PIIE PETERSON INSTITUTE FOR INTERNATIONAL ECONOMICS

POLICY BRIEF

US China
PIIE-CF40
Conference Series

19-11 China, Like the US, Faces Challenges in Achieving Inclusive Growth Through Manufacturing

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August 2019

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Author's note: This paper reflects ongoing work for a project undertaken for the Peterson Institute for International Economics on Manufacturing and Inclusive Growth. I am grateful for support from the Mastercard Center for Inclusive Growth; research assistance from Galit Eisman; extremely helpful comments from Olivier Blanchard, Gary Hufbauer, Egor Gornostay, Nicholas Lardy, and Steve Weisman; and editorial assistance from Madona Devasahayam and Cameron Fletcher. An earlier version of this paper was presented at the annual PIIE-CF40 joint conference in Beijing on May 11, 2019.

INTRODUCTION

For more than three decades the goal of becoming "the factory of the world" has been at the core of China's development strategy. The approach was to use the country's abundant labor supply to attract foreign firms to assemble components imported mainly from Asia and to export finished products to advanced industrial countries, especially to the United States. This strategy, in combination with high rates of domestic investment and low rates of consumption, made Chinese production the most manufacturing intensive in the world. Indeed, in 2015 (measured in current dollars) China accounted for 14.5 percent of world GDP, but its share in world manufacturing output was almost 25 percent.[1]

But the Chinese strategy has been changing. As its wages have risen, China's competitiveness in the most labor-intensive manufacturing industries has eroded. Its ability to assemble products remains a major source of its exports, but it has also tried to shift toward more sophisticated value-added production domestically. In addition, Chinese domestic spending has shifted away from investment toward more consumption as citizens' income has grown. Like Americans, Chinese people are also spending more on services than on manufactured goods. All these changes are fundamentally altering the structure of China's production, reducing the role of manufacturing, and increasing the skill levels of workers in manufacturing.

This Policy Brief reviews the challenges posed by these developments for China's long-term goal of achieving more inclusive growth.[2] Historically, as in the United States, China's manufacturing sector provided important employment opportunities for relatively unskilled and less educated Chinese workers. Whereas in the United States jobs in manufacturing have been especially important for less educated men, in China manufacturing has been especially important in allowing women to move out of low-productivity jobs in agriculture and into higher-productivity jobs in the formal urban economy.[3] In recent decades, the movement of Chinese workers into manufacturing—which has both higher productivity levels and higher productivity

1. According to data from the Trade in Value Added (TiVA) database of the Organization for Economic Cooperation and Development (OECD), https://stats.oecd.org/Index.aspx?DataSetCode=TIVA_2018_C1&_ga=2.235399496.896680962.1547236806-2117414497.1547236806 (accessed on July 20, 2019).

2. "We want to continuously enlarge the pie, while also making sure we divide the pie correctly. Chinese society has long held the value of 'Don't worry about the amount, worry that all have the same amount'," Xi Jinping wrote in the *People's Daily* in 2014 (Wildau and Mitchell 2016).

3. According to estimates of the International Labor Organization, www.ilo.org/ilostat. In 2017, 53.4 percent of employment in manufacturing was female.

growth rates than the rest of the economy—has contributed significantly to China's rapid growth. Because manufacturing output is tradable, China has become richer by increasing manufacturing exports and using the earnings to purchase machinery and inputs that could not be produced locally.

This Policy Brief presents evidence, however, that commonly held perceptions that Chinese manufacturing employment growth is robust are wrong. In fact, such growth has peaked and China is now following the pattern of structural change that is typical of a more mature emerging economy, in which the share of employment in manufacturing declines as workers are increasingly employed in services.

IS CHINESE MANUFACTURING EMPLOYMENT GROWTH NOW MORE TYPICAL?

Before examining the Chinese data it is instructive to consider the international evidence on the relationship between manufacturing employment and economic development among many countries with similar historical experience. As can be seen in figure 1, which is derived by fitting a curve to the data for 42 countries from 1950 through 2012, the relationship between economic development as measured by real income per capita in 2016 dollars and the share of manufacturing employment is generally hump-shaped.[4]

Typically, in the early phases of economic development the shares of workers employed in manufacturing and services both rise. However, eventually the share of employment in manufacturing reaches a peak and then declines steadily as employment shifts from the production of goods to the production of services. These declines in the manufacturing employment share have been evident even in countries such as Germany, Japan, and Korea, which have large trade surpluses in manufacturing (Lawrence and Edwards 2013).

Economic theory can explain this evolution. The hump-shaped curve emerges naturally in closed-economy models in which manufacturing productivity growth and manufacturing income elasticities lie between those of agriculture and services.[5] In these models spillovers of demand from agriculture boost manufacturing employment during the expansion phase but they eventually decline as the agricultural sector shrinks. In an open economy, initially rapid productivity growth in manufacturing can bolster manufacturing employment by generating a net export surplus. However, although their peaks may be higher, even countries with a comparative advantage in manufactured products eventually experience declining employment shares in manufacturing.[6]

The theory's predictions are borne out by the behavior of the manufacturing employment share in several of the most successful developing economies, especially in Asia. As shown in figure 2, even though their trade surpluses in manufacturing value added are still a large share of their GDP, Singapore, Japan, South Korea, and Malaysia have all passed their manufacturing employment peaks and for several years have seen declining manufacturing employment shares.[7]

Another feature of the international experience is that over time the hump seems to have shifted downward and to the left (figure 3) (Felipe, Mehta, and Rhee 2019). With the exception of some Asian economies, countries that have been latecomers to economic development have failed to achieve the same manufacturing peaks and levels as the early industrializers—a phenomenon that has become known as premature deindustrialization (Dasgupta and Singh 2006, Rodrik 2016). In a forthcoming study I will argue that this phenomenon occurs because (a) technological progress in manufacturing is more rapid than in services and (b) this manufacturing technology is diffusing internationally more rapidly than technology in services.[8] As time passes, therefore, late industrializers (such as China) are more productive in manufacturing than early industrializers (such as the United States and the United Kingdom) were when they reached the same level of income.

For example, measured in current dollars China's per capita income in 2018 was $9,800. While in real terms, according to the Conference Board,[9] this level is similar to that reached by the United States in 1962, the manufacturing machines and technologies available to China today are far superior. As a result, China can manufacture the

4. The estimates are converted to the 2016 price level using 2011 purchasing power parity estimates, based on data from the GGDC database (www.rug.nl/ggdc/productivity/10-sector/) used by Timmer, de Vries, and de Vries (2015). For additional evidence on the hump-shaped profile, see Herrendorf, Rogerson, and Valentinyi (2013) and Rodrik (2016).

5. Specifically, productivity growth is fastest in agriculture, while income elasticity is highest for services. Sector demands are all assumed to be less than one. For a model based on productivity growth differences, see Ngai and Pissarides (2007).

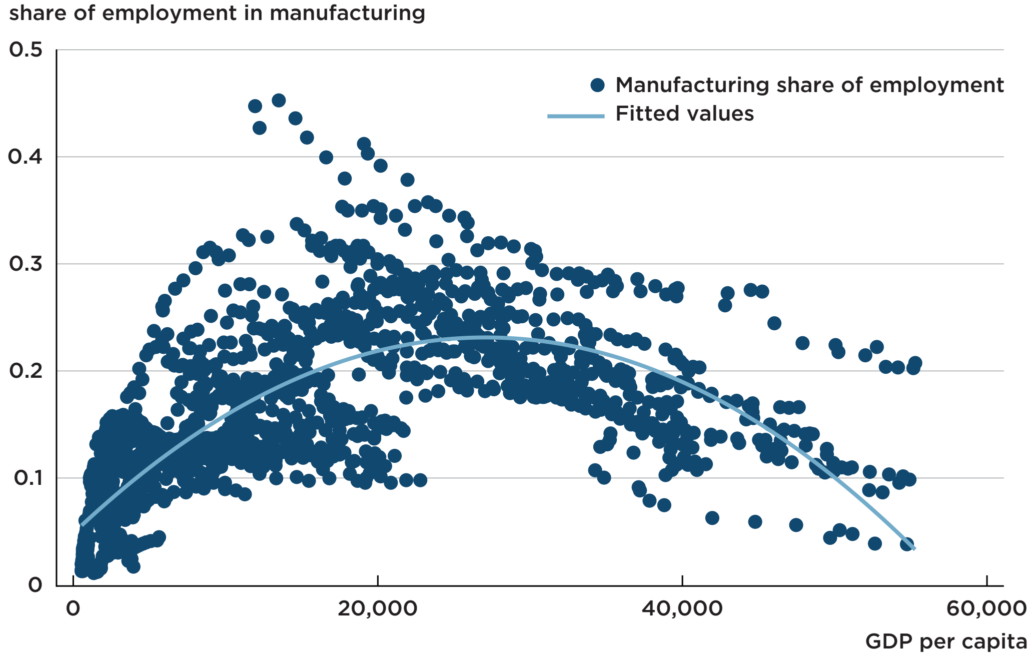
6. This result is obtained in a Ricardian framework by Uy, Yi, and Zhang (2013). Initially, net exports generate increases in manufacturing employment but, as productivity growth in manufacturing advances, eventually the employment content of the net exports declines and the negative effects of manufacturing productivity growth on employment that operate through domestic spending tend to dominate.

7. Of the 64 countries in the TiVA database, in 2015 their net trade surplus in manufacturing value added (measured as a share of GDP) ranked 3rd (Korea 11.5 percent of GDP), 4th (Singapore 9 percent of GDP), 11th (Malaysia 5 percent of GDP), and 18th (Japan 2.4 percent of GDP).

8. This is consistent with the findings of Dani Rodrik (2013).

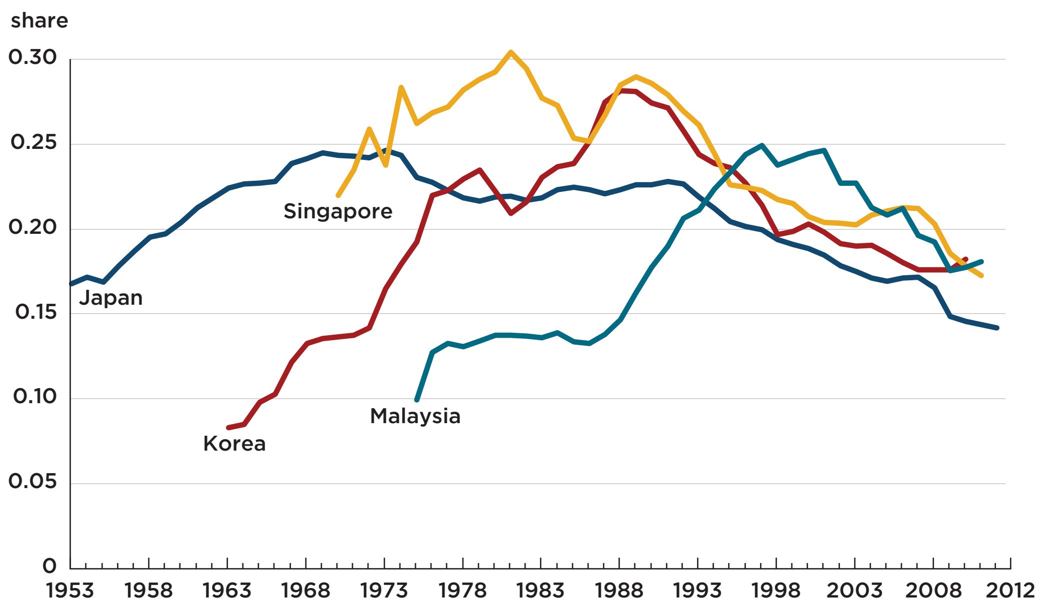
9. Conference Board Total Economy Database, www.conference-board.org/data/economydatabase.

Figure 1
Employment share in manufacturing versus per capita income, 1950–2012 (42 countries)



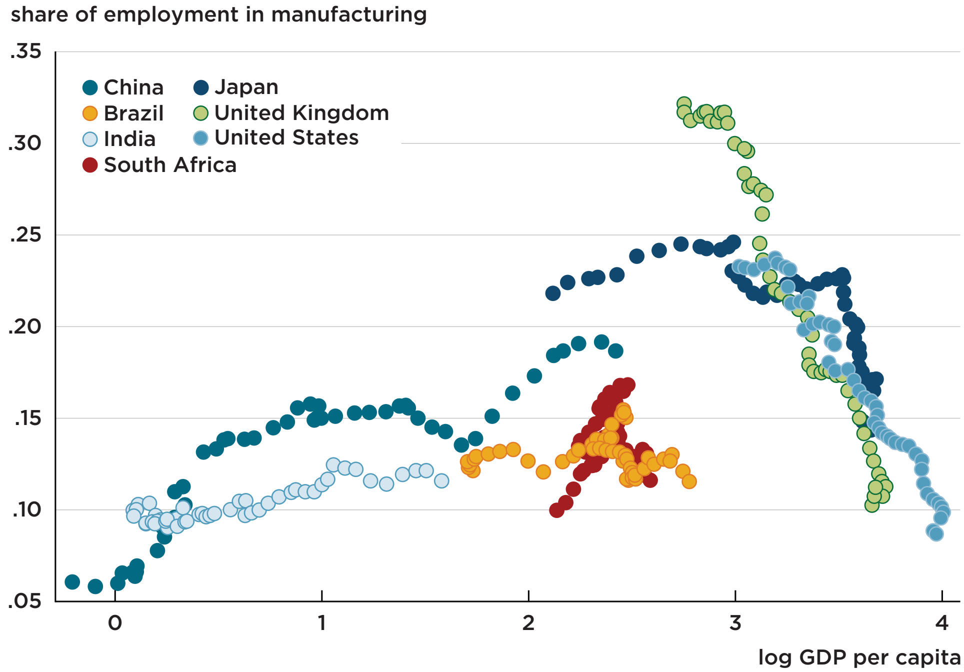
Sources: Groningen Growth and Development Centre (GGDC) 10-Sector Database for the share of manufacturing, and Penn World Tables for GDP per capita, which is purchasing power parity expressed in 2016 dollars.

Figure 2
Manufacturing employment shares in selected trade surplus Asian economies, 1953–2011



Source: Groningen Growth and Development Centre (GGDC) 10-Sector Database.

Figure 3
Manufacturing employment shares and per capita incomes in early industrializers (Japan, the United Kingdom, and the United States) and BRICS (Brazil, China, India, and South Africa), 1950–2011



Sources: Groningen Growth and Development Centre (GGDC) 10-Sector Database for the share of manufacturing, and Penn World Tables for GDP per capita, which is purchasing power parity expressed in 2016 dollars.

products demanded by people at a $9,800 per capita income level more cheaply and with less labor than the United States could in 1962. If demand is price inelastic, as it appears to be, this implies that, at this real income level, China will have a lower employment share in manufacturing, which shifts the curve downward, and a higher share of spending on services, which shifts the curve to the left.

Evidence of premature deindustrialization can be seen vividly in figure 3, which uses the data from figure 1 and plots the shares of manufacturing employment against the log of per capita GDP using purchasing power parity data from 1950 to 2011. The manufacturing employment shares of the United Kingdom, the United States, and Japan at given levels of real per capita incomes were much higher than those of BRIC economies such as Brazil, India, China, and South Africa when they later reached similar income levels.

In light of this international experience, it is natural to explore two questions. First, has China's share of manufacturing employment peaked? And second, is it another example of premature deindustrialization? To answer these questions an examination of the Chinese employment data is required.

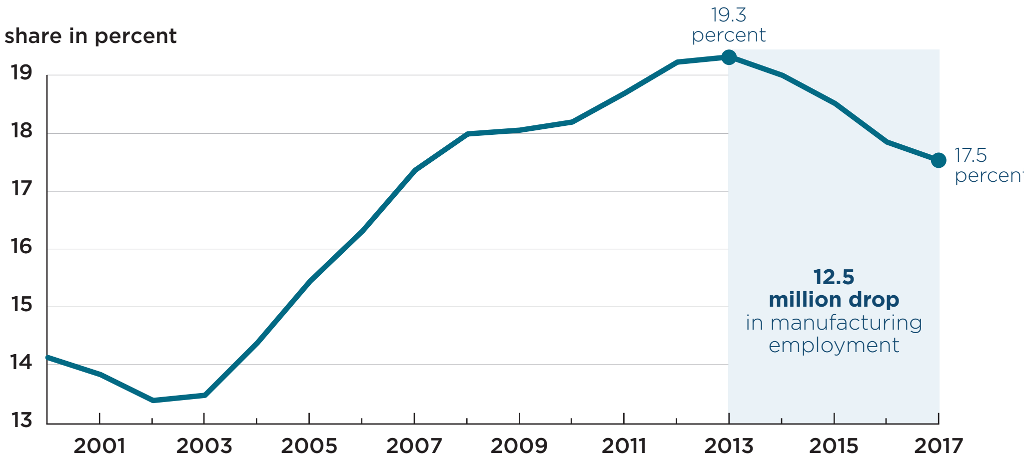
Changing Employment Trends

Because of the way the Chinese data are reported, official data on the share of total employment in Chinese manufacturing are hard to come by. The official statistics tend to report employment in the "secondary" sector, which includes not only manufacturing but also construction and public utilities. Alternatively, there are national statistics on manufacturing employment in a number of disaggregated categories that distinguish between urban and rural workers and between workers in state-owned enterprises and those who are self-employed or work for private enterprises. Nonetheless, while differing in magnitude, both Chinese official estimates and those by international organizations tell a qualitatively similar story. Between 1980 and 2013, according to estimates of the Conference Board,[10] for example, the number of persons employed in Chinese manufacturing more than doubled from 63 million to 148.5 million,[11] and the share of workers in Chinese manufacturing rose from 13.3 to 19.3 percent.

10. Ibid.

11. The World Input-Output Database (WIOD) for 2014 provides similar data; see www.wiod.org/home (accessed on July 20, 2019).

Figure 4
Share of manufacturing in total Chinese employment, 2000–17



Sources: Conference Board Total Economy Database (TED) and International Labor Comparisons (ILC) Databases.

The employment gains in Chinese manufacturing were especially impressive because labor productivity growth in Chinese manufacturing was also very strong. According to the Conference Board, between 1980 and 2013 the average annual growth in output per employed person in manufacturing in China increased at an annual rate of 9.4 percent. Despite this high rate of productivity growth, until 2013 the demand for manufacturing output was sufficiently robust that employment in the sector grew rapidly, and manufacturing continued to play its traditional role as a generator of opportunities for relatively less educated workers. In 2009, for example, only 4.2 percent of Chinese workers in manufacturing had a college (or tertiary education) degree (compared with 6 percent of workers in the economy as a whole).[12]

Based on this employment performance, some scholars have disputed whether China has experienced the deindustrialization seen in other countries. Nicholas Lardy (2015), for example, presented data showing that there was rapid growth in China's urban manufacturing employment (a subset of overall Chinese manufacturing employment) from 39.84 million in 2003 to 79.61 million in 2014. He attributed the strength of this employment growth to "China's growing income from a low level, the high share of investment, and surging manufacturing exports." Dieter Ernst (2016, 1) similarly argued that "China's comparative advantage in manufacturing and the extraordinary size of its economy explain why China has not followed Dani Rodrik's pattern of 'premature deindustrialization'."

But more recent data tell a different story. While differing in magnitude, both official data and those of international organizations suggest that Chinese manufacturing has been falling, both in absolute numbers and as a share of overall employment. The Conference Board reports a decline in the share of employment in manufacturing from 19.3 percent in 2013 to 17.5 percent in 2017 (figure 4) and an absolute decline in manufacturing employment from 148.5 million in 2013 to 136 million in 2017—a drop of 12.5 million in just four years.[13] Data from the International Labor Organization (ILO)[14] indicate higher employment numbers for manufacturing but a drop in the share of manufacturing employment of 5 percent between 2014 and 2018.

Updating Lardy's data and replicating his methodology through 2017 also suggest that the trends in China's urban manufacturing employment have changed. Data from China's *National Statistical Yearbook* indicate that from 2014 to 2018 urban manufacturing employment numbers fell from 79.6 million to 75.7 million and the share of manufacturing declined from 22.7 to 18.9 percent of overall urban employment. Thus data from three different sources all suggest that Chinese manufacturing employment has declined and it seems reasonable to speculate that it has passed its peak share. As shown in table 1, though Chinese income was slightly higher than Japan when its employment

12. Data from WIOD, Socio Economic Accounts, update July 2014, www.wiod.org/database/seas13 (accessed on July 20, 2019).

13. Aside from employment in transportation equipment, which grew by just 4 percent between 2013 and 2016, and tobacco, a small sector in which employment growth was robust, employment fell in every major manufacturing industry. Data from the Conference Board International Labor Comparisons (ILC) Database, www.conference-board.org/ilcprogram (accessed on July 20, 2019).

14. Available at www.ilo.org/ilostat.

Table 1
Manufacturing: Peak employment shares and associated real per capita income, selected countries

Country	Peak employment year	Peak employment share (percent)	Income per capita in peak year (thousands of 2018 PPP dollars)	2010 employment share (percent)
United States	1953	25.6	16.4	8.7
United Kingdom	1961	32.3	15.1	10.3
France	1964	25.4	16.2	11.3
West Germany	1965	35.3	19.9	n.a.
Japan	1969	24.5	12.1	14.4
China	2013	19.3	12.7	18.2

n.a. = not applicable; PPP = purchasing power parity

Sources: Groningen Growth and Development Centre (GGDC) 10-Sector Database and Conference Board Total Economy Database (TED).

Table 2
Chinese manufacturing value added shares in GDP, net trade, and spending, 2005–15

Variable	2005	2007	2008	2009	2010	2011	2012	2013	2014	2015
1) MAN/GDP	0.346	0.352	0.347	0.343	0.346	0.340	0.333	0.326	0.324	0.307
2) $X - M$/GDP	0.060	0.077	0.075	0.054	0.055	0.053	0.053	0.048	0.045	0.040
3) $C + I + G$/GDP	0.286	0.275	0.272	0.289	0.290	0.287	0.280	0.278	0.279	0.267
4) C/GDP	0.114	0.107	0.102	0.103	0.100	0.100	0.101	0.102	0.103	0.103
5) I/GDP	0.168	0.155	0.152	0.177	0.173	0.167	0.168	0.166	0.165	0.160
6) G/GDP	0.004	0.013	0.018	0.009	0.018	0.019	0.011	0.010	0.011	0.005
Share of manufacturing value added in:										
7) Final investment	0.402	0.389	0.370	0.384	0.374	0.363	0.360	0.356	0.359	0.358
8) Final consumption	0.131	0.129	0.123	0.119	0.120	0.123	0.123	0.122	0.123	0.125

Source: OECD TiVA Database, www.oecd.org/sti/ind/measuring-trade-in-value-added.htm.

share peaked, the Chinese experience may provide additional evidence that developing economies that have emerged later are not able to reach the peaks in manufacturing employment shares that were attained in the past by the industrial countries, even when manufacturing plays as dominant a role as it has in China's development.

Analysis of Demand

These employment shifts reflect changes in the demand for Chinese manufacturing output brought about by recent structural developments. The changes in demand can be demonstrated using data from the Trade in Value Added (TiVA) project of the Organization for Economic Cooperation and Development (OECD) and the World Trade Organization (WTO), which links the input-output tables of 64 countries and provides data on the origins of value added in final demand. Table 2, row 1, reports the shares of manufacturing value added in Chinese GDP, MAN/GDP; row 2, China's net exports in manufacturing value added as a share of GDP, $(X - M)$/GDP; and row 3, by subtracting net exports from domestic value added, provides a measure of manufacturing value added in Chinese domestic spending, $(C + I + G)$/GDP.[15]

The share of manufacturing value added in Chinese GDP is very high by international standards—indeed, though it has declined over the past decade, the 30.7 percent of GDP represented by Chinese manufacturing value added in 2015 was still the highest of the 64 countries in the TiVA database that accounted for about 95 percent of global value added in manufacturing in 2011. While the country's net trade surplus in manufacturing value added played a role, the high Chinese production share reflects an extraordinarily high share of manufacturing value added in Chinese

15. $Y = C + I + G + X - M$: output (Y) equals consumption (C) plus investment (I) plus government spending (G) plus exports (X) – imports (M). Thus domestic spending ($C + I + G$) = $Y - (X - M)$.

domestic spending. Indeed, if China had had balanced trade but sustained the same manufacturing value added in its spending, in 2015 its share of value added in GDP would have been smaller by 4.2 percent of GDP and manufacturing value added production just 13 percent lower.[16]

The high share of Chinese manufacturing value added in domestic demand is in turn a reflection of the high share of gross fixed capital formation in Chinese GDP in combination with the high manufacturing content in gross fixed capital formation. In 2015, for example, gross fixed capital formation accounted for 44.5 percent of Chinese GDP. Fully 35 percent of this represented value added originating in manufacturing and was equal to 16 percent of Chinese GDP (row 5). Gross fixed investment was 77 percent more intensive in manufacturing value added than consumption. While Chinese consumption accounted for 35.8 percent of GDP, the manufacturing value added content of this consumption was equal to just 10.3 percent to GDP (row 4). Given these relative shares of manufacturing value added in investment and consumption, it can be inferred that a shift in Chinese demand from investment to consumption would reduce the share of value added in Chinese manufacturing and thus the demand for manufacturing labor.

Table 2 also captures changes in the origins of Chinese manufacturing value added over time. It shows that China's net trade surplus in manufacturing value added as a share of GDP (row 2) declined steadily from 7.7 percent in 2007 to 4.0 percent in 2015. Thus China's increasing reliance on domestic demand for output of manufacturing value added is a decade-long trend. In addition, the composition of domestic demand is shifting from investment to consumption. According to the International Monetary Fund (IMF), the share of Chinese GDP represented by gross fixed capital formation declined from 48 percent in 2011 to 44.41 percent in 2017 and is forecast to decline to 41.5 percent by 2023.[17] Assuming the share of manufacturing value added in gross investment remains at its 2015 level, manufacturing value added in investment will fall to 15 percent of GDP, 2.7 percentage points lower than its peak in 2009.

Impacts on Inclusivity

These recent data raise questions about the degree to which Chinese manufacturing can continue to provide employment opportunities, especially for less skilled and female workers. The share of Chinese workers without a high school degree in manufacturing remains very high—they accounted for 57 percent of all workhours in 2009.[18] In addition, according to the ILO, women account for 64 percent of the manufacturing workers who have lost their jobs.

Looking forward, China's current industrial policies that emphasize leading-edge technologies are likely to lead to further reductions in the demand for low-skilled manufacturing workers. As has been noted, the demand for manufacturing value added is likely to grow more slowly as China shifts toward increasing the share of domestic consumption spending and reducing the share of investment.

The motives behind China's new industrial policies are clear. Notwithstanding its recent rapid growth, the country is far behind the advanced economies with respect to the technological sophistication of its manufacturing production. In 2017, output per worker in Chinese manufacturing was $24,470 (measured in current dollars), only a seventh of the $180,270 level of output per worker in US manufacturing in the same year.[19] Similarly, as indicated by their educational attainment, the average skill levels of Chinese manufacturing workers remain far behind those of their counterparts in advanced economies. In 2009, according to the World Input-Output Database, for example, the share of manufacturing workhours performed by workers with a college degree was 4.2 percent in China and 27.3 percent in the United States.

To be sure, the number of students graduating from college in China has been growing rapidly,[20] as have productivity and skill levels in Chinese manufacturing. However, between 2000 and 2009, the pace of labor productivity growth and increases in the college graduate employment share in manufacturing were 8.0 and 6.5 percent annually, respectively. If these growth rates are sustained, it will take China until 2045 to reach *current* US output per worker levels and until 2040 to reach the *current* share of college graduates in US manufacturing. Given US growth in the share of college graduates of 2.2 percent annually, it would take China 45 years to reach parity with US skill levels. If China's ambition is to move out of the middle-income category, it will have to maintain these rates of improvement for many years. This explains why its industrial policy is at the center of its development strategy, although it also raises the question of why China is committing so many resources to innovation—i.e., pushing out the global technological frontier, which is risky and expensive—rather than to emula-

16. Of the 64 countries in the TiVA sample, only Vietnam (28.4 percent) and Cambodia (27.2 percent) had higher shares of spending on manufacturing value added as a share of GDP.

17. IMF, *World Economic Outlook* Database, April 2019.

18. WIOD Socio Economic Accounts, www.wiod.org/database/seas13.

19. Conference Board and US Bureau of Economic Analysis, www.bea.gov.

20. National Bureau of Statistics of China, http://data.stats.gov.cn/easyquery.htm?cn=C01.

tion—i.e., moving toward the existing frontier, which is likely to be much easier.

The approach China has chosen is a combination of demand- and supply-side measures. On the demand side is the thrust to drive growth by increasing both domestic consumption and the domestic content of its tradable sector.[21] On the supply side, the emphasis is on gaining know-how using expansive state support for the development and acquisition of advanced manufacturing technology and production. If these policies succeed, Chinese citizens will, on average, be richer. But the combined direct impacts of reduced growth in the demand for manufacturing workers and increased demand for workers who are more skilled are likely to make Chinese manufacturing growth less inclusive. Unless the added growth creates spillovers in the demand for these workers in services, China's already high level of income inequality is likely to rise.[22]

IMPACT OF CURRENT TRADE FRICTIONS

Whatever the results of the current negotiations between China and the United States, the trade friction over the past two years will fundamentally alter some of the presumptions behind China's manufacturing strategy Made in China 2025, formulated in 2015. Especially after China's accession to the WTO in 2001, both Chinese and foreign firms made their location and production decisions on the assumption that the regime for international market access was secure and subject to an enforceable international rule of law. The result was the flourishing of global value chains that firmly established China as the "factory of the world." But the imposition in 2018 of tariffs on US imports from China and China's retaliation have severely damaged the confidence that global value chains can operate without fear that they will be disrupted by tariffs. Firms from the United States and other countries that invest in China are far less certain about the terms on which their products from Chinese plants will gain access to the United States, and they are predictably switching to production in other locations that promise more secure access to the US market. Similarly, firms in China that have seen the vulnerabilities of leading companies such as ZTE and Huawei that stem from their reliance on imported US inputs are likely to place a higher priority on domestic self-sufficiency.

Made in China 2025 reflects the view that to advance economic development, China's manufacturing capabilities need to be enhanced. While it addresses information technology, agricultural technology, and artificial intelligence, most of its initiatives are in or closely related to the manufacturing sector.[23] The program is designed to increase the sophistication of Chinese manufacturing by increasing the domestic content of Chinese manufactured products and to change China's approach from providing assembly operations as "the factory of the world" to becoming a leader in products that use advanced manufacturing technologies.

But the assumptions on which the program is based need to be reexamined because its protectionist and nationalistic elements have generated negative reactions in the advanced economies. In particular, the assumption that China could upgrade its technological capabilities by acquiring foreign firms has been called into question by growing restrictions on such activities imposed by the United States and other industrial countries. In addition, China will now find it more difficult to use access to its domestic market to induce foreign firms to transfer technologies on favorable terms.

These reactions suggest that unless China can effectively change perceptions about the discriminatory nature of its programs, the future of manufacturing productivity and employment in China will become more difficult and increasingly dependent on domestic developments in the country's economy. China will also have to adapt by relying less on its exports of assembled products to tide it over until it can replace these with exports of high-technology products. Thus either China will have to improve its relations with the advanced economies by giving their firms a larger stake in its industrial policies or Chinese domestic demand and indigenous innovation will have to assume even larger roles.

Moreover, even if these policies are successful in stimulating growth, as the experiences of other successful Asian economies suggest, the combination of greater emphasis on technology and skills and more reliance on domestic consumption spending could mean that manufacturing employment is likely to grow more slowly (or decline) and become more skill intensive. This will mean that manufacturing's role in promoting inclusive growth in China is likely to diminish.

21. The 2025 plan aims at raising the domestic content of core components to 40 percent by 2020 and 75 percent by 2025.

22. For an analysis suggesting that information technology that substitutes for unskilled labor could actually raise wages for unskilled workers by increasing the demand for them in personal services, see Autor and Dorn (2013).

23. Released in 2015, Made in China 2025 is the government's ten-year plan to update China's manufacturing base by rapidly developing ten high-tech industries. Chief among these are electric cars and other new energy vehicles, next-generation information technology and telecommunications, and advanced robotics and artificial intelligence. The other sectors are agricultural technology, aerospace engineering, new synthetic materials, advanced electrical equipment, emerging biomedicine, high-end rail infrastructure, and high-tech maritime engineering. See McBride and Chatzky (2019).

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