WPS8659

Policy Research Working Paper 8659

Developing Countries and Services in the New Industrial Paradigm

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WORLD BANK GROUP
Finance, Competitiveness and Innovation Global Practice
December 2018

Policy Research Working Paper 8659

Abstract

The traditional export-led manufacturing model provided the twin benefits of productivity gains and job creation for unskilled labor in the past. Over the past two decades, however, the peak shares of manufacturing in value added and employment across a range of developing economies occurred at lower levels of per capita income compared to their high-income, early-industrializer precursors. Looking ahead, there is a concern whether labor-saving technologies associated with Industry 4.0—such as robotics, the Internet of Things, and 3-D printing—will make it even more difficult for lower-income countries to have a significant role in global manufacturing. Can services-led development be an alternative? This paper provides a conceptual framework to inform the discussion, drawing on available empirical evidence from the literature on the subject. The features of manufacturing once thought to be uniquely special for productivity growth are increasingly shared by some services that yield the benefits of scale, greater competition, and technology diffusion associated with international trade. Yet, without sufficient human capital, there are limits to how much labor can be absorbed in these service sectors, which are also highly skill-intensive. Further, while some high-productivity services largely serve final demand or derive demand from several sectors, others are more closely linked to a manufacturing base.

This paper is a product of the Finance, Competitiveness and Innovation Global Practice. It is part of a larger effort by the World Bank to provide open access to its research and make a contribution to development policy discussions around the world. Policy Research Working Papers are also posted on the Web at http://www.worldbank.org/research. The authors may be contacted at gnayyar_@worldbank.org.

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JEL Classification: O14, O10

Keywords: Premature deindustrialization, Industry 4.0, services sector, economic development

1. Introduction

Some of the biggest development gains in history have been associated with industrialization. Annual growth in global GDP per capita was below 0.1 percent until the early 19th century, yet technological change from the late 1700s to the mid-1800s spurred a manufacturing-based, fossil-energy fueled Industrial Revolution, leading to a significant boost in growth among early industrializers. In Western Europe's earliest industrializers and in the United States, average annual per capita income growth sped up to 1.0 and 1.3 percent, respectively, over the 1820–70 period, compared with close to zero in other regions such as East Asia and Latin America (Bolt and Van Zanden 2014). It was industrialization again that drove other countries to catch up to these early industrializers, starting in the late 19th century with Japan, and then spreading to other parts of East Asia during the 1960s and more recently China (Leipziger 1997; Rodrik 1994; Stiglitz and Yusuf 2001).

Over the last two decades, however, the peak shares of manufacturing in value added and employment across a range of developing economies were both lower and occurred at lower levels of per capita income compared to their high-income, early-industrializer precursors. This premature deindustrialization suggests that not all countries have benefited equally from the manufacturing sector as a central driver of their development. Looking ahead, a concern is whether new technologies and resulting shifts in patterns of globalization will make it even harder for lower-income countries to have a significant role in manufacturing. To the degree that new technologies associated with Industry 4.0—such as robotics, the Internet of Things, and 3-D printing—may be labor-saving, they potentially narrow the paths for less-developed countries to industrialize.

The declining share of manufacturing in value added and employment largely reflects the fact that services have grown faster. At the same time, the features of manufacturing that were once thought of as uniquely special for productivity growth are increasingly shared by the services sector. Technologies associated with the information and communication technology (ICT) revolution have meant that several professional services can be internationally traded. Moreover, the deregulation of services markets has coincided with a marked increase in foreign direct investment (FDI) inflows for some services activities. This increased trade and investment integration means that services increasingly yield the benefits of scale, greater competition, and technology diffusion. Innovation has grown rapidly in certain segments of the services sector recently, too. These productivity-enhancing characteristics associated with different service sectors are reflected in those sectors' productivity levels and contribution to economic growth.

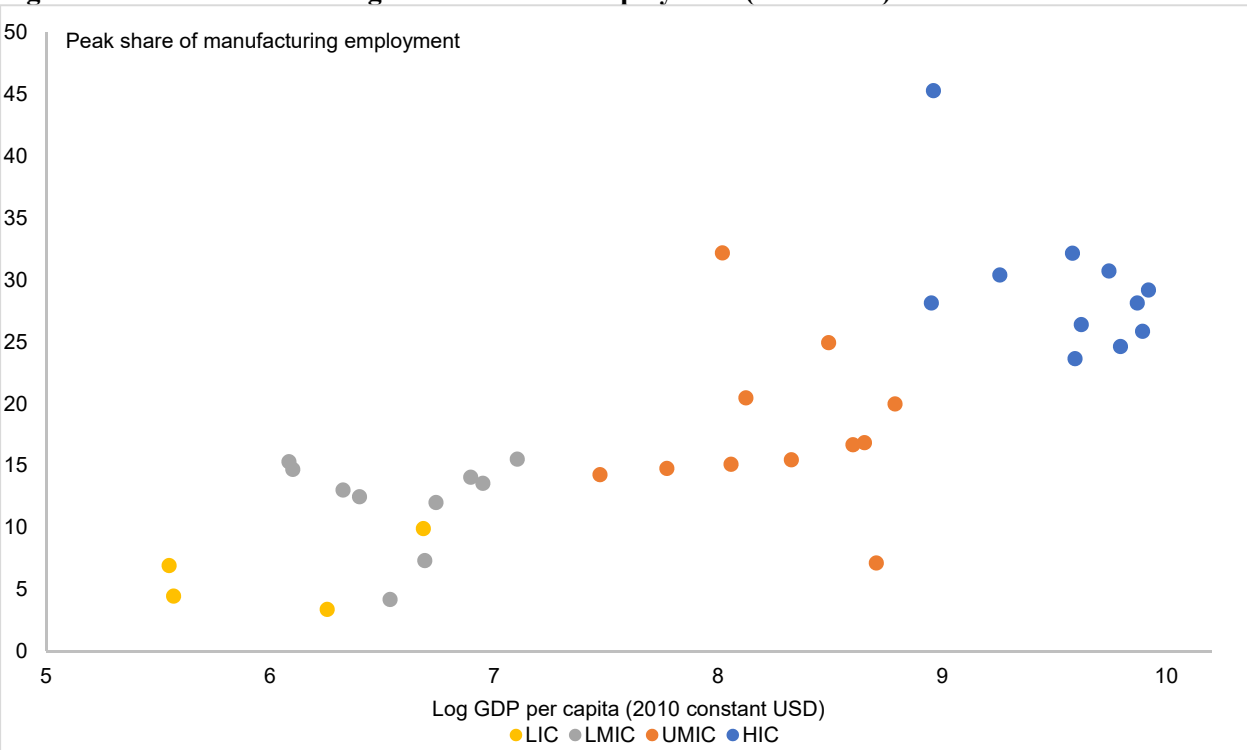
So, can services-led development be an alternative to the traditional export-led manufacturing model? This paper provides a conceptual framework to inform the discussion by focusing on two questions: (a) the potential for widespread job creation, particularly for unskilled labor, in highly productive service activities and (b) whether the services sector can grow in the absence of a manufacturing core. In doing so, it draws on available empirical evidence from the literature on the subject. The paper analyzes these sector-level dynamics cognizant of the widely documented productivity differences across firms within sectors and, therefore, the potential of resource reallocation within sectors as an important driver of growth opportunities.

The structure of the paper is the following. Section 2 contextualizes the trend of premature deindustrialization and what it implies for development opportunities. Section 3 analyzes what the onset of Industry 4.0 might imply for manufacturing-led development strategies in the future. Section 4 outlines why manufacturing was considered special for development in the past. Section 5 examines the role of the services sector as alternative source of productivity and job creation and whether countries still need to follow the conventional linear path of structural transformation. Section 6 concludes.

2. Premature Deindustrialization

The literature on structural change during the 1960s documented canonical shifts of output and labor first from agriculture to industry, and later from industry to services in the structural transformation of today's advanced economies (Kaldor, 1967; Kuznets, 1971). Recent trends, however, show that the share of manufacturing in employment and value added appears to be peaking at lower levels and at earlier levels of per capita GDP than in the past (figure 1). Controlling for population size and per capita GDP in a sample of 42 economies between 1950 and 2012, Rodrik (2016) finds a lower share of manufacturing in employment and value added over time, as reflected in the magnitudes of coefficients of decadal time dummy variables, which are negative and larger over time. Therefore, if industrialization is defined as an increase in the share of manufacturing in employment and value added, these results are indicative of "premature deindustrialization" (Dasgupta and Singh 2007). The following is important to highlight.

Figure 1: Peak Manufacturing Share of Total Employment (1950-2012)



Source: Hallward-Driemeier and Nayyar (2017)
Note: The sample covers the period 1950-2012

First, the trend of "premature deindustrialization" is not uniform across manufacturing subsectors. Take the example of low- and lower-middle-income countries in Sub-Saharan Africa that experienced a decline in the manufacturing share of GDP between 1994 and 2015. The share of commodity-based processing manufactures such as food, beverages, and tobacco typically expanded. Tanzania is one example. Among upper-middle-income countries in Latin America—where the manufacturing share of GDP declined between 1994 and 2015—Peru and Ecuador experienced an increase in the GDP share of commodity-based processing manufactures, while Brazil, Colombia, Mexico, and Uruguay experienced an increase in the share of high-skill global innovators in GDP over the same period, albeit from a low base (Hallward-Driemeier and Nayyar 2017).

Second, defining deindustrialization as declining *shares* does not necessarily mean that manufacturing employment or value added has declined in *absolute* terms over time. In fact, these relative declines of the manufacturing sector in GDP or employment translate into absolute declines in very few instances. Among a large cross-section of countries, 12 experienced an absolute decline in real manufacturing value added in the past 20 years, many of which had conflict situations. Some HICs have had only marginal increases over the past 20 years (such as Italy, the United Kingdom, and the United States), but many countries have seen significant growth, more than doubling and tripling their real manufacturing value added. As for employment,[1] a somewhat larger share of countries experienced an absolute decline in jobs. Seven countries stand out for having lost close to 1 million manufacturing jobs or more over the period 1994–2011 (Hallward-Driemeier and Nayyar 2017).

Third, premature deindustrialization may be attributable, at least in part, to the fact that activities that were earlier classified as "manufacturing" are now "services." This refers to a statistical artifice whereby what was earlier subsumed in manufacturing value added is now accounted for as service sector contributions to GDP. Owing to a larger scale and the application of new technologies, which has increased the complexity of production, firms in the manufacturing sector may find it more profitable to "contract out" service activities to specialist providers than to produce them in-house – a process that Bhagwati (1984) refers to as "splintering". Estimates suggest that such 'contracting out' explained about 10 percent of annual average services value-added growth in large developing economies, including Brazil, China, India, and the Russian Federation, between 2000 and 2014 (Nayyar, Cruz and Zhu 2018).[2]

3. Industry 4.0 and the changing feasibility of manufacturing-led development

The potential for low- and middle-income economies to boost their manufacturing exports in the future, and leverage them for growth, will be further influenced by how emerging labor-saving technologies transform production processes. Greater digitalization through the Internet of Things (IoT), advanced robotics, and 3D printing – which are among the most emphasized technologies in the Industry 4.0 literature (Cirera et al. 2017) – may challenge established patterns of comparative advantage if it becomes more efficient to rebundle activities in "smart" factories. By

[1] For which there are comparable data across sectors only from 66 countries.

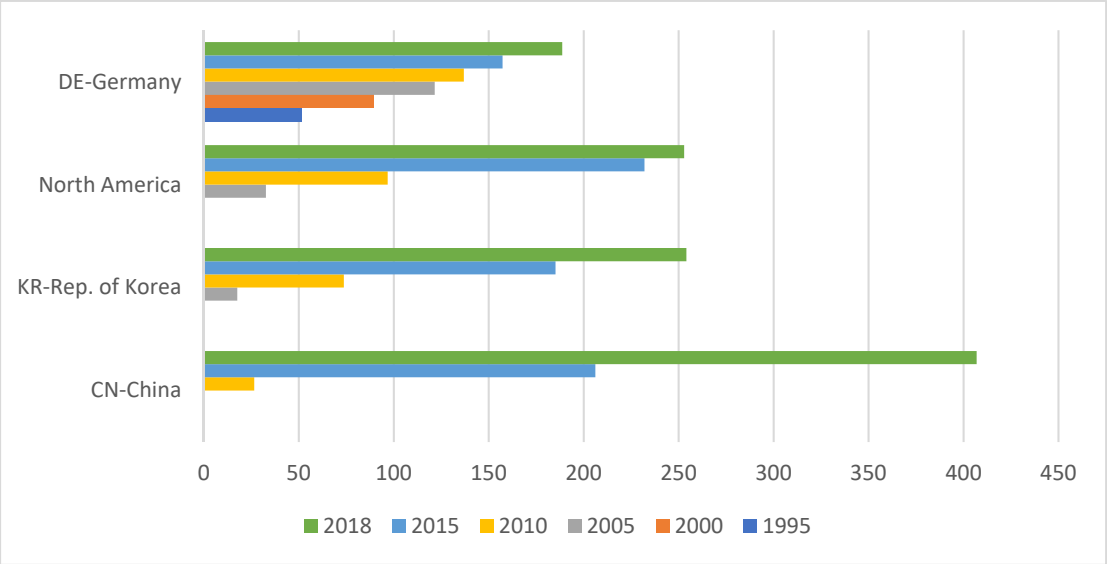
[2] It is worth noting that these estimates are based on input-output tables and therefore do not reflect the increased service intensity of manufacturers, as it takes place within firm boundaries.

reducing the relative importance of wage competitiveness, increased automation under Industry 4.0 can make it feasible for some leading firms to reshore labor-intensive activities back to high-income economies and closer to final consumers.

While the available evidence about the advent of reshoring, and resulting changes in globally fragmented production, is limited (De Backer et al. 2016), there are signs of a beginning. A report by Citigroup and the University of Oxford's Oxford Martin School finds that 70 percent of Citi institutional clients surveyed believe automation will encourage companies to move their manufacturing closer to home, with North America seen as having the most to gain from this trend, while China, Association of Southeast Asian Nations (ASEAN) member countries, and Latin America are seen as having the most to lose (Citigroup 2016). Take the example of footwear manufacturing, where 3-D printing can dramatically shorten the design-to-production cycle from 18 months to less than a week (*Economist* 2017). Adidas, the German sporting goods company, has established "Speedfactories" in Ansbach, Germany, and Atlanta, which will use computerized knitting, robotic cutting, and 3-D printing almost exclusively to produce athletic footwear.

At the same time, China stands out as a middle-income country that is rapidly automating production through robotization to address declining wage competitiveness. Standard Chartered Global Research (2016) found that 48 percent of 290 manufacturers surveyed in the Pearl River Delta would consider automation as a response to labor shortages, while less than a third would consider moving capacity either inland or out of China. Some high-profile firms are already substituting a substantial number of workers with industrial robots. For example, Foxconn—the firm known for producing Apple and Samsung products in China's Jiangsu province—recently replaced 60,000 factory workers with industrial robots (*South China Morning Post* 2016). Nationally, the country is projected to have more than 400,000 industrial robots in operational stock in the manufacturing sector by 2018, more than doubling the number in 2015 (figure 2). This would give China the distinction of having the highest number of installed industrial robots in the world, accounting for about one-fourth of total industrial robots projected to be installed globally.

Figure 2: Operational Stock of Industrial Robots in the Manufacturing Sector, 1995-2018



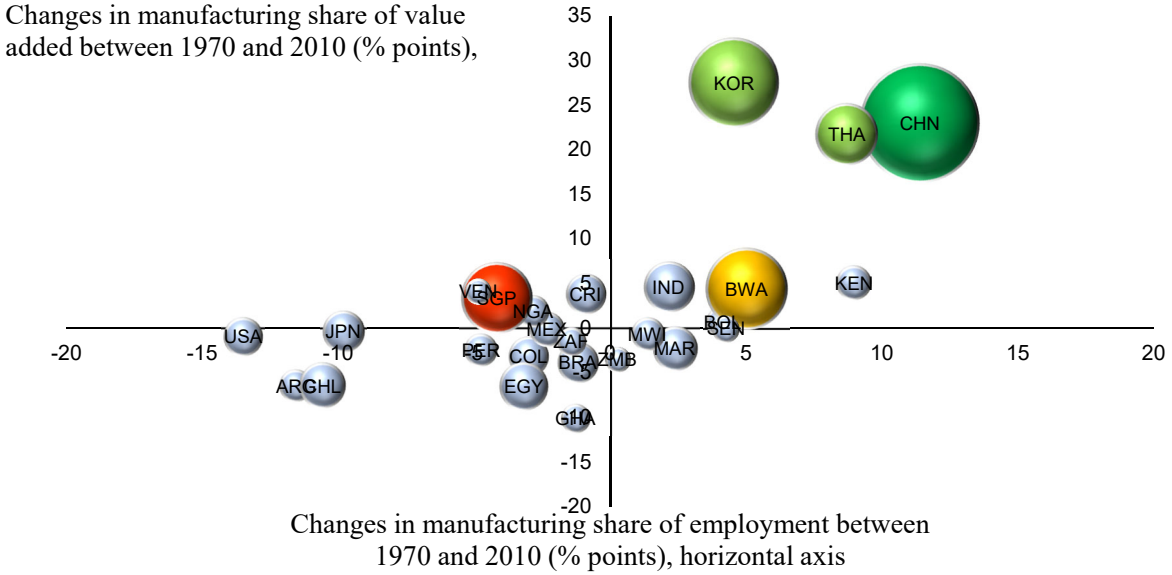
Source: Hallward-Driemeier and Nayyar (2017)

To the extent that high-income economies are reshoring production, this could affect current manufacturing exporters and stifle the potential entry of newcomers. The case of China is potentially even more important given recent expectations of an en masse migration of light manufacturing activities to poorer economies with lower labor costs, such as those in Sub-Saharan Africa. As a result, manufacturing-led development strategies could become less feasible. If low wages are no longer sufficient to stay competitive, these producers might need to meet more demanding ecosystem requirements in terms of infrastructure, logistics and other backbone services, regulatory requirements, supplier base, and so on. There will be greater challenges for firms in countries with a less established manufacturing base to leapfrog into using new technologies, not having already established certain processes, skills, and networks using more accessible technologies.

4. Why manufacturing was special in the past

"Kaldor's growth laws," based on data from high-income economies in the 1960s, outlined three positive associations between (a) growth of manufacturing output and average GDP growth, (b) growth of manufacturing output and manufacturing productivity, and (c) growth of manufacturing output and the overall productivity of the economy (Kaldor 1966). More-recent evidence based on data from low- and middle-income countries (LMICs) also reveals a positive relationship between the growth of manufacturing output and overall GDP growth (Fagerberg and Verspagen 1999; Szirmai and Verspagen 2015). Between 1970 and 2010, China, the Republic of Korea, and Thailand had significant increases in the share of manufacturing in employment and value added, combined with some of the highest per capita income growth rates in the world (figure 3).[3]

Figure 3: Countries with large increase in manufacturing as a share of employment and value added achieve high income growth



Source: Nayyar, Cruz and Zhu (2018)

[3] Those few countries that have reached high-income levels through other means have done so through natural resource extraction (Norway and, more recently, Chile) or the exploitation of specific locational or other advantages.

However, these relationships in the data represent correlations, not causality, which is hard to establish. In fact, how a good is produced has as important a potential impact on development—if not more so—than what is produced. Expanding a sector with potential positive spillovers, such as manufacturing, does not necessarily imply that the spillovers will automatically occur if the sector is not organized appropriately (Baldwin 1969; Rodríguez Clare 2007). For example, although both the Republic of Korea and Mexico began assembling electronics in the early 1980s, only Korea has produced a truly indigenous electronic device: the Samsung Galaxy smartphone line (Lederman and Maloney 2012).

The production process in the manufacturing sector typically absorbed large numbers of relatively unskilled workers from other sectors, particularly agriculture, at a substantial productivity premium. Large and systematic differences in labor productivity between the agricultural and manufacturing sectors are well documented, with these intersectoral gaps being wider in the poorest countries (Herrendorf, Rogerson, and Valentinyi 2013; Restuccia, Yang, and Zhu 2008). The typical worker in manufacturing produced four times more output than the typical worker in agriculture, on average, across developing countries. There is some variation across regions – the average manufactures-agriculture productivity ratio is 2.3 in Africa, 2.8 in Latin America, and 3.9 in Asia (McMillan et al. 2014).

Given these differences, a reallocation of labor from agriculture to manufacturing presented a significant opportunity for productivity-enhancing structural change. This relates to the movement of surplus labor from (rural) agriculture to (urban) manufacturing and capital accumulation in the latter at the center stage of economic development (Lewis 1954). The bulk of the difference between productivity performance in Asian countries, compared to most countries in Sub-Saharan Africa and Latin America, was accounted for by differences in the pattern of structural change – with labor moving from low to high-productivity sectors in Asia, but in the opposite direction in Latin America and Africa (McMillan, Rodrik and Verduzco-Gallo 2014).[4] Over time, if productivity growth in manufacturing is higher than in agriculture, the benefits from resource reallocation accrue dynamically.

In contrast, the mining sector— whose productivity also is significantly higher than in agriculture (16.8 times higher among a sample of 11 countries in Sub-Saharan Africa for example [McMillan and Rodrik 2011])—is capital-intensive and thus did not absorb as much of the unskilled labor supply as the manufacturing sector. Nor did a range of professional services (where high-value-added, high-productivity services are typically skill-intensive), whereas many low-end services that absorbed surplus labor from agriculture provide little productivity growth. This latter point illustrates Baumol's (1967) "cost disease" hypothesis, which emphasized that productivity in labor-intensive services cannot be readily increased through capital accumulation, innovation, or economies of scale.

Furthermore, unlike evidence on per capita income levels or aggregate labor productivity, Rodrik (2013) shows that labor productivity in (formal) manufacturing exhibits "unconditional convergence" across countries. Therefore, labor productivity in lagging manufacturing sectors, such as those in low- and middle-income economies, tends to rise over time and eventually

[4] After 2000, structural change contributed positively to Africa's overall productivity growth, accounting for about 40 percent of the total, on average, across the 19 countries in the sample.

converge with the global technological frontier regardless of policy and institutional determinants. More recent evidence suggests that high productivity growth in the manufacturing sector explains about 50 percent of the catch-up in relative aggregate productivity across countries (Duarte and Restuccia 2010). This convergence may be attributable to the manufacturing sectors' production of tradable goods, which provides firms with opportunities for scale economies, "learning-by-doing" and technology diffusion. Even when they produce just for the home market, manufacturing firms need to raise their productivity to compete with efficient suppliers from abroad.

Although the agricultural sector was also traded, it faced price volatility in international markets, and productivity improvements were closely linked to labor-saving technologies. Demand-side dynamics also play a role: as per capita incomes rise, the share of agricultural products in total expenditure declines, while the share of manufactured goods increases in accordance with a hierarchy of needs. As a result, countries specializing in agricultural production did not benefit from the global expansion of markets for manufactured goods (Szirmai 2012). As for the services sector, as noted earlier, high-end services have typically been skill-intensive and were largely not internationally tradable in the past.

Other spillover effects associated with the manufacturing sector were manifested in its contribution to innovation and linkages with other sectors in the economy. Based on a sample of 2,000 companies that spend the most on research and development, about 90 percent of patents published in 2014 were related to manufactured goods and almost 80 percent of total R&D among them came from manufacturing firms. Beyond R&D, the manufacturing sector has also long benefited from product and process innovation – about 22 percent of all manufacturers introduced a new product or service between 2006 and 2008, compared to 8 percent of non-manufacturing firms (Helper, Krueger and Wial 2012). Furthermore, direct backward and forward linkages within and between sectors were typically regarded to be stronger for manufacturing than for agriculture or services (Su and Yao 2016). For example, advances in ICT hardware technologies produced in the manufacturing sector (silicon chips, glass fiber cables) fuel technological change in software producing and software using service sectors (Szirmai 2012).

In sum, more so than the agriculture and services sectors, manufacturing combined tradedness and other productivity-enhancing characteristics with large-scale job creation for the relatively unskilled. It first absorbed a substantial part of the economy's low-skilled labor and thereafter placed the labor it employs on a productivity path that rises up to the global frontier.

This emphasis on tradability and labor-intensity in the production of manufactured goods for countries to benefit from industrialization is often exemplified by the contrasting growth experiences of East Asia and Latin America. The success of East Asian economies is often attributed to export-oriented industrialization, which integrated the countries with world markets, enabling them to achieve scale, face competition, and acquire foreign technology (Agénor and Canuto 2015). In contrast, import substitution industrialization in Latin American countries—an inward-oriented strategy that used trade barriers to strengthen local producers in sectors that did not conform to the country's comparative advantage—did not deliver similar growth benefits (Gereffi and Wyman 2014). Similarly, the adoption of capital-intensive production techniques in heavy industries did not result in the large-scale absorption of unskilled labor.

5. Prospects for Services-led Development

The unique desirability of manufacturing-led development in terms of the twin wins of productivity and jobs might be eroding. "Potential jobs" could be lost in LMICs as high-income countries adopt new technologies and keep more manufacturing within their own borders. Further, if the only way LMICs can compete in manufacturing GVCs is by adopting labor-saving processes, this, too, will eliminate a set of potential additional jobs. For example, the adoption of robotics in the manufacture of motor vehicles will reduce the labor intensity of production. The international trade dimension and its associated spillover effects may change too. If advanced robotics enables China to retain low-value-added manufacturing segments as they move up the value chain, GVCs might shorten. Further, if 3D printing reduces the need for physical parts and components to be moved across borders, the productivity benefits associated with international trade in manufactured goods will likely diminish too.

Therefore, whereas manufacturing held out the promise of both more productivity and job creation in the past, there may be more trade-offs going forward. At the same time, some services are coming to share many of the pro-development characteristics traditionally associated with manufacturing: they are becoming tradable in addition to being sources of innovation and technology diffusion. The use of automation such as through robotics in the services sector, relative to manufacturing, is also currently negligible (Hallward-Driemeier and Nayyar 2017).

a) Services as an alternative source of productivity and jobs

<u>The blurring lines between manufacturing and services</u>

The features of manufacturing that were once thought of as uniquely special for productivity growth might be increasingly shared by some service sectors, owing to changes in trade and technology, in several ways. This expands the range of activities that will likely have positive spillovers for development.

• *International tradability through ICT advances.* Dramatic changes in ICT have given rise to a category of "modern" services—financial, telecommunication, and business services—that can be digitally stored, codified, and more easily traded internationally (Ghani and Kharas 2010). Such "modern" services can therefore yield the benefits of greater competition, technology diffusion, and access to demand beyond the domestic market. Regulatory barriers continue to draw a wedge between what is tradable and what is actually traded in these service sectors, although deregulation has coincided with a marked increase in FDI inflows.

• *Increasing benefits of scale.* ICT development also means that scale economies have become important in ICT-enabled service sectors as the marginal cost of providing an additional unit approaches zero. Take the example of data centers, search engines and cloud platforms, all of which require high levels of fixed assets and for which costs rapidly decrease with scale (Fontagné, Mohnen, and Wolff 2014).

• *Contribution to technology development.* R&D expenditure in services increased from an annual average of 6.7 percent of total business R&D during 1990–1995 to nearly 17 percent during 2005–

10 (WTO 2013). This may reflect growing R&D investments in certain services sectors, the outsourcing of R&D to specialized laboratories that are classified in the services sector, as well as better measurement of R&D in services (Lopez-Bassols and Millot, 2013). When innovation is defined to take forms other than R&D – marketing and organizational innovation for instance – the share of innovating firms is relatively similar across manufacturing and services in most countries (Pires, Sarkar, and Carvalho 2008).

• *Growing linkages with other sectors.* Services are increasingly used as intermediate inputs in manufacturing production. On average, around 40 percent of gross output produced by OECD services industries is used as intermediate inputs by other industries (Pilat and Wölfl 2005). Further, manufacturing exports increasingly include more inputs from service industries – between 30% and 40% of manufacturing exports in OECD economies is actually value added that has been created within (domestic and foreign) services industries. Evidence is also indicative of services improving the productivity of manufacturing (Arnold, Javorcik and Mattoo 2011; Banga and Goldar 2004).

Productivity growth and catch-up

That the expanding opportunities for productivity gains have been realized is reflected in the sizable overlap between productivity growth among the service and manufacturing sectors. While the manufacturing sector typically experienced faster productivity gains than the service sector, the differential has shrunk since 2000 across most developed and developing economies. In many developing economies, including China, India, and some in Sub-Saharan Africa, average productivity growth in services has recently exceeded that of manufacturing (IMF 2018).

Furthermore, some service subsectors register as fast growth in labor productivity as the top-performing manufacturing subsectors. Across a sample of 19 advanced and 43 developing economies, for example, labor productivity in transport and communications as well as financial intermediation and business activities is comparable to, or higher than, in manufacturing (IMF 2018). This is reinforced by other evidence which suggests that knowledge, ICT, and trade intensive services such as telecommunication, finance, and distribution have recorded higher rates of productivity growth than manufacturing (Jorgenson and Timmer 2011). Evidence from the United States suggests that some services are also making a larger contribution to aggregate TFP growth.[5]

The reallocation of resources from agriculture to services has featured prominently in the contribution of structural change to aggregate productivity growth in developing economies. In Africa for example, where the positive contribution of structural change since 2000 has been particularly large, the bulk of this contribution was accounted for by the movement from agriculture into services (Enache, Ghani, and O'C onnell 2016; McMillan, Rodrik, and Sepulveda 2017). And in India, the positive contribution of structural change to economic growth after the 1990s was largely attributable to the expansion of high-productivity service activities: finance, IT,

[5] Productivity shocks across different sectors can lead to heterogeneous effects on TFP.

business process outsourcing (BPO), and other business services (McMillan, Rodrik, and Sepulveda 2017).

Further, there is evidence of unconditional convergence of productivity to the frontier: countries starting from lower labor productivity in the services sector grew faster than those with higher initial labor productivity in that sector (Enache, Ghani, and O'Connell 2016; Kinfemichael and Morshed 2016). This relates to the fact that new ICT technologies, international tradability, and increased competition, especially since the 1990s, were no longer within the exclusive domain of manufacturing. There are differences across subsectors. For instance, IMF (2018) finds significant convergence in trade and accommodation, transport and communications, and financial and business services. The evidence of convergence notwithstanding, prospects for narrowing productivity gaps may be reduced if the level of productivity in services is further away from the technological frontier compared to manufacturing. However, for most developing countries, the productivity gap vis-à-vis the United States in 2005 was larger for goods-producing sectors than for the service sector (IMF 2018).

Trade-off between productivity growth and job creation

Ancillary evidence suggests that service industries with favorable productivity dynamics account for a meaningful share of employment and can play a key role in driving aggregate productivity growth. For instance, financial intermediation in Hungary, Russia, and Slovenia; and telecommunication services in Korea and Lithuania registered above-average labor productivity growth and rising employment shares during the 2000s (IMF 2018). Furthermore, as technology creates new occupations largely in the non-routine cognitive category, much of this job expansion will occur in finance, telecommunications, software, legal and professional services. For example, estimates suggest that two-thirds of new occupations in India and 85 percent in Vietnam are in these high-productivity service sectors (Asian Development Bank 2018).

However, service industries that rank in the top third of the labor-productivity growth distribution between 2000 and 2010 accounted, on average, for about 30 percent of total service employment, and close to 20 percent of overall employment (IMF 2018). What is more, most service sectors that exhibit "productivity-enhancing" characteristics are less likely to be associated with employment creation for unskilled labor. This is reflected in Nayyar, Cruz and Zhu (2018), which classifies manufacturing and service subsectors based on firm-level data from six LMICs along a range of trade, innovation, learning-by-doing and factor-use characteristics. IT services, for example, are classified as "high" or "medium" with regard to their potential for scale economies; exports; and innovation as measured by new products, new processes, and R&D spending, but also belong to the group that is "high" in skill intensity. Therefore, without sufficient human capital, there are limits to how much labor can be absorbed in highly skill-intensive service sectors – it is comparatively easy to turn a rice farmer into a garment factory worker than a software engineer.

Much of the employment expansion across developing countries over the past few decades was accounted for by wholesale and retail trade, hotels and restaurants, and construction (IMF 2018; Nayyar 2012). Yet, these unskilled labor-intensive services are less likely to provide much by way of productivity gains. Again, this dichotomy is reflected in Nayyar, Cruz and Zhu (2018) where

construction services and hotels and restaurants are characterized by "low" skill intensity but also by "low" or "medium" productivity-enhancing traits: formal worker training programs, use of foreign technology, exports (direct and indirect), introduction of new products and new processes, and R&D spending. Such non-traded service sectors could also be constrained by the pace of expansion in domestic demand. For instance, the productivity-enhancing structural change in Africa has been attributed to an expansion in low-end services, but it appears that this expansion might be unsustainable, owing to limited demand beyond the domestic market (McMillan, Rodrik, and Sepulveda 2017).[6]

Among service sectors, tourism and wholesale and retail trade are perhaps exceptions in that they are both tradable and create jobs for unskilled labor. Based on the analysis of firm-level data across manufacturing and service sectors from a sample of six LMICs in Nayyar, Cruz and Zhu (2018), wholesale and retail trade was classified as "low" skill-intensive but "medium" in tradability, linkage effects, use of foreign technology, and on-the-job learning programs. Similarly, many low-income countries have used tourism services to diversify their exports away from volatile primary sectors. In Uganda, for instance, services account for just over half of total exports, with 45 percent of that figure made up of tourism. Furthermore, technology has the potential to transform some low-productivity services such as construction and tourism (for example, through e-commerce platforms), as it allows services to be produced and traded just like goods and hence generate greater employment opportunities. Given that barriers to international trade are higher for services than for goods (Miroudot, Sauvage, and Shepherd 2012), there is potential for exports of these services to gather speed if appropriate policy actions are taken.

The issue of the *quality* of employment among lower-end service activities, which are the large employment creators for unskilled labor, is particularly relevant in light of the labor market polarization resulting from changes in technology and trade (Autor 2015). Evidence suggests that labor compensation in the industrial sector is somewhat higher than in services for comparable workers. In a sample of 20 advanced economies, for example, the median difference in labor earnings between industry and services for high- and low-skilled workers is about 6 percentage points and 9 percentage points, respectively (IMF 2018). Similarly, in the United States, lower-wage workers in manufacturing earn about 11 percent more than their peers in other sectors, while high-wage workers earn just 4 percent more (Helper, Krueger, and Wial 2012). Using data from India, Nayyar (2011) finds that similar workers earn less in wholesale and retail trade, hotels and restaurants, transport services, and community and personal services than in manufacturing.

Yet, some valuable nonwage attributes of manufacturing jobs appear less widespread in other sectors. Manufacturing jobs tend to be characterized by formal employment arrangements with associated benefits for workers, such as access to minimum wages, labor codes, retirement plans, paid holidays and sick leave, and health and life insurance. They also tend to provide relatively stable arrangements, relying less on part-time or temporary contracts than other sectors, and may offer collective bargaining via unions (Jaumotte and Osorio Buitron 2015). Recent experimental evidence from Ethiopia also indicates that not all manufacturing jobs are better than self-employment in services: in the studied factories, there is no evidence of a significant industrial

[6] That said, recent studies suggest that the domestic demand for services exhibiting strong productivity growth may increase in relative terms over time as they become more affordable (IMF 2018).

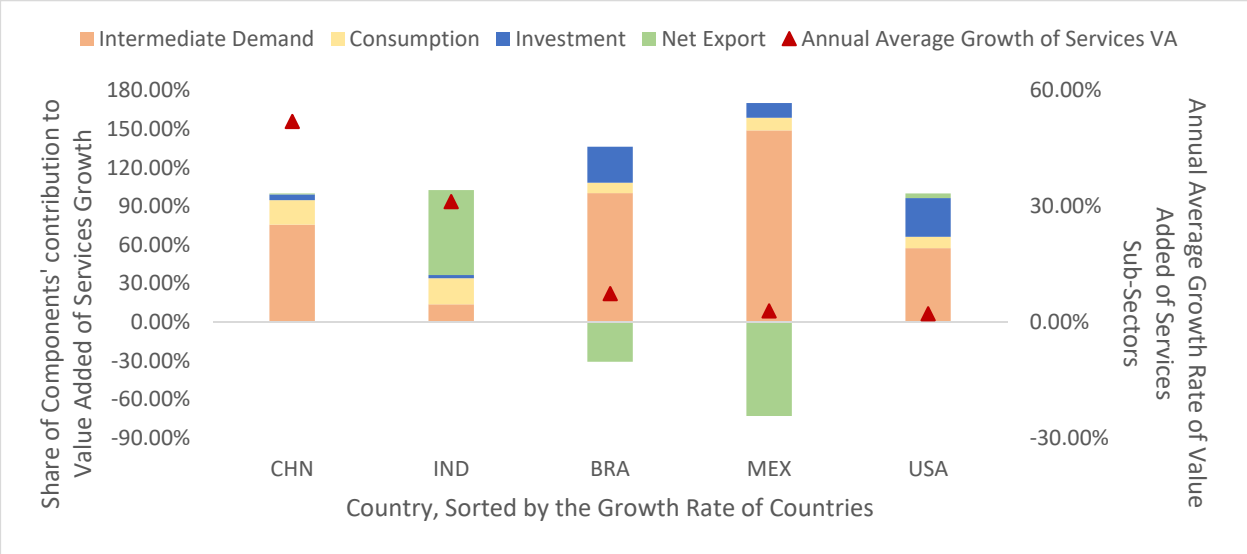
wage premium, and there are significant concerns about worker health and the safety of working conditions (Blattman and Dercon 2016).

b) Service-Led Development without a Manufacturing Base

There is the question of whether service sectors with productivity-enhancing characteristics "need" a manufacturing core to develop. High-productivity services such as transportation and communications, wholesale and retail trade, and professional, scientific, and technical services serve consumers directly but are also linked to other sectors. Therefore, to the extent that final demand contributes substantially to the growth of a given services subsector, opportunities can be created independent of a country's manufacturing base.

A range of professional, scientific and technical services – including software services, business process outsourcing and other information technology services, accounting, legal services, education and health care – are increasingly "stand-alone" whereby transactions takes place directly between a service provider and the final consumer. Numerous LMICs have sought to diversify their export baskets through offshore professional services. Many countries began with BPO services, such as contact and call centers, which laid the foundation for higher-value services such as finance and accounting. India was at the forefront of diversifying into these operations (Nayyar 2012), where final demand and (net) exports, respectively, accounted for about 90 percent and two-thirds of the value-added growth in professional, scientific and technical services (figure 4). Other countries that have successfully entered the market are Costa Rica and the Philippines (Bamber et al. 2017). Medical tourism is also on the rise, including in Sub-Saharan African countries, where many hospitals are treating foreign patients (Dihel and Goswami 2016).

Figure 4: Decomposition of value added growth in professional, scientific and technical services, 2000-2014



Source: Nayyar, Cruz and Zhu (2018)

In addition, there is a range of professional services that are either embedded in goods and often bundled together in a single product—including apps for personal electronic devices, after-sales

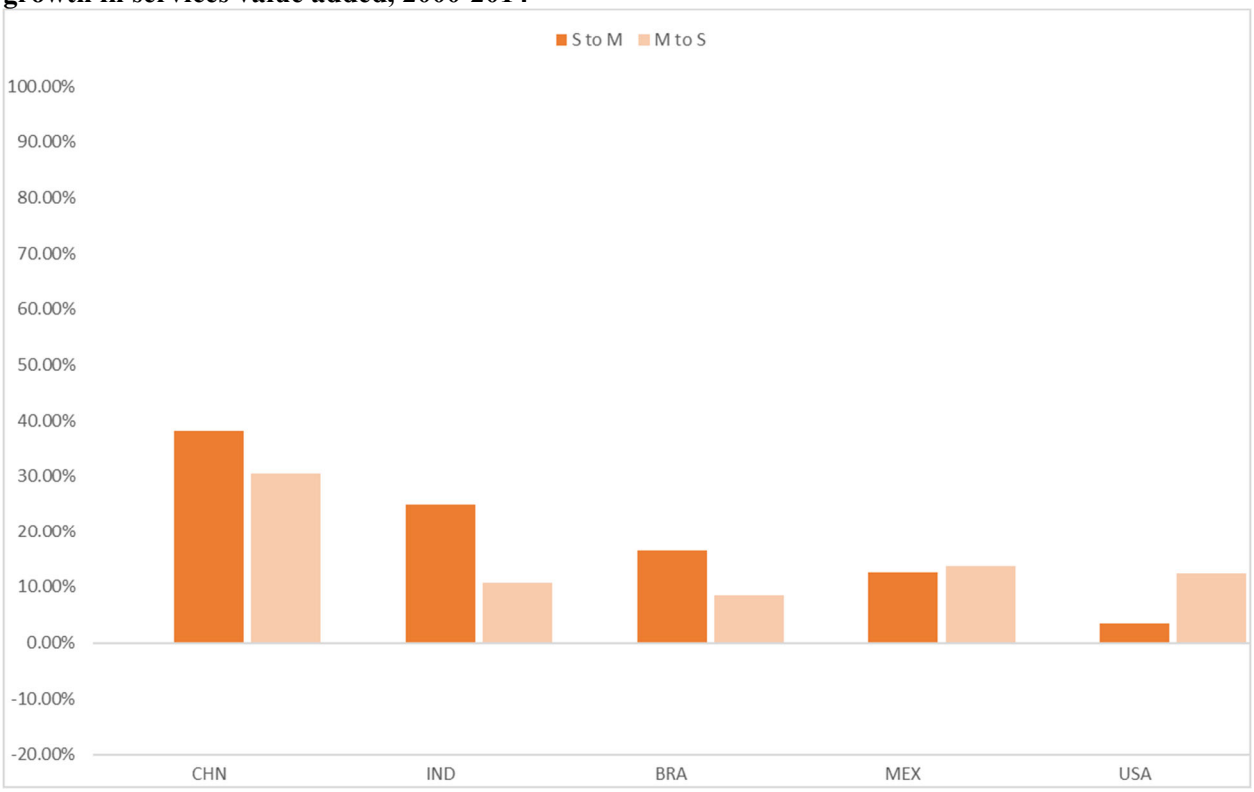
maintenance services for consumer durables, or "smart" solutions for "smart" factories. There is the possibility for these services to develop without firms being involved in the complementary manufacturing process. For one, the development of content that tailors global business and technology solutions to local needs provides an advantage to domestic firms, e.g. mobile phone applications where local language and cultural considerations are taken into account. For another, technological solutions need to be adapted. In areas with low communication coverage, for instance, lower-technology solutions need to be designed—for example, by using narrowband instead of broadband, mobile money instead of bank transfers, and so on. This market for apps development is booming everywhere, including in Africa, which has seen several incubators and accelerators support the development of local technological solutions and start-ups. FinTechs, AgTechs, e-health, and distance learning are just some of the areas where the digital revolution is showing the potential of embedded services for growth (Bamber et al. 2017).

Evidence also suggests that growth opportunities for professional, scientific and technical services in the absence of a manufacturing core might be reinforced if intermediate demand for a given services subsector derives largely from sectors other than manufacturing. Take the case of China where the contribution of final demand to the sector's growth between 2000 and 2014 in China was 24 percent, while that of (net) exports was only 1 percent. Therefore, the contribution of intermediate demand in the growth of these services was paramount, but this was not limited to links with the manufacturing sector; the input of professional scientific and technical services into mining, utilities and construction and other services made sizeable contributions to the growth of the sector (Nayyar, Cruz and Zhu 2018).

The expansion of transportation and storage services presents a similar picture. Final demand dominated the sector's growth between 2000 and 2014 in India, with a negative contribution of intermediate demand. Furthermore, while intermediate demand accounted for 70 percent of the sector's growth in China over the same period, this demand derived from manufacturing, mining, utilities and construction, as well as other services, although services input into manufacturing was the most important. The contribution of final demand, at approximately 50 percent, appears to be less important in explaining the growth of wholesale and retail trade between 2000 and 2014 in both China and India. Furthermore, the contribution of intermediate demand to the growth of wholesale and retail trade depends more on a manufacturing core. Input into manufacturing value added accounted for, respectively, 63 percent and 38 percent of annual average distribution services value added growth between 2000 and 2014 in China and India (Nayyar, Cruz and Zhu 2018).

That services may "need" a manufacturing core to develop does not take away from the fact that many services such as design, marketing, logistics and distribution, in turn, are vital inputs into the production of manufactured goods. Hence, to the extent that services are embodied in manufacturing, there will likely be a symbiotic relationship between the two sectors. The increasing servicification of manufacturing underscores the growing interdependence of the two sectors. For example, in China, which experienced high rates of growth in services value added between 2000 and 2014, services input into manufacturing accounted for 38 percent of the annual average growth in services value added between 2000 and 2014, while manufacturing input into services accounted for 30 percent (figure 5). Increasingly, therefore, the growth of the manufacturing sector too will depend on a vibrant and robust services sector.

Figure 5: Contribution of intermediate demand from manufacturing to services and vice versa to growth in services value added, 2000-2014



Source: Nayyar, Cruz and Zhu (2018)

6. Conclusion

The features of manufacturing once thought to be uniquely special for productivity growth are increasingly shared by some service sectors that are internationally tradable through ICT advances, yield the benefits of scale, and contribute to technology development. A range of these professional, scientific and technical services can provide growth opportunities without a manufacturing core in that they are, at least in part, "stand-alone" or provide inputs to other sectors. Yet, without sufficient human capital, there are limits to how much labor can be absorbed in these productivity-enhancing service sectors—finance, telecommunication services, information technology, accounting, and legal services—which are also highly skill-intensive.

On the flip side, low-end services that will create jobs for unskilled labor are less likely to provide much by way of productivity gains. Therefore, a given service subsector is unlikely to provide opportunities for productivity growth and job creation for unskilled people simultaneously. Wholesale and retail trade and tourism somewhat buck this trend in that they are both tradable and create jobs for unskilled labor. Furthermore, there is the possibility for technology and greater international trade to enhance the productivity of construction and hotels and restaurants – service sectors that have accounted for the lion's share of employment expansion, particularly for unskilled labor.

In exploring the prospects for services-led development compared to the traditional export-led manufacturing model, the following is worth emphasizing. First, that services may "need" a manufacturing core to develop does not take away from the fact that many services, in turn, are vital inputs into the production of manufactured goods. This symbiotic relationship between the two sectors therefore requires a reexamination of the linear structural change process from agriculture to manufacturing and then services.

Second, productivity gains from resource reallocation will also happen within sectors, for which there is evidence of large heterogeneity across firms (McMillan and Rodrik, 2011; Bloom et al. 2010, Syverson 2011). Hsieh and Klenow (2009) find that between a third and half of the differences in manufacturing total factor productivity between China and India and the United States can be explained by the large number of inefficient firms. This dispersion in the productivity distribution of firms applies equally, if not more, to services. Using firm-level data from Portugal, for example, Dias et al. (2016) show that reducing misallocation in the service sector to manufacturing levels would boost aggregate value added by around 31 percent. The importance of productivity gains within sectors is underscored by China's experience where reallocation accounted for only one-fourth of the productivity growth in the three decades between 1980 and 2010 (Herrendorf, Rogerson and Valentinyi 2013).

Third, firms are increasingly structured around the close interaction of 'manufacturing' and 'services', which makes it difficult to assign them exclusively to one sector. Manufacturing companies increasingly no longer sell only physical goods, but instead sell bundles including design, development, marketing, warranties and after-sales care, etc. Xerox, for example, has restructured itself into a 'document solution' company, offering technology advanced printer systems but also services like document managing and consulting; in fact, services represent around 40% of Xerox's turnover and are soon expected to represent more than 50% (Benedettini et al. 2010). Similarly, many services firms are becoming more like manufacturing firms, as outputs are mass produced, and have even introduced new goods such as Google in the market for tablets and Amazon with its Kindle (Lopez-Bassols and Millot 2013).

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