Industrial Development Report 2013

Sustaining Employment Growth: The Role of Manufacturing and Structural Change

Overview

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

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Foreword

Since the eruption of the financial crisis in 2008, much of the public debate has focused, after decades of silence, on development economics: how to sustain growth, create lasting jobs, generate incomes and enable the accumulation of wealth, thus eradicating the scourge of poverty and preventing social polarization and fragmentation. The rising number of unemployed people in industrialized economies, the unrest in the streets of Northern Africa, the increasingly vocal demands from voters in emerging economies and the discussion towards a new international agenda for development, all point in the same direction – at the central role that productive activities and jobs have in the life of individuals and countries.

Yet, despite a legitimate wish for the contrary, jobs simply do not fall like manna from heaven. They arise out of economic development, from private entrepreneurs and governments generating new businesses and economic activities. Sustained job creation requires structural change, or the ability of an economy to constantly generate new fast-growing activities characterized by higher value added and productivity and increasing returns to scale.

Since the industrial revolution, manufacturing has been at the core of structural change, consistently creating higher levels of output and employment, and leading to an unprecedented growth in incomes. The rising incomes led, in turn, to greater demand for manufactured goods and a relative decline in spending on agricultural products. Productivity gains raised demand further as prices of manufactures declined even more relative to those of other goods and services. Accompanying these changes were major shifts in the labour force and population from agriculture and rural areas, initially into manufacturing and to urban areas, and later into services. This experience has repeated itself across the globe, wherever countries have achieved a mature stage of economic and social development.

For developing countries aiming to maintain growth while sustaining job creation, manufacturing offers an opportunity not only to rebalance the economy towards higher value-added sectors but also to provide a relatively wide employment base with higher labour productivity. The transition from agriculture to services, especially for low-income countries, offers the opportunity to achieve only the first objective, not the second.

UNIDO's *Industrial Development Report 2013* provides a solid foundation to correctly frame the debate on jobs in the world today. Manufacturing remains an important employer, accounting for around 470 million jobs worldwide in 2009 – or around 16 percent of the world's workforce of 2.9 billion. Moreover, the report provides a detailed and largely path-breaking account of how structural change has taken place over the last 40 years.

One of the key findings of this report is that countries need to move from lower tech to higher tech sectors, from lower value-added to higher value-added sectors and from lower productivity to higher productivity sectors. The structural change analysis performed for this report indicates that while conditions may vary significantly across time and space and technological change may still bring large surprises, the trends of the past are very likely to stretch into the future. There is much to learn from understanding history and what drove it. And there is much to learn by developing countries from countries both slightly – and further – ahead of them.

The report highlights how, nearly 40 years after Member States of UNIDO issued the Lima Declaration at the Second General Conference of the Organization in 1975, in which they expressed their firm conviction of industry's role as a dynamic

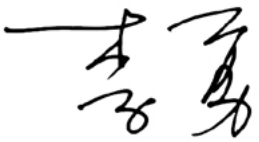
instrument of growth essential to the rapid economic and social development of the developing countries, particularly the least developed countries, the underlying principles have stood the test of time: industrialization remains an indispensable route to development. Industry increases productivity and generates income, reducing poverty and providing opportunities for social inclusion. As countries further develop their industries, the motivation to increase value added drives a greater application of science, technology and innovation, encourages more investment in skills and education and provides the resources to meet broader development outcomes.

As the global community embarks on formulating a new development agenda to build on the foundation laid by the Millennium Development Goals, the report underscores the need for integrating inclusive and sustainable industrial development into this new agenda. This calls for an expansion of productive capacities and a growth of responsible value addition to encourage increased job creation and income generation, while respecting planetary boundaries and ensuring an efficient use of scarce resources. It is only through inclusive and sustainable industrial development that countries around the world, be they industrialized or developing, will be able to achieve the socially equitable and ecologically sustainable economic growth that generates employment and income, and creates the wealth to achieve wider developmental goals for health, education and human rights.

Structural transformation of the economy lies at the heart of this process, together with conscious and considered measures to encourage economic growth, enhanced productivity and the development of technology, innovation, infrastructure and trade. The report provides ample guidance on how to initiate and sustain such a process – by exploring the key drivers of structural change and providing practical policy options for governments of countries at different levels of development.

The state can use policy instruments to target key drivers. Education and skills, for example, would be underprovided in a pure market-driven environment as employers have too few incentives to allocate funds for these public goods. Similarly, limited returns on investment, lack of competitive finance and coordination failures make technology and innovation prone to market failures, resulting in underinvestment. Such market failures can be addressed through targeted policy measures to reduce input costs where the market is unable to provide a reliable supply system of low-cost and high-quality material inputs critical to local industries.

It gives me great pleasure to present this report at this early stage of my tenure as Director General of UNIDO. I am particularly pleased that the report underlines the critical need for international cooperation to achieve the structural change and economic growth required to combat poverty, and reaffirm the commitment of my Organization to fulfil its unique mandate in support of this effort. I am grateful to the UNIDO staff and the international experts that joined hands to produce this report, and look forward to seeing it become a key component in the development debate.



LI Yong
Director General, UNIDO

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Technical notes and abbreviations

References to dollars ($) are to US dollars, unless otherwise indicated.

In this report, *industry* refers to the manufacturing industry and *sectors* refers to specific manufacturing sectors.

This report defines *developed countries* or *developed economies* as the group identified as "high-income OECD countries" by the World Bank and *developing countries* or *developing economies* as all other economies. See the Annex for a complete list of economies by region, income level, least developed countries and largest developing economy in each region.

Components in tables may not sum precisely to totals shown because of rounding.

BIT	Bilateral investment treaty
FDI	Foreign direct investment
GDP	Gross domestic product
GVC	Global value chain
ILO	International Labour Organization
ISIC	International Standard Industrial Classification
MDG	Millennium Development Goal
MVA	Manufacturing value added
OECD	Organisation for Economic Co-operation and Development
PPP	Purchasing power parity
R&D	Research and development
SME	Small and medium-size enterprise
SOE	State-owned enterprise
TVET	Technical and vocational education and training
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDESA	United Nations Department of Economic and Social Affairs
UNIDO	United Nations Industrial Development Organization

Overview

The role of manufacturing and structural change

Industrial structural change and manufacturing employment

Key messages

- Manufacturing – with around 470 million jobs in 2009, or one in six jobs globally – still matters for employment generation. In 2013, there likely are more than half billion jobs in manufacturing.
- Manufacturing employment is rising in developing countries and falling in developed countries, but the declines in developed countries are mitigated by the growth of manufacturing-related services.
- Least developed countries have immense potential for industrialization in food and beverages (agroindustry), and textiles and garments, with good prospects for sustained employment generation and higher productivity.
- Middle-income countries can benefit from entering the basic and fabricated metals industries, which offer a range of products necessary for investment and are demanded by the more advanced industries and which are facing rapidly growing international demand.
- Developed countries have great possibilities for investing and innovating in high-tech industries and for sustaining jobs in these industries' related services.
- Industrialization improves not only the number of jobs but also their quality in all countries.
- Manufacturing concentrates in cities at early stages of development and "suburbanizes" at later stages. Cities thus remain crucial for industrialization in developing countries.

Jobs do not fall like manna from heaven. They arise out of economic development, from entrepreneurs and governments generating new enterprises and economic activities. Sustained job creation requires structural change, or the ability of an economy to constantly generate new fast-growing activities characterized by higher value added and productivity and increasing returns to scale. Greater opportunities than in other sectors to accumulate capital, exploit economies of scale, acquire new technologies and – more fundamentally – foster embodied and disembodied technological change are found in manufacturing, which has become the core of structural transformation and economic growth.

Since the industrial revolution, manufacturing has driven output and employment, sparked by improvements in mechanization and leading to unprecedented incomes. Higher incomes have led to greater demand for manufactured products and a relative decline in spending on agricultural goods. Productivity gains raised demand as prices of manufactures declined even further relative to those of other goods and services. Accompanying these changes were major labour force and population shifts from agriculture and rural areas, initially into manufacturing and to urban areas, and later into services.

The role of manufacturing changes as structural change evolves. At lower incomes the application of low capital-intensive technologies allows for improvements in both productivity and employment. As the capital intensity of technology increases, productivity gains dominate and employment shifts towards manufacturing-related and other services. Manufacturing remains an important employer, with around 470 million jobs worldwide in 2009 – or around 16 percent of the world's workforce of 2.9 billion – a figure far higher than many might expect. By 2013 there must be more than half a billion jobs in manufacturing.

For developing countries aiming to maintain growth while creating sustainable jobs, manufacturing offers

> **Manufacturing can be catalytic in transforming the economic structure of agrarian societies**

an opportunity not only to re-balance the economy towards higher value-added sectors but also to provide a relatively wide employment base with higher labour productivity. This contrasts with a direct transition from agriculture to services, especially for low-income countries, which offers the opportunity to achieve only the first objective, not the second. Manufacturing also offers the potential to improve wages and raise incomes, thus helping create a domestic market.

Least developed countries, mainly in Africa, face openings in low-tech labour-intensive industries like agroindustry, textiles, and clothing and apparel, which offer prospects for both sustained employment generation and productivity increases. Middle-income countries could benefit from entering medium-tech industries such as basic metals and fabricated metals industries. Although they do not generate large amounts of employment, they are high-productivity industries and can generate resources for investment. Further, their products include steel, bricks, cement, boilers, metallic structures, hand tools and plastics, most of which are intermediate goods in high demand by more advanced industries and are facing growing international demand.

The impact of manufacturing structural change on employment also has a spatial dimension. Shifts in relative shares of industries go hand in hand with geographical shifts in the location of people, often driven by trade. Historically, the geographical location of manufacturing shifted from the United Kingdom to Continental Europe, to the United States and later to Japan. Today, it is moving towards East Asia, including countries such as the Republic of Korea and mainland China. Yet employment is not equally distributed between emerging and traditional industrial powerhouses. And within countries manufacturing is usually more geographically concentrated in cities during the structural change from agriculture to manufacturing, reflecting agglomeration economies. But this trend has reversed somewhat in developed economies – "suburbanizing" – when services become more important.

The impact of within-manufacturing structural change – the shift from low-, to medium-, to high-technology industries – on employment varies by industry. Low-tech industries produce vast employment opportunities and some possibilities for capital accumulation. Medium- and high-tech industries offer opportunities for capital accumulation but generate less employment than do low-tech industries. High-tech industries also offer openings for innovation and new knowledge and skill development and thus the capacity to invent new industries and restart the structural change cycle. It is these capacities to accumulate capital and to innovate, alongside a growing division of labour of service activities, which produce employment opportunities.

In developed countries manufacturing remains an engine of growth as the main source of financial and knowledge resources for sustaining growth and (to some extent) for creating jobs, though the bulk of the new jobs to be created are in the services required for developing manufacturing further and in the services to be added to industrial goods. As developed countries move up the structural change ladder, manufacturing will continue to contribute to the quality of jobs by improving wages and by providing wider opportunities for female employment.

Industrialization, structural change and economic growth

A large body of empirical evidence shows that manufacturing can be catalytic in transforming the economic structure of agrarian societies. In fact, the very concept of economic development is intrinsically linked to the changes in the structure of economic activity that takes place as countries become richer.

A positive perspective

Structural change can be approached from a positive or normative perspective. Although the former simply refers to a change in the composition of an aggregate (in this case, the sectoral composition of GDP), the latter expands this definition by including the notion of desirability in the direction of change. Shifts in the economy from low-productivity activities with limited opportunities for technological change and

“As incomes rise, even in the initial stages of development, manufacturing and services’ share keeps growing and agriculture’s declines

value-added gains towards high-productivity activities with greater opportunities for innovation and value-added expansion would thus become the core of structural change and – more broadly – economic development. The rest of this subsection sticks to this positive definition and analyses patterns of the last half century; in the next subsection the focus is on the normative perspective.

A first approach is to analyse the changing importance in these sectors’ shares of GDP at different points in time for different countries. In 1950 almost 40 percent of 68 developing countries’ GDP originated in agriculture and only 12 percent in manufacturing. Fifty-five years later the share of agriculture had dropped to just 16 percent of GDP. In the interim, manufacturing industries had first increased their share of GDP (peaking at around 17 percent in the early 1980s) but it later fell. Throughout these years services showed a steady increase, gaining more than 10 percentage points (Szirmai, Naudé and Alcorta 2013). By contrast, in 1950, 21 advanced economies were already based heavily on manufacturing (at almost 30 percent of GDP), and agriculture represented only a minor share (16 percent). These economies, too, became much more services oriented, but manufacturing showed a steady decline, and by 2005 it had almost the same share as in developing countries (Szirmai, Naudé and Alcorta 2013).

One feature is the wide variety of patterns, even within developing countries. At mid-century in China, Indonesia, the Republic of Korea, Malaysia and Thailand, for example, agriculture accounted for at least 40 percent of GDP, and manufacturing 14 percent at most; 55 years later, agriculture accounted for only 3–13 percent of GDP and manufacturing more than 25 percent – a huge shift. But other developing countries took a different path. In the largest Latin American economies – Argentina, Brazil and Mexico – the structure shifted from agriculture towards services (and to a lesser extent non-manufacturing industries).

The above suggests two things. First, any average across a heterogeneous sample of observations (resource-rich countries, small or large countries, regional groups) lends itself to identifying a pattern over time that is not particularly representative of any single country’s performance. Second, and more important, the degree of heterogeneity within the sample may become even greater over time, precisely as an outcome of structural change.

So it is instructive to look at how structural change takes place by looking at the changing importance of sectors at different incomes instead of different moments in time. The approach controls for important features that shape differently the structural change of countries as they become richer. A complementary view to the more traditional analysis of structural change over time, it has the advantage of uniquely illustrating the general pattern of structural change, without averaging the important differences in structure that arise from different incomes and from two country-specific characteristics (population size and natural resources).

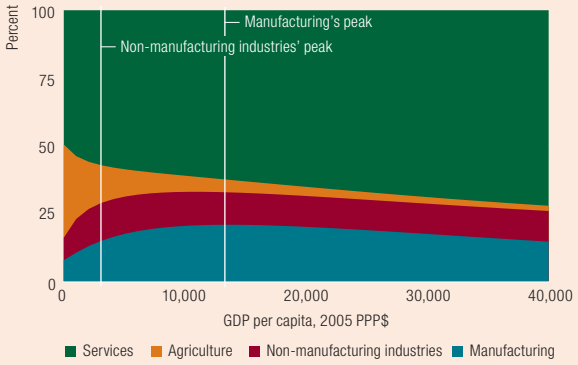
This approach pools countries together by income at any point in time. Structural change can then be seen as the set of transformations that takes place as countries become richer, regardless of when it occurred and its speed.[1]

At very low incomes (for some countries in the sample a contemporary feature, for others a feature of the early 1960s), agriculture accounts for a high share of GDP, typically larger than manufacturing and non-manufacturing industries (mining, utilities and construction) together. This situation is reversed as income grows: manufacturing starts gaining ground and reaches a peak of about 20 percent of GDP at roughly $14,000 per capita income.[2] In other words, economic development is associated with a near tripling of the share of manufacturing, largely at the expense of agriculture, whose share shrinks dramatically (Figure 1).

After the peak the share of manufacturing starts declining and at very high incomes is comparable to earlier stages of development. As incomes rise, even in the initial stages of development, services’ share keeps growing and agriculture’s declines. Non-manufacturing industries show a sharp increase at very low incomes, but after peaking at around $4,000 per

> **Manufacturing generates externalities in technology development, skill creation and learning that are crucial for competitiveness**

Figure 1
GDP composition by income and sector, 1963–2007



Note: Pooled data for 100 countries.
Source: UNIDO estimate based on CIC (2009) and World Bank (2013b).

capita income they maintain a stable share. Overall, there do not appear to be significant changes at higher incomes and for high-income countries.

Structural change viewed at such an aggregate level masks important features of what happens inside each sector (manufacturing is discussed subsequently). Regression results reveal, for example, significant time breaks during the 1963–2007 period of analysis and the significance of population size and natural resources on these patterns.

A normative perspective

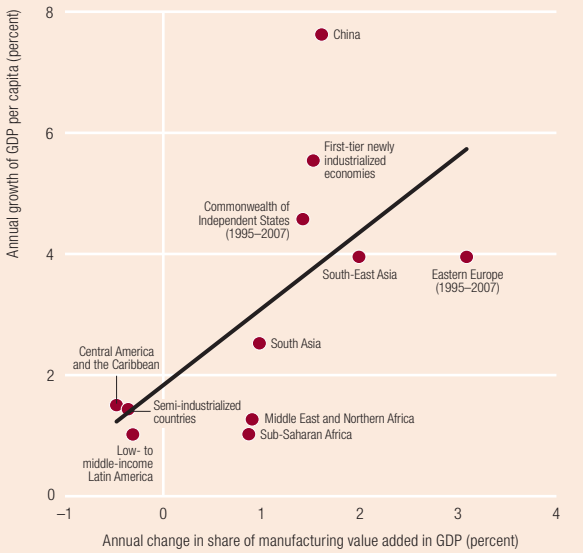
When structural change is understood from a normative perspective, manufacturing becomes the engine of economic growth, and thus any shift of resources from low-productive activities (such as rural agriculture or urban informal services) towards manufacturing entails an important structural change bonus, in what some authors have labelled "growth-enhancing structural change" (McMillan and Rodrik 2011).

The literature presents several arguments to support the idea that manufacturing is the main engine of economic growth. Perhaps the most influential came from Nicholas Kaldor in the 1960s. In his view what distinguishes manufacturing from other sectors is the capacity to generate dynamic increasing returns and thus greater productivity through expanded production.

Following this line manufacturing is the main driver of productivity growth, due to improvements in the division of labour, technological change and economies of scale (Ocampo 2005). Its dynamism also has key effects on the rest of the economy: its development stimulates, for example, the demand for more and better primary goods (in agriculture, forestry, fishing and mining) and services (such as banking, insurance, communications, trade and transport). Manufacturing also generates externalities in technology development, skill creation and learning that are crucial for competitiveness.

The theoretical arguments are backed by a large body of empirical studies that has demonstrated a close positive link between economic growth and structural change in manufacturing (Figure 2). The

Figure 2
Economic growth and changes in the share of manufacturing value added in GDP, selected regions and country groups, 1970–2007



Note: The values have been calculated as simple average across the countries included in each group. Sub-Saharan Africa: Cameroon, Ethiopia, Kenya, Mozambique, Tanzania, Uganda and Zimbabwe. Central America and the Caribbean: Costa Rica, Dominican Republic, Guatemala and Jamaica. Low- to middle-income Latin America: Bolivia, Ecuador and Peru. Semi-industrialized countries: Argentina, Brazil, Chile, Colombia, Mexico, South Africa, Turkey and the Bolivarian Republic of Venezuela. South Asia: Bangladesh, India, Pakistan and Sri Lanka. South-East Asia: Indonesia, Malaysia, Philippines, Thailand and Viet Nam. First-tier newly industrialized economies: Republic of Korea, Singapore and Taiwan Province of China. Middle East and Northern Africa: Algeria, Egypt, Islamic Republic of Iran, Jordan, Morocco, Saudi Arabia, Tunisia and Yemen. Commonwealth of Independent States: Russian Federation and Ukraine. Eastern Europe: Bulgaria, Czech Republic, Hungary, Poland and Slovakia.
Source: Adapted from UNDESA (2006) based on CIC (2009) and World Bank (2013b).

“For developing countries growth and development are not about pushing the technology frontier but rather about changing the structure of production towards higher productivity activities

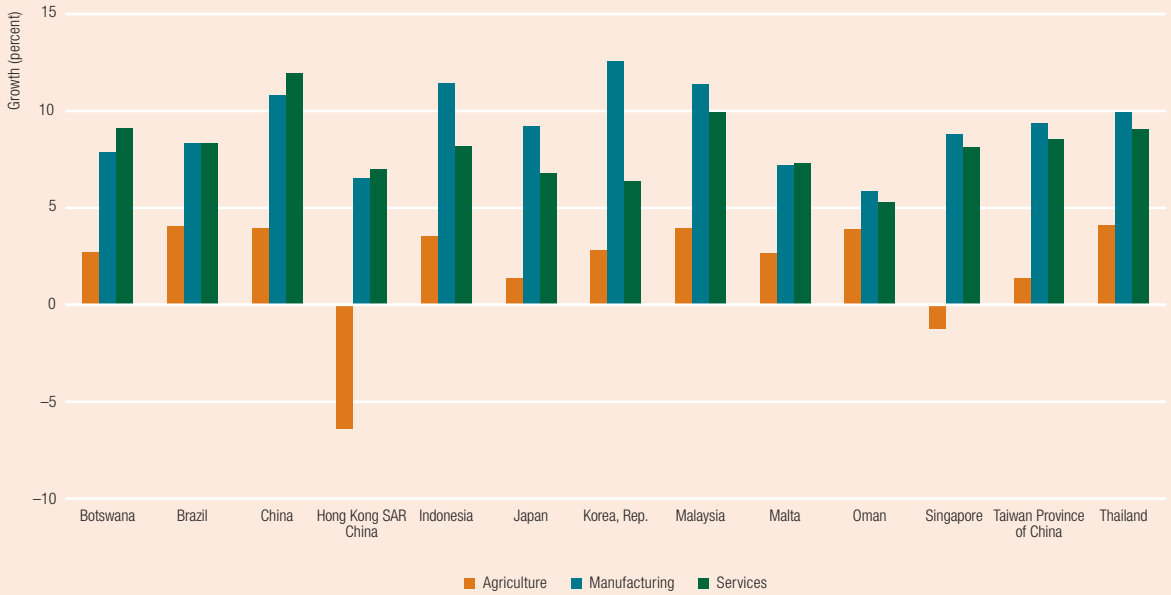
country groups that achieved the fastest growth during 1970–2007 are at the same time those where the shift towards manufacturing was most intensive, including the first Asian newly industrialized economies, Southeast Asia and China. At the other extreme are country groups, mainly in Latin America, that show exactly the opposite trend: they deindustrialized during the period and achieved only very modest per capita GDP growth.

The above analysis confirms a pattern familiar to economic thinking and explored in the *World Economic and Social Survey 2006* (UNDESA 2006). For developing countries growth and development are not about pushing the technology frontier but rather about changing the structure of production towards higher productivity activities. Economies can achieve this type of structural change by absorbing existing technologies, producing manufacturing goods and related services for world markets and rapidly accumulating physical and human capital.

Slightly more recent empirical work also suggests that manufacturing plays a fundamental role in sustained rapid growth. The Report of the Commission on Growth and Development identified 13 economies that sustained very rapid growth of at least 7 percent for 25 years after World War II (an updated version is Figure 3; World Bank 2008). The sample includes economies from all developing regions of the world, some rich in natural resources, others not; some among the most populated in the world, others with a population below 500,000. Crucially, all but three economies were driven by manufacturing industries.

In 8 of the 13 economies manufacturing shows the fastest growth, implying that the sector has increased its share of total GDP over the period – that is, the economy has shown a structural change towards manufacturing. In Brazil and Malta manufacturing and services grew at almost the same rate, and in only Botswana, China and Hong Kong SAR China

Figure 3
Growth rates by sector, 13 long-term fast-growing economies



Note: Many of the calculations apply to different periods than given in the text for data-consistency reasons: Botswana (1965–2006); Brazil (1950–1980); China (1965–2010); Hong Kong SAR China (1974–1997); Indonesia (1966–1997); Japan (1953–1983); Republic of Korea (1960–2001); Malaysia (1970–1997); Malta (1970–1994); Oman (1988–1999); Singapore (1967–2002); Taiwan Province of China (1965–2002) and Thailand (1960–1997).
Source: Adapted from World Bank (2008) based on World Bank (2013b) and Groningen Growth and Development Centre (2013). See Timmer and de Vries (2009) for the underlying methodology of the database.

"The direct absorption of workers by manufacturing reached 388 million jobs worldwide in 2009, up from an estimated 211 million in 1970

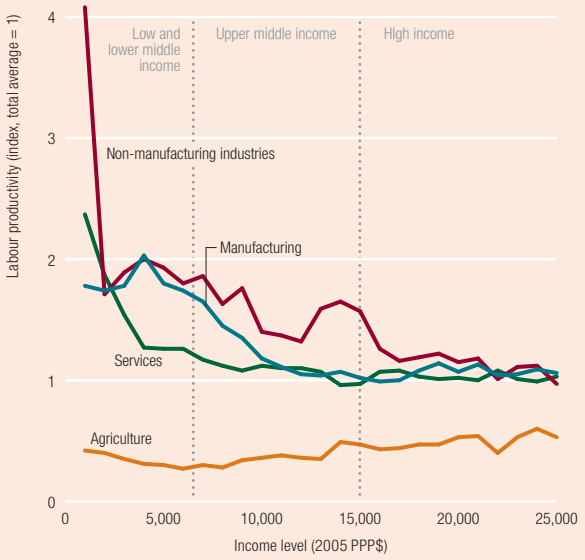
did manufacturing show slower growth than services. These success stories reinforce the argument for the key role of manufacturing in sustaining growth.

Manufacturing and productivity

How did the relative productivity of each major sector (here taken to be agriculture, manufacturing, non-manufacturing industries and services) evolve as countries developed over the last two decades (Figure 4)?

The relative nature of the indicators gives a straightforward rule to determine the best direction of structural change at each level of development. As expected, non-manufacturing industries show the highest relative productivity at all levels of development, driven mainly by the high capital intensity of mining and public utilities. But the size of this sector is limited, as is its capacity to absorb labour. In most income ranges the second-highest relative productivity is achieved by manufacturing industries, especially at per capita GDP of $2,000–$14,000 in purchasing power parity (PPP) terms, which underlines the importance of manufacturing in middle-income economies. In this range, both the share of manufacturing value added (MVA) in GDP and manufacturing employment in total employment grow rapidly, but the share of value added in GDP grows much faster, suggesting that productivity increases are accounted for by increases in output. And at very low income ($2,000–$4,000 per capita in PPP), the relative productivity of manufacturing rises, while that of agriculture and services falls, revealing that manufacturing delivers dynamic as well as static productivity gains.[3]

Figure 4
Relative labour productivity by income and sector, 1991–2010



Note: Pooled data for 108 countries, excluding natural resource–rich countries. Total economy average of productivity = 1.
Source: UNIDO estimate based on World Bank (2013b) and Groningen Growth and Development Centre (2013). See Timmer and de Vries (2009) for the underlying methodology of the database.

At initial stages of development, services show extremely high relative productivity, probably driven by non-market services such as public administration, health or education. But immediately after, this coefficient drops dramatically, mainly in line with the increase of low-productive services such as wholesale and retail trade and personal services. Subsequently, the relative productivity of services converges to the national average.

At high incomes ($17,000 and above) in fact, the relative productivity of the three major sectors (manufacturing, non-manufacturing industries and services) converge to the national average. At this stage, agriculture's share is already too small for this inter-sectoral structural change to drive productivity, and so structural change within sectors becomes fundamental. The key at this stage is not shifting resources further towards manufacturing but achieving productivity growth within manufacturing (from low- to high-tech industries). By the same token structural change within services also becomes a leading driver of productivity growth.

It may be easy to grasp intuitively the importance of manufacturing in economic growth and structural change, but the sector's precise role in job creation is less straightforward.

Manufacturing employment

How many jobs?

The direct absorption of workers by manufacturing reached 388 million jobs worldwide in 2009, up from

“Any assessment of the scale of manufacturing’s employment creation based purely on data from industry surveys will heavily undercount its true size

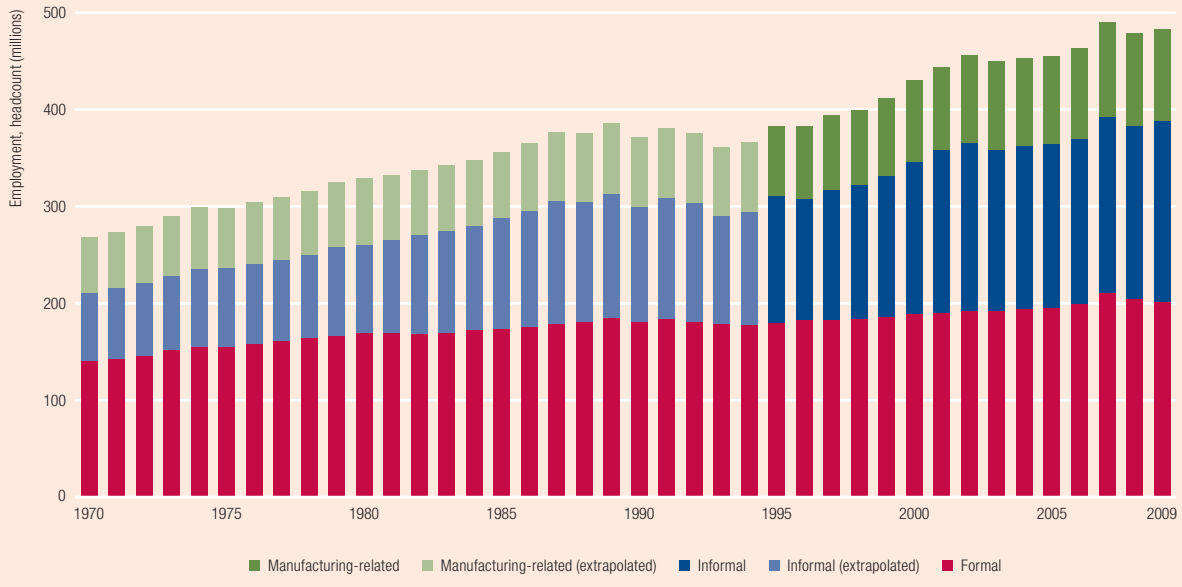
an estimated 211 million in 1970 (Figure 5). Nearly half of them were informal (jobs in small and medium-size enterprises, self-employed and workers not subject to labour legislation), a share that is growing, largely reflecting the rise of many emerging economies as new hubs in manufacturing.

Failure to capture informal jobs in manufacturing is not the only way by which manufacturing jobs are typically underestimated. Perhaps more important, in view of the global economic transformations of the last few decades, is the unbundling of certain production processes that statistically used to be included in manufacturing but are now included in services. In fact, it could be argued that the very distinction between manufacturing and services has become blurred (Manyika et al. 2012). Not only are manufacturing firms increasingly outsourcing their non-core operations such as warehousing, transport, human resource management and information technology, but manufactured products are increasingly bundled with a host of services and after-market functions (such as telephone help-lines, extended warranty, and repair and retail services).[4]

Still, manufacturing-related jobs in services over 1995–2009 appeared to grow much faster than those in direct formal manufacturing (reflecting the outsourcing approaches discussed above), reaching 95 million by 2009. Thus manufacturing – broadly defined to include formal, informal and manufacturing-related services – offered 470 million jobs, employing around 16 percent of the world’s workforce of 2.9 billion in the series peak year of 2009 (see Figure 5).[5] Any assessment of the scale of manufacturing’s employment creation based purely on data from industry surveys will heavily undercount its true size. Employment data from this type of source represent, at best, half the total number of jobs directly and indirectly created by manufacturing.

Beyond that, scattered evidence gathered in Lavopa and Szirmai (2012) suggests that manufacturing has much stronger links and much larger employment multipliers in an economy: for every job created in manufacturing, their evidence points to two or three outside. This is much higher than estimates here for manufacturing-related jobs in services, which were intentionally calculated more conservatively to

Figure 5
Number of jobs created by manufacturing industry and manufactured-related services, 1970–2009



Source: UNIDO estimate based on ILO (2011, 2013), UNIDO (2012) and Timmer (2012).

“Manufacturing is also important for absorbing workers with modest skills – as the sector where “the world’s middle classes take shape and grow”

include only certain sectors and exclude second- or third-round effects (input-output multiplier effects) and income-induced effects. It can thus be concluded that the real impact of manufacturing on employment creation is much higher than what the figure illustrates.

Beyond numbers, manufacturing jobs possess some characteristics that make them more desirable than other jobs, from macroeconomic and human angles. Higher productivity jobs are normally associated with higher wages, and historical evidence for the advanced economies and the successful newly industrialized countries shows that wage gains associated with industrializing structural change have helped pull large sections of the population out of poverty (Weiss 2013). Besides offering higher wages, manufacturing typically provides better employee benefits and security than do jobs in other sectors and tends to develop higher skills than equivalent jobs in the rest of the economy (Lavopa and Szirmai 2012). Manufacturing is also important for absorbing workers with modest skills – as the sector where “the world’s middle classes take shape and grow” (Rodrik 2011).

Structural change and employment generation

What is the relationship between structural change and employment generation as countries develop? Manufacturing – more than agriculture or services – performs a particularly important engine of growth role at early stages of development. It helps raise people’s living standards by enhancing their ability to acquire goods and services and to invest in education and health. It allows enterprises to accumulate capital, which can then be used to further improve technology or realize new investment opportunities. At the same time it provides new jobs for the population at large. Rising employment and incomes, additional productivity gains and the generation of new economic activities become a major source of economic growth and prosperity. Agriculture and services, while providing employment opportunities, do so at lower productivity levels and hence makes it more challenging for economies to accumulate capital and sustain structural change, growth and employment in the long run.

At higher incomes countries can still reap the benefits of structural change from agriculture, but as the economy becomes more internally integrated, productivity differentials across sectors narrow. Manufacturing employment may still have scope for growth but so does services employment. At around $15,000 the scope for employment growth through redistribution of resources can no longer be measured by looking only at macro sectors. At higher incomes it may be expected that employment in manufacturing-related services increases relative to employment in manufacturing production, as higher income countries move to more knowledge-intensive services activities.

The next subsection looks at the spatial shifts – in manufacturing employment (and other metrics) between regions and within countries – that stem from structural change.

Shifts between regions

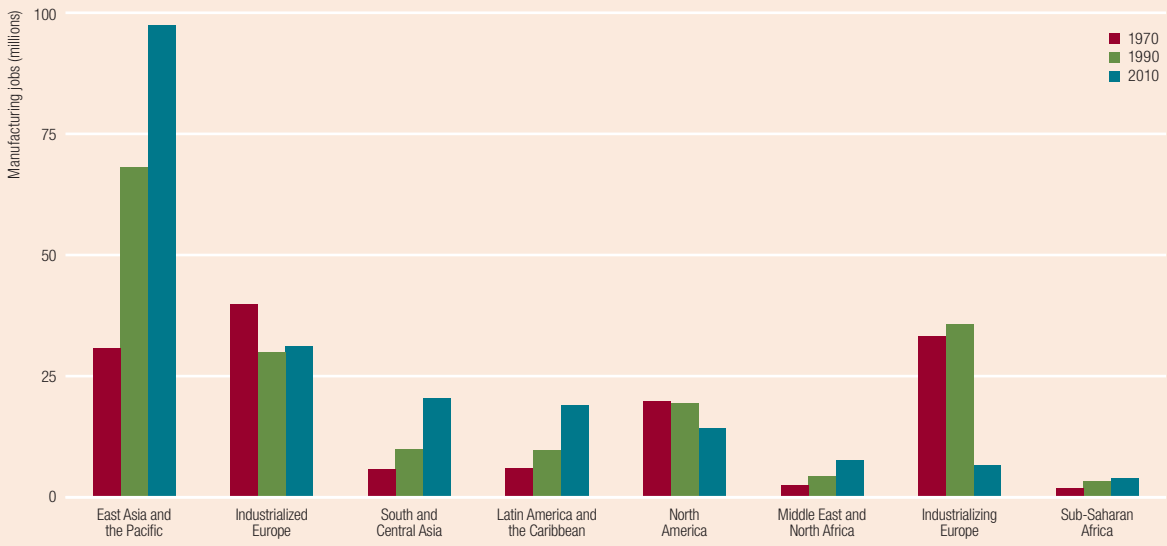
As developed countries have become richer and many less developed countries have lifted themselves out of poverty, recent decades have seen an important shift in the global distribution of manufacturing employment. International trade has become a key driver of the structural transformations underpinning these employment shifts.

Direct manufacturing employment

Although North America, Industrialized Europe and Japan still account for around 40 percent of global MVA (World Bank 2013b), the rise in value added of East Asia and the Pacific, particularly China, over the last few decades has been dramatic – a shift even more prominent in formal manufacturing employment (Figure 6). Formal jobs rose by about 67 million between 1970 and 2010 in the region. South and Central Asian, Latin American and Caribbean, Middle East and North African, and Sub-Saharan African jobs have also increased. Over the last 40 years

“Regional employment growth patterns in manufacturing-related services confirm that manufacturing and manufacturing-related activities are shifting to Asia

Figure 6
Trends in formal manufacturing employment by region, 1970, 1990 and 2010



Source: UNIDO estimate based on UNIDO (2012).

the big winners in manufacturing employment have been developing countries, confirming the importance of manufacturing as a source of employment for these countries.

Employment in manufacturing-related services

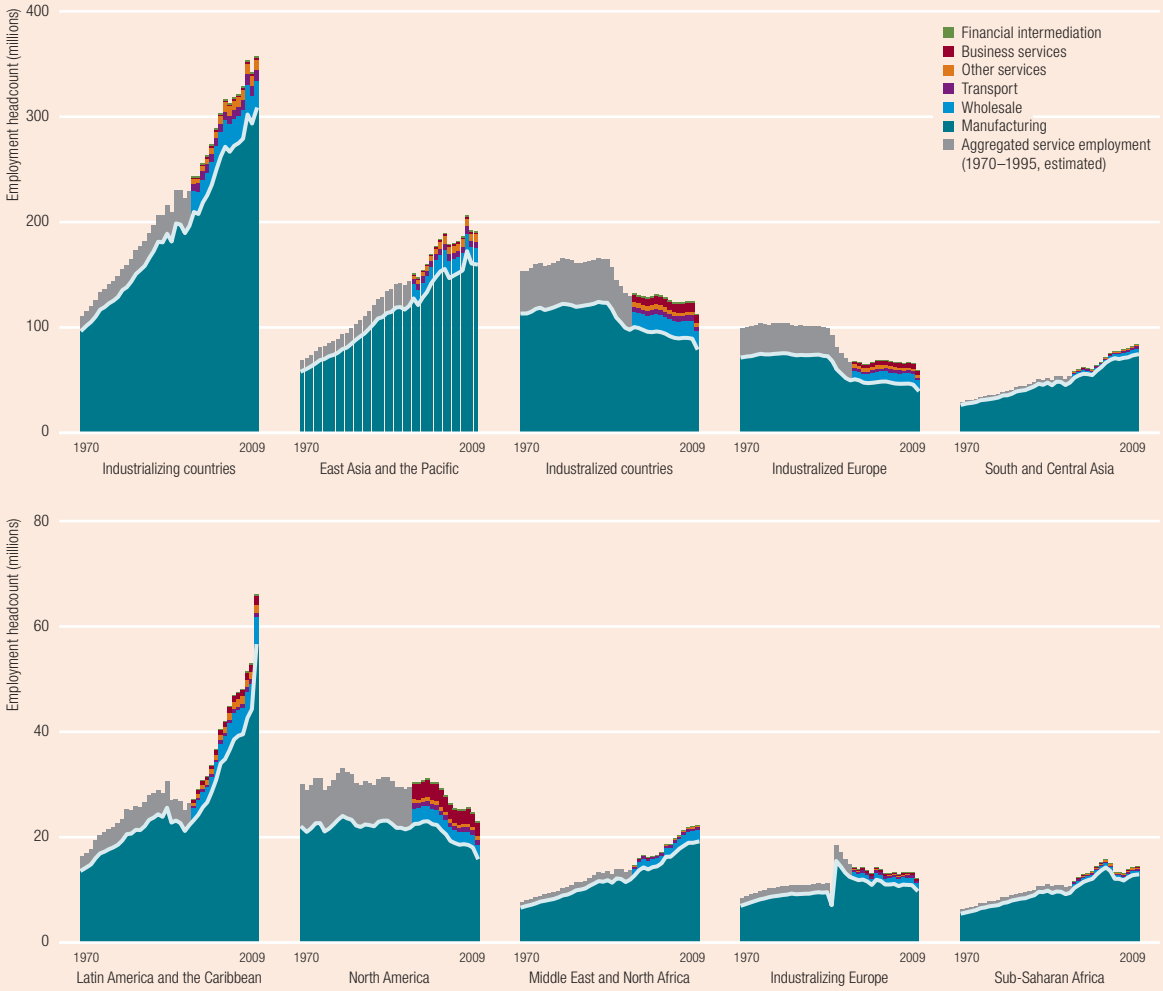
Some sections of services activities are targeted specifically at manufacturing activities, without which products would not be in the hands of consumers. These direct manufacturing-related services – formerly part of manufacturing – can be legitimately considered part of manufacturing activities. With the aid of input-output techniques that allow analysts to identify the closeness and extent of involvement of specific services in manufacturing, these cover: research and development (R&D); renting of office equipment and machinery; real estate activities; wholesale and retail; maintenance and repair of motor vehicles and motorcycles; financial intermediation; inland transport; air and water transport; other supporting and auxiliary transport activities; post and telecommunications; and hotels and restaurants. These are grouped into business services, financial intermediation, wholesale, transport and other services.

With this broader view that includes manufacturing-related services, the decline of manufacturing employment in industrialized countries is somewhat mitigated. As industrialized economies shift into services, manufacturing value generation is also increasingly shifted towards business services such as design, R&D, engineering, branding, advertising and marketing. Although employment in manufacturing production has been declining in industrialized countries, employment in manufacturing-related services held steady at around 32 million jobs between 1995 and 2009, thus increasing its share from 24 percent to 29 percent of total employment in manufacturing and manufacturing-related services (Figure 7). North America is a case in point, where the share of that total increased from 29 percent to 32 percent over the period. The growth in industrialized countries is more notable in businesses-related services.

Overall, regional employment growth patterns in manufacturing-related services confirm that manufacturing and manufacturing-related activities are

“From close to 24 million jobs in 1995, manufacturing-related services employment increased to more than 31 million jobs in 2009

Figure 7
Main types of services employment in manufacturing production by region, 1970–2009



Note: Some countries of the former Soviet Union are categorized after 1990 in South and Central Asia and Middle East and North Africa (Tajikistan, Georgia, Kazakhstan and Kyrgyzstan), others in Industrializing Europe (Albania, Latvia, Moldavia, Romania, the Russian Federation and Ukraine) and in Industrialized Europe (Estonia, the Russian Federation and Lithuania), which explains the jump in the corresponding regional graphs. Manufacturing includes formal and informal jobs.
Source: UNIDO estimate based on UNIDO (2012) and Timmer (2012).

shifting to Asia, particularly to East Asia and the Pacific (see Figure 7). From close to 24 million jobs in 1995, manufacturing-related services employment increased to more than 31 million jobs in 2009. Around three-quarters of this gain comes from China. Business services and transport seem to play a strong and rising role in such employment in East Asia and the Pacific, reflecting the region’s position as a manufacturing hub for the world but also growing efforts to move up the value-added ladder.

Shifts within countries

Structural transformation leads to shifts in manufacturing employment not only between regions and countries, but also within countries. Within countries manufacturing has usually become more geographically concentrated during the structural change from agriculture to manufacturing, reflecting agglomeration economies, but the trend has reversed somewhat in developed economies – “suburbanizing” – when services become more important. Cities have also

“Some African countries are witnessing increasing urbanization without structural change – cities are not just production centres but also consumption centres

changed, becoming not only producer centres but also consumer centres.

Structural transformation and geographical concentration

Because relative productivity is an important driver of specialization and trade, agglomeration economies are key in explaining how manufacturing locates across space. As seen, the emergence of China, the Republic of Korea and Singapore as manufacturing hubs is related to agglomeration economies at the country level, yet this type of spatial clustering is usually more prominent within countries, because some of the forces that encourage geographical concentration are much stronger at the small scale of cities, regions or towns than at the large scale of countries. Not all of China is becoming a factory – many of its regions remain based on agriculture.

When looking within countries, manufacturing tends to become geographically more concentrated during the structural change from agriculture to manufacturing, but the trend reverses when services become more important, for two main reasons.

First, agriculture is land intensive, but this is less true of manufacturing and even less so of services. So when manufacturing replaces agriculture manufacturing tends to cluster, but when services become more important manufacturing tends to disperse.

Second, the structural change is driven partly by productivity gains and innovation. In the early stages of industrialization, when there are high gains from knowledge clusters, manufacturing concentrates. Later, as manufacturing matures, those gains become smaller, and it often moves to areas where land is cheaper. For example, over the last half-century in the United States and Western Europe manufacturing has been relocating to less congested areas, making it geographically more dispersed. In less advanced economies this is less true, and manufacturing continues to have a strong presence in urban areas. There is thus a link between a country’s level of development and the geographical concentration of its manufacturing.

This more recent trend of manufacturing in advanced economies to move to less congested areas needs to be qualified in three ways. First, although manufacturing firms are moving out of cities, they are not moving to the middle of nowhere. Manufacturing is “suburbanizing” rather than “ruralizing”. Second, not all manufacturing subsectors are moving out of cities. Firms in highly innovative subsectors prefer to be in urban settings where knowledge spillovers are stronger. Third, the increasing fragmentation of the value chain implies that specialization is becoming more functional than sectoral. This fragmentation allows the more complex parts of manufacturing to remain in cities and the more routine parts to relocate to cheaper places. Once again, cities remain attractive for the knowledge-intensive part of manufacturing.

Cities as centres of learning – and consumption

It is not only economic development that leads to spatial concentration or urbanization – the opposite is true as well. Cities are laboratories for learning and knowledge creation. Wages are higher in urban environments because people are more productive. And the longer people stay in cities, the more productive they become. The highly interactive environment stimulates knowledge acquisition, and most young innovative firms are in dense economic clusters. A disproportionate share of patents is generated in cities. All of this leads to a self-reinforcing process in which economic development feeds into urbanization, and urbanization into economic development.

But urbanization does not only have to do with productivity. People may also prefer living in cities; some African countries are witnessing increasing urbanization without structural change – cities are not just production centres but also consumption centres.

Structural change and employment generation within manufacturing

Processes of structural transformation take place across sectors and within sectors. Indeed, sectoral

> **“As resources move from agriculture into industry, low-tech industries account for a large share of manufacturing value added**

processes are more often than not the reflection of shifts within them, which underlines the need to explore the changes taking place in manufacturing.[6]

Structural change within manufacturing

From a normative perspective, structural change within manufacturing is approximated by the growing technology content of activities and a progressive shift from low- to medium- and high-tech industries and eventually leading to greater value addition. Low-tech industries are characterized by labour-intensive production processes and low capital intensity; medium-tech industries are primarily capital-intensive resource-processing industries; and high-tech industries are mainly capital- and technology-intensive industries. The classification of industries is based on the technological classification of the Organisation for Economic Co-operation and Development (OECD 2005), which relates R&D expenditure to value added and production statistics (Table 1).

The shares of each type of industry change as countries increase their per capita GDP (Figure 8). As resources move from agriculture into industry, low-tech industries account for a large share of MVA – at very low GDPs, industries in this category account for around two-thirds. This share falls progressively as structural within-industry transformation ensues, and when countries reach a per capita GDP of about $17,000 (in PPP terms), low-tech industries no longer account for the largest share.

The shares of medium-tech industries (green line) in total MVA follow a much smoother path as they

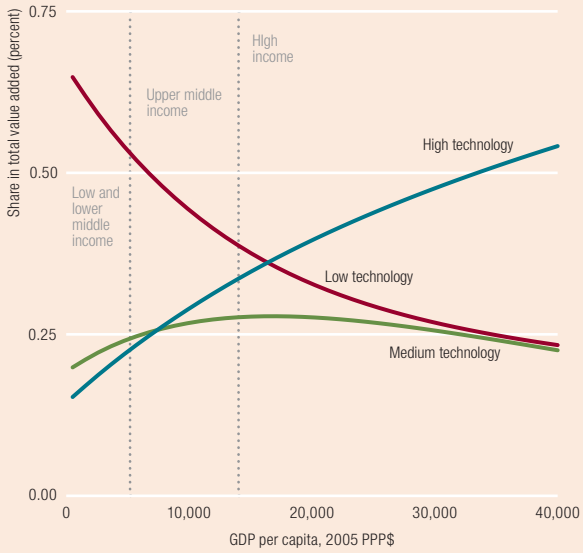
Table 1
Classification of manufacturing industries by technology group

International Standard Industrial Classification full description	Abbreviation used in this report	International Standard Industrial Classification code Revision 3	Technology group
Food and beverages	Food and beverages	15	Low tech
Tobacco products	Tobacco	16	Low tech
Textiles	Textiles	17	Low tech
Wearing apparel, fur, leather products and footwear	Wearing apparel	18 and 19	Low tech
Wood products (excluding furniture)	Wood products	20	Low tech
Paper and paper products	Paper	21	Low tech
Printing and publishing	Printing and publishing	22	Low tech
Furniture; manufacturing, not elsewhere classified	Furniture, not elsewhere classified	36	Low tech
Coke, refined petroleum products and nuclear fuel	Coke and refined petroleum	23	Medium tech
Rubber and plastic products	Rubber and plastic	25	Medium tech
Non-metallic mineral products	Non-metallic minerals	26	Medium tech
Basic metals	Basic metals	27	Medium tech
Fabricated metal products	Fabricated metals	28	Medium tech
Chemicals and chemical products	Chemicals	24	High tech
Machinery and equipment, not elsewhere classified; office, accounting and computing machinery	Machinery and equipment	29 and 30	High tech
Electrical machinery and apparatus; radio, television and communication equipment	Electrical machinery and apparatus	31 and 32	High tech
Medical, precision and optical instruments	Precision instruments	33	High tech
Motor vehicles, trailers, semi-trailers and other transport equipment	Motor vehicles	34 and 35	High tech

Note: Shaded rows represent the manufacturing industries analysed.
Source: UNIDO's elaboration based on UNIDO (2012).

“High-tech industries expand continually from a combined share of 5 percent at $1,000 (in PPP terms) per capita GDP to around 54 percent at $40,000

Figure 8
Changes in the shares in manufacturing value added by income and technology group, 1963–2007



Source: UNIDO estimate based on CIC (2009) and UNIDO (2012).

gradually expand and, later, decrease. At low incomes they account for around 20 percent, peaking at around 28 percent at a per capita GDP of around $16,000 (in PPP terms), and falling back to around 23 percent at the highest per capita GDP levels. Individually, for almost all per capita GDP levels, these industries retain at least half of their highest share of MVA, attesting to their stability and long life.

High-tech industries (blue line) are by far the most dynamic in increasing their share of MVA. They expand continually from a combined share of 10 percent at $1,000 (in PPP terms) per capita GDP to around 54 percent at $40,000.

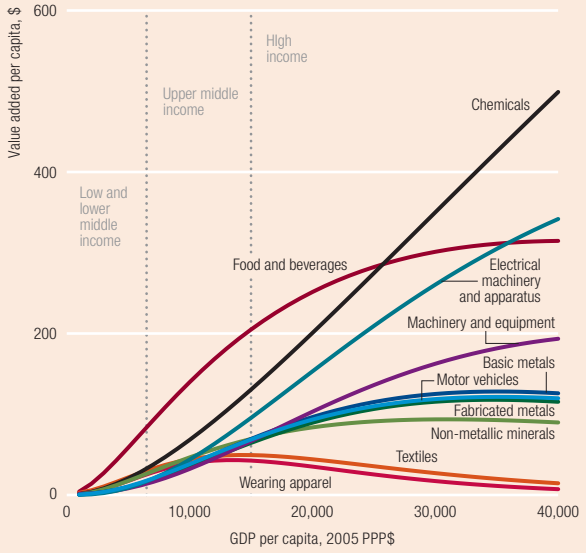
Shifts in value added and employment

How do value added and employment perform as the structure of manufacturing shifts in this way?[7] For manufacturing as a whole, although value added per capita in many industries continues to grow at high incomes per capita, the employment–population ratio exhibits very different trends. It displays a rapid surge at low and middle levels of per capita GDP, but at high income per capita no manufacturing industries are able to sustain employment growth (Figures 9 and 10).[8]

Low-tech industries – providing basic needs goods – show higher levels of value added and employment growth at lower rather than higher per capita incomes. Food and beverages' value added and employment continue to grow though, even beyond upper middle-income levels, though value-added growth is slightly higher than employment, resulting in sustained labour productivity gains at all incomes. The food and beverages industry is unique in this way, as no other manufacturing industry shows such sustained performance.

Textiles and wearing apparel both reduce value added and employment as countries move into upper middle and high incomes, but textiles can prolong the growth of value added after the industry starts reducing employment – and thus increasing productivity – due to its ability to substitute capital for labour. Wearing apparel's growth rates of employment and value added decline almost in parallel, indicating limited room for the industry to substitute capital for labour. This characteristic implies that once countries

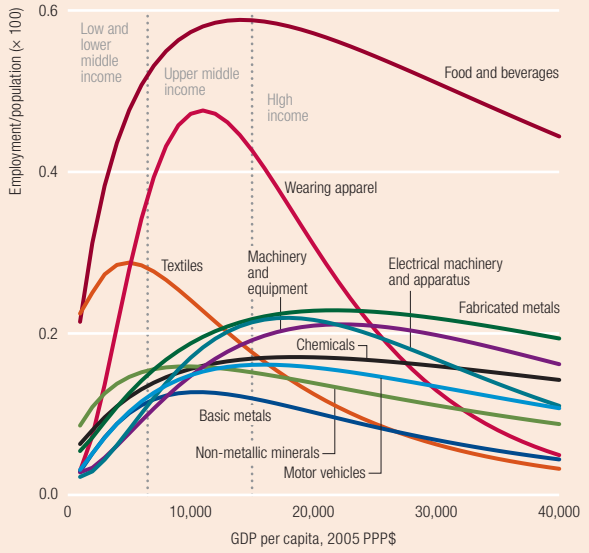
Figure 9
Changes in value added per capita by income and manufacturing industry, 1963–2007



Note: Pooled data for 74 countries.
Source: UNIDO estimate based on CIC (2009) and UNIDO (2012).

“Labour-intensive industries seem to be crucial in generating employment at low incomes and are the main reason for manufacturing’s overall role in employment generation at early stages of structural change

Figure 10
Changes in employment by income and manufacturing industry, 1963–2007



Note: Pooled data for 95 countries.
Source: UNIDO estimate based on CIC (2009) and UNIDO (2012).

lose the labour-cost advantage, they tend to lose sectoral competitiveness quite fast.

Medium-tech industries show small increases in value added and employment at very low incomes and then a slow decline in both variables. Non-metallic minerals’ value added and employment decline at all incomes, though employment falls more rapidly than value added, thus allowing for steady growth in productivity. Basic metals and fabricated metals have a similar development pattern in value added per capita but less so in employment. The basic metals industry has seen a fairly rapid decline in employment growth, resulting in a fast increase in labour productivity as it has the most capital-intensive production process among medium-tech industries. Fabricated metals saw a decrease in employment growth, but a much more pronounced decline in MVA. The industry is further downstream in the production value chain, which involves more customization and less-automated production processes.

High-tech industries exhibit rapid growth of value added and employment at lower per capita GDP but then both decelerate fast (value added less so), generating large increases in labour productivity. These industries – including electrical machinery and apparatus, machinery and equipment, and chemical products – are unlikely to reach the peak employment level of any of the labour-intensive industries. Except for chemical products, they emerge at a fairly late stage of development and make a major contribution to MVA usually after countries reach an upper middle-income level.

Electrical machinery and apparatus, and to a lesser extent machinery and equipment, seem to undergo considerable technological change. These industries have an extensive expansion stage at lower middle incomes, where increasing their employment growth rates is the key contributing factor to their value-added growth. Then, from the upper middle-income stage, development is based more on rising labour productivity, which sustains the fast growth of value added during the slowdown of employment growth and later even a reduction of the labour force. For its part the chemicals industry often emerges at a relatively early stage of country development, owing to demand for soap and basic chemical products such as colouring materials and tanning agents. At high incomes, however, the industry can increase value added quickly through fast growth of labour productivity, similar to electrical machinery and apparatus and to machinery and equipment.

Labour-intensive industries seem to be crucial in generating employment at low incomes and are the main reason for manufacturing’s overall role in employment generation at early stages of structural change. As the population begins to shift from agriculture, setting up labour-intensive industries may be the only option to productively absorb the many people seeking jobs. There are also opportunities for capital accumulation, and these are largely restricted to food and beverages and to textiles.

Labour-intensive low-tech industries provide significant opportunities for entry by low- and lower middle-income countries. African economies and some Asian economies can use these industries as a stepping stone towards industrialization. In addition

“Manufacturing structural change offers employment opportunities for high-income countries as they transit from high-tech industries to manufacturing-related services

to generating employment and productivity, they exhibit low barriers to entry and initially cater for local tastes. Low-tech industries do not require huge capital outlays and factories can be set up with workers with relatively low skills. Local markets play a key role at the early stage of development resulting in low information and learning costs. While some of these industries are highly competitive, particularly the textile and garments industries, new producers in lower income developing countries can benefit from continuous changes in international market conditions, particularly cost conditions, and thus attract investment to their shores, at least temporarily.

Medium-tech industries offer potential for investment to middle- and upper middle-income developing countries. Although they do not generate significant amounts of employment, they are high-productivity industries and can generate resources for investment. Further, their products include steel, bricks, cement, boilers, metallic structures, hand tools and plastics, most of which are intermediate goods in high demand by more advanced industries. Global markets for industrial inputs are growing fast, underpinned by the demand of emerging industrial powerhouses in East Asia, so these industries can also become important sources of foreign exchange.

High-tech industries perform a less important role in sustaining employment at higher incomes, as they only partially compensate for job losses in labour-intensive industries. But they are critical for capital accumulation, skills development and improving the knowledge base of countries and thus for improving productivity and, as will be seen, wages.

Structural change and employment in manufacturing-related services

The processes of structural transformation do not halt at the border between manufacturing and services.[9] As mentioned earlier, manufacturing activities have become progressively fragmented, with service activities being decoupled and outsourced from manufacturing firms. Indeed, in that such fragmentation involves a shift towards higher value addition and productivity in areas such as marketing, R&D and engineering, shifts can be construed as the next phase of structural transformation and employment generation for higher income economies.

Labour-intensive low-tech industry, such as textiles and wearing apparel, generates a large number of jobs at low incomes and a limited number of related-service employments. In industrialized countries the textiles and wearing apparel industries have steadily reduced both manufacturing and related service employment, though the latter have a relatively larger proportion than in developing countries (Figure 11).

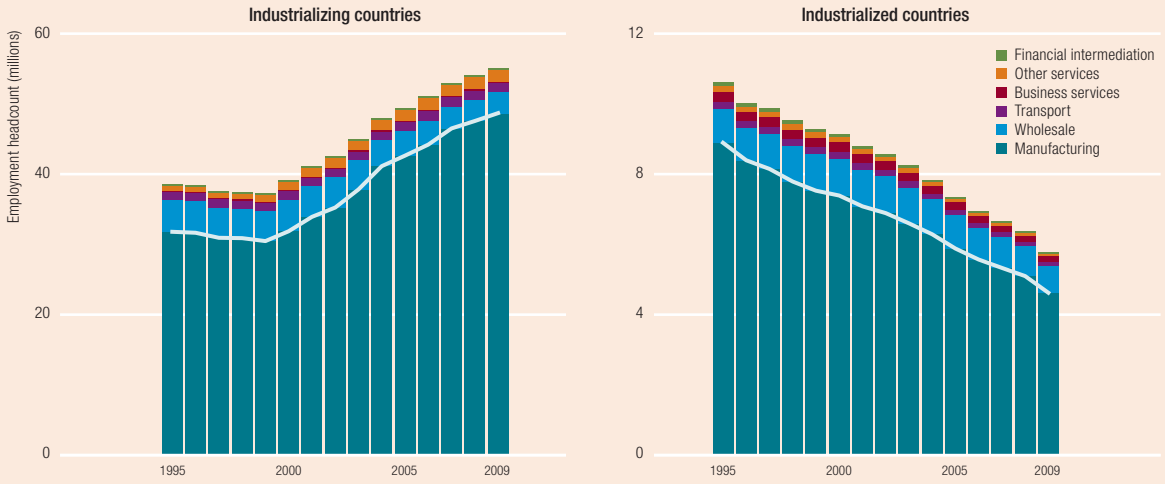
Medium- and high-tech industries do not generate as many jobs within their industries as low-tech industries, but their contributions to creating related service jobs are much higher. Figure 12 shows that medium-tech industries, such as non-metallic minerals and basic and fabricated metals, generate a higher proportion of manufacturing-related service jobs than “pure” manufacturing jobs – the former helping to compensate for the reduction in the latter. Similarly, countries at high incomes could sustain fast growth of some high-tech industries, such as chemicals and motor vehicles (Figure 13). These industries also contribute substantially to manufacturing-related service employment, especially business services, which include R&D and consultancy jobs.

Thus, taking manufacturing-related service employment into account (and not just pure production), manufacturing’s contribution to job creation is more sustained, helping both compensate for declining manufacturing jobs and generate modern service jobs. These latter jobs are likely to play a crucial role in linking high-tech manufacturing industries with innovative service activities that support the growth of increasingly service-oriented high-income countries.

Manufacturing structural change thus offers employment opportunities for high-income countries as they transit from high-tech industries to manufacturing-related services. Developed countries aiming to increase value added while generating employment may therefore find it optimal to focus on innovation and marketing, if they are not already, to compensate

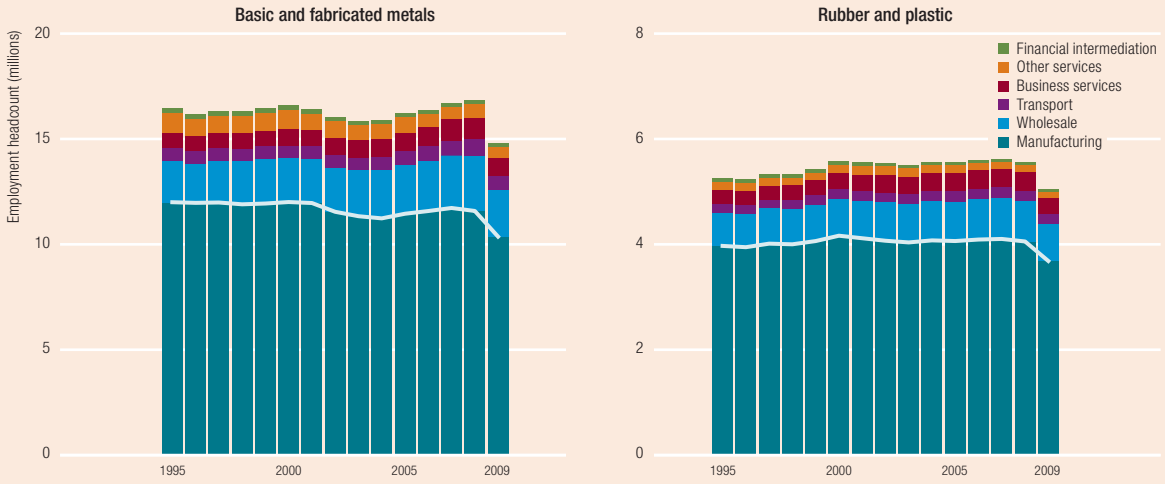
> **The low-income economies have the largest wage differences among manufacturing industries**

Figure 11
Number of jobs required for the production and delivery of textiles and textile products, 1995–2009



Note: Manufacturing employment here comprises only formal employment.
Source: UNIDO estimate based on Timmer (2012).

Figure 12
Number of jobs required for the production and delivery of medium-tech industry products in industrialized countries, 1995–2009



Note: Manufacturing employment here comprises only formal employment.
Source: UNIDO estimate based on Timmer (2012).

partially or fully for the loss of manufacturing production jobs.

Quality of manufacturing employment

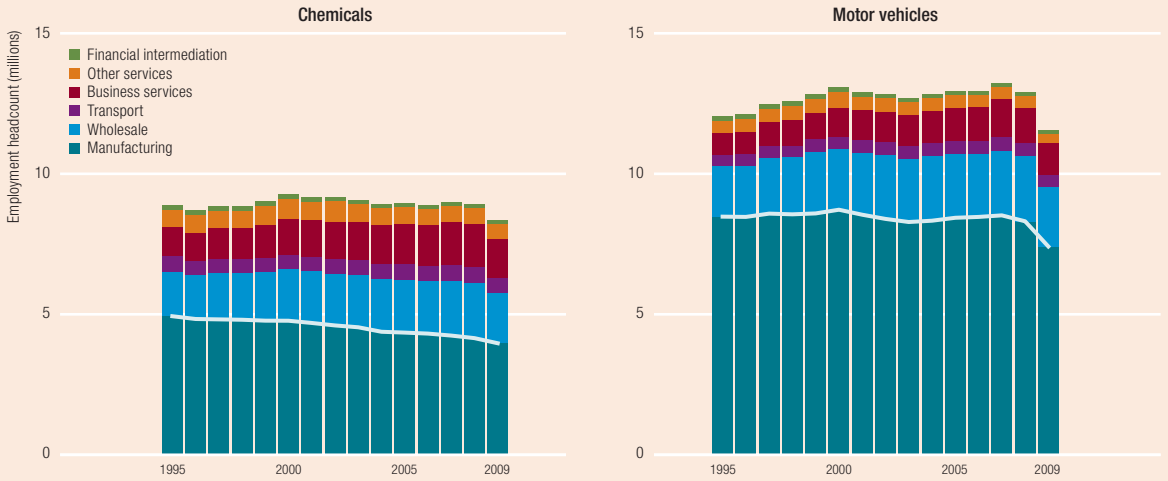
Manufacturing structural change does not only improve employment numbers as countries increase their income; it also improves job quality.

Wages

Among all countries, the low-income economies have the largest wage differences among manufacturing industries. As textiles and wearing apparel are two of the three largest manufacturing employment sources at low incomes, many people are in low-wage manufacturing employment, which coexists with relatively few

“As countries develop, differences in wage levels among manufacturing industries tend to narrow, due to the rise in labour productivity in low-wage jobs

Figure 13
Number of jobs required for the production and delivery of high-tech industry products in industrialized countries, 1995–2009



Note: Manufacturing employment here comprises only formal employment.
Source: UNIDO estimate based on Timmer (2012).

jobs paying far higher wages than the manufacturing average. This wage structure does not necessarily work against a country's development as long as the wages of this majority of manufacturing employment (including food and beverages) are higher than in the main sources of employment (agricultural, subsistence and informal activities) – usually the case.

At higher incomes, the manufacturing structure shifts from labour intensity to skill intensity, and the weight of medium- and high-tech industries in manufacturing employment increases. While medium- and high-tech industries do not create as many jobs as food and beverages, textiles and wearing apparel, their wages are usually higher than in these three industries. In addition, as countries develop, differences in wage levels among manufacturing industries tend to narrow, due to the rise in labour productivity in low-wage jobs. Manufacturing employment may thus lose headcount attractiveness as incomes rise, but the sector's structural change helps raise its wages.

Female employment

Employment in manufacturing, as in other sectors, is not gender neutral, though the data are scarce. Regardless of a country's stage of development, women's manufacturing employment is skewed towards labour-intensive jobs, which derive their competitiveness from flexibility and cost rather than skills. This tendency might help lift women's economic status at early stages of development, when a country's manufacturing jobs are rising, because the increasing availability of labour-intensive manufacturing jobs allows people without skills to get a formal job, which is often superior to the alternative existing jobs for wages and security. But as industrialization advances, continuing concentration of female employment in labour-intensive work is a cause for concern because such work usually pays less than jobs in other manufacturing industries that become more common as countries develop.

> **Wages are a result of structural change – as workers move up to higher value-added industries and raise their productivity, they receive higher salaries**

Drivers of structural change in manufacturing

Key messages

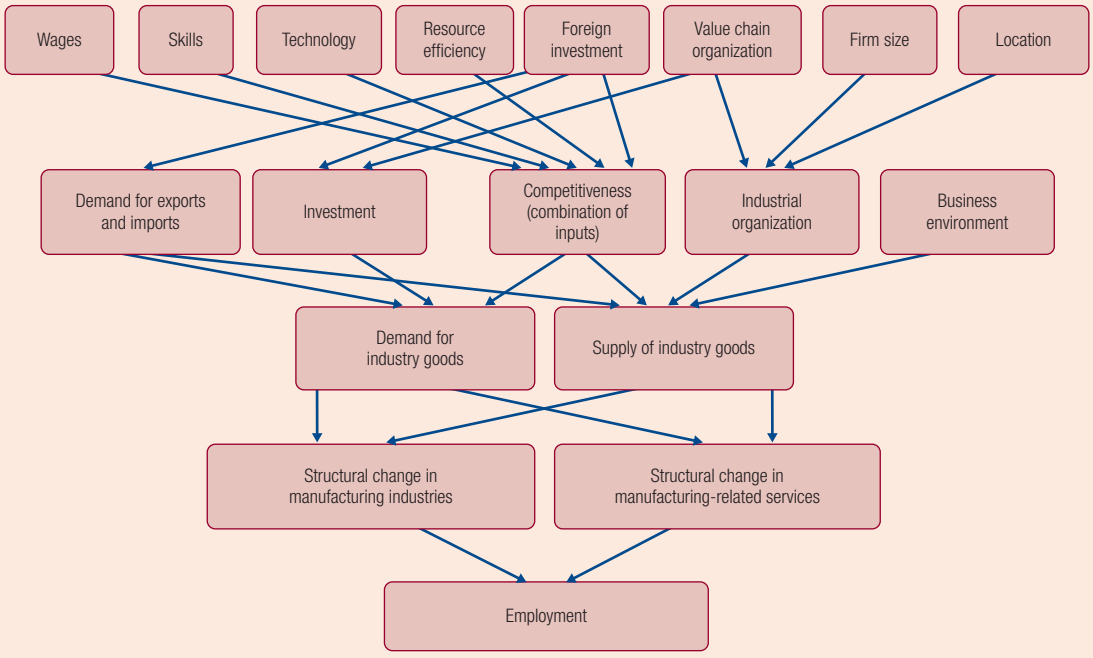
- Costs, as well as technology and demand, remain critical drivers of structural change and industrial development.
- Matching the type of skills to the structure of industry as incomes grow can drive industrial structural change.
- Product innovation results in structural transformation and generates employment through the creation of new business opportunities.
- Resource efficiency, emerging as a major driver of structural change and industrial development, will be even more important in the future.
- The impact of the drivers of structural change on sustaining employment depends on the industrial policies adopted.

Traditional and emerging drivers

The previous section depicted structural change across sectors and within manufacturing industry and their relationship to employment. But what are the drivers of this structural change? And how do they sustain employment through structural change? Certainly the interactions are extremely diverse, complex and non-linear. This section discusses the drivers for structural change in manufacturing (Figure 14). Due to limited availability of evidence and the scope of this study, not all possible combinations of interactions will be examined.

In principle, structural change in any sector in any country is governed by the conditions of demand and supply for products and services that interact with each other. Supply-side conditions generally include wages, skills, technological change, industrial organization and the overall business environment, which work through the competitiveness of industry. Demand-side conditions include demand for imports

Figure 14
Drivers of structural change in manufacturing



Source: Industrial Development Report 2013 Team.

“Skills need to be attuned to the structure of the industry and change over time as industrialization proceeds

and exports and investment, which in turn result from foreign direct investment (FDI) efforts as well as operations arising from activities within GVCs. Often, some of these drivers work through both demand and supply.

Wages are both a constraint on and a result of structural transformation. They are a constraint in that high wages may push investors away from a project, particularly in labour-intensive industries, though most investors do not make investment decisions on wages alone but also look into other factors like productivity, infrastructure, logistical facilities and supplies (cost and availability). Too high wages may prompt a withdrawal of investment, leading to deindustrialization and falling employment, while attractive wages may generate more and new work opportunities. Wages are also a result of structural change – as workers move up to higher value-added industries and raise their productivity, they receive higher salaries.

Skills need to be attuned to the structure of the industry and change over time as industrialization proceeds (Box 1). Most sophisticated industrial sectors require different types of skills than less advanced ones. Intermediate industries require a low base of engineering and scientific skills, and early industries need literacy, numeracy and simple technical and managerial training. Advanced industries require highly specialized manufacturing skills with a focus on technical subjects such as engineering and mathematics and strong technical and vocational education and training (TVET). However, as this set of skills is cumulative it takes time to build the skill base for structural transformation.

Improvements in technology raise productivity and thus are a major driver of structural change, yet their effect on employment is negative as they normally raise the capital intensity of industry and reduce labour needs. More generally, however, innovation usually favours structural change through shifts in production processes and the generation of new products (and eventually industries), but their impact on employment varies. Most process innovation aims to increase efficiency or save on inputs and so reduce labour, but product innovation (by creating new business opportunities) normally leads to more jobs. What matters for employment is the net effect of both dimensions.

Technological change and increased pressures to compete have put a premium on high-level technical skills. This trend started early in the 20th century, causing a bias in technological change in favour of technology that uses skills, suggesting that where skill-using industries are located, better jobs are created. In developed economies it is now fairly well established that technological change in a skill-biased direction has been a key factor in creating a falling labour share in GDP, as unskilled jobs are replaced by capital. The significance for developing countries – as technology importers – is that the technology transferred to them has been created in response to market conditions in advanced economies.

The organization of industry affects processes of structural transformation depending on the mix of firm size, extent of economies of scale in production, degree of production fragmentation across value chains and the nature of spatial distribution and clustering of production within national economies. An industrial organization geared towards large firms and sectors will make it harder for the economy to shift to more advanced industries, while a more balanced combination, which includes a significant proportion of SMEs, may allow for more economic flexibility and potential for advancement and generate more employment.

The business environment has been highlighted as a key influence on enterprise growth and employment by, for example, the *World Development Report 2005* (World Bank 2005). The investment climate has been defined as “the many location-specific factors that shape the investment opportunities and incentives for firms to invest productively, create jobs and expand” (World Bank 2005, p. 2). It covers aspects of regulation and corruption linked to the cost of doing business, as well as broad issues like the quality of infrastructure, the skill base, the difficulty of accessing sources of finance, and aspects of the labour

“International trade promotes structural transformation through expanding the size and scope of local business, which do not need to rely solely on the domestic market to grow further

Box 1
Structural change and skill development

When economies undergo the structural change from agriculture to industry, a new set of skills is required (Box Table 1). Yet the short- and long-term nature of skill investment, the inherent uncertainties and externalities of the process, and the myriad public–private sector education and training schemes can lead to market failures in human resource formation. Policy support for skill development seems to be accepted worldwide, but governments can fail. How do policy-makers avoid that?

The answer is that they need to understand the complexity of industrial skill needs, match short-term needs and long-term goals, create skills gradually and sequentially, match supply and demand, and align skill policies with the broader socio-economic agenda. In turn this response leads to the following policy recommendations: support development of soft transferable skills for manufacturing, complement formal education with technical and vocational education and training (TVET), engage the private sector in designing TVET, encourage on-the-job training, make the financing for training efficient and equitable, develop nationwide certification for manufacturing skills, support skill development through inter-firm linkages, support private sector–university collaboration, ensure a focus on youth and do not forget the informal economy.

Box Table 1
Structural change, skill demand, and education and training

Industrial deepening	Technological capability	Skill demand	Education and training	In-firm training	Linkages to other players
Low-level, simple assembly and processing mainly for domestic market	Ability to master simple assembly technologies, copy simple designs and repair machines, but no capacity to adapt processes	Literacy, numeracy and simple technical and managerial training	Formal primary education	No formal in-firm training, except informal learning through repetition, trial and error	None likely
Intermediate level, including export-oriented activities in light industry	Capability to undertake minor adaptations to processes and products, but little or no design and development capabilities	Low base of engineering and scientific skills. Small and medium-size enterprises have low skill levels	Good secondary and technical schooling and management and financial training	Some in-house training mainly by export-oriented enterprises	To buyers and suppliers, but very unlikely to technology institutions
Advanced and deep industrial structure mainly in technology-intensive industries	Ability to monitor, import, adapt and operate state-of-the-art advanced technologies	Highly specialized manufacturing skills with a focus on technical subjects such as engineering and mathematics	Excellent tertiary technical education and specialized industrial training by institutions of TVET. High numbers of university-trained managers	Large investments in formal and informal in-firm training	Strong linkages to suppliers, buyers, consultants, universities and technology institutions

Source: Adapted from Lall (2001).

market – all of which are often crucial in low-income economies.

International trade promotes structural transformation through demand-side effects including expanding the size and scope of local business, which do not need to rely solely on the domestic market to grow further. Supply-side effects include the potential for substituting imports as local producers capture markets initially served by imports; exposing local firms to foreign competition and technology, which may lead to significant productivity gains; capturing valuable externalities and dynamic returns to scale; and generating opportunities for attracting additional FDI. Yet the evidence suggests that the impact of international trade is ambiguous and depends on additional economic and policy conditions.

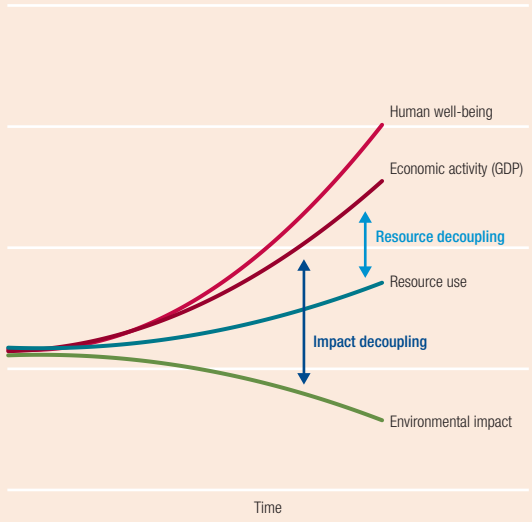
“Countries need to move from lower to higher tech, from lower value-added to higher value-added and from lower-productivity to higher-productivity sectors, industries and activities if they want to develop industrially

GVCs help structural transformation by segmenting the production process and facilitating the relocation of production. In producing a final product in one location there maybe be little scope for changing the capital–labour ratio, but once it becomes possible to fragment production into a series of stages there will inevitably be some that are more labour intensive than others and, with low transport and communication costs, it may be cost-effective to locate these in a low-wage economy. Technologically, participating in value chains makes industrialization “easier and faster” but at the same time locally “less meaningful” as firms in developing countries can link to international production networks and draw on the technological and marketing prowess of the lead firms in these chains while not making the effort themselves (Baldwin forthcoming). Their impact on employment tends to be positive, though it also depends on whether local production has been displaced.

FDI influences structural change by encouraging development of clusters and exploitation of cluster economies (when domestic investment is unavailable). It helps diversification into new sectors, particularly when it is attracted to new, high-tech sectors, and through spillover effects, which make local firms more competitive and attract local firms into new activities. FDI does not, however, automatically generate structural change, as spillovers only work if local entrepreneurs are involved.

Resource constraints have traditionally not been a driver of structural change but, given the polluting impact of industrialization in the past, sustainability will become a key driver in the future. Further, wasteful production and consumption patterns – along with continuing soil degradation, deforestation and overfishing – are already exacerbating water shortages and escalating prices for food, energy and other commodities. Efficient use of inputs, therefore, has clear economic advantages, boosting competitiveness and generating resources for investing in further growth and structural transformation. In the long run, industrial structure will have to change towards a direction that decouples economic activity from resource use and environmental impact (Figure 15).

Figure 15
Decoupling economic activity from resource use and environmental impact



Source: UNEP 2011.

Drivers as necessary conditions

As said at the start of this report, jobs do not fall like manna from heaven – and neither of course is structural change imposed this way. Yet one of the key themes of this report is that countries need to move from lower to higher tech, from lower value-added to higher value-added and from lower-productivity to higher-productivity sectors, industries and activities if they want to develop industrially. The structural change analysis for this report indicates that while conditions may vary greatly across time and space and technological change may still throw up huge surprises, the regularities from the past are very likely to stretch into the future. There is much to learn from understanding history and what drove it. And developing countries can learn much from countries slightly ahead of them – and far.

The impact of drivers on structural change, however, has not been, and will not be, unambiguous. Wages can support – or hinder – employment generation depending on how they are set. The timing of the availability of skills seems to be crucially important for them to support the emergence of new

“By promoting positive structural change at all development stages and by overseeing close coordination with other policies so that there is consistency in action, governments can have a major impact on sustaining employment generation

jobs. Technology sheds labour if it is process oriented but generates employment if it is product oriented. International trade does not always lead to a virtuous circle of structural change and employment, as the contrasting experiences of East Asia and Latin America illustrate. A simple examination of each one of the drivers will reveal that their impact may go in either direction, something complicated by the fact that drivers often interact with each other before generating an impact.

The state (alongside the private sector) needs to work hard at ensuring that the drivers have a positive impact on employment generation while transforming the economy. By targeting policy at key drivers, such as education and skills, appropriability and international trade, governments can set in motion a virtuous, rather than a vicious, circle involving structural change. Well-run interventions can promote industrial growth and employment, as confirmed by the results of recent impact evaluations for high-income countries. By promoting positive structural change at all development stages and by overseeing close coordination with other policies so that there is consistency in action, governments can have a major impact on sustaining employment generation. But developing countries should not simply emulate high-income countries. They may well benefit from showing flexibility in experimenting, learning and evaluating.

Drivers are thus necessary for successful structural change but will require a good set of well-coordinated government policies to make industrialization work for employment generation.

National and international industrial policy

Key messages

- Achieving sustained employment generation requires industrial policies to focus on the structural transformation of the economy.
- The state can promote industrial policy either as a regulator, financier, producer or consumer. It should oversee close coordination with other policies as they can undermine the objectives of industrial policy if they are misaligned.
- For industrial policy to be effective, the policy-making process is as important as the policy content.
- International cooperation in the areas of labour standards, investment and sustainable economic development targets after 2015 is key to ensure that industrialization generates much needed high-quality jobs.

Promoting structural change

Industrial policy – the main objective of which is to “anticipate structural change, facilitating it by removing obstacles and correcting for market failures” (Syrquin 2007, p. 49) – should seek to promote such change at each stage of development, in four main ways: as a regulator establishing tariffs, fiscal incentives or subsidies; as a financier influencing the credit market and allocating public and private financial resources to industrial projects; as a producer participating directly in economic activity through, for example, state enterprises; and as a consumer guaranteeing a market for strategic industries through public procurement programmes (Peres and Primi 2009).

At an early stage of industrialization (from agriculture to low-technology manufacturing) it should do this primarily by aligning agricultural and industrial policies and by creating or supporting labour-intensive and resource-based manufacturing with low entry barriers. Towards the middle-income stage it should do this by improving manufacturing’s efficiency and productivity and diversifying and upgrading the economic structure. And at an advanced stage it should do this through technological innovation, pursuing both differentiation by raising quality and innovation

“Coordination is particularly important because competition and industrial policies are often viewed as mutually conflicting

by launching new products and services, including green technology.[10]

Targeting key drivers of structural change

Governments can use policy instruments to target key drivers. Education and skills, for example, would be underprovided in a pure market-driven environment as employers have too few incentives to provide funds for them. Similarly, limited appropriability, lack of competitive finance and coordination failures make technology and innovation prone to market failures, resulting in underinvestment (Martin and Scott 2000). And as a reliable supply system of low-cost and high-quality material inputs is critical to local industries, countries sometimes use policy instruments to reduce input costs.

The targeting of key drivers requires close coordination with other policies – notably on competition, trade and FDI, and exchange rates – that play an important complementary role to industrial policy. Failure to ensure synergies may counteract policy objectives. Coordination is particularly important because competition and industrial policies are often viewed as mutually conflicting, as the former typically aims to foster rivalry between firms in an industry (for greater efficiency and economic welfare), while the latter frequently gives a market advantage over competitors to favoured domestic sectors or industries.

Coordination among trade and FDI policies helped, for example, former low-income countries such as the Republic of Korea catch up, and today despite restrictions imposed by bilateral and multilateral trade policy agreements, governments still have some space to use trade-related instruments for industrial policy, especially non-tariff barriers. They can also use export-promotion instruments that support exporters’ access to competitive financing, R&D and training.

Measures such as closely monitoring the real exchange rate and keeping it undervalued to support the tradable sector, primarily manufacturing (including manipulation of the nominal exchange rate), have featured in almost all successful catch-up countries (Rodrik 2008). They are also crucial in preventing the current account deficit from becoming unsustainable (McCombie and Thirlwall 2004).

Industrial policy instruments

Four types of instruments are available to governments to achieve structural change. Fiscal incentives are government transfers of public resources to firms, activities, whole industries or regions, free or at below-market rates, made through direct subsidies (cash or in kind) or indirect subsidies (tax incentives).

A well-functioning financial market is crucial to boost industrial development through the provision of competitive lending for working capital, leasing of capital goods, loans for fixed assets including investment projects and real-estate development, as well as of consultancy services. Access to reasonably priced credit is a key constraint for SMEs in particular, even for those with projects having positive private and social returns, as they usually lack collateral or credit history.

In pursuing development objectives, the state has historically played a key role in industrial development through state-owned enterprises (SOEs). State ownership can be justified when there are natural monopolies unsuitable for private enterprises, for social or developmental goals, to achieve investment returns for supporting budgetary objectives, and for national economic security (Mattlin 2009). They can also act as incubators for technical skills and managerial talent, as in China (Rodrik 2010).

As a consumer, a national government can be the single largest buyer in several markets for goods and services in a country. It can use this purchasing power to stimulate economic activity and innovation, protect national industry against foreign competition, improve competitiveness of some industrial sectors or remedy regional disparities (Watermeyer 2000).

Developing skills

Most governments agree that human capital is a crucial driver of economic growth. Some of the elements in successful skill policies include appreciating the complexity of industrial skill needs, matching

“Each country has to go through its own learning process – combining industrial policy experimentation with rigorous impact evaluation to generate an evidence base on which industrial policy measures work

short-term needs and long-term goals, creating skills gradually and sequentially, matching supply and demand and aligning skill policies with the broader socio-economic agenda.

At the “hard end”, manufacturing employers are not just looking for technical skills but also for cognitive, social and behavioural skills. Some consider teamwork and problem solving key for blue-collar workers, and critical thinking crucial for white-collar workers (Bodewig 2012). Many of these soft skills have to be developed at an early age, hence the importance of supporting policies that establish the learning foundations of the future workforce. Beyond that stage, the last few decades have seen a strong emphasis on TVET to meet the demand for industrial skills. Private sector involvement – through, for example, inter-firm linkages and university–private sector collaboration, including on-the-job training – is crucial because this is the most efficient way to link skills to the labour market (DFID 2011).

Still, lack of financing for high-quality TVET remains a bottleneck. And it also remains important to produce training for the informal sector, both to develop that sector and to strengthen the link between the informal and formal sectors, making it easier for workers to move to the latter.

Getting industrial policy to work

Carefully chosen and implemented interventions can promote industrial growth and employment, as confirmed by evidence from the results of impact evaluations for high-income countries in 2010 and 2012. For instance, subsidies to manufacturing firms can increase employment at comparably very low cost per job (Criscuolo et al. 2012). Well-allocated firm-level subsidies can also boost total factor productivity (Aghion et al. 2012) and tariffs that account for the varying skill levels among industries have the potential to boost economic growth (Nunn and Trefler 2010).[11]

But these types of studies must be interpreted with great caution. First, many were not performed thoroughly enough and hence an assessment of their internal validity suggests that causal relationships between policy instruments and observable impacts are hard to establish. Second, the findings on the achievements or failures that can be distilled from international experiences cannot easily be generalized because of country heterogeneity.[12]

One upshot, though, is that evidence-based and realistic industrial policy run in a consensual way is key for effectiveness, irrespective of the concrete instruments used. So those making such policy should:

- *Use – do not fight – the political system.* A fact of political life is that no policy will be underwritten unless those in power agree to it.
- *Strengthen political leadership.* This will set a national transformation agenda that aims, in low-income countries, to create and nurture productive activities or, in middle-income countries, to advance technologically.
- *Encourage public–private dialogue.* This will help both in designing interventions that draw on expert knowledge in the private sector and in ensuring that all key stakeholders support decisions.
- *Boost industrial policy management capabilities.* These have to be strengthened considerably among key actors in developing countries in a pragmatic and concentrated way.

International experience with policy instruments can provide interesting lessons, but developing countries are unlikely to succeed by simply emulating high-income economies because a strategic approach to forming industrial policy has to be tailored to national circumstances. Each country has to go through its own learning process – combining industrial policy experimentation with rigorous impact evaluation to generate an evidence base on which industrial policy measures work in a given context and which do not.

Cooperating internationally

International cooperation on structural change is required to prevent any race to the bottom. Firms in rich countries could be tempted to relocate to low-income countries with lower labour costs, less restrictive labour laws and weaker monitoring of labour conditions and environmental impacts. At the same time,

“Bilateral investment treaties aim to protect the sources of FDI and so stimulate investment and create jobs

to address these challenges, national regulators need a measure of policy autonomy, a position that may be at odds with international cooperation through trade agreements.

Cooperation is required for international labour standards, particularly in the fairly new area of “private sustainability standards”, which emerged once social activists discovered that reputation was a firm’s tangible asset that they could easily harm. Initially welcomed as “one of the most innovative and startling institutional designs of the past 50 years” (Cashore, Auld and Newsom 2004), doubts have emerged more recently over the potential of these new standards for developing countries. Yet it seems that there are no sound, overall quantitative studies aimed to estimate the effects on labour conditions or employment – an important task for multilateral organizations.

Another key legal instrument involving international cooperation is the bilateral investment treaty (BIT). As FDI runs risks (host states maintain the legal right to decide how to treat it), rules in BITs can allay these concerns by requiring states to compensate for expropriation and allowing repatriation of assets. In this way BITs aim to protect the sources of FDI and so stimulate investment and create jobs. Governments accede to these stringent conditions because prospects of FDI are enticing, promising technology transfers and domestic job creation (Elkins, Guzman and Simmons 2006). And so the number of BITs has surged in the last couple of decades, from a mere 447 in 1990 to more than 3,000 unique, bilateral agreements in 2011 (UNCTAD 2012).

Still, BITs and other investment regulations have further potential to improve conditions for manufacturing-related employment generation, which international organizations can encourage. Similarly, as many (mainly developing) countries have not become signatories for various reasons, international bodies can buttress coordination efforts to allow them to benefit more from BITs, in three ways. First, they can serve as forums for aggregating multilateral interests, by extending their databases on investment agreements and ensuring transparent reporting of agreements signed, cases disputed and the firms and locations of FDI. Second, they can provide consultative services to states. Third, they can disseminate knowledge on states keeping to investment agreements – violating terms of BITs triggers marked reputational damage that decreases FDI inflows.

As the world examines how to move beyond the Millennium Development Goals (MDGs) after 2015, it can look to build a framework with goals anchored in the three dimensions – economic, social and environmental – of sustainable development. The eight MDGs were intended to unify pursuit of these three dimensions (UN System Task Team 2012), but an economic dimension was missing and a target on employment was only added in 2008. But generating new employment remains a pivotal global social concern. The first indicative findings from the United Nations–led consultations on the post-2015 development agenda, through which more than 200,000 people from across the world contributed their views on the ideal development priorities after the expiry date of the MDGs, show that job creation will remain a major social challenge, encompassing almost all economies well beyond 2015 (UNDG 2013). The post-2015 agenda thus offers a new opportunity for states to recouple considerations for sustainable manufacturing and employment with the focus on human development that dominated the first MDG programme, by recommitting to the economic dimensions of development.

Trends in global manufacturing value added and exports

Since the start of this century industrializing economies have accounted for a growing share of global MVA. This trend is as much the result of a gradual shift of production from industrialized to industrializing countries to benefit from lower wage and non-wage labour costs and improved infrastructure as it is

> **Over the last 20 years global MVA has nearly doubled, averaging 3 percent annual growth**

a reflection of the growth of industrializing countries' domestic markets for industrial goods owing to higher incomes and a fast-rising middle class.

Indeed, over the last 20 years global MVA has nearly doubled, averaging 3 percent annual growth. While industrialized countries' MVA expanded by a mere 1.8 percent a year – below their 2.1 percent GDP growth – MVA in industrializing countries rose 6.4 percent a year – faster than their 5.0 percent GDP growth – and increasing more than three-fold.[13]

World MVA reached an all-time high in 2012 of 16.7 percent of global GDP, having recovered fully from the sharp contraction of 2008–2009 and the global economic and financial crisis. MVA's share of GDP in industrialized countries fell from 16.4 percent in 1990 to 15.0 percent in 2012, while it rose from 16.5 percent to 21.3 percent in industrializing countries.

The greater dynamism of industrializing economies is reflected in their increased share of world manufactured exports, from 13.9 percent in 1997 to 29.6 percent in 2011. The emerging economies accounted for most of this increase, their world share more than doubling from 12.3 percent to 27.1 percent over the period.[14] The expansion in exports from large industrializing countries such as China and India also helped world manufactured exports recover from the contraction that followed the financial crisis. Given the current trend and growth in network trade, it is expected that more manufacturing activities will be based in industrializing countries.

Manufacturing value added

Industrializing countries' near-doubling of their share of global MVA – from 18 percent in 1992 to 35 percent in 2012 – and a mirroring retreat of the industrialized countries underscore the structural changes taking place in both groups. This increase in share is underscored by rapid growth rates, much higher than those of industrialized countries (Table 2).

Shares of manufacturing value added

The high and sustained MVA growth in China over this period (11.4 percent a year on average) is behind its emergence as the factory of the world: in 2012, 50 percent of industrializing economy manufactured goods were produced in China. Of all other large industrializing economy manufacturers, only India (7.4 percent annual average MVA growth) kept pace with China. India gained MVA share to become the second-leading manufacturer among industrializing economies, superseding Mexico and Brazil, which saw their MVA shares among industrializing economies fall more than half, from 11.7 percent and 10.5 percent in 1992 to 5.7 percent and 4.9 percent in 2012.

A theme in this report is that manufacturing continually shifts to products with higher technological complexity. And indeed the share of medium- and high-tech products in world MVA rose from 43.2 percent in 2002 to 47.8 percent in 2011. Industrialized and industrializing countries exhibited similar trends, with their share of resource-based products decreasing and that of medium- and high-tech products increasing over 2002–2011. Low-tech manufacturing maintained its MVA share at around 25 percent during 2002–2011 worldwide but there was a substantial relocation of production from industrialized to industrializing countries, mainly to China.

In 2011 the dominant manufacturing sectors worldwide were food and beverages (11.6 percent), chemicals and chemical products (11.2 percent), machinery and equipment (8.9 percent), basic metals (8.6 percent) and radio, television and communication equipment (8.3 percent). The last two had made significant gains over 2002–2011 resulting from the higher demand for basic metals derived from the acceleration of MVA growth in industrializing countries and the global surge in demand for electronic devices.

The five fastest growing sectors in 2007–2011 were basic metals; radio, television and communication equipment; office, accounting and computing machinery; electrical machinery and apparatus; and other transport equipment. All are medium- and high-tech activities, whose fast growth is likely explained by demand from emerging economies such as China and India.

“ In Sub-Saharan Africa most countries exhibited robust annualized manufacturing value added growth

Table 2
Manufacturing value added by industrialization level, region and income group, 2007–2012

	Manufacturing value added (constant 2005 $ billion)						Average growth rate (percent)	
	2007	2008	2009	2010	2011	2012	2003–2007	2007–2012
World	8,400	8,380	7,740	8,460	8,720	8,900	4.98	1.18
Industrialized economies	6,100	5,960	5,220	5,730	5,780	5,800	3.79	–1.02
Industrializing economies	2,300	2,430	2,520	2,730	2,940	3,110	8.60	6.23
By industrialization level								
Emerging industrial economies	2,060	2,180	2,270	2,460	2,660	2,820	8.91	6.55
Other industrializing economies	209	217	216	228	235	240	5.91	2.84
Least developed countries	32	34	36	39	41	44	7.47	6.52
By region								
East Asia and the Pacific	1,170	1,270	1,400	1,520	1,670	1,810	11.32	9.08
Excluding China	201	210	207	226	236	253	6.24	4.64
Europe	161	168	163	174	182	186	8.60	3.00
Excluding Poland	96	98	92	94	96	97	6.99	0.26
Latin America and the Caribbean	481	489	453	492	511	517	4.24	1.43
Excluding Mexico	315	324	304	328	340	340	5.09	1.52
Middle East and North Africa	186	190	185	200	212	221	6.76	3.51
Excluding Turkey	91	95	97	100	102	107	5.12	3.36
South and Central Asia	224	231	247	264	282	294	9.38	5.61
Excluding India	76	76	77	81	86	89	8.85	3.26
Sub-Saharan Africa	76	78	74	78	81	84	4.08	2.04
Excluding South Africa	30	31	32	34	35	37	3.94	4.49
By income group								
High income industrializing	387	403	416	444	471	495	7.26	5.04
Upper middle income industrializing	133	142	143	150	158	163	7.84	4.12
Lower middle income industrializing	1,750	1,850	1,930	2,100	2,270	2,410	8.99	6.64
Low income industrializing	30	32	33	36	38	41	7.43	6.54

Source: UNIDO's elaboration based on UNIDO (2013b).

China was the first- or second-ranked manufacturer in the world in 20 of 22 industrial sectors in 2011. Other industrializing countries among the top five included India, Indonesia, Mexico, Brazil, Argentina and Turkey.

Manufacturing value added by region

The manufacturing performance of individual countries and regions reflected their different levels of integration in the world economy. Although all regions showed growth in MVA, the ratio was 6:1 between the fastest and slowest regions over 2007–2012.

East Asia and the Pacific scored the highest MVA growth at 9.1 percent a year over 2007–2012, driven by China (9.9 percent annual growth). Only two small economies outperformed Chinese manufacturing in 2007–2012: Myanmar (14.2 percent a year) and Timor-Leste (11.2 percent). Most of the countries in the region profited from China's dynamism, from widespread participation in regional production networks and from their own (as well as others') stimulus packages.

South and Central Asia registered the second-highest growth in manufacturing over 2007–2012, averaging 5.6 percent a year. It benefited from proximity to

> **In 2011 world manufactured exports peaked at $13,469 billion, growing faster than manufacturing value added and GDP over 2007–2011**

China and production networks in East Asia, and from the dynamism of Indian manufacturing (in turn fuelled by strong domestic demand), and a shift towards more technologically complex products. Since 2009 India has become the second-largest manufacturer among industrializing countries and ranks ninth in the world.

In the Middle East and North Africa MVA grew 3.5 percent a year in 2007–2012. Industrial performance was mixed, with the bulk of countries showing moderate growth averaging 3–5 percent a year thanks to strong domestic demand, though most growth took place only after 2009.

Industrializing countries in Europe showed aggregate annualized MVA growth of 3 percent over 2007–2012, which would seem to indicate a remarkable recovery after the slump in 2009. However, this average masked wide disparities. While there was considerable growth in Belarus (7.6 percent a year) and Poland (6.6 percent), and a mild increase in Albania and Romania, manufacturing elsewhere in the region (mainly in Eastern Europe and the Balkans) stagnated or regressed drastically over 2007–2012, emulating the general trend observed in industrialized countries in the region.

In Sub-Saharan Africa most countries exhibited robust annualized MVA growth. Only a few countries, including the Central African Republic, The Gambia and Zimbabwe, saw a decline in manufacturing output during 2007–2012. The modest performance of South Africa (0.3 percent a year), the region's largest producer, accounted for the low overall growth.

Latin America and the Caribbean's MVA expanded the least, by 1.4 percent, which explains how its share of industrializing countries' MVA fell from 21.0 percent in 2007 to 16.6 percent in 2012. Many countries in the region have the United States as a major destination of their manufactured exports and were thus hit hard by the crisis.

The industrial performance of the least developed countries over 2007–2012 was strong, with the highest average annual growth as a group (6.5 percent). Some of these countries seem to be integrating with international production networks in their regions.

World manufactured exports

In 2011 world manufactured exports peaked at $13,469 billion, growing faster than manufacturing value added and GDP over 2007–2011 (Table 3). They recovered fully from the contraction that followed the crisis, owing mainly to the expansion in exports from large industrializing countries such as China and India. Exports of primary products grew nearly twice as fast over the period, often fuelled by higher prices and strong demand from rapidly growing countries. Industrialized countries' manufactured exports grew just 3.7 percent a year over 2007–2011, reaching $9,483 billion in 2011, as they struggled to recover from the fall in economic activity brought about by the crisis. In industrializing countries, manufactured exports grew by 10.5 percent a year over the period, to a peak of $3,985 billion in 2011.

Shares of world exports

Industrializing economies increased their share of world manufactured exports from 13.9 percent in 1997 to 29.6 percent in 2011. It was the emerging economies (China and 31 other economies) that accounted for most of this increase. Together, the combined manufactured exports of the largest country in each industrializing region – Mexico, China, India, Poland, South Africa and Turkey – accounted for 67.5 percent of the industrializing countries' total in 2011, up from 59.9 percent in 2002 and 55.1 percent in 1997, confirming the higher dynamism of the larger countries and a worrying widening gap with the smaller economies.

All industrializing regions have increased their share of world manufacturing exports since 1997 but at different paces. The surge in industrializing countries' exports of manufactures since the turn of the century is largely attributable to the emergence of China as a large manufacturer and exporter of many of these products. Its exports of manufactured goods grew on average 22.1 percent a year over 2002–2011, twice as fast as the world's 11.0 percent. Having become the world's largest exporter of manufactures in 2008, China extended its lead further, achieving

"Together, the combined manufactured exports of the largest country in each industrializing region – Mexico, China, India, Poland, South Africa and Turkey – accounted for 67.5 percent of the industrializing countries' total in 2011

Table 3
World manufactured exports by industrialization level, region and income group, 2006–2011

	Manufactured exports ($ billion)						Average growth rate (percent)	
	2006	2007	2008	2009	2010	2011	2003–2007	2007–2011
World	9,447	10,861	12,120	9,516	11,558	13,469	15.6	5.5
Industrialized economies	7,232	8,189	8,980	6,954	8,242	9,483	13.6	3.7
Industrializing economies	2,215	2,672	3,139	2,562	3,316	3,985	23.2	10.5
By industrialization level								
Emerging industrial economies	1,989	2,417	2,853	2,334	3,002	3,646	24.0	10.8
Other industrializing economies	206	232	270	214	297	321	16.7	8.5
Least developed countries[a]	20	24	16	14	17	18	17.9	–6.9
By region								
East Asia and the Pacific	1,169	1,454	1,688	1,431	1,868	2,232	26.4	11.3
Excluding China	248	287	318	275	349	407	15.8	9.1
Europe	230	292	355	263	314	402	24.8	8.3
Excluding Poland	136	170	204	143	176	237	23.4	8.7
Latin America and the Caribbean	420	459	537	417	536	639	15.7	8.6
Excluding Mexico	219	250	308	232	297	370	21.3	10.3
Middle East and North Africa	178	224	274	202	247	274	23.5	5.2
Excluding Turkey	101	127	155	114	147	154	24.0	4.9
South and Central Asia	154	171	197	181	254	327	21.2	17.6
Excluding India	49	46	41	32	66	75	12.7	13.0
Sub-Saharan Africa	64	73	89	68	97	112	16.7	11.3
Excluding South Africa	29	31	38	32	48	54	16.9	14.9
By income group								
High income industrializing	339	399	478	408	518	629	18.7	12.1
Upper middle income industrializing	178	217	257	195	240	289	24.2	7.4
Lower middle income industrializing	1,677	2,032	2,389	1,947	2,541	3,052	24.1	10.7
Low income industrializing	21	25	15	12	17	15	20.6	–12.0

a. About half the least developed countries have yet to report 2011 data.
Source: UNIDO's elaboration based on UNIDO (2013a).

with exports of $1,825 billion and a world market share of 16.6 percent in 2011.

The largest share of world manufactured exports is between industrialized countries: in 2011, 48.7 percent ($6,472 billion) of the total. By contrast, exports of manufactures among industrializing countries represented only 9.1 percent ($1,208 billion) of the total. But although both trade flows increased during 2006–2011, those between industrializing countries did so at nearly 20 percent a year.

Manufactured trade flows between the groups of industrialized and industrializing countries accounted together for 42.1 percent of total world exports of manufactures and grew at comparable rates of around 11–12 percent over 2006–2011. However, despite expanding their export share faster, industrializing countries showed a trade deficit with industrialized countries in 2011 of $274 billion.

The recovery of manufactured exports

By 2011 trade in manufactured exports had fully recovered from the impact of 2009, setting a new record of $13,469 billion, 11 percent higher than the 2008 peak. Despite their smaller share of

> **Of the $1,349 billion additional exports in 2011, industrializing economies accounted for $846 billion, while industrialized economies registered only $503 billion more**

manufacturing output and exports compared with industrialized economies, industrializing economies were behind the trade revival. Of the $1,349 billion additional exports in 2011 (over 2008), industrializing economies accounted for $846 billion (62.7 percent), equivalent to a growth rate of 8.3 percent a year in 2008–2011, while industrialized economies registered only $503 billion more (37.3 percent), or a growth rate of 1.8 percent a year. This was as much a reflection of the industrialized countries' struggle to reset their economies when most of the industrializing world was already up and running in 2010 as it was of the intensification of network trade and the incorporation of more industrializing countries into existing production networks (Hanson 2012).

Notes

1. The analysis is undertaken for a large panel dataset of 100 countries over 1963–2007, though not all countries are represented for all years. Fixed effects are introduced to account for the fact that each country enters the sample several times and that the observations for some countries (especially high-income ones) are more numerous. For reasons of space, details of the econometric approach and main regression results are not presented.
2. This is about the per capita income at which countries transition from the middle-income to the high-income category in the World Bank's classification. See Table A4 for country classification by income (constant 2005 PPP$).
3. For the list of countries classified by income (PPP) see Table A4.
4. Business services, wholesale and retail, financial, transport and other services.
5. Data from World Bank (2013a) for the same sample of countries.
6. Most figures in this section have been produced based on the UNIDO Industrial Statistics Database two-digit International Standard Industrial Classification (ISIC) Revision 3 for the estimations of manufacturing development patterns. The dataset has unbalanced data on employment and value added for 23 manufacturing industries at the two-digit ISIC level for 1963–2007. The 23 industries were consolidated into 18 industries because many countries reported together some of the industries.
7. To investigate the details of manufacturing development underlying the above structural change, the following analysis looks at the changes in the levels of the development of 10 out of 18 manufacturing industries at the two-digit ISIC Revision 3 level. The 10 selected industries are representative of manufacturing as a whole, which consists of industries characterized by different technological content and stages of development, and usually account for more than 75 percent of value added and employment in manufacturing. They include three low-tech, three medium-tech and four high-tech industries with different degrees of labour intensiveness.
8. Value added per capita and employment–population ratio are used because, unlike shares, they are not influenced by the ups and downs of other industries and are thus better able to expose industrial characteristics (such as growth rates and elasticities). Value added per capita of a manufacturing industry indicates the development level of the industry in an internationally comparable manner, as per capita GDP does so for a country's economy. For the employment–population ratio, because employment divided by population tends to be a very small number, it is multiplied by 100.
9. The analysis in this section uses the World Input-Output Database (see Timmer 2012). Here manufacturing-related service employment is defined as employment in the services sector, required for the production and delivery of manufacturing products.
10. A key issue raised in the literature is to what extent should industrial policy anticipate structural change (see Lin and Chang 2009).
11. These studies emphasize clean-research designs and use either randomized control trials or natural experiments to identify causal effects.

12. The empirical evidence on trade policy instruments does not let us conclude that, for example, industrial policies promoting openness will spur growth and those promoting trade protection will hamper growth.
13. See Tables A1 and A2 for a classification of industrialized and industrializing countries.
14. Including China and 31 other fast-growing, high and higher MVA per capita economies.

Annex

Country and economy groups

Table A1
Countries and economies by region

Industrialized economies				
East Asia and the Pacific				
Australia	Hong Kong SAR China	Macao SAR China	New Zealand	
French Polynesia	Japan	Malaysia	Singapore	
Guam	Korea, Rep. of	New Caledonia	Taiwan Province of China	
Europe				
Austria	France	Italy	Netherlands	Slovenia
Belgium	Germany	Liechtenstein	Norway	Spain
Czech Republic	Hungary	Lithuania	Portugal	Sweden
Denmark	Iceland	Luxembourg	Russian Federation	Switzerland
Estonia	Ireland	Malta	Slovakia	United Kingdom
Finland				
Latin America and the Caribbean				
Aruba	British Virgin Islands	French Guiana	Puerto Rico	US Virgin Islands
Middle East and North Africa				
Bahrain	Israel	Kuwait	Qatar	United Arab Emirates
North America				
Bermuda	Canada	Greenland	United States	

Industrializing economies				
East Asia and the Pacific				
Brunei Darussalam	Indonesia	Micronesia, Federated States of	Philippines	Tonga
Cambodia	Kiribati	Mongolia	Samoa	Tuvalu
China	Korea, Dem. People's Rep. of	Myanmar	Solomon Islands	Vanuatu
Cook Islands	Lao People's Dem. Rep.	Palau	Thailand	Viet Nam
Fiji	Marshall Islands	Papua New Guinea	Timor-Leste	
Europe				
Albania	Bulgaria	Latvia	Montenegro	Serbia
Belarus	Croatia	Macedonia, Former Yugoslav Rep. of	Poland	Ukraine
Bosnia and Herzegovina	Greece	Moldova, Rep. of	Romania	

Table A1 *(continued)*
Countries and economies by region

Industrializing economies (continued)				
Latin America and the Caribbean				
Anguilla	Chile	Grenada	Mexico	St. Vincent and the Grenadines
Antigua and Barbuda	Colombia	Guadeloupe	Montserrat	Suriname
Argentina	Costa Rica	Guatemala	Nicaragua	Trinidad and Tobago
Bahamas	Cuba	Guyana	Panama	Uruguay
Barbados	Dominica	Haiti	Paraguay	Venezuela, Bol. Rep. of
Belize	Dominican Republic	Honduras	Peru	
Bolivia, Plurinational State of	Ecuador	Jamaica	St. Kitts and Nevis	
Brazil	El Salvador	Martinique	St. Lucia	
Middle East and North Africa				
Algeria	Egypt	Lebanon	Palestinian Territories	Syrian Arab Rep.
Armenia	Georgia	Libya	Saudi Arabia	Tunisia
Azerbaijan	Iraq	Morocco	South Sudan	Turkey
Cyprus	Jordan	Oman	Sudan	Yemen
South and Central Asia				
Afghanistan	India	Kyrgyzstan	Pakistan	Turkmenistan
Bangladesh	Iran, Islamic Rep. of	Maldives	Sri Lanka	Uzbekistan
Bhutan	Kazakhstan	Nepal	Tajikistan	
Sub-Saharan Africa				
Angola	Congo, Dem. Rep. of	Guinea	Mozambique	Somalia
Benin	Congo	Guinea-Bissau	Namibia	South Africa
Botswana	Côte d'Ivoire	Kenya	Niger	Swaziland
Burkina Faso	Djibouti	Lesotho	Nigeria	Tanzania, United Rep. of
Burundi	Equatorial Guinea	Liberia	Rwanda	Togo
Cameroon	Eritrea	Madagascar	Réunion	Uganda
Cape Verde	Ethiopia	Malawi	São Tomé and Príncipe	Zambia
Central African Rep.	Gabon	Mali	Senegal	Zimbabwe
Chad	Gambia, The	Mauritania	Seychelles	
Comoros	Ghana	Mauritius	Sierra Leone	

Source: UNIDO elaboration based on UN Statistics Classification.

Table A2
Countries and economies by industrialization level

Industrialized economies				
Aruba	Estonia	Ireland	Malta	Slovenia
Australia	Finland	Israel	Netherlands	Spain
Austria	France	Italy	New Caledonia	Sweden
Bahrain	French Guiana	Japan	New Zealand	Switzerland
Belgium	French Polynesia	Korea, Rep. of	Norway	Taiwan Province of China
Bermuda	Germany	Kuwait	Portugal	United Arab Emirates
British Virgin Islands	Greenland	Liechtenstein	Puerto Rico	United Kingdom
Canada	Guam	Lithuania	Qatar	United States
Curaçao	Hong Kong SAR China	Luxembourg	Russian Federation	US Virgin Islands
Czech Republic	Hungary	Macao SAR China	Singapore	
Denmark	Iceland	Malaysia	Slovakia	

Industrializing economies				
Emerging industrial economies				
Argentina	Colombia	Kazakhstan	Romania	Turkey
Belarus	Costa Rica	Latvia	Saudi Arabia	Ukraine
Brazil	Croatia	Macedonia, Former Yugoslav Rep. of	Serbia	Uruguay
Brunei Darussalam	Cyprus	Mauritius	South Africa	Venezuela, Bol. Rep. of
Bulgaria	Greece	Mexico	Suriname	
Chile	India	Oman	Thailand	
China	Indonesia	Poland	Tunisia	
Other developing economies				
Albania	Cook Islands	Guyana	Mongolia	Seychelles
Algeria	Côte d'Ivoire	Honduras	Montenegro	Sri Lanka
Angola	Cuba	Iran, Islamic Rep. of	Montserrat	St. Kitts and Nevis
Anguilla	Dominica	Iraq	Morocco	St. Lucia
Antigua and Barbuda	Dominican Republic	Jamaica	Namibia	St. Vincent and the Grenadines
Armenia	Ecuador	Jordan	Nicaragua	Swaziland
Azerbaijan	Egypt	Kenya	Nigeria	Syrian Arab Rep.
Bahamas	El Salvador	Korea, Dem. Rep. of	Pakistan	Tajikistan
Barbados	Equatorial Guinea	Kyrgyzstan	Palau	Tonga
Belize	Fiji	Lebanon	Palestinian Territories	Trinidad and Tobago
Bolivia, Plurinational State of	Gabon	Libya	Panama	Turkmenistan
Bosnia and Herzegovina	Georgia	Maldives	Papua New Guinea	Uzbekistan
Botswana	Ghana	Marshall Islands	Paraguay	Viet Nam
Cameroon	Grenada	Martinique	Peru	Zimbabwe
Cape Verde	Guadeloupe	Micronesia, Federated States of	Philippines	
Congo	Guatemala	Moldova, Rep. of	Réunion	

Table A2 (continued)
Countries and economies by industrialization level

Industrializing economies (continued)				
Least developed economies				
Afghanistan	Congo, Dem. Rep. of	Lesotho	Rwanda	Timor-Leste
Bangladesh	Djibouti	Liberia	Samoa	Togo
Benin	Eritrea	Madagascar	São Tomé and Príncipe	Tuvalu
Bhutan	Ethiopia	Malawi	Senegal	Uganda
Burkina Faso	Gambia, The	Mali	Sierra Leone	Vanuatu
Burundi	Guinea	Mauritania	Solomon Islands	Yemen
Cambodia	Guinea-Bissau	Mozambique	Somalia	Zambia
Central African Rep.	Haiti	Myanmar	South Sudan	
Chad	Kiribati	Nepal	Sudan	
Comoros	Lao People's Dem. Rep.	Niger	Tanzania, United Rep. of	

Source: UNIDO 2013c.

Table A3

Countries and economies by income (gross national income per capita)

High income ($12,476 or more)				
Andorra	Curaçao	Guam	Macao SAR China	Singapore
Anguilla	Cyprus	Hong Kong SAR China	Malta	Slovakia
Aruba	Czech Republic	Hungary	Netherlands	Slovenia
Australia	Denmark	Iceland	New Caledonia	Spain
Austria	Equatorial Guinea	Ireland	New Zealand	Sweden
Bahamas	Estonia	Israel	Norway	Switzerland
Bahrain	Finland	Italy	Oman	Taiwan Province of China
Barbados	France	Japan	Poland	Trinidad and Tobago
Belgium	French Polynesia	Korea, Rep. of	Portugal	United Arab Emirates
Bermuda	Germany	Kuwait	Puerto Rico	United Kingdom
Brunei Darussalam	Greece	Liechtenstein	Qatar	United States
Canada	Greenland	Luxembourg	Saudi Arabia	US Virgin Islands
Croatia				

Upper middle income ($12,475–$4,036)				
Algeria	Chile	Iraq	Mauritius	South Africa
American Samoa	China	Jamaica	Mexico	St. Lucia
Angola	Colombia	Jordan	Montenegro	St. Vincent and the Grenadines
Antigua and Barbuda	Costa Rica	Kazakhstan	Namibia	Suriname
Argentina	Cuba	Latvia	Palau	Thailand
Azerbaijan	Dominica	Lebanon	Panama	Tunisia
Belarus	Dominican Rep.	Libya	Peru	Turkey
Bosnia and Herzegovina	Ecuador	Lithuania	Romania	Turkmenistan
Botswana	Gabon	Macedonia, Former Yugoslav Rep. of	Russian Federation	Uruguay
Brazil	Grenada	Malaysia	Serbia	Venezuela, Bol. Rep. of
Bulgaria	Iran, Islamic Rep. of	Maldives	Seychelles	

Table A3 (continued)
Countries and economies by income (gross national income per capita)

Lower middle income ($4,035–$1,026)				
Albania	El Salvador	Lao People's Dem. Rep.	Papua New Guinea	Syrian Arab Rep.
Armenia	Fiji	Lesotho	Paraguay	Timor-Leste
Belize	Georgia	Marshall Islands	Philippines	Tonga
Bhutan	Ghana	Micronesia, Federated States of	Samoa	Tuvalu
Bolivia, Plurinational State of	Guatemala	Moldova, Rep. of	São Tomé and Príncipe	Ukraine
Cameroon	Guyana	Mongolia	Senegal	Uzbekistan
Cape Verde	Honduras	Morocco	Solomon Islands	Vanuatu
Congo	India	Nicaragua	South Sudan	Viet Nam
Côte d'Ivoire	Indonesia	Nigeria	Sri Lanka	Yemen
Djibouti	Iraq	Pakistan	Sudan	Zambia
Egypt	Kiribati	Palestine	Swaziland	

Low income ($1,025 or less)				
Afghanistan	Comoros	Haiti	Mali	Sierra Leone
Bangladesh	Congo, Dem. Rep. of	Kenya	Mauritania	Somalia
Benin	Eritrea	Korea, Dem. Rep. of	Mozambique	Tajikistan
Burkina Faso	Ethiopia	Kyrgyzstan	Myanmar	Tanzania, United Rep. of
Burundi	Gambia	Liberia	Nepal	Togo
Cambodia	Guinea	Madagascar	Niger	Uganda
Central African Rep.	Guinea-Bissau	Malawi	Rwanda	Zimbabwe
Chad				

Source: World Bank 2012.

Table A4
Countries and economies by income (constant 2005 PPP$)

High income ($15,000 or more)				
Antigua and Barbuda	Chile	Iceland	Malta	Singapore
Argentina	Cyprus	Ireland	Mauritius	Slovakia
Australia	Czech Rep.	Israel	Netherlands	Slovenia
Austria	Denmark	Italy	New Zealand	Spain
Bahamas	Equatorial Guinea	Japan	Norway	Sweden
Bahrain	Estonia	Kazakhstan	Oman	Switzerland
Barbados	Finland	Korea, Rep. of	Palau	Taiwan
Belarus	France	Kuwait	Portugal	Trinidad and Tobago
Belgium	Germany	Libya	Puerto Rico	United Arab Emirates
Bermuda	Greece	Luxembourg	Qatar	United Kingdom
Brunei	Hong Kong SAR China	Macao SAR China	Saudi Arabia	United States
Canada	Hungary	Malaysia	Seychelles	
Upper middle income ($6,500–$15,000)				
Armenia	Costa Rica	Latvia	Romania	Tunisia
Azerbaijan	Croatia	Lebanon	Russian Federation	Turkey
Belize	Cuba	Lithuania	Serbia	Turkmenistan
Botswana	Dominican Rep.	Macedonia, Former Yugoslav Rep. of	South Africa	Ukraine
Brazil	Gabon	Marshall Islands	St. Kitts and Nevis	Uruguay
Bulgaria	Georgia	Mexico	St. Lucia	Venezuela, Bol. Rep. of
Cape Verde	Grenada	Montenegro	Suriname	
China	Iran, Islamic Rep. of	Panama	Swaziland	
Colombia	Jamaica	Poland	Thailand	
Low and lower middle income ($6,500 or less)				
Afghanistan	Côte d'Ivoire	Indonesia	Mozambique	Sri Lanka
Albania	Djibouti	Iraq	Namibia	St. Vincent and Grenadines
Algeria	Dominica	Jordan	Nepal	Sudan
Angola	Ecuador	Kenya	Nicaragua	Syria
Bangladesh	Egypt	Kiribati	Niger	Tajikistan
Benin	El Salvador	Kyrgyzstan	Nigeria	Tanzania, United Rep. of
Bhutan	Eritrea	Lao People's Dem. Rep.	Pakistan	Timor-Leste
Bolivia	Ethiopia	Lesotho	Papua New Guinea	Togo
Bosnia and Herzegovina	Fiji	Liberia	Paraguay	Tonga
Burkina Faso	Gambia, The	Madagascar	Peru	Uganda
Burundi	Ghana	Malawi	Philippines	Uzbekistan
Cambodia	Guatemala	Maldives	Rwanda	Vanuatu
Cameroon	Guinea	Mali	Samoa	Viet Nam
Central African Rep.	Guinea-Bissau	Mauritania	São Tomé and Príncipe	Yemen
Chad	Guyana	Micronesia, Federated States of	Senegal	Zambia
Comoros	Haiti	Moldova, Rep. of	Sierra Leone	Zimbabwe
Congo, Dem. Rep. of	Honduras	Mongolia	Solomon Islands	
Congo	India	Morocco	Somalia	

Source: CIC 2009.

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"Structural change through the development of manufacturing is essential to any developing country for job creation, poverty reduction and sustained development. UNIDO's *Industrial Development Report 2013* provides careful theoretical reviews, solid empirical evidence and practical policy advice for how to facilitate the development of manufacturing in developing countries. I strongly recommend this report to anyone who is interested in finding out a path to achieve prosperity in developing countries."

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Former Chief Economist and Senior Vice President, The World Bank

"Structural change is the core of sustainable development. Continuous upgrading of manufacturing industries offers opportunities for growth, productive employment and the efficient use of resources. UNIDO's *Industrial Development Report 2013* provides ample evidence of how and why structural change works and presents sustainable paths to industrialization. It is an extremely valuable companion for policy-makers dealing with manufacturing upgrading and employment generation."

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