia, build skills and foster cluster development may also be necessary. Proving conformity with standards and technical regulations requires the establishment of efficient testing, certification and accreditation mechanisms that conform to the requirements of the WTO Agreement on Sanitary and Phytosanitary Standards and the Technical Barriers to Trade Agreement, and enjoy international recognition. These facilities are thus of utmost importance for developing countries that wish to benefit from trade opportunities.

Technical assistance programmes can help to build national and regional export potential by:

- Strengthening national capacity to undertake analysis of competitive potential at the product and subsector level
- Assisting developing countries to establish the quality and conformity assessment infrastructure required to increase exports
- Working in productive sectors with high export potential to upgrade product and production quality and comply with standards and regulations so that enterprises can export successfully
- Trouble-shooting in cases where export products encounter technical barriers and advising on technical solutions to problems

Despite the obvious need for trade capacity-building services and trade-related infrastructure, the private sector is, in many cases, not able to provide them. Trade-related infrastructure can be very costly to build and in a small country the investment may take a long time to pay off. Thus, international assistance can play an important role in eliminating impediments to trade by strengthening essential public sector capacities. It can also help to lay the foundations for the support services that can eventually be provided profitably by private enterprise. One mechanism for mobilizing international support for trade capacity development is Aid for Trade.

Box 8.2 Internationally recognized conformity infrastructure in Sri Lanka

With an export structure based on processed products (such as garments and textiles, ceramics, rubber and shrimps) and in the absence of internationally accredited testing laboratories able to issue globally accepted testing certificates, Sri Lankan exporters were faced with the problem of proving compliance with international market requirements and hence getting their products onto international markets. Recognizing the importance of having these testing capacities developed locally, UNIDO, with a financial contribution of $1.8 million from the Government of Norway, through the Norwegian Agency for Development Cooperation (NORAD), provided significant support for the development of Sri Lanka's conformity infrastructure. The assistance provided was timely and of strategic importance, not only in cutting the extremely high costs incurred in testing nationally manufactured products abroad, but also in providing Sri Lankan exporters trading on the world market assurance of the conformity of their products with international standards and/or those of the recipient markets.

Within a relatively short time (2000-2006), the UNIDO/NORAD intervention managed to make available in the country seven internationally accredited testing laboratories covering chemical testing, microbiology testing, rubber/plastics testing and food analysis. Support was provided to establish and upgrade the testing laboratories along the ISO/IEC 17025 guidelines and lead them towards international accreditation of their services from the Swedish Board for Accreditation and Conformity Assessment (SWEDAC). To ascertain the accuracy of the tests and ensure the reliable calibration of the testing equipment used by the laboratories, the country's industrial metrology capabilities were also strengthened by upgrading the industrial metrology laboratories in the areas of dimensional, volume, mass, thermometry, pressure and electrical metrology so as to achieve international accreditation of their services also through SWEDAC.

Source: UNIDO.

8.4. Reforming Aid for Trade

Aid for Trade, if well designed and adequately funded, can support countries trying to enter the global market place by helping them to address poorly performing infrastructure and institutions. If badly designed and inadequately funded, it is at best a sideshow of the global trade negotiation process.

Today, Aid for Trade is at a critical juncture. It has come a long way from the early days of a small donor window designed to help the LDCs comply with the new WTO rules arising from the Uruguay Round, but it is not yet a comprehensive programme aimed at helping developing countries that want to compete effectively in the global economy.

A. What is Aid for Trade?

Aid for Trade is a key outcome of the WTO Doha negotiation process. In their Hong Kong Declaration of December 2005, trade ministers called on bilateral and multilateral donors to increase the resources for Aid for Trade, endorsed enhancing the Integrated Framework for Trade-Related Assistance to least developed countries, and established a Task Force on Aid for Trade. The Declaration states:

> "Aid for Trade should aim to help developing countries, particularly LDCs, to build the supply-side capacity and trade-related infrastructure that they need to assist them to implement and benefit from WTO Agreements and more broadly to expand their trade."

The focus of Aid for Trade is therefore to address "supply-side constraints" and develop trade-related infrastructure (trade facilitation, transport and ports, quality infrastructure).

At the outset of the Aid for Trade discussions in the context of the Doha Round, developing countries sought assurances that increased Aid for Trade would be provided in addition to existing resource commitments. WTO, with the assistance of the OECD Development Assistance Committee, counted concessional flows—grants and loans that have a high grant component—from bilateral and multilateral donors that support trade. They included all investments in transport, energy and telecommunications infrastructure and all budget support as trade-related. They also included as "trade development" any assistance for general private sector development and for activities aimed at improving the business climate, access to trade finance and trade promotion.

Under this generous definition, Aid for Trade commitments amounted to $25 billion annually between 2002 and 2005, roughly 40 per cent of all official development assistance (ODA) excluding debt relief. On average, 60 per cent of this amount was for infrastructure ($10 billion) and for budget support ($5 billion). Low-income countries, including LDCs, received about half the total Aid for Trade commitments (World Bank, 2007b).

By this reckoning, it is difficult to argue that ODA has ignored Aid for Trade. Yet with such a large share of total ODA already appearing to be directly or indirectly targeted at trade, future increases are likely to occur only if the envelope for all concessional aid expands. Unfortunately, the aid envelope does not appear to be growing. Despite the commitment of the Group of Eight to double aid by 2010, "programmable aid"—the OECD Development Assistance Committee's term for aid flows that result in net increases in developing country budgets—has not increased since 2005.

Despite its shortcomings, Aid for Trade has made a significant contribution in highlighting the need to promote industrial exports and industrialization in developing countries in general. Previously, most development agencies and donors concentrated almost exclusively on supporting social and human development. A second major contribution arising from Aid for Trade is the focus on overcoming standards and quality challenges facing developing country exporters. The WTO Technical Barriers to Trade Agreement and the Agreement on Sanitary and Phytosanitary Standards have become de facto trade obstacles for developing countries that do not generally possess the necessary standards, metrology, testing, certification and accreditation infrastructure to comply fully with their provisions. Standards-related issues are covered under the Aid for Trade definition of "trade-related infrastructure". Many donors are currently providing funding for quality infrastructure development necessary to assist developing country exporters to gain access to global markets.

B. The Enhanced Integrated Framework and Aid for Trade

The Integrated Framework is a multi-agency (International Monetary Fund, International Trade Centre, United Nations Conference on Trade and Development, United Nations Development Programme, World Bank and WTO), multi-donor programme drawn up to assist LDCs in setting national trade priorities through trade diagnostics. By 2007, 25 LDCs had completed trade diagnostic studies. Evaluations of the Integrated Framework have highlighted a number of shortcomings. The most important of these has been the failure to integrate trade issues fully into national growth and poverty reduction strategies.

In many low-income countries, trade issues have remained at the periphery of the dialogue on economic policy within and between governments and the donor community. Of the 71 poverty reduction strategies available in 2005, 70 per cent mentioned trade as part of

the strategy for growth. However, few articulated operational programmes to address constraints on trade. Specific policy measures to address transport and trade facilitation were included in only 26 of the 71 strategies, for export promotion in 23 and regional integration issues in 25 (World Bank, 2007b).

Even though the Integrated Framework was also intended to address issues related to supply capacity—including standards, testing, quality and conformity—its focus has been mainly on such aspects as customs procedures, special treatment for LDCs, access to finance and governance. The net result has been that the benefits accruing to the LDCs have been relatively limited.

Owing to these concerns an Enhanced Integrated Framework was formally launched in May 2007. The Stockholm Pledging Conference on the Enhanced Integrated Framework in September 2007 mobilized $110 million for the first two years of operation. A new trust fund and a management mechanism were put in place to ensure that the Enhanced Integrated Framework was effectively utilized to implement projects identified in the diagnostic trade integration studies covered under the Integrated Framework. These actions have the potential to mainstream support for trade in national growth and poverty reduction strategies and in the dialogue with the donor community.

C. What should Aid for Trade be?

What should Aid for Trade be? The answer is that it should be a more ambitious version of its sponsors' original vision. It should encompass a resource mobilization tool and coordination mechanism, as well as a targeted programme to develop the supply side, address shortcomings in trade-related infrastructure, and improve the international competitiveness of developing countries (in particular, LDCs).

The first point on resource mobilization is a simple one. Aid for Trade will not succeed unless the international community meets its commitments to increase overall development assistance. The broader donor community endorsed additional development assistance to improve trade capacity in developing countries at the Gleneagles Summit of the Group of Eight in 2005, but if the amount of overall aid does not increase, it is inconceivable that concessional Aid for Trade will increase sufficiently to meet the needs.

There is some positive news with regard to resource mobilization. Despite the current mismatch between initial Aid for Trade expectations and actual delivery, a number of donors have made major commitments. In particular, the European Union is committed to meet its €2 billion a year target by 2010 and there are specific European Union policy guidelines on how that commitment is to be met.[28] The Government of Norway's 2007 Action Plan on Aid for Trade commits a 50 per cent increase in funding and also indicates key priority areas.

Box 8.3 Beyond trade liberalization: Industrial modernization and upgrading in the Syrian Arab Republic

The Syrian Arab Republic offers a recent example of the important link between trade liberalization and investments in quality, standards and safety. For the Syrian Arab Republic, liberalization of trade means strengthening its competitive advantage by raising the quality and safety of its products and services in accordance with international standards. This will lead to greater access to international markets, increase exports and make a significant impact on the growth and competitiveness of industry.

The Industrial Modernization and Upgrading Programme is a technical assistance programme developed jointly by UNIDO and the Syrian Ministry of Industry and funded by the Italian Development Cooperation. It aims at developing the competitiveness of the private manufacturing sector, focusing on the textile value chain, so that it can benefit from new trade opportunities in regional and global markets. Technical assistance is being provided to 40 selected enterprises in the textile sector on a pilot basis. This includes design of detailed actions, training for top and middle management and for national consultants and consultancy companies, export development, and promotion of access to international market and investment partnerships,

The programme also provides technical assistance to the Ministry of Industry and the private sector for upgrading and modernization to improve the competitiveness and productivity of the industrial sector as a whole. The programme involves the formulation of a national programme for industrial upgrading and a funding scheme to enable local enterprises to carry out in-depth diagnostic studies and implement the improvement/upgrading plans.

Source: UNIDO.

The Stockholm Pledging Conference on the Enhanced Integrated Framework obtained significant contributions from a number of donors and the global reviews on Aid for Trade were completed in November 2007. It is therefore premature to assess the full donor commitments or the impact of programmes.

Aid for Trade can also provide a useful coordination tool for donor responses to regional integration. Addressing key trade capacity challenges at the regional level can stimulate greater market integration and result in penetration of global markets beyond the reach of individual countries. Regional projects can also be more cost-effective: one common accreditation body may, for example, be sufficient for a group of countries. Cross-border investments in physical infrastructure, transport and logistics and collaboration on policy can help to lower trade costs. However, many regional bodies in developing countries cannot borrow from donors without country guarantees for physical infrastructure development projects. At the same time, countries are reluctant to use even part of their scarce ODA to

28 In 2005, the European Union committed itself to raising its annual Aid for Trade effort to € 2 billion by 2010. The European Commission proposed an intermediate target of 600 million for the Member States in 2008. A sizeable proportion of these resources are to be earmarked for the African, Caribbean and Pacific countries in the context of the economic partnership agreements (European Commission, 2007).

guarantee regional investment projects. Here, Aid for Trade has an obvious role in mobilizing support for regional investments.

Finally, the Aid for Trade initiative needs to shift its focus on coordination from donors to recipients. Many low-income countries do not have strategies to promote competitiveness. As seen throughout this report, these strategies have to be comprehensive, dealing not only with trade incentives, but also with investment policies and even with labour and product market regulations. Access to high-quality services at competitive costs—in particular transport, telecommunication and power—is also central to export development.

In most countries, responsibility for these areas is dispersed across several ministries. Ministers of trade often have only marginal influence in areas of public policy that fundamentally affect competitiveness and export performance. Using the Aid for Trade initiative, donors can promote more effective coordination among government agencies to promote trade, but to do so they will first have to agree among themselves that trade and the industrial development opportunities it offers to low-income countries can play a central role in development and poverty reduction.

8.5. How developed countries can support transformative resource extraction

The key decisions that harness natural resources for development are taken by the governments of resource-rich countries. However, governments of developed countries have the power to be either supportive or undermining.

There is scope for a more positive agenda supporting the introduction of voluntary international standards and codes pertinent for effective management of resource extraction. For many years, OECD Governments have developed standards and codes for their own economic management. Indeed, the OECD is, at its core, a club of rich countries that mutually support economic governance. The standards, however, are pertinent for issues of importance to OECD countries. Further, the strategies that are appropriate for a resource-rich, low-income country are quite different from those appropriate for the few resource-rich OECD countries.

Voluntary international standards and codes work in three ways. First and foremost, they shine a spotlight on those few decision points that are critical to whether resources are harnessed for development. This helps both the government and civil society to focus on them. Secondly, they provide a convenient means of resolving contention within the society. Finally, although entirely voluntary, they can bring pressure to bear. As governments adopt them, others are revealed as being reluctant to commit to them and citizens may reasonably ask why.

Of course, it is not appropriate for OECD Governments to promulgate voluntary standards and codes for the management of natural resources in non-OECD countries. However, they are sufficiently important in the international system that without their support such standards cannot come about. The Extractive Industries Transparency Initiative is an important precedent for such standards. Initiated by civil society, it has now evolved into an international organization supported by many governments of resource-rich countries. The standard that it promotes, namely, transparency in revenue reporting, was the appropriate place to start, but by itself it does not address key economic decisions.

The process of harnessing natural resources in the context of development is fundamentally about transforming assets that are below the ground into productive assets above the ground. This transformation can be thought of as a sequence. The first step is for the government to capture a substantial proportion of the economic rents from resource extraction as revenue. In turn, this depends on how extraction rights are sold and how they are taxed. While there is no single ideal approach, to date, far too often this stage has been unsatisfactory and international standards could guard against a repetition. The second step is that these revenues should be allocated between consumption, investment and savings abroad. In order to stretch additional consumption beyond the horizon of resource extraction, much of the revenues will need to be invested or held abroad, but it is also appropriate to increase public and private consumption right from moment of discovery. Again, while there is no single ideal to date, huge errors have often been made that a standard could help avoid. The final step is for governments to manage additional consumption and investment effectively. Abrupt increases in spending can lead to inefficiencies, which have been the norm in the past. However, they can also be an opportunity for improved practices of efficiency, and the adoption of new standards could facilitate such an improvement. A possible set of voluntary international standards for managing natural resources is suggested in Collier (2008).

There are proposals to offer a package of infrastructure in return for rights to resource extraction. The packages are generally thought to include an element of aid. Governments could encourage a consortium of resource-extraction companies, construction companies and aid agencies to bid for the right to resource extraction through several offers of infrastructure.

The recent commodity boom was an important opportunity for transformative development in low-income countries. To date, however, there is little evidence of prospects having improved in this direction.

Box 8.4 Developed countries can help to address the environmental consequences of industrial growth

Developed countries can play an important role in assisting developing countries in addressing the environmental consequences of industrial growth. At present, policy initiatives by developed countries focus largely on three aspects of mitigation: transport-related emissions, carbon leakage and the clean development mechanism. In addition, some developed countries, working through organizations such as UNIDO, are providing technical assistance in other environment-related areas of industrial growth, such as cleaner production, industrial wastewater treatment, industrial air pollution and industrial waste management.

Efforts to deal with the transport-related emissions of imported goods began 10 years ago with the "food-miles" labelling schemes of some major United Kingdom retailers. The main problem with such schemes is that they evaluate products based only on transport-related carbon emissions without any regard for carbon emissions during the rest of a food product's life cycle. This is likely to place developing country exporters at a disadvantage relative to home country producers since the growing of food is often more energy intensive in the developed countries than in the developing countries. Recent initiatives to broaden the measurement of a product's carbon footprint might be able to address this issue, but they are significantly more time- and resource-intensive and could put developing countries at a disadvantage owing to lack of expertise. Proper use of standards and labelling schemes can be an important vehicle to deal with these issues.

The issue of carbon leakage reflects the same concerns. Carbon leakage describes the situation where strong domestic action in one country to reduce carbon emissions could cause firms to lose market share to competitors in countries where similar action has not been taken or to relocate to such countries. In such a case, a country suffers economically for no net environmental benefit, since the emission reductions achieved at home are offset by an increase in emissions abroad. Policy responses, in the form of broader carbon adjustment schemes (also known as "border tax adjustment") are being proposed in both the United States and the European Union, primarily to address competitiveness concerns related to carbon leakage. These schemes run the risk of unfairly restricting market access for developing countries. Rigorous impact assessment methodologies should be developed for these initiatives, to judge not only their impact on market access but also their ability to deliver on the environmental objectives they claim.

At present, developing countries are being brought into industrial mitigation through, among other means, the clean development mechanism. This provides finance for projects that reduce carbon emissions relative to a given baseline. By making the resulting reduction in carbon emissions internationally tradable, the scheme enables the world to reduce emissions at a lower cost and also provides a financial flow to developing countries. To date, the main beneficiaries have been China and India. The countries of the bottom billion barely participate in the mechanism. This is in part the inevitable consequence of the concentration and growth of heavy industry in China and in part because the project-specific approach is intensive in documentation and systems of verification. With funding from Austria and other countries, UNIDO has been working to reduce the high transaction costs for these countries through training and capacity-building. As part of the post-kyoto negotiations, various changes to the clean development mechanism are being discussed. For instance, there is a proposal that a country-based approach should be adopted, instead of the current project-based approach.

UNIDO's own experience shows how technical assistance programmes supported by the international community can help to solve environmental problems at the plant level. Through its National Cleaner Production Centre Programme, UNIDO has promoted energy efficiency at the process level. UNIDO is now taking that work to a new level, working on promoting energy efficiency at the systems level in industrial plants. The work is being supported by the Global Environment Facility, funded primarily by developed countries. UNIDO is also working closely with the International Organization for Standardization in the development of new international energy management standards, which will allow companies to certify that they are implementing energy management systems.

Source: UNIDO.

8.6. Conclusions

Developed countries could do more to promote industrialization in developing countries for three reasons. Firstly, it serves their own interest. The influx of cheap manufactured products from developing countries has been the foundation of an unprecedented period of prosperity in developed countries. Secondly, the income gap between developed and developing countries, which widened during the past two centuries but has at last begun to narrow, still remains unacceptably wide, and industrial development is an indispensable driver of poverty-reducing economic growth. Thirdly, it unites ethical imperatives in a single priority to pump-prime the process of industrialization in the poorest countries in the world.

Industrialization is lumpy in geographical space, in product space and in time. It is the lumpiness in time that is critical: once an economy crosses over the threshold of competitiveness, its industrial expansion can be explosive, as demonstrated by China. Yet below that threshold the outcome is most likely to lead to industrial stagnation. The existence of such a threshold implies that, for countries below it, marginal efforts to improve competitiveness are likely to fail. What is needed is a concerted and coordinated effort to raise countries of the bottom billion above the threshold. However, the most astonishing implication is that this effort need only be temporary.

There is thus a reasonable case for a concerted OECD-wide approach to using trade preferences to pump-prime a redefined group of "least developed manufacturing countries" into global markets. The end of the MFA need not mark the end of trade preferences for new entrants to manufacturing, but, at present, different OECD countries have different schemes. The very multiplicity of schemes is a needless source of complexity.

While preferential market access can offer an opportunity for countries of the bottom billion to cross the threshold to explosive industrial growth, a focus on the supply side is also needed. Most of the poorest countries in the world lack the necessary skills and institutions to produce goods that can compete in terms of quality, timely delivery and international standards in export markets. Thus, trade capacity-building remains central to the success of efforts to achieve industrial growth through exports.

A necessary complement to preferences is investment in the infrastructure and institutions needed to support effective global integration by the poorest countries: Aid for Trade. Today, Aid for Trade is at a critical juncture. It has opened up space for a dialogue between developing countries—in particular, low-income countries—and donors on the need for development strategies that balance growth and social development objectives. By focusing on the supply side and incorporating standards and quality challenges within its mandate, Aid for Trade can be seen as the first high-level donor commitment to the promotion and diversification of exports in poor countries.

Aid for Trade must become a more ambitious version of its sponsors' original vision. It should encompass a resource mobilization tool, a targeted programme to improve the international competitiveness of developing countries (in particular, LDCs) and a coordination mechanism. Aid for Trade will not succeed unless the international community meets its commitment to increase overall development assistance. For low-income countries, the recently launched Enhanced Integrated Framework, which has obtained significant funding, can be a catalyst to introduce trade issues into the dialogue on economic policy within government and between governments and the donor community. By linking trade to growth, and growth to poverty reduction, the Aid for Trade agenda offers the potential to mainstream support for trade into national growth and poverty reduction strategies and in the dialogue with the donor community.

The key decisions that harness natural resources for development are taken by the governments of resource-rich countries. However, governments of developed countries have the power to be supportive. There is scope for a positive agenda supporting the introduction of voluntary international standards and codes pertinent for effective management of resource extraction.

Voluntary international standards and codes work in two ways. First and foremost, they shine a spotlight on those few decision points that are critical to whether resources are harnessed for development. This helps the government and civil society to focus on them. Secondly, they provide a convenient way of resolving social contention.

The recent commodity boom was an important opportunity for transformative development in low-income countries. To date, however, there is little evidence of prospects having improved in this direction.

Part B

The global manufacturing scene:
A review of trends in industry and trade performance

Chapter 9
Manufacturing value added and employment

The annual growth of global manufacturing value added (MVA) slowed from 4.3 per cent between 1995 and 2000 to 2.6 per cent between 2000 and 2005. During the period 2000-2005, world MVA reached $6,537 billion. The lack of dynamism in the aggregate masks massive changes in its composition. These changes are the subject of this chapter.

Section 9.1 focuses on recent changes in the composition of MVA, while section 9.2 looks at longer-term changes in the structure of MVA and employment.

9.1 Manufacturing and the developing economies: At a watershed?

The slowdown in global MVA growth masks a sharp shift in the relative performance of developed and developing countries, as well as countries with economies in transition. The growth of MVA in industrialized countries decelerated to virtual stagnation, growing at only 1.1 per cent in 2000-2005, compared with 3.7 per cent in the previous five years. In contrast, in developing countries MVA growth accelerated to 7 per cent from an already rapid 6.5 per cent. MVA in countries with economies in transition grew even faster at 7.2 per cent. Thus, the overall slowdown in global MVA growth masks an accelerating shift in the location of manufacturing growth from developed to developing countries.

A. Developing countries in global manufacturing

Industrialised countries accounted for 74.3 per cent of world MVA in 2000, but dropped to 69.4 per cent in 2005. Developing countries, for their part, increased their share by almost five percentage points (see Table 9.1). Countries with economies in transition accounted for a very small percentage of world MVA—only 1.7 per cent in 2005. Reflecting its high rate of output growth, East Asia and the Pacific increased its share of global MVA from 13.3 per cent in 2000 to 17.5 per cent in 2005. Latin America and the Caribbean lost ground marginally, from a 6.6 per cent share of global MVA in 2000 to 6.4 per cent in 2005. The share of sub-Saharan Africa remained unchanged at 0.7 per cent, as did the share of LDCs, which remained at 0.3 per cent.

Table 9.1 Manufacturing value added share within developing country groups of selected countries, 2000 and 2005 (Percentage)[a]

Country group and region	2000	2005
Industrialized countries	74.3	69.4
Countries with economies in transition	1.4	1.7
Developing countries	24.3	29.0
Sub-Saharan Africa	0.7	0.7
excluding South Africa	0.3	0.3
South Asia	1.5	1.8
excluding India	0.3	0.4
Middle East and North Africa	1.9	2.2
excluding Turkey	1.4	1.7
Latin America and the Caribbean	6.6	6.4
excluding Mexico	4.7	4.7
East Asia and the Pacific	13.3	17.5
excluding China	6.7	7.7
Least developed countries	0.3	0.3
World	100.0	100.0

Source: UNIDO database.
a MVA is in constant 2000 dollars.

MVA growth among the five geographical regions of the developing world was very uneven (Table 9.2). East Asia and the Pacific had the highest annual growth (almost 9.8 per cent), resulting mainly from the rapid MVA growth in China. If China is excluded, East Asia's growth rate falls to 6.1 per cent. The next best performing region is South Asia, with an annual growth rate of 7.9 per cent. India alone accounts for nearly 80 per cent of South Asian MVA. The Middle East and North Africa show an annual growth rate of 6.4 per cent, followed by sub-Saharan Africa (3.1 per cent) and Latin America and the Caribbean (1.9 per cent). In the LDCs, MVA grew relatively fast, at 7.3 per cent per annum, but from a tiny base.

Table 9.2 Manufacturing value added[a], and average annual growth rate, by country group and region, 2000-2005

Country group and region	2000	2001	2002	2003	2004	2005	Annual growth rate, 1995–2000	Annual growth rate, 2000–2005
	(billons of dollars)						(percentage)	
World	5,774.3	5,674.7	5,765.9	5,979.6	6,296.1	6,536.6	4.3	2.6
Industrialized countries	4,289.8	4,158.5	4,171.1	4,257.1	4,433.1	4,535.2	3.7	1.1
Countries with economies in transition	80.1	85.8	88.1	101.7	104.4	108.9	1.6	7.2
Developing countries	1,404.4	1,430.4	1,506.7	1,620.7	1,758.6	1,892.5	6.5	7.0
Sub-Saharan Africa	39.7	40.9	42.0	41.9	43.8	45.8	3.0	3.1
excluding South Africa	16.7	17.2	17.7	18.0	18.8	19.7	3.7	3.5
South Asia	85.8	88.8	94.3	100.5	109.6	119.9	5.5	7.9
excluding India	20.1	21.4	22.3	23.7	26.2	28.8	5.0	8.7
Middle East and North Africa	110.5	112.6	119.8	127.1	137.4	145.9	6.4	6.4
excluding Turkey	83.5	87.8	92.9	98.0	105.3	111.9	7.2	6.8
Latin America and the Caribbean	378.4	371.9	367.7	374.9	402.8	415.2	3.5	1.9
excluding Mexico	271.2	268.8	265.3	273.8	297.7	308.7	1.8	2.8
East Asia and the Pacific	770.4	798.7	866.5	958.9	1,046.6	1,146.7	8.6	9.8
excluding China	385.5	380.9	406.7	430.8	471.8	502.3	6.2	6.1
Least developed countries	16.7	17.6	18.6	19.8	21.1	22.7	6.1	7.3

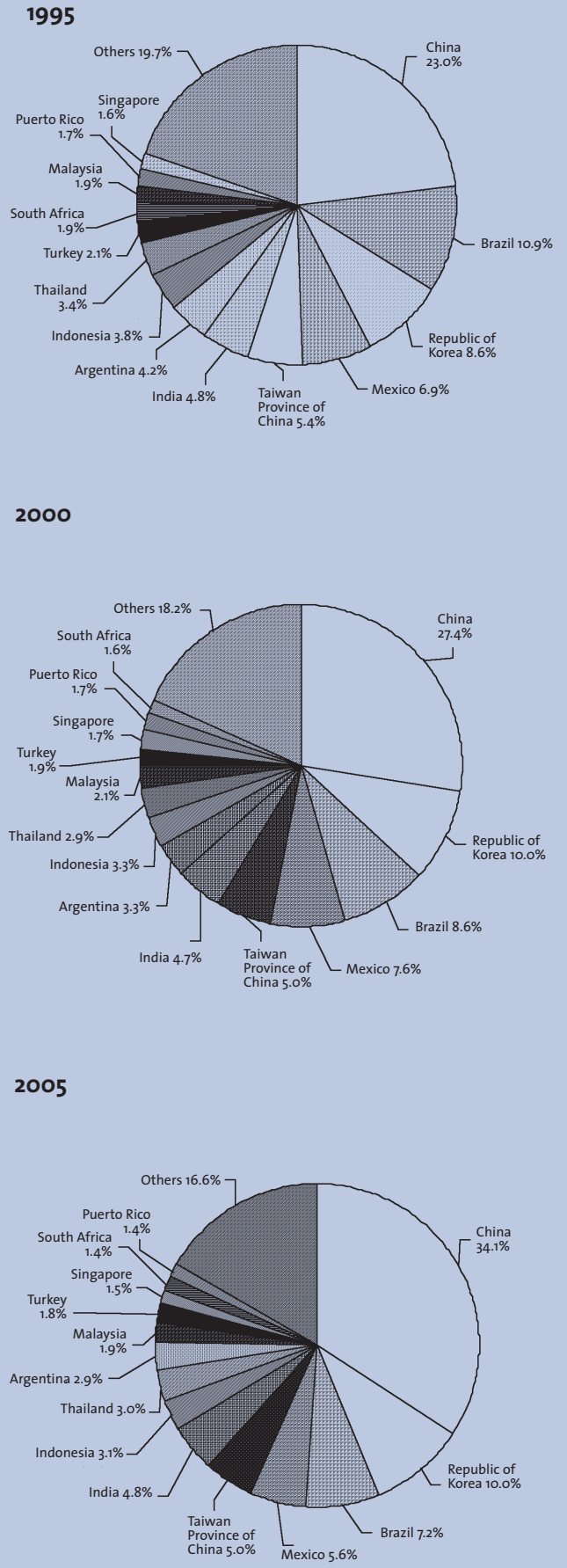
Source: UNIDO database.
a MVA is in constant 2000 dollars.

Leading developing country manufacturers

China is by far the leading country among developing countries in MVA (Figure 9.1). Between 1995 and 2005, it increased its share of MVA produced by developing countries at an accelerating rate, from 23 per cent in 1995 to 27.4 per cent in 2000 and to 34 per cent in 2005. Six of the remaining top developing country manufacturers were also in East Asia and the Pacific (in order, the Republic of Korea, Taiwan Province of China, Indonesia, Thailand, Malaysia and Singapore), and three were in Latin America and the Caribbean (in order, Brazil, Mexico and Argentina).

With the exception of China's surge in market share, there was little change in the relative importance of leading manufacturers among developing countries after 2000. Brazil and Mexico suffered modest declines in their share of developing country MVA, from 8.6 to 7.2 per cent and from 7.6 to 5.6 per cent, respectively. The Republic of Korea maintained its market share. India, despite its recent rapid economic growth and technology boom, increased its share of global developing country MVA by only 0.1 per cent, from 4.7 to 4.8 per cent, a level that has been largely stable since 1995.

Figure 9.1 Share in developing country manufacturing value added by selected developing countries, 1995, 2000 and 2005 (Percentage)[a]



Source: UNIDO database.
a MVA is in 2000 constant dollars.

B. Technological upgrading in developing country industry

Developing country manufacturing is growing increasingly technologically sophisticated. In line with previous UNIDO Industrial Development Reports, four categories of industry are distinguished by the level of process technology: resource-based industries (RB), low-technology industries (LT), and medium- and high-technology industries (MHT).[29] The share of medium- and high-technology products in developing country MVA grew from 38.1 per cent in 1993 to 40.4 per cent in 1998 (Table 9.3). Developing country MVA has continued to upgrade since 2000; in 2003, the share of medium- and high-technology products in MVA for low- and middle-income countries was 43.8 per cent. Low-technology products fell from 20.6 per cent of developing country MVA in 1993 to 19.4 per cent in 1998 and 17.7 per cent in 2003.

Most of the drive to greater technological sophistication in developing country manufacturing emanates from East Asia. East Asia, excluding China, has the most advanced industrial structure among developing regions, followed by China, and South Asia, driven mainly by India's relatively sophisticated technological structure.

Table 9.3 Technology composition of MVA share, 1993-2003, selected years (Percentage)[a]

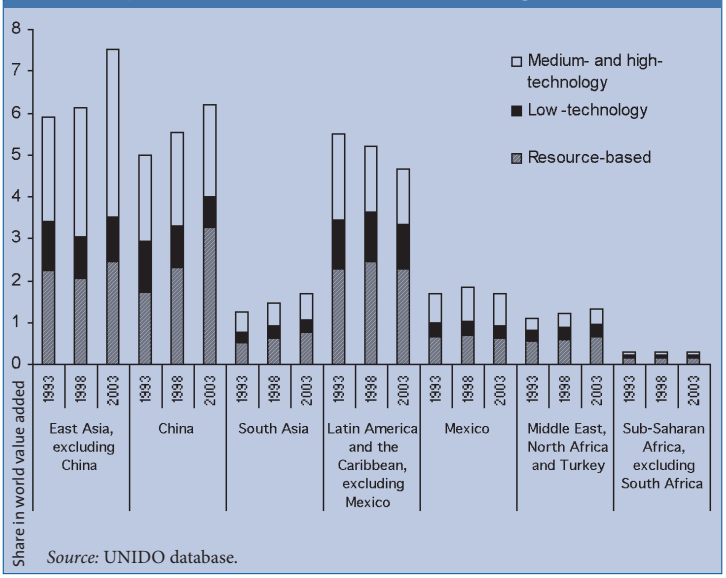
	1993			1998			2003		
	RB	LT	MHT	RB	LT	MHT	RB	LT	MHT
World	33.1	19.3	47.6	31.6	18.4	50.1	32.3	17.5	50.2
Industrialized countries	31.0	19.1	49.9	29.1	18.3	52.6	29.9	17.5	52.6
Countries with economies in transition	48.2	22.9	28.9	49.5	20.6	29.8	50.4	22.3	27.3
Developing countries	41.4	20.6	38.1	40.2	19.4	40.4	38.5	17.7	43.8

Source: UNIDO database.
[a] MVA is in constant 2000 dollars.

East Asia's dominant position in global manufacturing is well known, as evidenced by the region's huge share of medium- and high-technology products in MVA and exports. China's dramatic rise as a global manufacturing powerhouse is seen in resource-based and in medium to high levels of technology. East Asia (excluding China), shows similarly impressive gains. Latin America and the Caribbean have lost their share in global MVA in medium- and high-technology industries (Figure 9.2).

29 The technology classifications are given in annex II.

Figure 9.2 Share in world value added, by region and technology category, 1993-2003 (Percentage)



Source: UNIDO database.

The fastest-growing manufacturing sectors

Table 9.4 shows the world's five fastest-growing manufacturing activities between 2000 and 2006. In descending order they are: other transport equipment (16 per cent annual growth); radio, television and communications equipment (15.4 per cent); electrical machinery and apparatus (15.1 per cent); basic metals (10.4 per cent); and machinery and equipment (8.9 per cent). It also shows the share of world-leading and leading developing countries for each of the fastest-growing products in 2000 and 2006. Germany, Japan and the United States figure prominently among the world-leading countries in the fastest-growing sectors. Four developing countries, Brazil, China, India, and Taiwan Province of China, are among the world leaders. Of these, China appears in all five product groups and the Republic of Korea in three. India is the only new entrant among developing countries into the world leaders between 2000 and 2006, reflecting its rapid development of electrical machinery and apparatus.

The same eight developing countries appear among the leading developing countries in both 2000 and 2006. China occupied the top position among the leading developing countries in all fast-growing product groups in both 2000 and 2006. By 2006, both Brazil and India had entered four of the five fastest-growing product groups. Taiwan Province of China was in three, Mexico (other transport equipment and basic metals) and Singapore (electrical machinery and apparatus and machinery and equipment) in two each, and Malaysia (radio, television and communications equipment) was in one.

One striking feature of the structure of production among developing countries in each of these fast-growing product categories is the extent to which the top two producers dominate the developing country manufacturing scene. The share of the top two developing country producers in total developing country MVA ranges from 80 per cent in other transport equipment down to 58 per cent in machinery and equipment, both industries being dominated by China. The next three developing country manufacturers are confined to production shares in single digits in all five fast-growing industrial sectors, the bare exception being radio, television and communications equipment, where the share of Taiwan Province of China is just over 10 per cent.

C. Regional trends among developing countries

East Asia and the Pacific, especially China, dominate developing country manufacturing. In 2005, East Asia and the Pacific accounted for 61 per cent of MVA of developing countries, of which over half was accounted for by China. In East Asia and the Pacific, MVA increased by nearly 50 per cent, to $1,147 billion, during the period 2000-2005 (Figure 9.3).

Growth of MVA in Latin America and the Caribbean, the developing world's second leading industrial region, was uneven, with MVA declining during 2000-2003 but recovering thereafter. South Asia grew rapidly, but from a much smaller base than East Asia. South Asia's performance is driven by India, where particular industries grew very rapidly, notably, electrical machinery and apparatus, iron and steel, processing of nuclear fuel, and chemicals. The industrial performance of sub-Saharan Africa lags behind all other regions. MVA increased by only $6 billion over five years, and half of this was attributable to South Africa.

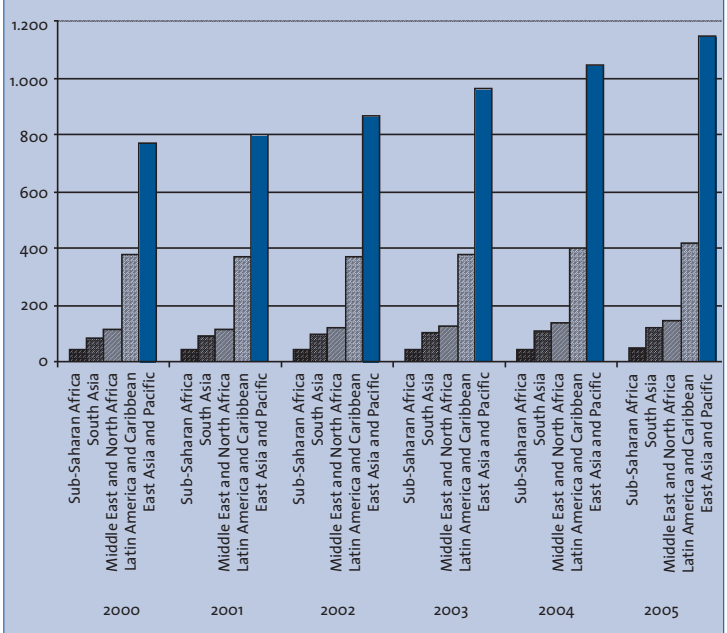
The leading manufacturing countries in each of the five regions are China, India, South Africa, Turkey and Mexico. Together they produce some 50 per cent of the MVA of the developing countries and, because of the rise of China, are becoming more dominant (Table 9.5). However, South Africa and Turkey, although dominant in their regions, are relatively small industrial economies by global standards.

Table 9.4 Top five countries in the fastest-growing manufacturing sectors, 2000 and 2006

The five fastest-growing manufacturing value added sectors	World-leading countries or territories (percentage share in world value added)				Leading developing countries or territories (percentage share in developing country value added)			
	2000		2006		2000		2006	
Other transport equipment (ISIC 35) (16.0 per cent annual growth)								
	United States	26.5	China	34.1	China	54.0	China	68.0
	China	17.5	United States	20.4	Brazil	15.8	Brazil	12.5
	Japan	7.6	Brazil	6.3	Republic of Korea	9.9	Republic of Korea	7.0
	United Kingdom	6.6	Japan	5.8	India	6.7	India	5.1
	Brazil	5.1	United Kingdom	4.8	Taiwan Province of China	3.0	Taiwan Province of China	1.4
	France	4.4	Republic of Korea	3.5	Mexico	2.5	Mexico	1.1
Radio, television and communications equipment (ISIC 32) (15.4 per cent annual growth)								
	United States	61.8	United States	69.1	China	30.1	China	43.0
	Japan	15.1	Japan	10.1	Taiwan Province of China	21.6	Republic of Korea	30.3
	China	4.1	China	6.8	Republic of Korea	21.2	Taiwan Province of China	10.7
	Taiwan Province of China	2.9	Republic of Korea	4.8	Malaysia	6.6	Malaysia	4.3
	Republic of Korea	2.9	Taiwan Province of China	1.7	Brazil	3.4	Brazil	1.8
Electrical machinery and apparatus (ISIC 31) (15.1 per cent annual growth)								
	Japan	21.6	China	28.2	China	45.2	China	64.9
	United States	19.4	Japan	19.1	Singapore	10.1	India	6.8
	China	12.2	United States	11.9	Republic of Korea	7.8	Singapore	5.2
	Germany	12.1	Germany	10.3	Brazil	6.5	Republic of Korea	4.5
	Italy	3.5	India	2.9	India	5.8	Brazil	4.4
Basic metals (ISIC 27) (10.4 per cent annual growth)								
	Japan	22.7	China	23.8	China	40.1	China	54.6
	United States	13.8	Japan	19.0	Republic of Korea	11.6	Republic of Korea	7.8
	China	12.7	United States	10.9	India	7.0	India	7.3
	Germany	5.7	Germany	4.9	Mexico	6.6	Mexico	4.1
	Republic of Korea	3.6	Republic of Korea	3.4	Taiwan Province of China	6.2	Taiwan Province of China	3.8
Machinery and equipment (ISIC 29) (8.9 per cent annual growth)								
	Japan	22.4	Japan	21.5	China	37.2	China	46.4
	United States	20.3	United States	16.7	Republic of Korea	14.3	Republic of Korea	11.5
	Germany	12.8	Germany	12.2	Brazil	7.7	Brazil	6.3
	China	6.5	China	11.0	Mexico	6.1	India	5.8
	Italy	5.7	Italy	4.8	India	5.9	Singapore	4.8

Source: UNIDO (2008a).

Figure 9.3 MVA[a], by region, 2000-2005 (Billions of dollars)



Source: UNIDO database.
a MVA is in constant 2000 dollars.

D. How have the least developed countries fared?

MVA in the LDCs is dominated by Bangladesh, which accounts for more than 40 per cent of total LDC MVA. Table 9.6 shows the top and bottom five LDCs according to three measures: MVA, MVA per capita and share of MVA in GDP.

Some structural change in favour of manufacturing has taken place in LDCs since 2000. In nine of both the top and bottom five countries MVA per capita has grown, and in six of both the top and bottom five countries MVA as a share of GDP has also grown. Two East Asian LDCs, Cambodia and the Lao People's Democratic Republic, have experienced a significant shift towards manufacturing, which currently accounts for some 20 per cent of GDP in both countries.

Table 9.5 Contribution of the five largest developing economies to manufacturing value added[a] in developing economies, 1995 and 2000-2005 (Percentage)

	1995	2000	2001	2002	2003	2004	2005
Developing economies	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Contribution of China, India, Mexico, South Africa and Turkey	38.8	43.9	45.1	46.0	47.3	47.1	48.1
Sub-Saharan Africa	100.0	100.0	100.0	100.0	100.0	100.0	100.0
South Africa	59.0	57.8	57.9	57.9	57.2	57.2	57.0
South Asia	100.0	100.0	100.0	100.0	100.0	100.0	100.0
India	76.2	76.6	75.9	76.4	76.4	76.1	75.9
Middle East and North Africa	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Turkey	26.7	24.4	22.0	22.4	22.9	23.3	23.4
Latin America and the Caribbean	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mexico	22.8	28.3	27.7	27.9	27.0	26.1	25.6
East Asia and the Pacific	100.0	100.0	100.0	100.0	100.0	100.0	100.0
China	45.4	50.0	52.3	53.1	55.1	54.9	56.2

Source: UNIDO (2008a).
a MVA is in constant 2000 dollars.

Table 9.6 Manufacturing value added[a] in least developed countries[b]

MVA (millions of dollars)				MVA per capita (dollars)				MVA as a share of GDP (percentage)			
Top 5	**2000**	**Top 5**	**2005**	**Top 5**	**2000**	**Top 5**	**2005**	**Top 5**	**2000**	**Top 5**	**2005**
Bangladesh	6,920.4	Bangladesh	9,632.4	Samoa	197.7	Samoa	226.6	Lao People's Democratic Republic	16.9	Lao People's Democratic Republic	20.5
Sudan	958.3	Cambodia	1,124.4	Maldives	170.8	Maldives	172.1	Cambodia	16.0	Cambodia	19.9
United Republic of Tanzania	624.3	Myanmar	1,046.5	Cape Verde[c]	113.2	Cape Verde[c]	142.4	Lesotho	15.2	Mozambique	16.2
Cambodia	585.1	Mozambique	932.5	Lesotho	73.4	Lesotho	85.9	Samoa	14.8	Bangladesh	15.7
Senegal	568.0	United Republic of Tanzania	909.8	Senegal	60.5	Lao People's Democratic Republic	81.5	Bangladesh	14.7	Lesotho	15.6
Bottom 5	**2000**	**Bottom 5**	**2005**	**Bottom 5**	**2000**	**Bottom 5**	**2005**	**Bottom 5**	**2000**	**Bottom 5**	**2005**
Vanuatu	10.7	Timor-Leste	11.2	Mali	7.2	Mali	7.6	Sierra Leone	3.3	Timor-Leste	3.3
Comoros	9.2	Comoros	10.1	Ethiopia	6.4	Ethiopia	6.5	Angola	2.9	Mali	3.2
Timor-Leste	8.7	Vanuatu	9.3	Sierra Leone	4.8	Sierra Leone	6.3	Timor-Leste	2.8	Sierra Leone	2.8
Sao Tome and Principe	2.1	Sao Tome and Principe	2.4	Kiribati	4.3	Kiribati	4.3	Djibouti	2.3	Djibouti	2.3
Kiribati	0.4	Kiribati	0.4	Democratic Republic of the Congo	4.2	Democratic Republic of the Congo	4.3	Kiribati	0.7	Kiribati	0.8

Source: UNIDO database.

a MVA is in constant 2000 dollars.
b Data available for 44 out of 49 LDCs.
c Cape Verde is currently listed as a developing/non-LDC country.

9.2. Structure of global manufacturing employment

Chapters 1 and 2 made the point that what a country makes matters for growth. This section reviews patterns of structural change in manufacturing employment between 1975 and 2000. It uses the two-way classification of countries by initial income level and growth introduced in section 1.1.

Countries have been classified into five groups on the basis of their growth performance between 1975 and 2005 and their initial level of income in 1975. Growth performance is measured by the relative frequency of "growth experiences" for each country. A growth experience is defined as a year in which aggregate per capita GDP growth for a country is above the median growth rate for the sample as a whole. Countries are classified as "fast growers" if more than half of their total country-year observations are growth experiences.[30]

The two-way classification yields five country groups:

- High-income countries (OECD countries)
- Fast-growing middle-income countries, for example, Chile, Malaysia, Republic of Korea, Slovakia and Tunisia (33 countries in this group)
- Slow-growing middle-income countries, for example, Algeria, Colombia, Morocco and South Africa (36 countries)
- Fast-growing low-income countries, for example, Botswana, China, Egypt, Honduras and India (23 countries)
- Slow-growing low-income countries, for example, Cambodia, Ghana, the Lao People's Democratic Republic, Senegal and the United Republic of Tanzania (24 countries).

A. The changing structure of manufacturing employment

Table 9.7 shows how labour has shifted among the 28 ISIC sectors within each of the five country groups. Each row shows the average share of workers employed in the sector as a share of average total manufacturing employ-

30 Since data availability differs from country to country, the number of country-year observations varies.

ment (all 28 sectors) in the country group for two time periods, 1975-1985 and 1985-2004. Table 9.8 gives the average share of workers employed in the sector as a percentage of average total global employment (in all five country groups) for both time periods.

Thus, Table 9.7 shows changes in the composition of employment by sector within each country group, while Table 9.8 shows the shift of employment across the country groups within each sector. For example, in OECD countries prior to 1985, on average, 10.5 per cent of labour was employed in the food sector (311); after 1985 that figure had grown to 12.3 per cent (Table 9.7). From a global perspective, prior to 1985, on average, 32 per cent of world employment in the food sector was in OECD countries, while after 1985 OECD countries, on average, made up 29.7 per cent of world food sector employment (Table 9.8).

The structure of employment within country groups

The most remarkable thing about Table 9.7 is the stable structure of employment within each country group. Cells with lighter shading show sectors that have lost more than a two percentage point share in total employment within the group. Cells with darker shading indicate sectors that have gained 2 percentage points within the group. In the OECD countries, only iron and steel manufacturing lost more than 2 per cent of total manufacturing employment, dropping from 7.3 to 4.3 per cent. In fast-growing middle-income countries, manufacturing employment contracted most sharply in the food sector. It expanded most in the apparel sector. In fact, the apparel sector increased its employment share significantly in three of the four developing country groups; only slow-growing low-income countries did not register any increase in the share of apparel employment in their total manufacturing employment. In slow-growing low-income countries, employment shifted from beverages and textiles to food manufacturing.

The structure of employment between country groups

While structural changes within manufacturing sectors over the entire 30-year period were modest, the rich countries were losing their global share of employment in manufacturing to fast-growing low-income countries in almost all sectors across the board (Table 9.8). Twenty-four of the 28 manufacturing sectors listed in table 9.8 show sharp declines in the OECD countries' global share of employment. OECD countries had significant increases in the share of global employment only in furniture (332) and other equipment (385).

The fast-growing low-income countries are a mirror image of the OECD countries. They increased their global share of employment in every manufacturing sector, sometimes dramatically. The most astonishing increase was in apparel. The share of low-income countries in global employment in apparel increased dramatically. Employment in the tobacco, textiles, leather, industrial chemicals, petroleum refining, and non-metallic minerals sectors in fast-growing low-income countries currently exceeds 50 per cent of global employment in each sector.

The fast-growing middle-income countries have lost more than two percentage points of their employment share globally in 10 sectors that span a wide range of industrial activity. They recorded substantial gains in only four sectors—footwear, printing, electrical machinery and transport equipment. Slow-growing middle-income countries lost more extensively, with significantly declining global employment shares in 17 sectors. They experienced particularly sharp declines in their share of global employment in footwear, non-metallic minerals and fabricated metals.

Slow-growing low-income countries—many of them in Africa—remained at the margin of global manufacturing. Only two manufacturing sectors in the slow-growing low-income countries, beverages and furniture, had more than 1 per cent of global employment in the period after 1985. Sixteen of the 28 manufacturing sectors in slow-growing low-income countries lost employment shares, mainly to their more dynamic low-income counterparts.

The role of China

The fast-growing low-income countries continue to show very strong gains in the global share of employment, even when China is excluded. The main difference is for the OECD countries and the fast-growing middle-income countries. The OECD countries made substantial gains in employment share globally in seven manufacturing sectors. These included transport equipment, fabricated metals, plastics and wood products. China's impact on the fast-growing middle-income countries was equally dramatic. Without China, the number of sectors in which the fast-growing middle-income countries' employment share declined significantly falls from 7 to 2, while the number of sectors in which they made significant gains rises from 3 to 16. China's impact is most strongly seen in the fabricated metals, machinery, electrical machinery and transport equipment sectors.

Neither the slow-growing middle-income nor the slow-growing low-income countries change much, in terms of industrial structure, if China is excluded. Employment shares in the slow-growing middle-income countries still fall across a wide range of industries and the slow-growing low-income countries remain marginalized.

Table 9.7 Within-country share of employment in manufacturing[a], mean values before and after 1985
(Percentage)

Period	Sector[a]	Stagnant low-income countries	Successful low-income countries	Stagnant middle-income countries	Successful middle-income countries	OECD
<1985	311	25.9	22.1	20.1	18.1	10.5
≥1985	Food	30.6	20.3	21.5	15.0	12.3
<1985	313	8.0	3.5	4.6	3.0	1.6
≥1985	Beverages	5.6	3.3	5.3	3.1	1.4
<1985	314	2.3	5.6	1.5	1.3	0.5
≥1985	Tobacco	2.2	2.9	0.9	0.8	0.3
<1985	321	19.8	24.2	10.3	10.2	5.8
≥1985	Textiles	15.9	20.1	8.6	7.7	4.1
<1985	322	4.3	3.1	7.8	11.4	5.0
≥1985	Apparel	4.2	10.4	10.4	14.8	3.6
<1985	323	1.7	0.8	0.9	1.0	0.5
≥1985	Leather	0.7	1.7	1.2	0.9	0.4
<1985	324	1.8	1.2	2.2	2.0	1.0
≥1985	Footwear	1.6	2.1	1.7	2.0	0.8
<1985	331	8.5	4.3	4.8	3.9	3.6
≥1985	Wood	7.7	4.4	3.9	2.9	3.9
<1985	332	3.3	2.6	2.7	2.6	2.4
≥1985	Furniture	3.1	2.2	3.0	2.9	3.1
<1985	341	1.1	1.6	2.1	2.4	3.9
≥1985	Paper	2.1	2.1	2.6	2.7	3.7
<1985	342	4.1	2.7	3.6	3.4	5.2
≥1985	Printing	3.9	2.5	5.4	4.1	6.6
<1985	351	3.3	2.5	2.0	2.0	3.5
≥1985	Industrial chemicals	4.9	3.1	2.9	2.7	3.7
<1985	352	3.1	3.5	3.7	2.8	2.5
≥1985	Other chemicals	5.0	3.1	4.5	3.1	3.2
<1985	353	0.6	0.6	2.6	0.6	0.4
≥1985	Petroleum refining	0.6	0.6	2.5	0.5	0.5
<1985	354	0.0	0.2	0.2	0.2	0.2
≥1985	Petroleum and coal	0.0	0.1	0.2	0.2	0.2
<1985	355	1.0	1.7	1.2	1.7	1.3
≥1985	Rubber	1.0	3.7	1.2	1.2	1.1
<1985	356	0.9	0.8	2.0	2.4	2.0
≥1985	Plastic	1.9	1.5	3.0	3.2	3.5
<1985	361	0.5	1.0	0.7	0.6	0.9
≥1985	Pottery	1.5	2.1	1.7	0.9	1.0
<1985	362	0.3	0.8	0.9	1.0	1.0
≥1985	Glass	0.5	0.6	1.0	1.0	0.9
<1985	369	3.8	3.9	6.2	4.5	2.9
≥1985	Non-metallic minerals	4.1	5.4	5.6	3.6	2.7
<1985	371	0.6	2.2	2.4	2.5	7.3
≥1985	Iron and steel	1.2	2.1	3.8	1.9	4.3
<1985	372	0.3	0.6	0.6	1.1	1.6
≥1985	Non-ferrous metals	0.5	0.7	0.8	1.1	1.5
<1985	381	5.4	4.4	6.3	5.8	8.0
≥1985	Fabricated metals	5.0	4.0	5.9	6.1	10.0
<1985	382	0.7	3.6	3.5	4.9	9.4
≥1985	Machinery	0.8	3.3	3.1	6.3	11.0
<1985	383	1.3	2.1	3.0	6.5	8.3
≥1985	Electrical machinery	1.4	2.5	3.1	8.5	9.4
<1985	384	3.1	2.5	4.5	4.8	9.1
≥1985	Transport equipment	2.7	3.0	3.2	5.5	9.1
<1985	385	0.1	0.3	0.4	1.3	1.3
≥1985	Equipment	0.1	0.3	0.4	1.8	2.4
<1985	390	3.3	1.5	1.4	2.2	1.5
≥1985	Other	3.3	2.7	1.6	2.2	1.5

Source: Based on data contained in UNIDO database.
a ISIC Rev. 2.

Table 9.8 Global share of sectoral employment in manufacturing[a], mean values before and after 1985
(Percentage)

Period	Sector[a]	Stagnant low-income countries	Successful low-income countries	Stagnant middle-income countries	Successful middle-income countries	OECD
<1985	311	1.1	17.1	10.5	13.8	32.0
≥1985	Food	0.9	31.6	8.2	12.1	29.7
<1985	313	1.5	14.4	11.7	14.3	30.4
≥1985	Beverages	1.1	43.7	8.6	11.7	19.1
<1985	314	1.1	49.7	7.8	13.7	15.9
≥1985	Tobacco	0.7	74.4	3.8	7.5	7.8
<1985	321	1.1	29.8	7.1	15.5	24.2
≥1985	Textiles	0.7	57.5	4.7	11.2	14.8
<1985	322	0.3	2.3	8.5	16.6	35.6
≥1985	Apparel	0.3	31.0	8.9	18.4	23.1
<1985	323	0.9	13.7	9.8	17.7	25.3
≥1985	Leather	0.3	53.0	5.7	12.7	12.5
<1985	324	0.7	2.5	13.7	18.1	26.9
≥1985	Footwear	0.5	19.1	8.6	22.4	21.7
<1985	331	1.3	7.2	9.7	15.1	38.6
≥1985	Wood	0.8	25.2	6.0	14.2	34.8
<1985	332	0.7	2.5	9.0	15.9	39.0
≥1985	Furniture	1.2	14.4	5.8	16.2	43.3
<1985	341	0.4	11.9	7.1	10.0	51.5
≥1985	Paper	0.5	35.1	5.2	9.9	38.5
<1985	342	0.6	10.0	7.0	8.1	62.6
≥1985	Printing	0.4	21.0	4.7	10.8	55.8
<1985	351	0.3	22.0	3.7	10.6	30.3
≥1985	Industrial chemicals	0.2	56.6	4.1	6.5	17.0
<1985	352	0.8	19.0	9.5	11.4	38.7
≥1985	Other chemicals	0.8	31.5	6.3	13.2	39.1
<1985	353	0.5	13.3	9.2	6.8	27.9
≥1985	Petroleum refining	0.2	51.3	6.0	6.9	16.1
<1985	354	0.2	14.6	4.9	10.6	22.2
≥1985	Petroleum and coal	0.0	36.7	2.7	8.8	13.3
<1985	355	0.7	14.1	6.8	15.4	38.2
≥1985	Rubber	0.4	40.2	4.6	14.0	27.0
<1985	356	0.5	5.5	9.1	18.1	50.7
≥1985	Plastic	0.3	24.6	5.6	15.8	45.6
<1985	361	0.2	14.4	7.0	15.7	30.4
≥1985	Pottery	0.3	42.3	10.9	14.5	17.2
<1985	362	0.3	17.1	6.4	15.5	34.8
≥1985	Glass	0.3	40.1	3.4	12.4	27.1
<1985	369	0.4	16.6	8.6	10.7	23.2
≥1985	Non-metallic minerals	0.3	52.7	4.0	7.5	16.2
<1985	371	0.1	21.8	5.5	10.0	36.1
≥1985	Iron and steel	0.1	47.6	6.4	8.4	19.2
<1985	372	0.1	14.3	4.3	12.1	41.0
≥1985	Non-ferrous metals	0.1	45.1	2.4	8.3	26.7
<1985	381	0.6	6.4	8.5	12.9	50.6
≥1985	Fabricated metals	0.4	20.5	4.2	14.4	46.0
<1985	382	0.0	15.8	3.1	8.0	27.5
≥1985	Machinery	0.0	37.7	1.8	8.4	29.2
<1985	383	0.1	8.9	3.7	11.3	43.6
≥1985	Electrical machinery	0.1	27.6	2.7	14.3	37.3
<1985	384	0.3	8.7	4.8	8.5	42.3
≥1985	Transport equipment	0.2	26.8	3.2	11.1	39.4
<1985	385	0.0	8.1	1.9	8.9	43.0
≥1985	Equipment	0.0	22.5	2.0	9.1	48.7
<1985	390	0.4	9.0	4.9	15.2	37.4
≥1985	Other	0.4	42.8	2.6	11.0	25.9

Source: Based on data contained in the UNIDO database.
a ISIC Rev. 2.

B. From the richer to the poorer: A structural shift in manufacturing

The most dramatic change over the past 30 years is the relative gain by fast-growing low-income countries in the global share of employment and production intensity across the manufacturing sector. Successful low-income countries now employ between 14.4 per cent of all workers worldwide (in furniture manufacturing) and 74.4 per cent (in tobacco products).

This structural shift in global manufacturing reflects more than the rise of China. Even if China is excluded, fast-growing low-income countries registered major increases in their shares of industrial employment across a wide range of activities. Where China looms largest is in the higher-technology sectors. The intensities of machinery and electrical machinery production for fast-growing low-income countries, except China, were generally below global norms. With the exception of China, and India in the 1990s, production intensities in these and other more complex manufacturing products did not rise significantly in fast-growing low-income countries between 1975 and 2000.

The rise in the relative importance of low-income countries has come mainly at the expense of the OECD countries, where a decline in their global share of manufacturing employment has taken place without substantial changes in the structure of employment or the intensity of production within OECD countries manufacturing. In OECD countries, production intensities have persisted over time.

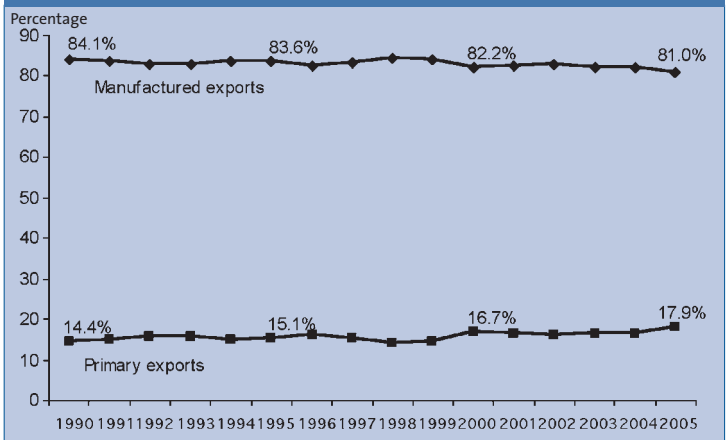
The fast-growing middle-income countries lost significant employment shares and had declining production intensity in such mass manufacturing industries as textiles, mainly to the benefit of the fast-growing low-income countries. They have made gains, at the expense of the OECD countries, in electrical machinery, transport equipment manufacturing and footwear.

Slow-growing low- and middle-income countries appear to be increasingly marginalized in the global industrial picture. Middle-income slow-growing countries have badly lagged behind their more successful middle-income rivals in such sectors as machinery and electrical machinery, where they began and ended the 30-year period well below the average production intensity globally. Low-income slow-growing countries generally represent less than 1 per cent of global employment in all manufacturing sectors, and they show little sign of change in employment intensity of production across sectors.

Chapter 10
Manufactured exports and the developing countries

The focus of this chapter is on global trade in manufactures. Firstly, the role of developing countries in the recent growth of manufactured exports is reviewed. Attention then turns to some important structural changes taking place in global trade in manufactured goods, including the increasing technological sophistication of manufactured exports from developing countries. Manufactured goods constitute the vast bulk of world trade. Despite the commodity boom of recent years, manufactured exports accounted for 81 per cent of total world exports in 2005 (Figure 10.1), a share that has been remarkably stable over the past 15 years. The share of manufactured exports in total exports has fluctuated between 80 and 85 per cent since 1990.

Figure 10.1 Share of primary and manufactured exports in total exports, 1990-2005 (Percentage)



Source: UN COMTRADE.

10.1. Manufactured export growth between 1990 and 2005

Trade in manufactures has boomed during the past several decades. Global manufactured exports continue to grow faster than MVA. Between 2000 and 2005, exports of manufactures grew annually at 9.7 per cent, compared with only 2.6 per cent for MVA (Table 10.1).[31]

Table 10.1 World trade by main category, 2000-2005

Category	2000	2001	2002	2003	2004	2005	Average annual growth rate (percentage) 2000-2005
	(billions of dollars)						
Total trade	5,985	5,752	6,034	7,051	8,531	9,670	10.1
Primary	1,002	946	961	1,173	1,417	1,734	11.6
Manufactures	4,918	4,740	5,005	5,792	7,017	7,830	9.7
Other transactions	66	66	68	86	98	106	10.1

Source: UN COMTRADE.

A. Technological sophistication and export growth

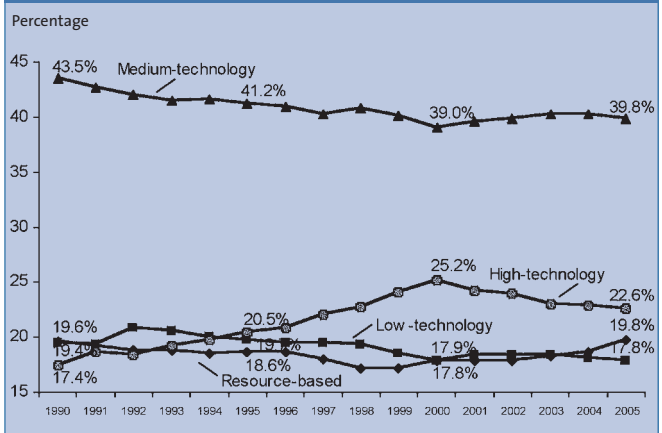
Despite some slippage in recent years, complex (medium- and high-technology) exports dominate world trade in manufactures. Since 1990, the share of complex (medium- and high-technology) exports in total manufactured exports has hovered around 60 per cent and they accounted for 62.4 per cent in 2005 (Figure 10.2). Low-technology exports, in contrast, constitute about 18 per cent of trade in global manufactured goods and have experienced a slow decline in their market share since the early 1990s.

Between 1990 and 2005, the rate of growth in high-technology exports exceeded that for all other categories of manufactured products, 10 per cent per annum (Figure 10.3). Their relative expansion was particularly rapid in the 1990s, especially between 1995 and 2000, when the rate of growth in high-technology exports was more than twice that of all other manufacturing categories. Medium-technology manufactured exports expanded at approximately the same rate as low-technology exports between 1990 and 2005 (at some 8 per cent per year), but they experienced a particularly rapid growth during the period 2000-2005.

Some important structural changes appear to be taking place within manufactured goods trade. Since around 2000, medium-technology exports have increased their share in the complex goods category and resource-based manufactures have experienced very rapid growth.

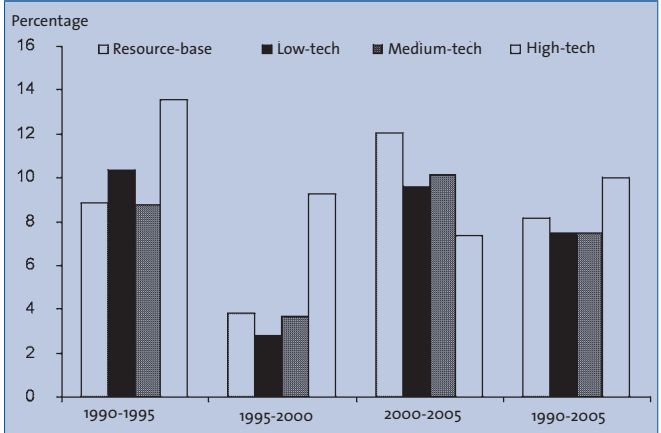
31 Given the lack of disaggregated trade data at constant prices, this section uses current dollars (as in previous Industrial Development Reports). This can sometimes be problematic as inflation can distort the interpretation of trade growth, in particular when analysing long periods of time. This is not the case here because the period of analysis is only five years (from 2000 to 2005) and global inflation between 2000 and 2005 was rather low (average of 4.5 per cent).

Figure 10.2 Share of resource-based, low-, medium- and high-technology exports in total manufactured exports, 1990-2005 (Percentage)



Source: UN COMTRADE.

Figure 10.3 Annual growth rate of manufactured exports by technology category, 1990-2005 (Percentage)



Source: UN COMTRADE.

B. The world's most dynamic exports

The period 2000-2005 saw a shift towards technologically somewhat less sophisticated goods, due to the strong demand from China for construction materials. Between 1995 and 2000, eight of the most dynamic sectors were high-technology and 14 were complex (Table 10.2). By 2000-2005, the number of high-technology dynamic exports had fallen to five and the number of complex exports had fallen to ten (Table 10.3). Resource-based dynamic exports had increased from three to five.

Iron and steel-related manufactures in their different forms and levels of processing dominate the rankings of the world's 20 most dynamic manufactured exports between 2000 and 2005. Petrol and hydrocarbons and other resource-based manufactures are also among the fastest-growing products in global trade. Compared with the 1990s, the number of high-technology products among the most dynamic exports has declined considerably, reflecting, to a large degree, the hunger of China and India for resource-based manufactures.

Table 10.2 World's 20 most dynamic manufactured exports above $20 billion, 1995-2000

Ranking	Code[a]	Technology category	Product	Value 2000 (billions of dollars)	Average annual growth rate 1995-2000 (percentage)
1	334	Resource-based	Heavy petroleum/bituminous oils	160.0	16.4
2	764	High-technology	Telecommunications equipment not elsewhere specified (n.e.s.)	207.7	13.1
3	714	Medium-technology	Engines non-electric n.e.s.	46.2	12.8
4	515	Resource-based	Organic-inorganic compounds	45.7	11.8
5	542	High-technology	Medicaments (including veterinary)	75.2	11.0
6	776	High-technology	Valves/transistors/etc.	284.5	10.6
7	759	High-technology	Office equipment parts and accessories	150.8	10.5
8	771	High-technology	Electrical power machinery	31.8	8.4
9	752	High-technology	Computer equipment	188.5	8.2
10	792	High-technology	Aircraft/spacecraft/etc.	98.8	7.8
11	773	Medium-technology	Electrical distribution equipment	40.5	7.5
12	772	Medium-technology	Electrical circuit equipment	90.7	7.3
13	845	Low-technology	Articles of apparel n.e.s.	55.4	7.1
14	872	Medium-technology	Medical and other instruments	25.7	6.9
15	874	High-technology	Measuring and other instruments n.e.s.	70.8	6.7
16	667	Resource-based	Pearls and precious stones	47.2	6.5
17	821	Low-technology	Furniture and stuffed furnishings	59.6	6.3
18	598	Medium-technology	Miscellaneous chemical products n.e.s.	37.6	5.6
19	781	Medium-technology	Motorcars and other vehicles	301.2	5.5
20	699	Low-technology	Base metal manufactures n.e.s.	51.6	5.1

Source: UN COMTRADE.
a SITC Rev. 3.

10.2. Developing countries are increasingly exporting manufactures

Exports of manufactures by developing countries reached nearly $2.5 trillion in 2005, up from $1.4 trillion in 2000. This increase was $120 billion more than what developing countries achieved between 1990 and 2000 (UNIDO, 2004).

A. Regional patterns of export growth

Manufactured exports from all developing regions, except Latin America, grew faster than the world average and faster than exports from the developed countries (Table 10.4). South Asia was the fastest-growing region, reflecting India's rapid export growth, followed by the Middle East and North Africa, where performance was dominated by Turkey. Manufactured exports from sub-Saharan Africa grew quite rapidly, at some 13 per cent, albeit from a very small base.

Table 10.3 World's 20 most dynamic manufactured exports above $20 billion, 2000-2005

Ranking	Code[a]	Technology category	Product	Value 2005 (billions of dollars)	Average annual growth rate 2000-2005 (percentage)
1	871	High-technology	Optical instruments not elsewhere specified (n.e.s.)	42.5	26.0
2	282	Resource-based	Ferrous waste/scrap	23.5	25.7
3	281	Resource-based	Iron ore/concentrates	27.6	24.6
4	671	Medium-technology	Pig iron, etc./ferro-alloys	25.2	22.9
5	542	High-technology	Medicaments	205.2	22.2
6	672	Medium-technology	Primary/products of iron/steel	28.4	19.7
7	679	Low-technology	Iron/steel pipes/tubes/etc.	53.6	19.2
8	676	Low-technology	Iron/steel bars/rods/etc.	51.3	17.5
9	673	Low-technology	Flat-rolled iron/steel products	64.5	16.9
10	342	Resource-based	Liquid propane/butane	22.5	16.8
11	675	Low-technology	Flat-rolled alloy steel	42.8	16.3
12	541	High-technology	Pharmaceut. exc. medicaments	66.1	16.2
13	334	Resource-based	Heavy petroleum/bituminous oils	344.6	16.1
14	511	Resource-based	Hydrocarbons/derivatives	48.3	16.1
15	723	High-technology	Civil engineering plant	67.0	16.1
16	763	High-technology	Sound/tv recorders, etc.	52.3	15.9
17	512	Medium-technology	Alcohols/phenols/derivatives	28.3	15.9
18	786	Medium-technology	Trailers/caravans/etc.	23.0	15.9
19	571	Medium-technology	Primary ethylene polymers	37.6	15.3
20	691	Low-technology	Iron/steel/aluminium structures	26.8	15.0

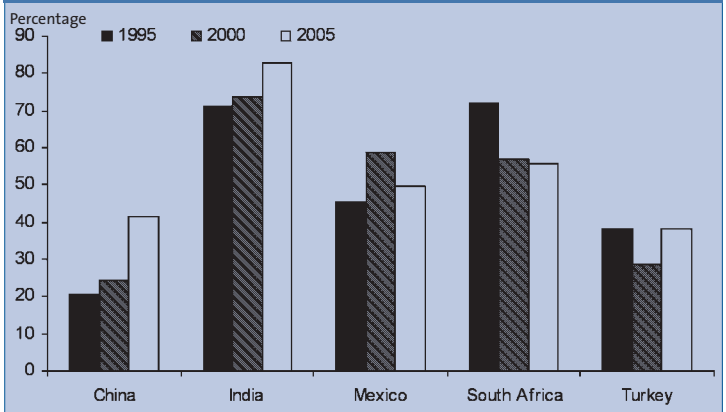
Source: UN COMTRADE.
a SITC Rev. 3.

Table 10.4 World trade in manufactures by country group and region, 2000-2005

Region and country group	2000	2001	2002	2003	2004	2005	Average annual growth rate 2000-2005 (percentage)
	(billons of dollars)						
World	4,918	4,740	5,005	5,792	7,017	7,830	9.7
Developed countries	3,457	3,356	3,512	4,013	4,751	5,160	8.3
Countries with economics in transition	83	81	91	115	160	193	18.5
Developing countries	1,375	1,300	1,399	1,662	2,101	2,473	12.4
Sub-Saharan Africa	32	34	34	41	49	58	12.6
excluding South Africa	14	14	16	18	21	26	13.2
South Asia	51	54	62	75	93	108	16.1
excluding India	14	17	17	21	24	19	6.7
Middle East and North Africa	84	87	92	112	150	174	15.6
excluding Turkey	60	59	60	69	92	108	12.4
Latin America and the Caribbean	244	240	233	247	297	350	7.5
excluding Mexico	100	101	92	107	139	176	11.9
East Asia and the Pacific	930	855	947	1,154	1,472	1,744	13.4
excluding China	702	610	644	744	913	1,021	7.8
Least developed countries	11	11	10	14	16	9	-2.9

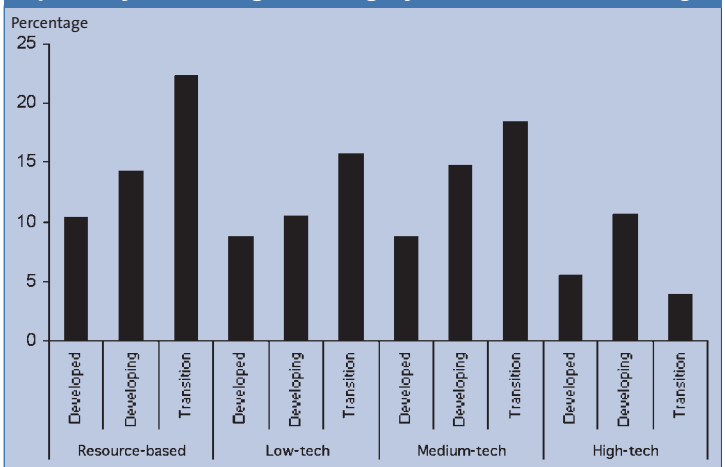
Source: UN COMTRADE.

Figure 10.4 Share of China, India, Mexico, South Africa and Turkey in their respective region's manufactured exports, 1995-2005, selected years (Percentage)



Source: UN COMTRADE.

Figure 10.5 Average annual growth of manufactured exports by technological category, 2000-2005 (Percentage)

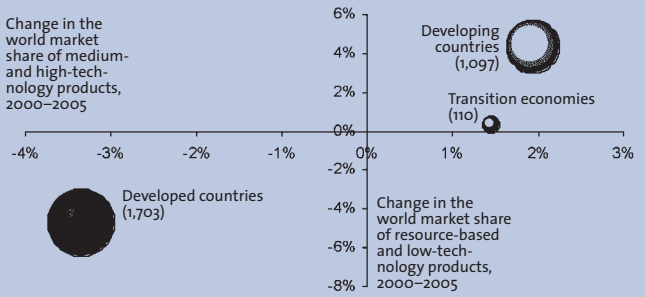


Source: UN COMTRADE.

The disturbing news is that the LDCs lost ground in manufactured goods trade between 2000 and 2005. Exports of manufactures from LDCs reached $16 billion in 2004, up from $11 billion in 2000, but then plummeted by 44 per cent in 2005 to a level lower than at the turn of the century. This reflected the ending of the MFA and the consequent reduction in the preference for apparel exported from Bangladesh.

Within regions, the big five industrial economies (China, India, Mexico, South Africa and Turkey) dominate the export picture (Figure 10.4). India accounted for 83 per cent of South Asia's manufactured exports; South Africa accounted for 56 per cent of sub-Saharan Africa's manufactured exports; and Mexico accounted for 50 per cent of Latin America's manufactured exports. The big five exporters gained market shares in East and South Asia and in the Middle East and North Africa. Not only have developing countries outperformed developed countries in total manufactured exports, they have also done so in technology-intensive sectors. Exports from developing countries have grown faster than exports from developed countries in all technology categories, notably in medium- and high-technology exports (Figure 10.5).

Figure 10.6 Market share of developing countries in all categories of manufactured exports, 2000-2005 (Percentage)[a]



Source: UN COMTRADE.

a Bubble size (number in parenthesis) indicates the increase in the value of total manufactured exports between 2000 and 2005 in billions of dollars.

B. Developing countries and technology exports

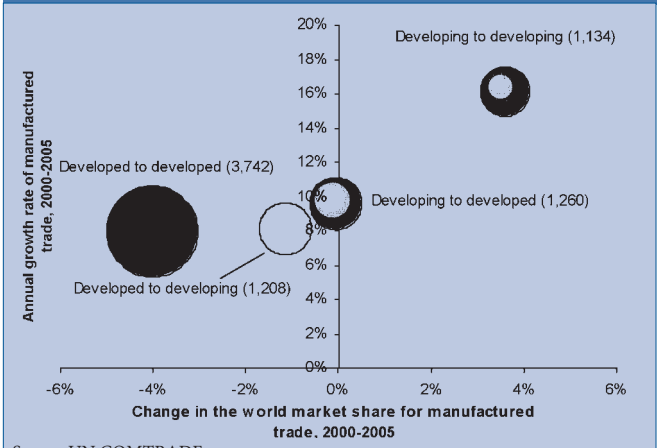
Developing country performance in the high-technology category—where the growth rate is twice that of both high-income countries and countries with economies in transition—is particularly impressive. As a result of these export growth rates, developing countries are catching up with the high-income countries in all categories of manufactured exports. Between 2000 and 2005, developing countries gained a world market share in both simple (resource-based and low-technology) and complex (medium- and high-technology) manufactures (Figure 10.6).

Despite changes in the composition of the 20 most dynamic industrial exports towards resource-based and lower-technology products, developing countries experienced little change in their market share of those exports. Developed countries accounted for 61 per cent of global trade in the most dynamic manufactured exports in 2005, down slightly from 64 per cent in 2000. Developing countries increased their share of the most demanded products by only one per cent; the remainder was taken up by countries with economies in transition.

10.3. South-South trade is growing

The rapid growth of developing country exports of manufactures was driven primarily by the very rapid growth of trade between developing countries: South-South trade (Figure 10.7). While global manufactured trade continues to be concentrated within the developed world, South-South trade has increased its share in world trade by four percentage points in only five years—it currently accounts for 14.5 per cent of global trade. Trade in manufactures within the developing

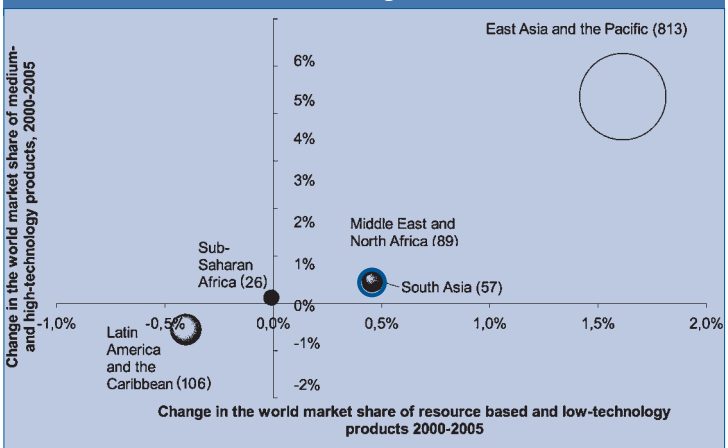
Figure 10.7 Trade patterns between the North and South: World market share, annual growth rates and export values, 2000-2005 (Percentage)[a]



Source: UN COMTRADE.

a Bubble size (number in parenthesis) indicates the value of manufactured exports in 2005 in billions of dollars.

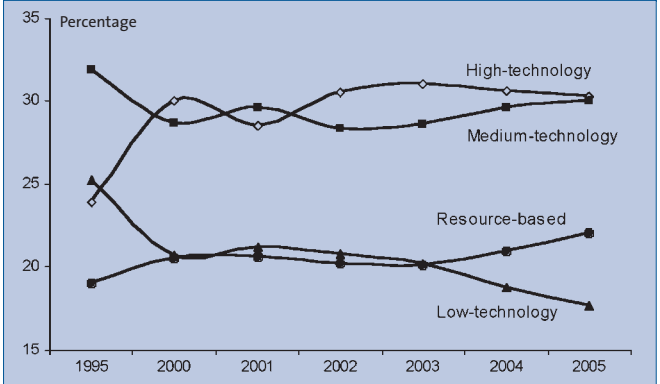
Figure 10.9 Gains in manufactured exports of East Asia, 2000-2005 (Percentage)[a]



Source: UN COMTRADE.

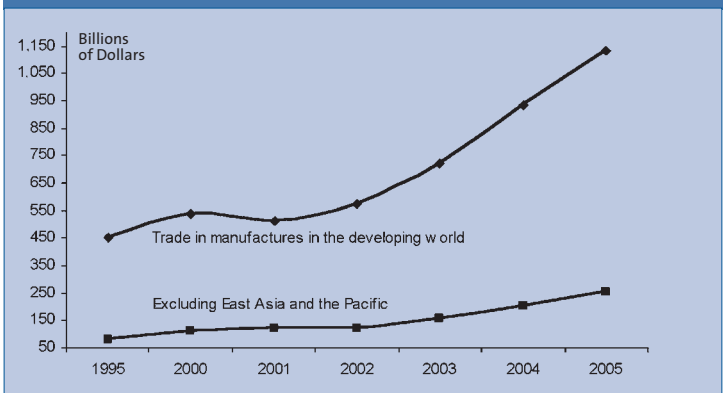
a Bubble size (number in parenthesis) indicates the increase in the value of total manufactured exports between 2000 and 2005 in billions of dollars.

Figure 10.8 Share in South-South trade in manufactures by technological category, 1995 and 2000-2005 (Percentage)



Source: UN COMTRADE.

Figure 10.10 Trends in South-South trade in manufactures, including and excluding East Asia and the Pacific, 1995 and 2000-2005 (Billions of dollars)



Source: UN COMTRADE.

world grew at 16 per cent per annum between 2000 and 2005, double the pace of manufactured trade between high-income countries. Trade between developed and developing countries grew at about half the rate of South-South trade. Developing-to-developed country trade roughly maintained its share of global trade in manufacturing, growing at some 10 per cent per year.

Low-technology and resource-based manufactures dominated South-South trade relations in the 1990s. The surge of integrated international production networks in electronics within East Asia resulted in a high-technology export boom of nearly $320 billion between 1995 and 2005. As a result, medium- and high-technology exports currently account for 60 per cent of total South-South trade in manufactures (Figure 10.8).

The recent commodity boom, driven by rapid growth of demand in East and South Asia, is apparent after 2003. Resource-based manufactured products sharply increased their market share of trade among developing countries, while low-technology products suffered a corresponding decline.

10.4. East Asia dominates developing country trade in manufactures

The regional distribution of gains in manufacturing trade among developing countries remains very uneven. East Asia alone accounted for 74 per cent of developing countries' increase in the value of manufactured exports between 2000 and 2005. As a result, it has widened its trade gap with the rest of the developing world (Figure 10.9). Latin America underperformed, losing its world market share between 2000 and 2005, possibly owing to the overwhelming increase in Chinese exports to the United States, Latin America's main market. Sub-Saharan Africa improved its market share of complex manufactured exports slightly, while the Middle East and North Africa and South Asia gained a market share in equal proportions in low-technology and resource-based exports as well as complex exports.

East Asia also dominated South-South trade. Intra-regional trade in East Asia accounted for 77 per cent of

manufactured trade within the developing world, and 83 per cent of East Asia's manufactured exports stayed within the region. This compared with 67 per cent for Latin America, 56 per cent for sub-Saharan Africa and 53 per cent for the Middle East and North Africa.

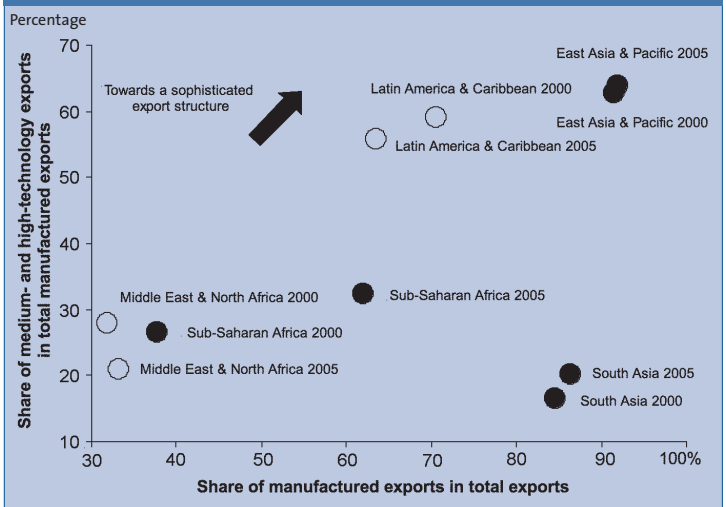
The explosive growth of trade in manufactures among developing countries was almost wholly due to the rapid expansion of trade among East Asian economies (Figure 10.10). The shares in South-South trade of all other developing regions increased by less than 1 per cent.

A. The complexity of East Asian exports

East Asia has the most complex export structure in the developing world. A simple measure of the changing complexity of exports can be captured by two ratios: the share of manufactured exports in total exports, and the share of medium- and high-technology exports in total manufactured exports. Figure 10.11 shows the evolution of export structures between 2000 and 2005, using these two measures in the five developing regions. The high-technology trade boom in the South can be attributed solely to East Asia: the region is engaged in more than 96 per cent of South-South trade in electronics products, parts and components. The specialization of East Asian countries in particular production stages in the electronics value chain—based on their industrial capabilities, wages and location—has boosted trade complementarities rather than sparked competition within the region. This explains why, despite the Chinese surge, most East Asian countries have been able to retain their export competitiveness in technology-intensive sectors (Lall and Albaladejo, 2004).

Most regions increased both the intensity of manufactured exports in total exports and the share of complex exports between 2000 and 2005. South Asia's modest move towards more complex exports is driven by India. The region's very high share of manufactured exports consists primarily of low-technology manufactures and there has been little or no increase in the intensity of complex manufactured goods exports from other countries in the region. Sub-Saharan Africa witnessed a substantial increase in the sophistication of its export structure, but this is distorted by the region's small export base and South Africa's dominant role. Latin America's export structure remains fairly sophisticated, despite a decrease in the share of manufactured exports in total exports, as well as a decrease in the share of complex exports in total manufactured exports. The Middle East and North Africa experienced a reduction in the share of complex exports between 2000 and 2005.

Figure 10.11 Evolution in trade structures, by developing region, 2000 and 2005 (Percentage)

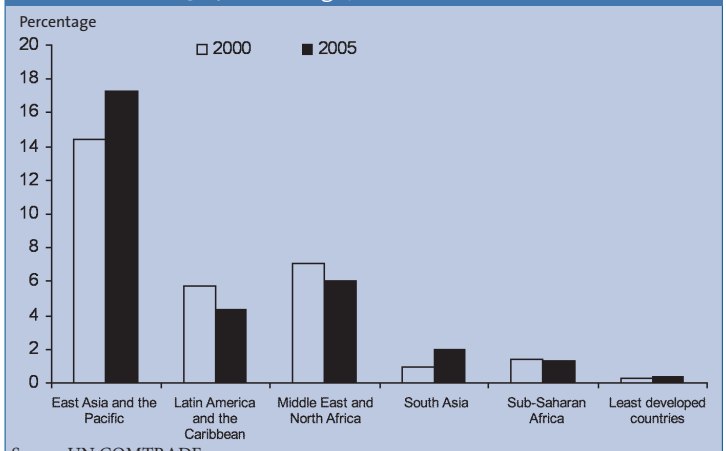


Source: UN COMTRADE.

B. The dominant position of East Asian dynamic exports

A similar story appears for the most dynamic exports. East and South Asia increased their market share between 2000 and 2005, while Latin America, sub-Saharan Africa and the Middle East and North Africa saw their market shares erode (Figure 10.12). Despite their weak overall manufactured export performance, the market share of the LDCs was marginal among the fastest-growing industrial exports.

Figure 10.12 World market share in the world's 20 most dynamic manufactured exports, by developing region, 2000 and 2005 (Percentage)



Source: UN COMTRADE.

Chapter 11
Benchmarking industrial performance at the country level: The UNIDO competitive industrial performance index

Over the past few years UNIDO has developed the competitive industrial performance (CIP) index to help assess national industrial performance in the global economy. This index aims to capture the ability of countries to produce and export manufactures competitively in a single, intuitively appealing measure. UNIDO first introduced the CIP index in the *Industrial Development Report 2002-2003*. It benchmarked 87 countries using a limited number of structural variables for which data were available (UNIDO, 2002). The UNIDO *Industrial Development Report 2004* presented a revised CIP index that included two new components, and expanded the coverage to benchmark 93 countries in 1980, 1990 and 2000 (UNIDO, 2004). Although the CIP index in this report uses the same methodology and indicators as the 2004 report, it has increased its coverage to 122 countries.[32] Box 11.1 provides information on the dimensions, indicators and calculations of the CIP.

11.1. Ranking countries by the competitive industrial performance index

The country ranking according to the CIP index reveals a familiar pattern (Table 11.1). Developed countries congregate near the top; countries with economies in transition and East Asian countries around the upper middle; low-income dynamic countries in the lower middle range; and low-income countries and LDCs at the bottom.

The CIP ranks changed little between 2000 and 2005. The correlation coefficient between the CIP index values for the two years was 0.98. However, leaps in the ranking are possible. Between 2000 and 2005, a total of 21 countries changed their rank by 10 places or more. Most of them were located in the middle of the pack. Countries at the top and bottom tended to maintain a relatively stable position.[33]

Singapore leads the country rankings, both in 2000 and 2005. Ireland and Japan follow, along with Switzer-

32 To see changes over a longer period, refer to the previous UNIDO Industrial Development Reports. However, there may be ranking inconsistencies owing to the different sample size.

33 There are more than three decimal places in the original calculations of the CIP index value, but, only three are shown in the table.

Box 11.1 How the competitive industrial performance (CIP) index is constructed

The CIP index combines four main dimensions of industrial competitiveness: industrial capacity, manufactured export capacity, industrialization intensity and export quality. Six quantitative indicators are used to measure these four dimensions:

(a) Industrial capacity. The CIP uses manufacturing value added (MVA) per capita as the basic indicator of a country's level of industrialization, adjusted for the size of the economy. It shows a country's capacity to add value in manufacturing. But the capacity to manufacture does not necessarily mean the capacity to manufacture competitively. Countries that have gone through a long period of protectionism and import substitution may have a substantial manufacturing capacity that is not globally competitive;

(b) Manufactured export capacity. In a globalizing world, the capacity to export is a key ingredient for economic growth and competitiveness. Manufactured exports per capita are used in the CIP as an indicator of the capacity of countries to meet global demands for manufactured goods in a highly competitive and changing environment. Manufactured exports show if national production is really competitive internationally;

(c) Industrialization intensity. The intensity of industrialization is measured by the simple average of two indicators: the share of manufacturing in GDP, and the share of medium- and high-technology activities in MVA. The former captures the role of manufacturing in the economy and the latter is a measure of the technological complexity of manufacturing. The CIP gives a positive weight to complex activities on the ground that a more complex structure denotes industrial maturity, flexibility and the ability to move to fast-growing activities. However, the indicator has some important limits imposed by the data. It only captures shifts across activities and not upgrading within them, thus missing an important aspect of technological improvement. It is also fairly aggregate and cannot capture fine technological differences within the categories (some low-technology activities may have elements of high technology and vice versa);

(d) Export quality. The quality of exports is measured by the simple average of two indicators: the share of manufactured exports in total exports, and the share of medium- and high-technology products in total exports. The reasoning is similar to that for industrialization intensity. The share of manufactures in total exports captures the role of manufacturing in export activity, while the share of medium- and high-technology exports in total exports reflects technological complexity and the ability to make more advanced products and to move to more dynamic areas of export growth.

The four dimensions are given equal weight. Thus each of the two indicators of the industrialization intensity and export quality get a weight of $^1/_2$ in the aggregate CIP. All six indicators are standardized according to the formula:

$$I_{i,j} = \frac{X_{i,j} - \mathrm{Min}(X_{i,j})}{\mathrm{Max}(X_{i,j}) - \mathrm{Min}(X_{i,j})}$$

Where $X_{i,j}$ is the value i of the country j, Min is the smallest value in the sample and Max the largest. The top country in the sample gets a 1 while the worst performing country gets a 0. The combined indices are simply calculated as the arithmetic mean of standardized values.

Source: UNIDO 2002.

Table 11.1 Ranking of countries by the competitive industrial performance (CIP) index, 2000 and 2005

Rank 2005	Rank 2000	Country or territory	CIP index value 2005	CIP index value 2000
1	1	Singapore	0.890	0.887
2	2	Ireland	0.689	0.778
3	3	Japan	0.678	0.694
4	4	Switzerland	0.659	0.653
5	5	Sweden	0.603	0.593
6	6	Germany	0.602	0.586
7	7	Finland	0.594	0.583
8	8	Belgium	0.581	0.563
9	12	Republic of Korea	0.575	0.528
10	10	Taiwan Province of China	0.555	0.552
11	9	United States of America	0.533	0.558
12	14	Austria	0.528	0.504
13	11	Hong Kong Special Administrative Region of China	0.500	0.532
14	24	Slovenia	0.486	0.448
15	16	United Kingdom of Great Britain and Northern Ireland	0.474	0.491
16	13	Malaysia	0.474	0.509
17	19	France	0.472	0.477
18	21	Netherlands	0.455	0.466
19	18	Luxembourg	0.453	0.481
20	15	Canada	0.453	0.500
21	20	Italy	0.447	0.471
22	29	Czech Republic	0.439	0.398
23	23	Denmark	0.437	0.456
24	25	Hungary	0.436	0.415
25	26	Thailand	0.423	0.408
26	31	China	0.418	0.387
27	17	Malta	0.414	0.483
28	32	Slovakia	0.402	0.364
29	27	Spain	0.392	0.407
30	30	Philippines	0.391	0.388
31	22	Israel	0.386	0.457
32	28	Mexico	0.379	0.404
33	37	Poland	0.332	0.310
34	35	Norway	0.328	0.326
35	33	Costa Rica	0.326	0.345
36	34	Portugal	0.320	0.344
37	39	Estonia	0.319	0.297
38	36	Brazil	0.308	0.323
39	40	Romania	0.308	0.286
40	53	Iceland	0.291	0.254
41	59	Cyprus	0.284	0.241
42	38	Indonesia	0.282	0.301
43	43	Turkey	0.280	0.268
44	41	New Zealand	0.277	0.281
45	46	El Salvador	0.270	0.261
46	48	South Africa	0.269	0.260
47	70	Qatar	0.268	0.215
48	54	Greece	0.266	0.252
49	52	Tunisia	0.263	0.254
50	49	Bulgaria	0.262	0.260
51	44	Jordan	0.257	0.267
52	45	Argentina	0.256	0.266
53	42	Australia	0.255	0.281
54	51	India	0.252	0.256
55	55	Mauritius	0.246	0.247
56	57	Georgia	0.245	0.245
57	61	Morocco	0.242	0.238
58	58	Swaziland	0.240	0.243
59	47	Bahamas	0.238	0.261
60	63	The former Yugoslav Republic of Macedonia	0.234	0.230
61	71	Lebanon	0.232	0.215
62	68	Latvia	0.231	0.217
63	81	Senegal	0.231	0.188
64	66	Pakistan	0.229	0.222
65	64	Bosnia and Herzegovina	0.221	0.224
66	75	Saudi Arabia	0.221	0.206
67	60	Barbados	0.219	0.238
68	72	Guatemala	0.219	0.212
69	79	Viet Nam	0.212	0.191
70	73	Colombia	0.212	0.212
71	84	Côte d'Ivoire	0.212	0.182
72	67	Lesotho	0.211	0.218
73	76	Bangladesh	0.208	0.205
74	78	Chile	0.206	0.200
75	50	Egypt	0.206	0.259
76	56	Macao Special Administrative Region of China	0.203	0.245
77	74	Jamaica	0.202	0.209
78	69	Trinidad and Tobago	0.202	0.217
79	65	Uruguay	0.201	0.222
80	82	Venezuela (Bolivarian Republic of)	0.200	0.186
81	62	Russian Federation	0.199	0.232
82	77	Zimbabwe	0.197	0.200
83	85	Cambodia	0.191	0.179
84	83	Botswana	0.181	0.182
85	98	Iran (Islamic Republic of)	0.180	0.144
86	90	Fiji	0.176	0.165
87	88	Republic of Moldova	0.176	0.170
88	94	Nigeria	0.176	0.152
89	91	Peru	0.175	0.162
90	111	Mozambique	0.173	0.115
91	86	Albania	0.172	0.172
92	80	Sri Lanka	0.172	0.189
93	93	Honduras	0.170	0.157
94	87	Niger	0.168	0.170
95	97	Nepal	0.166	0.149
96	92	Kuwait	0.164	0.161
97	103	Saint Lucia	0.162	0.133
98	95	Namibia	0.159	0.151
99	99	Central African Republic	0.146	0.144
100	108	Nicaragua	0.144	0.127
101	102	Kenya	0.140	0.135
102	101	Ghana	0.137	0.136
103	113	Syrian Arab Republic	0.137	0.110
104	100	Sudan	0.135	0.139
105	104	Madagascar	0.130	0.133
106	105	Eritrea	0.128	0.129
107	107	Malawi	0.125	0.127
108	115	Mongolia	0.119	0.095
109	116	Uganda	0.117	0.094
110	106	Paraguay	0.117	0.129
111	114	Rwanda	0.116	0.101
112	112	Ecuador	0.114	0.114
113	96	Oman	0.113	0.150
114	109	Zambia	0.111	0.121
115	117	United Republic of Tanzania	0.108	0.087
116	89	Bolivia	0.107	0.170
117	119	Benin	0.093	0.078
118	120	Cameroon	0.087	0.069
119	110	Panama	0.085	0.117
120	118	Algeria	0.063	0.083
121	121	Gabon	0.052	0.045
122	122	Ethiopia	0.035	0.044

Sources: Computed from the UNIDO database and UN COMTRADE.

land, Sweden and Germany, in order. The United States is the only mature industrial power that has seen a deterioration in its relative position. This was the result of the improved performance of the Republic of Korea and Taiwan Province of China.

Changes in the CIP ranks provide some insights into changes in industrial performance in the new international context. Small highly dynamic economies are displacing mature, developed countries as global industrial competitors. Among the mature economies, the United States, Canada, Italy, Spain, Portugal, New Zealand and Australia have moved lower in the rankings, overtaken by NICs and countries with economies in transition, such as Slovenia, Malaysia, Slovakia and China.

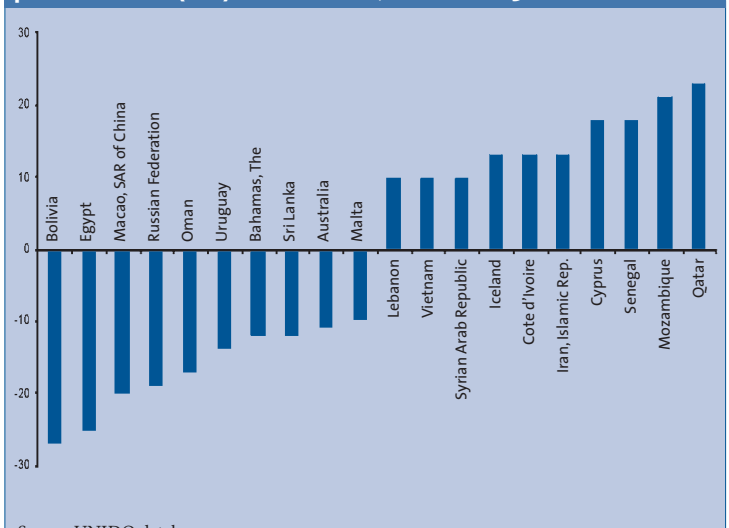
Among the top 60 countries, the largest improvements were registered by Qatar (23 places), Cyprus (18), Iceland (13) and Slovenia (10). The improvements in Qatar were the highest: albeit from a small base, MVA per capita grew annually at 8.3 per cent between 2000 and 2005. Cyprus and Iceland had strong export performance in manufactures and showed a clear movement towards technology-intensive sectors. Slovenia witnessed a rapid increase in manufactured exports per capita (17 per cent growth per annum between 2000 and 2005) and a significant upgrading of the technological structure of its exports by means of export-oriented FDI. Medium- and high-technology exports accounted for 57 per cent of Slovenia's total manufactured exports.

Among the bottom 60 countries, several African countries, including Mozambique, Senegal and Côte d'Ivoire, improved their ranking considerably—by 21, 18 and 13 places, respectively. Manufactured exports in the three countries grew much faster than MVA, and the share of primary exports in total exports declined sharply.

The Islamic Republic of Iran (13), Viet Nam (10), the Syrian Arab Republic (10) and Lebanon (10) made substantial improvements in their CIP ranking between 2000 and 2005. Viet Nam saw impressive growth of exports in the textile and clothing sector, which is mainly responsible for the 19 per cent rise in manufactured exports per capita for the period. Although the Islamic Republic of Iran and the Syrian Arab Republic remained dependent on the primary sector, exports of manufactures per capita grew, respectively, at 19 and 15 per cent annually between 2000 and 2005.

Developing countries that lost their rank significantly included Bolivia (27 places), Egypt (25), Oman (17), Uruguay (14), the Bahamas (12) and Sri Lanka (12). The Bahamas and Bolivia stagnated in both manufactured exports and MVA per capita, while Uruguay lost ground to many other countries in Latin America (Table 11.1 and Figure 11.1).

Figure 11.1 Major changes in the competitive industrial performance (CIP) index ranks, 2000-2005



Source: UNIDO database.

11.2. Competitive industrial performance by region

The regional distribution of CIP rankings presents few surprises (Table 11.2). As expected, East Asia leads the developing world in the CIP index. Also, as expected, sub-Saharan Africa lags behind all other regions. Within each region, however, some interesting changes in industrial competitiveness have taken place.

East Asia

The four mature economies continue to dominate the rankings in East Asia, although Hong Kong Special Administrative Region of China has dropped in industrial competitiveness. China continues its impressive performance and is in twenty-sixth position in the 2005 ranking, overtaking the Philippines and approaching Thailand. Malaysia and Indonesia have lost several positions in the country rankings.

Latin America

Latin America is losing ground to East Asia, as shown by the fact that the best three performers in the region, Mexico, Costa Rica and Brazil, in that order, lost several positions in the rankings. Only 8 of the 22 countries in Latin America improved their rank between 2000 and 2005.

Most Latin American countries struggled to produce and export manufactures competitively. Bolivia, Panama, Ecuador and Paraguay, for instance, were among the least competitive countries in industrial terms in the world. They did not show any signs of industrial dynamism in technology-driven sectors and continued to remain reliant on primary products and

Table 11.2 Ranking of countries by the competitive industrial performance (CIP) index, by developing region, 2000 and 2005

Country or territory	Rank 2005	Rank 2000
East Asia and the Pacific		
Singapore	1	1
Republic of Korea	9	12
Taiwan, Province of China	10	10
Hong Kong Special Administrative Region of China	13	11
Malaysia	16	13
Thailand	25	26
China	26	31
Philippines	30	30
Indonesia	42	38
Viet Nam	69	79
Macao Special Administrative Region of China	76	56
Cambodia	83	85
Fiji	86	90
Mongolia	108	115
Latin America and the Caribbean		
Mexico	32	28
Costa Rica	35	33
Brazil	38	36
El Salvador	45	46
Argentina	52	45
Bahamas	59	47
Barbados	67	60
Guatemala	68	72
Colombia	70	73
Chile	74	78
Jamaica	77	74
Trinidad and Tobago	78	69
Uruguay	79	65
Venezuela (Bolivarian Republic of)	80	82
Peru	89	91
Honduras	93	93
Saint Lucia	97	103
Nicaragua	100	108
Paraguay	110	106
Ecuador	112	112
Bolivia	116	89
Panama	119	110
South Asia		
India	54	51
Pakistan	64	66
Bangladesh	73	76
Sri Lanka	92	80
Nepal	95	97
Sub-Saharan Africa		
South Africa	46	48
Mauritius	55	55
Swaziland	58	58
Senegal	63	81
Côte d'Ivoire	71	84
Lesotho	72	67
Zimbabwe	82	77
Botswana	84	83
Nigeria	88	94
Mozambique	90	111
Niger	94	87
Namibia	98	95
Central African Republic	99	99
Kenya	101	102
Ghana	102	101
Sudan	104	100
Madagascar	105	104
Eritrea	106	105
Malawi	107	107
Uganda	109	116
Rwanda	111	114
Zambia	114	109
United Republic of Tanzania	115	117
Benin	117	119
Cameroon	118	120
Gabon	121	121
Ethiopia	122	122
Middle East and North Africa		
Turkey	43	43
Qatar	47	70
Tunisia	49	52
Jordan	51	44
Morocco	57	61
Lebanon	61	71
Saudi Arabia	66	75
Egypt	75	50
Iran (Islamic Republic of)	85	98
Kuwait	96	92
Syrian Arab Republic	103	113
Oman	113	96
Algeria	120	118

Source: UNIDO database.

unsophisticated manufactures. Despite some slippage in recent years, owing mainly to increased competition in the high-technology sector, Costa Rica remained a small dynamic economy that produced and exported competitively. Chile positioned itself well competitively with a different industrial strategy, following a model based on the exploitation, processing and export of natural resource-based products.

The Middle East and North Africa

The Middle East and North African region played a growing role in global manufacturing, although it still lagged behind Latin America and East Asia. Turkey and Saudi Arabia accounted for much of the region's industrial production, while most other countries struggled to compete internationally. The region continued to be heavily dependent on primary exports, with the commodity price bonanza of recent years reinforcing the trend. The Islamic Republic of Iran, Kuwait, the Syrian Arab Republic, Oman and Algeria remained highly dependent on primary exports, mainly oil and resource-based manufactures.

Turkey led the CIP ranking in the region and remained forty-third in the world. It had the most sophisticated export structure in the region—more than 90 per cent of its exports were manufactures and 41 per cent medium- and high-technology manufactures. Manufactured exports per capita grew annually at 21 per cent between 2000 and 2005. Tunisia and Morocco continued to improve in industrial competitiveness. They emerged as small dynamic economies and were able to compete in global markets not only in basic manufactures but also in sophisticated products.

South Asia

South Asia did not perform well on the CIP measure. India led the CIP in the region but lost three competitive positions in the global rankings, despite its strong IT and electronics sectors. Excluding India, South Asia had one of the least sophisticated export structures in the world, specializing in low-end operations in the fashion cluster (textile, clothing, shoes, leather, etc.). Pakistan and Bangladesh improved their ranks slightly but were still far from the industrial powers of the East Asian region.

Sub-Saharan Africa

Sub-Saharan Africa continued to be marginalized in the international industrial scene. Most of the region's countries clustered at the bottom of the CIP index and performance was dominated by countries losing in rank. Niger, Zambia, Zimbabwe and Lesotho saw the most dramatic descents (seven places for Niger and five for the others), reflecting weak performance in all dimensions of the CIP index.

South Africa was, by far, the most industrialized economy in the region and gained two positions between 2000 and 2005. There is a clear break after South Africa, with Mauritius and Swaziland following at a distance. Despite competitive pressures, both countries retained their positions from 2000, thanks to their strong performance in manufactured exports. However, MVA per capita in Mauritius declined between 2000 and 2005. Mozambique, Senegal and Côte d'Ivoire achieved rapid export growth, increasing at 57 per cent, 20 per cent and 16 per cent, respectively, between 2000 and 2005. The share of manufactures in total exports rose to more than 50 per cent in all three countries.

Annex I

Classification of country groups

A. Low-income countries

Slow-growing low-income countries		Fast-growing low-income countries	
Country	**Code**	**Country**	**Code**
Afghanistan	AFG	Bangladesh	BGD
Burundi	BDI	Bhutan	BTN
Benin	BEN	Botswana	BWA
Central African Republic	CAF	China	CHN
Côte d'Ivoire	CIV	Cameroon	CMR
Ghana	GHA	Egypt	EGY
Gambia	GMB	Ethiopia	ETH
Haiti	HTI	Equatorial Guinea	GNQ
Kenya	KEN	Honduras	HND
Cambodia	KHM	Indonesia	IDN
Lao People's Democratic Republic	LAO	India	IND
Liberia	LBR	Sri Lanka	LKA
Madagascar	MDG	Lesotho	LSO
Mauritania	MRT	Mongolia	MNG
Nigeria	NGA	Mozambique	MOZ
Senegal	SEN	Malawi	MWI
Solomon Islands	SLB	Nepal	NPL
Sierra Leone	SLE	Pakistan	PAK
Somalia	SOM	Rwanda	RWA
Togo	TGO	Syrian Arab Republic	SYR
United Republic of Tanzania	TZA	Thailand	THA
Yemen	YEM	Tonga	TON
Congo	ZAR	Uganda	UGA
Zambia	ZMB		

Source: UNIDO.
Note: Countries are classified into five groups on the basis of their long-term growth performance between 1975 and 2005 and their initial level of income in 1975.

B. Middle-income countries

Slow-growing middle-income countries		Fast-growing middle-income countries	
Country or territory	**Code**	**Country or territory**	**Code**
Netherlands Antilles	ANT	United Arab Emirates	ARE
Argentina	ARG	Belize	BLZ
Bahrain	BHR	Chile	CHL
Bahamas	BHS	Cape Verde	CPV
Bermuda	BMU	Cuba	CUB
Bolivia	BOL	Cyprus	CYP
Brazil	BRA	Dominican Republic	DOM
Barbados	BRB	Spain	ESP
Colombia	COL	Greece	GRC
Costa Rica	CRI	Grenada	GRD
Algeria	DZA	Hong Kong Special Administrative Region of China	HKG
Ecuador	ECU	Hungary	HUN
Fiji	FJI	Iceland	IRL
Gabon	GAB	Ireland	ISL
Guatemala	GTM	Republic of Korea	KOR
Iran (Islamic Republic of)	IRN	Macao Special Administrative Region of China	MAC
Iraq	IRQ	Mexico	MEX
Jamaica	JAM	Malta	MLT
Jordan	JOR	Mauritius	MUS
Kuwait	KWT	Malaysia	MYS
Morocco	MAR	Oman	OMN
Namibia	NAM	Panama	PAN
Nicaragua	NIC	Poland	POL
Peru	PER	Puerto Rico	PRI
Philippines	PHL	Portugal	PRT
Papua New Guinea	PNG	Romania	ROM
Paraguay	PRY	Singapore	SGP
Qatar	QAT	Slovakia	SVK
Saudi Arabia	SAU	Swaziland	SWZ
El Salvador	SLV	Tunisia	TUN
Suriname	SUR	Turkey	TUR
Trinidad and Tobago	TTO	Taiwan Province of China	TWN
Uruguay	URY	Saint Vincent and the Grenadines	VCT
Venezuela (Bolivarian Republic of)	VEN		
South Africa	ZAF		
Zimbabwe	ZWE		

Source: UNIDO.
Note: Countries are classified into five groups on the basis of their long-term growth performance between 1975 and 2005 and their initial level of income in 1975.

C. High-income countries, members of the Organisation for Economic Co-operation and Development, 1970s

Country or territory	Code
Australia	AUS
Austria	AUT
Belgium	BEL
Canada	CAN
Switzerland	CHE
Denmark	DNK
Finland	FIN
France	FRA
United Kingdom of Great Britain and Northern Ireland	GBR
Germany	GER
Israel	ISR
Italy	ITA
Japan	JPN
Luxembourg	LUX
Netherlands	NLD
Norway	NOR
New Zealand	NZL
Sweden	SWE
United States of America	USA

Source: UNIDO.
Note: Countries are classified into five groups on the basis of their long-term growth performance between 1975 and 2005 and their initial level of income in 1975.

Annex II

Statistical notes and tables

A. Statistical notes

1. International trade data

The source of the data in the tables in section B below is the United Nations Commodity Trade Statistics Database (COMTRADE).

The technological classification of trade is based on the Standard International Trade Classification (SITC), Revision 3. The exports examined are classified according to the Standard as follows:

Type of exports	SITC sector codes
Resource-based exports	016, 017, 023, 024, 035, 037, 046, 047, 048, 056, 058, 059, 061, 062, 073, 098, 111, 112, 122, 232, 247, 248, 251, 264, 265, 281, 282, 283, 284, 285, 286, 287, 288, 289, 322, 334, 335, 342, 344, 345, 411, 421, 422, 431, 511, 514, 515, 516, 522, 523, 524, 531, 532, 551, 592, 621, 625, 629, 633, 634, 635, 641, 661, 662, 663, 664, 667,689
Low-technology exports	611, 612, 613, 642, 651, 652, 654, 655, 656, 657, 658, 659, 665, 666, 673, 674, 675, 676, 677, 679, 691, 692, 693, 694, 695, 696, 697, 699, 821, 831, 841, 842, 843, 844, 845, 846, 848, 851, 893, 894, 895, 897, 898, 899
Medium-technology exports	266, 267, 512, 513, 533, 553, 554, 562, 571, 572, 573, 574, 575, 579, 581, 582, 583, 591, 593, 597, 598, 653, 671, 672, 678, 711, 712,713, 714, 721, 722, 723, 724, 725, 726, 727, 728, 731, 733, 735, 737, 741, 742, 743, 744, 745, 746, 747, 748, 749, 761, 762, 763, 772, 773, 775, 778, 781, 782, 783, 784, 785, 786, 791, 793, 811, 812, 813, 872, 873, 882, 884, 885
High-technology exports	525, 541, 542, 716, 718, 751, 752, 759, 764, 771, 774, 776, 792, 871, 874, 881, 891

2. Value added data

The source of the data for total manufacturing value added (MVA) is the United Nations Industrial Development Organization (UNIDO) database.

The source of the data for value added of branches within the manufacturing sector is the UNIDO Industrial Statistics database.

Data adjustments. Because only some of the economies sampled report industrial statistics according to the International Standard Industrial Classification of All Economic Activities, Third Revision (ISIC Rev. 3), data reported according to ISIC Rev. 3 were converted to ISIC Rev. 2. To fill in missing values, the ISIC Rev. 2 series were supplemented with ISIC Rev. 3 series. The data were "now cast" to year 2005 using the best econometric model. The data were then aggregated using the technological classification of ISIC Rev. 2:

Type of activity	ISIC category
Resource-based manufacturing	31, 331, 341, 353,354, 355, 362, 369
Low-technology manufacturing	32, 332, 361, 381, 390
Medium-technology manufacturing	342, 351, 352, 356, 37, 38 (excl. 381)
High-technology manufacturing	3522, 3852, 3832, 3845, 3849, 385

Because reporting of data at the group (four-digit) level of ISIC is inadequate to allow separation of medium- and high-technology products, the category "high-technology manufacturing" was not used; instead, medium- and high-technology products were combined in one category, medium/high-technology. The sectoral shares of value added were then calculated in relation to the total for manufacturing subsectors.

Because of differences in compilation methods and statistical definition, the (national account) total MVA does not necessarily add up to the sum of subsectors in industrial statistics.

3. Data clarifications (by indicator)

(a) Manufacturing value added per capita and as a share of gross domestic product

Year 2000. Syrian Arab Republic: 1998;
Year 2005. Syrian Arab Republic: 2003.

(b) Manufactured exports per capita

Year 2000. Bosnia and Herzegovina: 2003; Rwanda: 2001; Sri Lanka: 2001;

Year 2005. Bahamas: 2001; Bangladesh: 2004; Botswana: 2003; Cambodia: 2004; Eritrea: 2003; Ethiopia: 2003; Kenya: 2004; Kuwait: 2001; Lebanon: 2004; Lesotho: 2002; Macao Special Administrative Region of China: 2004; Nepal: 2003; Nigeria: 2003; Rwanda: 2003.

(c) Share of manufacturing in total exports

Year 2000. Rwanda: 2001; Sri Lanka: 2001;
Year 2005. Bahamas: 2001; Bangladesh: 2004; Botswana: 2003; Cambodia: 2004; Eritrea: 2003; Ethiopia: 2003; Kenya: 2004; Kuwait: 2001; Lebanon: 2004; Lesotho: 2002; Macao Special Administrative Region of China: 2004; Nepal: 2003; Nigeria: 2003; Rwanda: 2003.

(d) Share of medium/high-technology production in manufacturing value added

Year 2000. Albania: 2000; Algeria: 1997; Barbados: 1997; Botswana: 1997; Cambodia: 1995; Côte d'Ivoire: 1997; Estonia: 2000; Georgia: 2000; Ghana: 1995; Guatemala: 1997; Honduras: 1996; Iceland: 1996; Jamaica: 1996; Lithuania: 2000; Malaysia: 1997; Mozambique: 1997; Nepal: 1996; New Zealand: 1996; Nicaragua: 1997; Nigeria: 1996; Pakistan: 1996; Peru: 1996; Qatar: 2000; Republic of Moldova: 2001; Rwanda: 1999; Saint Lucia: 1997; Saudi Arabia: 1997; Sudan: 2001; Swaziland: 1995; Taiwan Province of China: 1996; Zambia: 1994; Zimbabwe: 1996;

Year 2005. Argentina: 2002; Belgium: 2001; Bolivia: 2001; Cameroon: 2002; Canada: 2002; Egypt: 2002; Finland: 2002; Guatemala: 1997; Hungary: 2002; Ireland: 2002; Japan: 2002; Kenya: 2002; Kuwait: 2001; Luxemburg: 2002; Mauritius: 2002; Mexico: 2000; Mozambique: 1997; Nicaragua: 1997; Niger: 2002; Norway: 2002; Paraguay: 2001; Poland: 2002; Republic of Korea: 2002; Saudi Arabia: 1997; Senegal: 2002; Sri Lanka: 2001; Sudan: 2001; Sweden: 2002; The former Yugoslav Republic of Macedonia: 2001; Trinidad and Tobago: 2002; Turkey: 2001; United States of America: 2002.

(e) Share of medium/high-technology products in manufactured exports

Year 2000. Bosnia and Herzegovina: 2003; Rwanda: 2001; Sri Lanka: 2001;

Year 2005. Bahamas: 2001; Bangladesh: 2004; Botswana: 2003; Cambodia: 2004; Eritrea: 2003; Ethiopia: 2003; Kenya: 2004; Kuwait: 2001; Lebanon: 2004; Lesotho: 2002; Macao Special Administrative Region of China: 2004; Nepal: 2003; Nigeria: 2003; Rwanda: 2003.

B. Tables

Table 1 Six indicators of industrial performance, by country, 2000 and 2005

Country or territory	Manufacturing value added per capita (dollars)[a]		Manufactured exports per capita (dollars)		Share of manufacturing value added in GDP (percentage)		Share of manufactured exports in total exports (percentage)		Share of medium/high-technology production in manufacturing value added (percentage)		Share of medium/high-technology exports in manufactured exports (percentage)	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Albania	120.4	140.5	79	193	10.2	9.4	92.0	91.2	9.3	8.0	6.5	10.4
Algeria	127.7	132.5	196	239	7.0	6.3	27.1	17.1	15.6	15.6	2.2	1.8
Argentina	1,264.4	1,372.6	376	577	16.5	17.2	52.7	55.7	30.2	25.9	35.3	32.1
Australia	2,410.4	2,422.0	1,590	2,522	11.6	10.4	47.8	48.5	28.5	23.1	36.0	30.9
Austria	4,362.9	4,786.4	6,894	13,052	18.2	18.6	86.7	91.3	36.6	37.4	57.5	57.5
Bahamas	655.6	694.9	1,449	877	4.0	4.3	78.7	71.3	27.3	27.3	55.8	50.2
Bangladesh	50.2	63.1	39	56	14.7	15.7	92.3	94.0	21.3	21.3	3.3	3.4
Barbados	500.5	469.8	975	1,217	5.3	4.6	95.1	90.8	23.6	23.6	33.1	27.1
Belgium	3,876.1	3,897.6	15,972	28,362	17.1	16.2	88.6	89.0	44.8	48.5	52.9	55.7
Benin	31.8	32.9	4	10	8.8	8.5	14.0	30.4	9.8	9.6	14.8	13.8
Bolivia	133.7	141.9	106	106	13.2	13.3	60.5	34.8	7.9	6.9	24.1	7.2
Bosnia and Herzegovina	117.7	144.1	206	489	9.3	9.4	78.6	80.0	30.5	30.5	29.6	26.6
Botswana	146.8	146.0	1,515	2,082	4.1	3.2	96.2	97.0	21.6	21.6	4.1	5.8
Brazil	700.4	748.7	245	463	20.0	20.4	77.4	72.8	36.6	33.5	47.8	47.9
Bulgaria	245.0	382.2	458	1,177	15.7	18.5	76.6	77.6	36.1	28.5	26.7	28.4
Cambodia	44.5	75.8	107	198	16.0	19.9	98.5	97.5	0.3	0.3	1.0	0.9
Cameroon	62.2	74.8	18	39	9.3	10.3	14.8	25.9	9.7	12.2	6.1	5.1
Canada	4,207.8	4,109.9	6,883	7,944	18.1	16.2	76.4	71.2	41.9	41.2	60.8	57.0
Central African Republic	21.9	23.8	16	22	8.5	10.3	78.3	77.5	11.4	11.4	3.4	1.9
Chile	870.5	977.9	595	1,241	17.6	17.0	50.3	52.4	16.4	22.7	13.2	11.7
China	307.2	495.9	182	556	32.1	34.1	92.1	95.1	43.1	46.9	45.3	57.5
Colombia	289.8	323.4	134	241	14.6	14.9	42.6	51.0	28.2	25.6	36.8	34.6
Costa Rica	935.9	958.6	1,024	1,251	23.1	21.3	73.3	75.7	22.1	22.5	66.3	59.8
Côte d'Ivoire	142.7	116.2	105	219	21.7	19.0	48.6	54.8	15.0	15.0	10.0	36.2
Cyprus	1,037.7	1,032.9	1,238	1,814	8.9	7.9	87.6	88.9	13.8	13.6	30.4	60.7
Czech Republic	1,342.7	1,732.2	2,690	7,180	24.3	26.1	95.1	94.0	27.3	31.3	56.5	62.8
Denmark	4,182.3	3,828.5	7,009	11,779	13.9	12.0	76.0	77.4	34.6	31.2	52.1	54.9
Ecuador	174.8	205.3	91	151	13.6	13.4	23.3	20.2	8.3	11.0	15.8	18.5
Egypt	265.1	278.9	52	83	18.0	17.4	74.5	57.6	39.5	33.7	19.3	11.7
El Salvador	488.1	506.1	145	202	23.1	23.2	68.0	83.7	23.1	23.1	26.4	23.6
Eritrea	17.7	19.4	3	1	10.4	11.4	60.3	39.0	7.7	10.9	8.5	20.6
Estonia	594.0	1,083.6	2,534	4,922	14.8	17.8	90.6	85.9	17.7	16.8	46.8	47.2
Ethiopia	6.4	6.5	1	1	5.4	4.8	18.3	15.7	8.3	6.6	0.5	0.5
Fiji	259.2	274.1	463	716	12.8	12.6	80.0	86.5	7.7	7.7	1.9	5.2
Finland	5,302.8	5,938.8	8,422	11,841	22.8	23.0	95.9	95.2	43.7	47.9	54.8	57.0
France	3,211.9	3,337.3	4,563	6,495	14.3	14.2	91.0	91.0	51.1	53.0	65.3	64.7
Gabon	163.2	176.9	368	613	4.2	4.5	18.0	16.7	5.4	5.4	2.8	7.9
Georgia	100.4	140.0	57	166	17.3	16.2	82.7	85.5	20.4	15.0	30.9	38.6
Germany	4,769.9	5,179.0	5,914	10,900	20.7	21.7	88.5	92.0	61.0	61.1	72.2	71.9

a In constant 2000 dollars.

Country or territory	Manufacturing value added per capita (dollars)[a]		Manufactured exports per capita (dollars)		Share of manufacturing value added in GDP (percentage)		Share of manufactured exports in total exports (percentage)		Share of medium/high-technology production in manufacturing value added (percentage)		Share of medium/high-technology exports in manufactured exports (percentage)	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Ghana	22.9	23.6	56	164	9.0	8.1	66.5	65.1	14.6	12.5	2.8	10.4
Greece	1,115.1	1,281.1	756	1,221	10.6	9.9	75.3	77.8	27.6	27.6	27.7	36.1
Guatemala	222.4	211.8	118	305	13.2	12.6	48.7	71.5	35.1	35.1	29.3	19.4
Honduras	156.9	172.8	73	90	17.0	17.7	43.5	50.4	10.4	10.4	16.4	20.1
Hong Kong Special Administrative Region of China	1,275.5	921.3	29,613	41,264	5.1	3.2	97.4	98.1	36.8	27.7	52.8	64.2
Hungary	974.9	1,251.4	2,516	5,600	20.8	21.2	91.5	90.7	41.8	45.6	73.0	75.5
Iceland	3,414.5	3,959.8	2,507	3,940	11.2	11.2	37.1	37.8	8.5	8.5	25.8	42.5
India	64.7	83.0	37	82	14.3	14.1	83.5	87.3	43.3	39.3	19.8	22.6
Indonesia	216.4	259.1	210	251	27.7	28.1	69.7	64.5	31.6	29.8	34.1	33.1
Iran (Islamic Republic of)	199.2	300.2	42	102	13.1	16.0	9.4	11.6	34.7	43.6	18.1	26.3
Ireland	7,495.5	6,589.5	18,389	24,416	29.8	21.3	91.7	92.3	57.4	62.1	57.7	57.2
Israel	2,982.4	2,637.7	4,821	5,210	15.6	13.9	96.5	84.3	48.0	47.8	50.1	38.6
Italy	3,571.9	3,379.0	4,019	5,949	18.7	17.1	95.2	93.5	40.6	40.6	52.9	53.6
Jamaica	394.9	378.8	462	544	12.7	11.7	91.5	95.4	18.0	18.0	6.4	4.3
Japan	8,129.6	8,474.1	3,598	4,387	22.2	21.7	95.2	94.2	54.2	56.9	85.2	82.0
Jordan	226.1	342.4	215	625	13.5	17.2	79.9	79.1	25.4	21.3	49.8	37.4
Kenya	42.9	46.6	20	42	10.3	10.1	38.2	52.4	21.4	19.4	14.8	11.0
Kuwait	1,160.7	1,532.9	3,739	2,869	6.9	7.8	42.2	40.4	8.3	10.0	11.6	14.1
Latvia	405.8	613.0	736	2,027	12.3	12.0	93.4	87.9	13.7	14.8	15.3	23.1
Lebanon	577.3	657.8	162	398	11.9	12.2	85.7	90.4	10.8	10.8	24.0	29.8
Lesotho	73.4	85.9	185	186	15.2	15.6	98.2	93.8	17.7	20.3	8.1	6.1
Luxembourg	4,677.2	4,495.5	15,616	24,654	10.1	8.8	91.6	88.6	9.2	3.8	42.6	38.7
Macao Special Administrative Region of China	1,128.3	772.5	5,686	6,068	8.6	3.5	99.0	98.7	5.9	6.8	8.8	8.5
Madagascar	26.9	27.3	35	29	11.1	11.6	68.7	64.3	6.1	2.8	2.9	8.6
Malawi	17.8	17.0	7	10	11.6	10.8	20.3	26.1	23.3	23.3	18.9	18.2
Malaysia	1,280.3	1,430.3	3,815	4,753	32.6	32.2	89.3	85.5	54.9	49.8	76.4	72.1
Malta	2,006.1	1,449.1	6,203	5,769	20.2	14.9	99.2	96.0	40.2	41.6	75.4	71.7
Mauritius	774.1	770.9	1,234	1,523	20.5	17.5	98.3	94.5	7.5	5.9	4.9	21.0
Mexico	1,083.5	1,000.6	1,471	1,707	18.4	16.7	86.7	82.2	44.6	45.2	75.8	74.6
Mongolia	17.7	20.9	124	346	4.7	4.5	63.8	83.0	4.0	2.5	1.8	1.9
Morocco	201.2	219.0	198	294	17.6	16.9	76.0	79.1	24.8	25.5	23.1	27.6
Mozambique	25.3	47.8	7	69	12.0	16.2	35.2	76.4	12.0	12.0	10.4	4.6
Namibia	180.4	224.1	525	776	10.0	10.8	75.0	63.0	7.4	7.4	6.0	19.3
Nepal	20.6	18.4	21	22	8.8	7.6	72.8	87.4	10.1	15.4	12.0	9.1
Netherlands	3,365.8	3,300.7	9,625	16,666	13.8	13.3	85.1	85.0	29.6	24.1	60.5	59.0
New Zealand	2,181.4	2,313.3	1,784	2,765	15.7	14.5	51.8	52.2	26.2	26.2	27.5	29.6
Nicaragua	117.0	130.4	35	60	15.1	16.3	27.1	35.6	15.0	15.0	10.8	15.4
Niger	11.4	11.3	19	20	6.8	6.7	69.5	78.6	19.5	24.8	24.3	10.4
Nigeria	14.4	19.1	0	4	3.6	4.1	0.2	2.5	35.9	35.9	60.7	74.9
Norway	3,601.1	3,953.0	3,590	5,767	9.7	9.8	26.9	25.7	34.7	37.0	46.9	44.9
Oman	413.4	580.4	755	659	5.4	7.3	17.0	8.3	11.9	6.7	56.3	38.7
Pakistan	70.8	98.2	58	92	13.8	17.1	87.0	88.9	29.7	29.7	11.0	8.7

a In constant 2000 dollars.

Country or territory	Manufacturing value added per capita (dollars)[a]		Manufactured exports per capita (dollars)		Share of manufacturing value added in GDP (percentage)		Share of manufactured exports in total exports (percentage)		Share of medium/high-technology production in manufacturing value added (percentage)		Share of medium/high-technology exports in manufactured exports (percentage)	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
Panama	372.7	315.9	100	67	9.5	7.2	38.3	22.4	8.9	11.1	12.2	11.0
Paraguay	199.8	185.4	54	77	15.5	14.2	33.4	26.8	13.6	11.2	5.9	13.3
Peru	296.3	346.0	145	411	14.4	14.8	54.7	67.2	17.9	17.9	5.3	3.9
Philippines	221.4	249.3	486	476	22.2	22.0	96.6	95.7	34.2	40.1	81.1	81.4
Poland	729.4	977.8	726	2,028	16.5	19.0	88.3	86.6	27.5	25.9	47.2	53.8
Portugal	1,675.4	1,660.0	2,284	3,143	14.9	14.4	95.9	87.0	25.6	23.1	43.1	43.5
Qatar	2,253.8	3,364.4	2,432	3,191	7.4	7.9	16.7	10.1	21.6	18.2	37.1	63.0
Republic of Korea	2,855.3	3,826.6	3,582	5,766	26.1	28.9	97.8	97.9	53.7	60.3	69.6	75.1
Republic of Moldova	42.8	63.2	83	221	14.2	14.9	72.9	78.4	8.1	9.0	12.9	10.3
Romania	361.4	471.6	429	1,217	21.9	21.5	92.8	95.0	23.6	29.5	26.2	33.4
Russian Federation	349.6	470.4	271	646	19.6	19.0	38.5	38.3	31.5	21.3	33.9	27.3
Rwanda	26.5	27.3	3	2	11.3	10.0	39.9	40.6	6.7	6.7	4.8	19.6
Saint Lucia	197.1	199.0	132	284	4.3	3.9	47.4	73.0	11.6	11.6	29.9	27.9
Saudi Arabia	822.3	942.9	731	1,821	9.7	10.5	19.5	23.3	54.0	54.0	21.7	27.5
Senegal	60.5	69.0	36	88	13.0	13.2	54.0	69.7	28.2	34.3	20.9	31.3
Singapore	5,945.4	6,707.7	33,314	50,028	25.8	26.1	97.1	94.6	71.4	77.6	77.8	72.1
Slovakia	782.7	1,105.5	2,102	5,651	20.9	23.3	95.3	95.1	33.3	37.9	50.7	55.0
Slovenia	2,233.8	2,744.7	4,147	9,089	23.0	23.8	94.5	94.3	40.0	46.4	53.7	57.4
South Africa	521.1	575.9	419	703	17.3	16.3	61.0	70.2	28.3	24.2	39.8	46.8
Spain	2,399.4	2,488.1	2,467	3,879	16.8	15.1	87.6	87.3	34.7	32.3	60.4	60.3
Sri Lanka	132.2	144.1	196	236	15.1	14.2	78.5	75.0	13.8	11.8	9.3	7.8
Sudan	30.5	25.6	38	107	7.7	5.4	76.1	88.7	8.5	8.5	7.3	0.1
Swaziland	331.3	346.4	804	1,299	24.9	24.3	94.3	93.6	0.2	0.2	13.5	16.3
Sweden	5,269.6	6,461.8	9,041	13,132	19.3	21.3	92.2	91.0	50.0	44.1	64.0	60.6
Switzerland	6,483.3	6,873.7	10,697	17,094	18.9	19.0	94.3	97.1	53.9	55.2	66.2	65.0
Syrian Arab Republic	146.7	152.5	44	87	18.0	19.3	16.0	25.8	9.7	9.7	6.4	16.4
Taiwan Province of China	3,425.9	4,144.1	6,494	8,053	23.8	25.2	97.5	96.8	49.4	49.4	71.3	70.2
Thailand	676.7	882.2	957	1,498	33.6	36.1	85.5	87.4	34.7	37.8	59.5	61.6
The former Yugoslav Republic of Macedonia	306.8	316.7	558	893	17.3	17.1	84.7	89.0	17.2	15.3	16.0	20.1
Trinidad and Tobago	446.5	619.7	2,560	4,642	7.1	6.9	77.0	63.0	28.8	22.8	15.8	20.6
Tunisia	372.8	414.7	522	889	18.2	17.2	85.4	85.0	19.7	23.6	24.8	31.5
Turkey	395.3	464.9	361	925	13.5	13.8	88.6	90.8	30.6	27.9	31.9	40.6
Uganda	22.4	25.8	5	10	8.9	9.2	29.4	36.6	9.9	10.9	12.1	21.4
United Kingdom of Great Britain and Northern Ireland	3,921.4	3,706.7	3,978	5,464	16.0	13.6	84.0	85.6	48.1	56.1	67.9	65.4
United Republic of Tanzania	17.9	23.7	7	22	6.9	7.2	37.0	54.5	12.4	12.4	3.9	3.4
United States	5,414.0	5,528.1	2,480	2,707	15.8	15.0	89.7	88.7	57.0	55.7	74.5	72.1
Uruguay	1,044.4	1,110.3	392	500	16.9	17.8	56.3	48.6	14.1	15.7	25.2	16.7
Venezuela (Bolivarian Republic of)	894.1	871.4	471	201	18.5	17.7	37.0	9.6	16.9	16.9	12.2	53.8
Viet Nam	74.1	120.3	87	211	18.6	22.5	46.8	54.0	20.6	21.9	21.5	21.4
Zambia	31.6	38.1	31	47	10.2	10.3	36.7	30.5	22.4	22.4	5.6	7.3
Zimbabwe	79.3	41.1	61	72	13.6	9.6	39.8	67.5	35.8	35.8	30.0	19.4

Source: UNIDO database.

a In constant 2000 dollars.

Table 2 Manufacturing value added[a], by region, 2000-2005 (Billions of dollars)

Region or country	2000	2001	2002	2003	2004	2005
World	5,774.3	5,674.7	5,765.9	5,979.6	6,296.1	6,536.6
Industrialized economies	4,289.8	4,158.5	4,171.1	4,257.1	4,433.1	4,535.2
Countries with economies in transition	80.1	85.8	88.1	101.7	104.4	108.9
Developing economies	1,404.4	1,430.4	1,506.7	1,620.7	1,758.6	1,892.5
Sub-Saharan Africa	39.7	40.9	42.0	41.9	43.8	45.8
excluding South Africa	16.7	17.2	17.7	18.0	18.8	19.7
South Asia	85.8	88.8	94.3	100.5	109.6	119.9
excluding India	20.1	21.4	22.3	23.7	26.2	28.8
Middle East and North Africa	110.5	112.6	119.8	127.1	137.4	145.9
excluding Turkey	83.5	87.8	92.9	98.0	105.3	111.9
Latin America and the Caribbean	378.4	371.9	367.7	374.9	402.8	415.2
excluding Mexico	271.2	268.8	265.3	273.8	297.7	308.7
East Asia and the Pacific	770.4	798.7	866.5	958.9	1,046.6	1,146.7
excluding China	385.5	380.9	406.7	430.8	471.8	502.3
Least developed countries	16.7	17.6	18.6	19.8	21.1	22.7

Source: UNIDO database.
a MVA is in constant 2000 dollars.

Table 3 Total exports, primary exports and manufactured exports, by technology category and region, 2000-2005 (Billions of dollars)

Country group and region	2000	2001	2002	2003	2004	2005
Total trade						
World	5,985.0	5,752.2	6,034.5	7,051.0	8,531.4	9,669.7
Industrialized economies	4,020.7	3,900.7	4,054.7	4,667.0	5,531.0	6,022.0
Countries with economies in transition	161.4	158.7	172.2	218.7	299.8	379.8
Developing economies	1,799.0	1,685.4	1,799.9	2,159.0	2,693.7	3,262.8
Sub-Saharan Africa	85.7	74.8	71.4	89.4	82.5	94.3
excluding South Africa	55.5	46.8	48.4	57.7	42.3	47.3
South Asia	60.7	63.5	72.5	86.9	106.7	125.6
excluding India	15.4	19.2	20.0	23.9	26.9	22.2
Middle East and North Africa	254.6	237.7	252.2	318.7	407.5	548.3
excluding Turkey	227.1	206.4	216.5	271.5	344.4	474.9
Latin America and the Caribbean	345.6	335.2	333.4	365.5	454.7	552.5
excluding Mexico	179.4	176.8	172.8	200.6	266.7	338.3
East Asia and the Pacific	1,017.6	942.1	1,037.9	1,263.4	1,599.9	1,897.5
excluding China	768.4	676.0	712.3	825.2	1,006.5	1,135.5
Least developed countries	16.4	20.1	20.6	24.8	29.8	21.1
Total primary exports						
World	1,001.5	946.1	961.4	1,173.4	1,416.6	1,734.2
Industrialized economies	511.6	493.2	489.8	591.0	708.2	780.4
Countries with economies in transition	77.3	76.1	80.2	102.2	138.2	184.2
Developing economies	411.7	372.8	387.1	476.1	569.0	768.4
Sub-Saharan Africa	51.6	39.0	35.8	46.1	31.2	32.8
excluding South Africa	39.9	31.330.8	37.2	19.0	18.8	
South Asia	9.3	9.9	10.9	11.7	13.4	16.6
excluding India	1.8	2.5	2.6	2.9	3.1	3.4
Middle East and North Africa	170.0	150.9	159.4	205.8	256.4	373.5
excluding Turkey	166.9	147.4	156.0	201.4	251.1	366.7
Latin America and the Caribbean	98.5	91.5	96.9	113.7	152.5	194.9
excluding Mexico	76.3	73.1	77.5	89.7	122.7	156.7
East Asia and the Pacific	81.1	80.3	83.0	97.5	113.8	143.7
excluding China	61.4	60.4	61.5	71.0	80.9	106.4
Least developed countries	4.8	7.8	8.3	9.4	11.2	10.9
Total manufactured exports						
World	4,917.9	4,740.3	5,005.0	5,791.5	7,017.2	7,829.7
Industrialized economies	3,456.8	3,355.5	3,512.1	4,012.7	4,751.0	5,160.0
Countries with economies in transition	82.8	81.4	90.7	114.9	159.6	193.2
Developing economies	1,375.4	1,300.0	1,398.9	1,662.0	2,101.2	2,472.6
Sub-Saharan Africa	32.3	33.7	33.8	40.6	48.9	58.4
excluding South Africa	13.9	13.6	15.8	18.1	21.4	25.9

Country group and region	2000	2001	2002	2003	2004	2005
	(billions of dollars)					
South Asia	51.3	53.5	61.5	74.6	92.8	108.4
excluding India	13.6	16.8	17.4	20.9	23.8	18.8
Middle East and North Africa	84.4	86.6	92.4	112.0	149.9	174.1
excluding Turkey	60.1	58.8	60.1	69.2	92.3	107.7
Latin America and the Caribbean	243.7	240.4	232.9	247.0	296.8	350.3
excluding Mexico	100.1	100.8	92.2	106.7	139.2	175.7
East Asia and the Pacific	930.2	855.0	947.1	1,154.1	1,472.1	1,743.8
excluding China	701.8	610.1	644.4	743.9	913.4	1,021.2
Least developed countries	10.5	11.0	10.5	13.7	16.5	9.1
Resource-based exports						
World	875.1	843.9	893.0	1,055.1	1,311.9	1,546.8
Industrialized economies	587.9	568.3	606.8	709.0	855.2	964.7
Countries with economies in transition	32.4	30.7	34.7	44.2	61.9	88.3
Developing economies	252.9	242.7	249.5	300.4	391.8	492.3
Sub-Saharan Africa	17.5	20.3	17.2	20.6	24.1	31.9
excluding South Africa	9.6	9.7	10.0	12.3	14.7	19.8
South Asia	13.0	13.5	17.0	20.5	29.2	39.7
excluding India	0.4	0.8	1.0	1.3	1.7	2.3
Middle East and North Africa	42.7	39.9	40.2	46.5	66.4	79.8
excluding Turkey	39.4	36.0	36.0	40.7	58.9	69.5
Latin America and the Caribbean	57.5	56.4	51.4	60.2	76.5	98.1
excluding Mexico	48.7	48.3	42.5	50.5	64.8	83.4
East Asia and the Pacific	109.8	101.2	110.3	137.7	178.0	223.7
excluding China	88.9	78.5	83.7	103.9	133.6	162.6
Least developed countries	2.8	3.6	3.0	4.4	5.2	7.6
Low-technology exports						
World	881.0	870.6	919.5	1,066.0	1,271.3	1,395.2
Industrialized economies	516.0	513.6	535.3	618.7	729.3	786.3
Countries with economies in transition	21.7	21.8	24.0	30.9	41.5	44.9
Developing economies	342.7	334.4	359.3	416.1	499.3	562.6
Sub-Saharan Africa	6.2	5.5	5.9	7.1	8.6	7.6
excluding South Africa	3.1	2.7	3.0	3.2	3.7	2.7
South Asia	29.7	30.9	33.8	40.1	46.6	46.8
excluding India	12.1	14.7	15.1	18.0	20.5	15.0
Middle East and North Africa	24.0	26.0	29.5	35.2	43.2	45.6
excluding Turkey	10.8	11.6	12.9	14.4	16.8	16.7
Latin America and the Caribbean	41.9	41.1	41.2	42.1	49.5	56.4
excluding Mexico	16.3	16.6	16.0	18.1	22.7	27.7
East Asia and the Pacific	235.7	226.0	243.9	286.1	345.7	402.5
excluding China	132.1	119.8	119.0	131.0	150.0	157.8
Least developed countries	7.2	7.0	7.0	8.5	10.4	1.0

Country group and region	2000	2001	2002	2003	2004	2005
	(billions of dollars)					
Medium-technology exports						
World	1,920.4	1,878.8	1,996.7	2,333.9	2,827.0	3,118.0
Industrialized economies	1,529.4	1,494.0	1,577.5	1,831.2	2,166.7	2,330.4
Countries with economies in transition	22.5	23.6	24.8	31.0	46.5	52.4
Developing economies	368.1	360.8	394.0	471.6	613.0	734.3
Sub-Saharan Africa	7.4	6.9	9.7	11.7	14.1	16.2
excluding South Africa	1.1	1.1	2.5	2.2	2.1	2.5
South Asia	6.3	6.4	7.6	10.2	12.7	16.6
excluding India	1.0	1.0	1.0	1.4	1.3	1.2
Middle East and North Africa	15.3	18.4	20.6	27.3	37.0	45.4
excluding Turkey	8.7	10.1	9.9	12.3	14.9	19.7
Latin America and the Caribbean	100.0	98.6	99.8	104.7	125.6	147.0
excluding Mexico	25.0	26.4	25.0	29.7	41.8	51.9
East Asia and the Pacific	233.0	224.9	251.3	311.9	415.7	501.9
excluding China	177.5	164.6	177.3	209.8	270.7	313.3
Least developed countries	0.5	0.4	0.4	0.6	0.7	0.5
High-technology exports						
World	1,241.5	1,147.1	1,195.9	1,336.5	1,606.8	1,769.7
Industrialized economies	4,020.7	3,900.7	4,054.7	4,667.0	5,531.0	6,022.0
Countries with economies in transition	6.2	5.2	7.2	8.7	9.6	7.5
Developing economies	411.6	362.1	396.1	473.8	597.1	683.4
Sub-Saharan Africa	1.1	1.0	1.0	1.2	2.1	2.7
excluding South Africa	0.1	0.1	0.2	0.3	0.9	1.0
South Asia	2.2	2.7	3.2	3.8	4.3	5.3
excluding India	0.1	0.2	0.3	0.3	0.4	0.3
Middle East and North Africa	2.4	2.3	2.2	3.0	3.3	3.2
excluding Turkey	1.2	1.1	1.4	1.8	1.7	1.9
Latin America and the Caribbean	44.4	44.3	40.6	40.0	45.2	48.8
excluding Mexico	10.1	9.5	8.6	8.3	9.8	12.7
East Asia and the Pacific	351.8	302.9	341.6	418.4	532.6	615.7
excluding China	303.4	247.2	264.3	299.2	359.1	387.6
Least developed countries	0.1	0.0	0.1	0.1	0.1	0.1

Source: UNIDO database.

Table 4 Components of the competitive industrial performance (CIP) index, by region, 2000-2005

Component and region	2000	2001	2002	2003	2004	2005
Manufacturing value added (MVA) per capita[a]						
World	967.5	939.0	942.5	965.8	1,004.9	1,031.3
Industrialized economies	4,616.8	4,453.7	4,446.2	4,517.4	4,683.4	4,771.0
Countries with economies in transition	252.8	271.6	279.6	323.5	333.0	348.6
Developing economies	297.4	298.4	309.8	328.4	351.4	372.9
Sub-Saharan Africa	61.8	62.1	62.4	60.9	62.3	63.6
excluding South Africa	28.0	28.1	28.1	27.9	28.5	29.2
South Asia	63.9	65.0	67.9	71.2	76.3	82.1
excluding India	61.7	64.3	65.6	68.3	73.8	79.6
Middle East and North Africa	330.0	330.1	344.8	359.3	381.5	398.1
excluding Turkey	313.3	323.0	335.4	346.9	365.9	381.4
Latin America and the Caribbean	745.4	721.7	703.2	706.7	748.7	761.2
excluding Mexico	663.6	647.9	630.2	641.1	687.3	703.2
East Asia and the Pacific	409.6	420.5	451.9	495.6	536.1	582.3
excluding China	613.7	598.2	630.5	659.4	713.2	750.0
Least developed countries	25.9	26.7	27.5	28.6	29.8	31.4
Manufactured exports per capita[a]						
World	824.0	784.4	818.1	935.4	1,120.0	1,235.3
Industrialized economies	3,720.3	3,593.8	3,743.8	4,258.0	5,019.2	5,428.2
Countries with economies in transition	261.1	257.5	287.7	365.6	509.2	618.4
Developing economies	291.3	271.2	287.6	336.8	419.8	487.2
Sub-Saharan Africa	50.2	51.3	50.2	59.0	69.5	81.2
excluding South Africa	23.3	22.2	25.1	28.1	32.4	38.5
South Asia	38.2	39.2	44.3	52.8	64.6	74.3
excluding India	41.7	50.4	51.2	60.3	67.0	51.9
Middle East and North Africa	251.9	254.0	266.1	316.6	416.3	474.7
excluding Turkey	225.4	216.5	217.1	245.2	320.6	367.1
Latin America and the Caribbean	480.1	466.6	445.4	465.7	551.6	642.2
excluding Mexico	245.0	243.0	218.9	249.9	321.3	400.2
East Asia and the Pacific	494.5	450.1	493.9	596.4	754.1	885.6
excluding China	1,117.2	958.2	998.9	1,138.6	1,380.6	1,524.9
Least developed countries	16.4	16.7	15.5	19.8	23.3	12.6
Share of MVA in GDP (percentage)						
World	18.2	17.7	17.6	17.8	18.0	18.0
Industrialized economies	17.6	16.9	16.7	16.7	16.9	16.8
Countries with economies in transition	18.7	18.9	18.5	19.9	19.0	18.6
Developing economies	20.5	20.4	20.7	21.1	21.4	21.7
Sub-Saharan Africa	11.7	11.7	11.6	11.1	11.1	10.9
excluding South Africa	8.1	8.0	8.0	7.8	7.7	7.6

Component and region	2000	2001	2002	2003	2004	2005
South Asia	14.2	14.1	14.4	14.3	14.4	14.5
excluding India	14.0	14.5	14.6	14.8	15.4	15.9
Middle East and North Africa	12.0	12.1	12.4	12.3	12.5	12.5
excluding Turkey	11.6	11.8	12.1	11.9	12.1	12.1
Latin America and the Caribbean	18.6	18.2	18.1	18.1	18.4	18.2
excluding Mexico	18.7	18.4	18.4	18.6	19.0	18.8
East Asia and the Pacific	27.4	27.2	27.6	28.7	29.0	29.5
excluding China	23.9	23.3	23.7	24.1	24.9	25.2
Least developed countries	9.7	9.7	9.8	9.9	9.9	10.0
Share of manufactured exports in total exports						
World	82.2	82.4	82.9	82.1	82.3	81.0
Industrialized economies	86.0	86.0	86.6	86.0	85.9	85.7
Countries with economies in transition	51.3	51.3	52.7	52.5	53.2	50.9
Developing economies	76.5	77.1	77.7	77.0	78.0	75.8
Sub-Saharan Africa	37.7	45.1	47.3	45.5	59.3	62.0
excluding South Africa	25.1	29.1	32.6	31.3	50.6	54.9
South Asia	84.5	84.3	84.9	85.8	87.0	86.3
excluding India	88.0	87.2	86.9	87.7	88.5	84.6
Middle East and North Africa	33.1	36.4	36.6	35.1	36.8	31.7
excluding Turkey	26.5	28.5	27.8	25.5	26.8	22.7
Latin America and the Caribbean	70.5	71.7	69.8	67.6	65.3	63.4
excluding Mexico	55.8	57.0	53.3	53.2	52.2	51.9
East Asia and the Pacific	91.4	90.8	91.2	91.3	92.0	91.9
excluding China	91.3	90.2	90.5	90.1	90.7	89.9
Least developed countries	64.2	54.7	50.8	55.2	55.3	43.1
Share of medium/high-technology production in MVA (percentage)						
World	54.8	53.3	55.4	61.4	70.4	74.8
Industrialized economies	54.8	54.7	56.8	63.1	71.4	75.2
Countries with economies in transition	35.8	33.6	36.3	39.1	53.8	55.1
Developing economies	55.5	50.5	52.4	58.3	68.8	74.9
Sub-Saharan Africa	21.6	19.4	25.4	30.8	37.1	41.3
excluding South Africa	7.4	7.2	15.3	14.4	16.0	17.5
South Asia	9.9	10.3	11.4	13.9	15.5	18.3
excluding India	5.2	5.8	5.6	7.1	6.3	5.2
Middle East and North Africa	16.0	18.4	19.0	23.9	29.3	33.3
excluding Turkey	11.8	12.8	12.1	14.4	15.8	19.2
Latin America and the Caribbean	38.2	38.4	38.2	38.6	42.4	47.2
excluding Mexico	12.9	13.4	12.7	13.9	17.3	20.9
East Asia and the Pacific	75.9	66.1	68.4	76.2	90.6	97.5
excluding China	48.9	38.3	35.5	34.2	35.2	32.8
Least developed countries	3.3	2.8	2.6	3.8	4.0	2.6

Component and region	2000	2001	2002	2003	2004	2005
Share of medium/high-technology exports in manufactured exports (percentage)						
World	64.3	63.8	63.8	63.4	63.2	62.4
Industrialized economies	68.1	67.8	67.5	66.9	66.6	66.1
Countries with economies in transition	34.7	35.4	35.3	34.6	35.2	31.0
Developing economies	56.7	55.6	56.5	56.9	57.6	57.3
Sub-Saharan Africa	26.6	23.6	31.6	31.8	33.2	32.4
excluding South Africa	8.9	9.2	17.2	14.3	14.1	13.3
South Asia	16.6	17.1	17.5	18.7	18.4	20.2
excluding India	7.7	7.4	7.2	8.0	6.9	8.0
Middle East and North Africa	20.9	24.0	24.6	27.1	26.9	27.9
excluding Turkey	16.5	19.1	18.8	20.3	18.0	20.0
Latin America and the Caribbean	59.2	59.4	60.3	58.6	57.5	55.9
excluding Mexico	35.1	35.6	36.5	35.7	37.1	36.8
East Asia and the Pacific	62.9	61.7	62.6	63.3	64.4	64.1
excluding China	68.5	67.5	68.5	68.4	69.0	68.6
Least developed countries	5.2	4.4	4.6	5.4	5.1	6.6

Source: UNIDO database.

a MVA is in constant 2000 dollars.

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Printed in Austria

UNIDO Industrial Development Report 2009

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Artwork: Maireder Visual Design, Vienna

United Nations Industrial Development Organization
Vienna International Centre, P.O. Box 300, A-1400 Vienna, Austria
Tel: +43 1 260 26-5031
E-Mail: e.mayer@unido.org

ISBN 978-92-1-106445-2
9 789211 064452