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Advancing India's Structural Transformation and Catch-up to the Technology Frontier

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Advancing India's Structural Transformation and Catch-up to the Technology Frontier

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ABSTRACT: While India's growth has been strong in recent decades, its structural transformation remains incomplete. In this paper, we first take stock of India's growth to date. We find that economic activity has shifted from agriculture to services, but agriculture remains the predominant employer. Catch up to the technological frontier has been uneven, with limited progress in agriculture, but also in construction and trade, which have grown the most in terms of employment. We do find some Indian firms already operating at the technological frontier. These strong performers tend to be large firms. We then consider India's employment challenge going forward. We find that India needs to create between 143-324 million jobs by 2050 and that doing so and with workers shifting towards more dynamic sectors could boost GDP growth by 0.2-0.5 percentage points. Structural reforms can help India create high-quality jobs and accelerate growth.

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WORKING PAPERS

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Executive Summary

India's growth has been strong in recent decades. Real GDP growth has averaged over 6 percent since 2000, leading to higher living standards and a sharp drop in multidimensional poverty, and it has become one of the world's largest producer of cereals, milk, and pulses. India's exports have diversified, and it has become of the largest exporters of jewelry and the largest exporter of generic drugs in the world. India's long-established strength as an exporter of services is ever diversifying into new fields and adding higher value-added services. India is estimated to account for 40 percent of Global Capability Centers. India's successful moon landing in August 2023 highlights its potential to develop businesses in the space economy.

However, India's structural transformation still has some way to go. While the role of agriculture in terms of aggregate output has declined in India from over 40 percent in 1980 to 15 percent in 2019, it remains large in terms of employment, accounting for 42 percent of workers in 2019. This has resulted in depressed labor productivity in the sector. In its place, economic activity in India has shifted over time mainly to services. Construction has also become an important employer, but as in agriculture, productivity in the sector is low and has not increased much since 1980.

The catch up of Indian industries to the technological frontier has been uneven. Using industry-level (KLEMS) data on output, inputs, and value added, we compare the productivity of Indian industries with that of advanced economies. We find that catch-up to the technological frontier has been limited in agriculture, which freed workers over the period, but also in construction and trade, where employment rose the most. Overall, services outperformed manufacturing in catch-up to the technological frontier. Employment in business services did increase significantly by 13 million workers, while the industry narrowed the distance to the technological frontier by 9 percentage points.

Some Indian firms, usually large firms, are already producing at the technological frontier. Using firm-level data on financial metrics from ORBIS, a global company database, we document that the productivity of Indian firms tends to be low on average, but that there are some strong performers already producing at the technological frontier. These strong performers operate across different industries, but are especially prevalent in computer programming, other information technology services, and jewelry manufacturing. They tend to be larger, measured by assets or by revenues.

Looking ahead, we estimate that India needs to create at least between 143-324 million jobs for its growing population by 2050. Our estimate includes the missing jobs as of 2022 and the increase in working age population by 2050, but it does not include additional job creation needs due to current underemployment or explicitly account for non-farm jobs that need to be created to help workers shift from agriculture to other sectors as the economy develops. We separately estimate that even a relatively small shift of employment away from agriculture and into either construction and services (which is the existing trend) or manufacturing can boost GDP growth by 0.2-0.5 percentage points.

In addition to continuing with the public investment push, structural reforms that can help create high-quality jobs and accelerate growth in India include:

- Strengthening education and skilling
- Advancing labor market reforms
- Fostering trade integration
- Removing red tape and other obstacles to private sector growth
- Strengthening the social safety net
- Facilitating access to credit.

Introduction

India has witnessed strong growth in recent years, yet many Indian workers remain employed in low-paying, low-productivity jobs and many firms remain far from the global productivity frontier. Real GDP growth has averaged over 6 percent since 2000, on the back of a large and expanding services sector. This growth has lifted an estimated 415 million people out of multidimensional poverty since 2005 (Arbatli Saxegaard and others, 2022). At the same time, manufacturing sector growth has remained sluggish and over half of all workers remain in low productivity jobs in agriculture, construction, and trade. Furthermore, the catch-up of Indian industries to the technological productivity frontier has been uneven. India needs to create productive, well-paying jobs in labor intensive sectors for its growing population. Combined with a shift of workers towards more dynamic sectors, this could accelerate sustainable, inclusive growth and raise wages for India's workers.

Economic activity in India has shifted over time from agriculture to services. Agriculture's share of value added declined from over 40 percent in 1980 to 15 percent in 2019 (Figure 1). The share of value added in the services sector simultaneously grew from just over 30 percent of value added to over 55 percent. The contribution of value added from other major sectors in the economy, including manufacturing and construction, has been relatively constant over this period.[1]

Figure 1. Contribution to Real Value Added, by Sector
(percent)

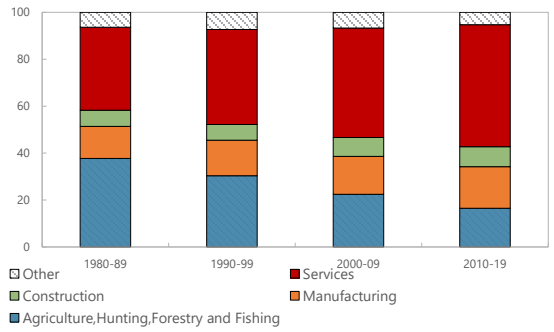
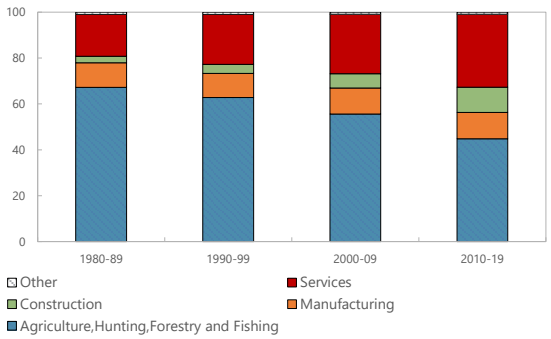


Figure 2. Distribution of Employment, by Sector
(percent)



Source: India KLEMS and IMF staff estimates.
Note: Figures show average values over ten-year period indicated. "Other" sector includes electricity, gas, and water and mining and quarrying.

While agriculture's share of value added has declined, it has remained the dominant source of employment (Figure 2). The share of workers in the agriculture sector did decline over time but has remained high: over 42 percent of workers are classified as working in agriculture and allied sectors.[2] The decline in the share of workers in the agriculture sector was made up for by a rise in employment in services and construction. While the share of workers in services has risen to about 34 percent since 1980, the sectors' value-added contribution to the economy has increased much more. Construction has also become an important employer,

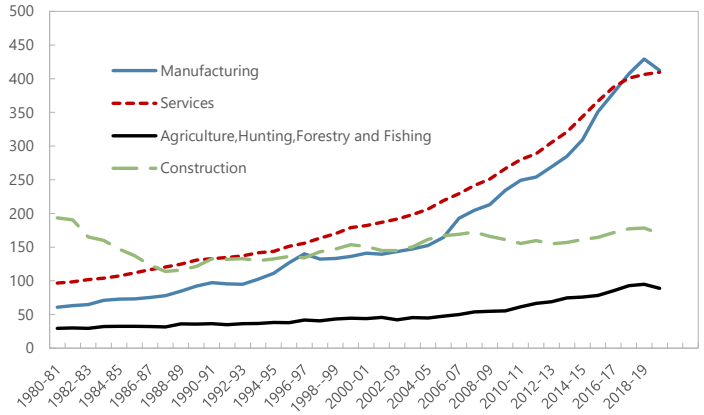
[1] Rodrik (2016) documents "premature deindustrialization".in recent decades among many emerging and developing economies. In this phenomenon, manufacturing has begun declining at relatively low levels of development, so that the reallocation of economic activity and employment has been from agriculture to services.

[2] The share of male workers employed in agriculture declined from 40.2 percent in the PLFS 2017/18 to 37.1 percent in the PLFS 2022/23. Over the same period, the share of female workers employed in agriculture increased from 57 to 64.3 percent.

with about 12 percent of workers in 2019. Notably the nature of employment in the construction sector -low-skill, largely casual workers– is similar to that in agriculture, and there is often significant movement of workers between the two sectors, especially in rural areas. Reflecting its sluggish value-added growth, employment in the manufacturing sector has also increased minimally over time.

With a low share of value added and large employment base, labor productivity in the agriculture and construction sectors has grown slower than other sectors since 1980 (Figure 3). In comparison, labor in 2019/20 in manufacturing and services was over 4.5 times more productive than in agriculture.[3] With low productivity workers in agriculture and construction making up over half the Indian workforce, there is significant potential to boost growth by enacting productivity-enhancing reforms to the sectors which will free workers to move to other, more productive sectors. This would also be beneficial to workers themselves, as wages would tend to rise with productivity. Furthermore, productivity enhancing reforms in manufacturing and services would help attract labor from agriculture and construction, while further boosting productivity.

Figure 3. Labor Productivity
(000's Rs. Constant 2011-12 prices)



Source: India KLEMS: and IMF staff estimates.

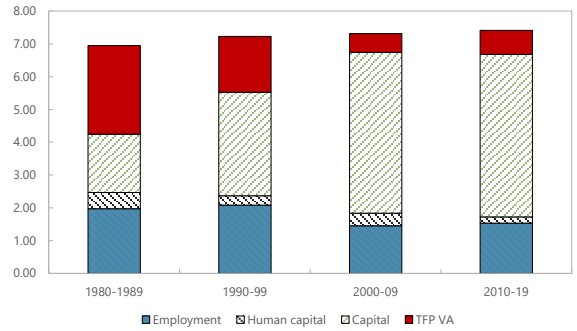
Sectoral growth decompositions suggest that physical capital has driven growth across most sectors of the Indian economy. Using data from India KLEMS and a production function approach for growth decomposition (see Kotera and Xu, 2022 for detailed description) shows that value added growth in India has shifted away from being labor driven in the 1980s towards more physical capital and TFP driven in more recent decades (Figure 4). This has been linked to pro-business reforms in the 1980s, market reforms in the early 1990s, the liberalization of the economy and increases in FDI, and rapid growth in the services sectors (Kotera and Xu, 2023, and references therein). On a sectoral basis capital and TFP have become more important in the services sector in particular, India's main driver of value added. This suggests that while services are largely supporting the Indian economy—broadly on account of the structural reforms—job creation in that sector has not been sufficient to deliver the number of formal, high-productivity jobs needed to raise growth and fully employ the working age population. For construction, growth has been largely driven by the shift of workers into the sector with little benefits from overall productivity.

[3] The fiscal year in India runs from April to March, so that 2019/20 corresponds to the period April 2019 to March 2020.

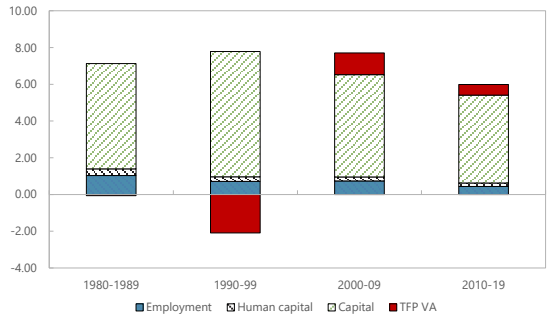
Figure 4. Growth Decomposition

(Percent)

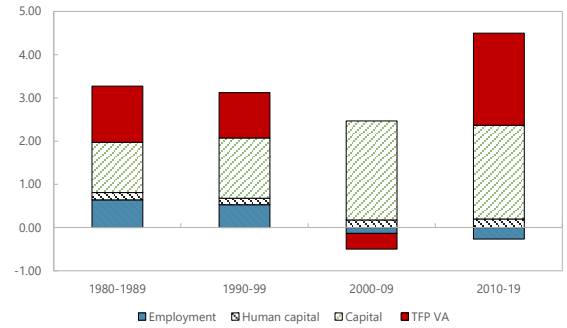
Services



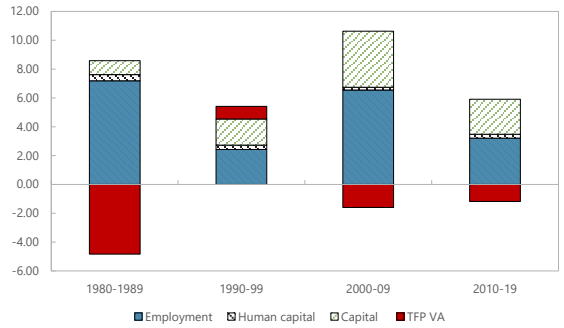
Manufacturing



Agriculture



Construction



Source: India KLEMS: and IMF staff estimates. Note: Bars show average values over ten-year period indicated on x-axis. Capital is the sum of capital stock and capital composition. Human capital is defined as labor quality in India KLEMS.

Catching up to the Technological Frontier: Evidence from Industry-Level Data

Methodology

We use industry-level data to study Indian productivity compared to the technological frontier. We use KLEMS (Capital, Labor, Energy, Materials, and Services) databases for Indian and advanced economies prepared by the Reserve Bank of India and the Luiss Lab of European Economics at Luiss University in Rome, respectively.[4] These databases provide broadly consistent information on inputs and output per industry at the 2-digit industry level. The RBI KLEMS database extends from 1980/81 to 2020/21, with the financial year running from April to March. The EU KLEMS database includes 27 European Union member states, the US, Japan, and the United Kingdom and runs from 1995 to 2020. So, it covers 30 advanced economies, although

[4] The India KLEMS database is available from https://www.rbi.org.in/Scripts/KLEMS.aspx. The EUKLEMS & INTANProd database is available from https://euklems-intanprod-llee.luiss.it/.

data is not available for every year and industry, constituting an unbalanced panel.[5] We focus on the period of overlap between the databases from 1995 to 2019 (1995/96 to 2019/20 for Indian data) and we disregard the most recent observation as it was the first year of the COVID-19 pandemic and it also disproportionately affected the Indian data.[6] We map 25 industries across the KLEMS databases as described in Annex 1, but we exclude government from the results shown below to focus on the productivity in the marketplace.

Our preferred measure of catch-up to the technological frontier is the change in relative labor productivity. We define labor productivity at the industry level as the value added (measured in constant U.S. dollars at 2011 prices) per employee.[7] And we define the technological frontier as the 90th percentile of labor productivity among advanced economies for each industry and at each point in time. The relative labor productivity is then the ratio between Indian labor productivity and the frontier labor productivity for each industry and time. Indian labor productivity relative to the frontier is shown in Figure 5, by industry and over time.

We consider two alternative measures of productivity:

- First, we use labor productivity measured in PPP (purchasing power parity)-adjusted U.S. dollars at the industry level to account for the fact that prices tend to increase with income per capita, especially for services. We use relative prices for 2005 at the industry level for the countries in our sample estimated by Inklaar and Timmer (2014) to express value added in PPP-adjusted U.S. dollars at 2005 prices. In particular, we compute value added measured in PPP-adjusted U.S. dollars at 2005 prices for industry i at time t in country c by:

$$VA^{PPP}{}_{i,t,c} = \frac{VA_{i,t,c}}{FX_{2005,c}\, PPP_{i,2005,c}} \frac{Deflator_{i,2005,c}}{Deflator_{i,t,c}}$$

  Where $VA_{i,t,c}$ is the nominal value added by industry i at time t in country c measured in local currency, $Deflator_{i,t,c}$ is the GDP deflator for industry i at time t (we normalize $Deflator_{i,2005,c} = 100$), $FX_{2005,c}$ is the average exchange rate against the U.S. dollar in 2005, and $PPP_{i,2005,c}$ is the relative price level in industry i in 2005 in country c obtained from Inklaar and Timmer (2014). $PPP_{i,2005,c}$ is normalized to 1 for the U.S., so that levels lower than 1 imply that it is cheaper to acquire the output from industry i in country c than it is in the U.S.

  It is attractive to use PPP-adjusted labor productivity because it allows to control for prices raising with income per capita in what is known as the Penn-effect (Samuelson, 1994). This is particularly important for services, which tend to be much cheaper in poorer countries than in advanced economies. However, estimates of relative prices of industry output are only available for the year

[5] Data availability is as follows in EUKLEMS. Labor productivity measured in constant U.S. dollars at 2011 prices is available for 24-30 countries across industries over time. Labor productivity measured in PPP-adjusted U.S. dollars at the industry level is available for 21-29 countries across industries over time. TFP data, whose calculation requires more variables, is available for 10-27 countries across industries over time.

[6] The World Health Organization declared the COVID-19 outbreak a global pandemic on March 11, 2020. So that slightly less than 10 months of production in EUKLEMS economies were affected in 2020, but the whole year of production in India was affected in FY 2020/21.

[7] Indian variables expressed in rupees at constant 2011/12 prices are multiplied by the average rupee-U.S. dollar exchange rate in 2011/12 to convert them in constant U.S. dollars at 2011 prices. Variables in the EUKLEMS database expressed as chained-linked volumes with base in 2015 are converted to U.S. dollars using the 2015 exchange rate and then deflated to 2011 prices using the U.S. GDP deflator.

2005 (Inklaar and Timmer, 2014) and so, require extrapolation based on growth of industry-specific deflators, which have some methodological weaknesses and inconsistencies across countries. In particular, India does not have producer price indexes and so the deflators for some services instead rely on wholesale prices indexes on associated goods. Thus, we present these results as a robustness check, rather than as baseline estimates.

- Second, we measure productivity through an estimate of the Total Factor Productivity (TFP). For consistency across the KLEMS databases, we define TFP for industry i at time t in country c as a residual from the following equation:

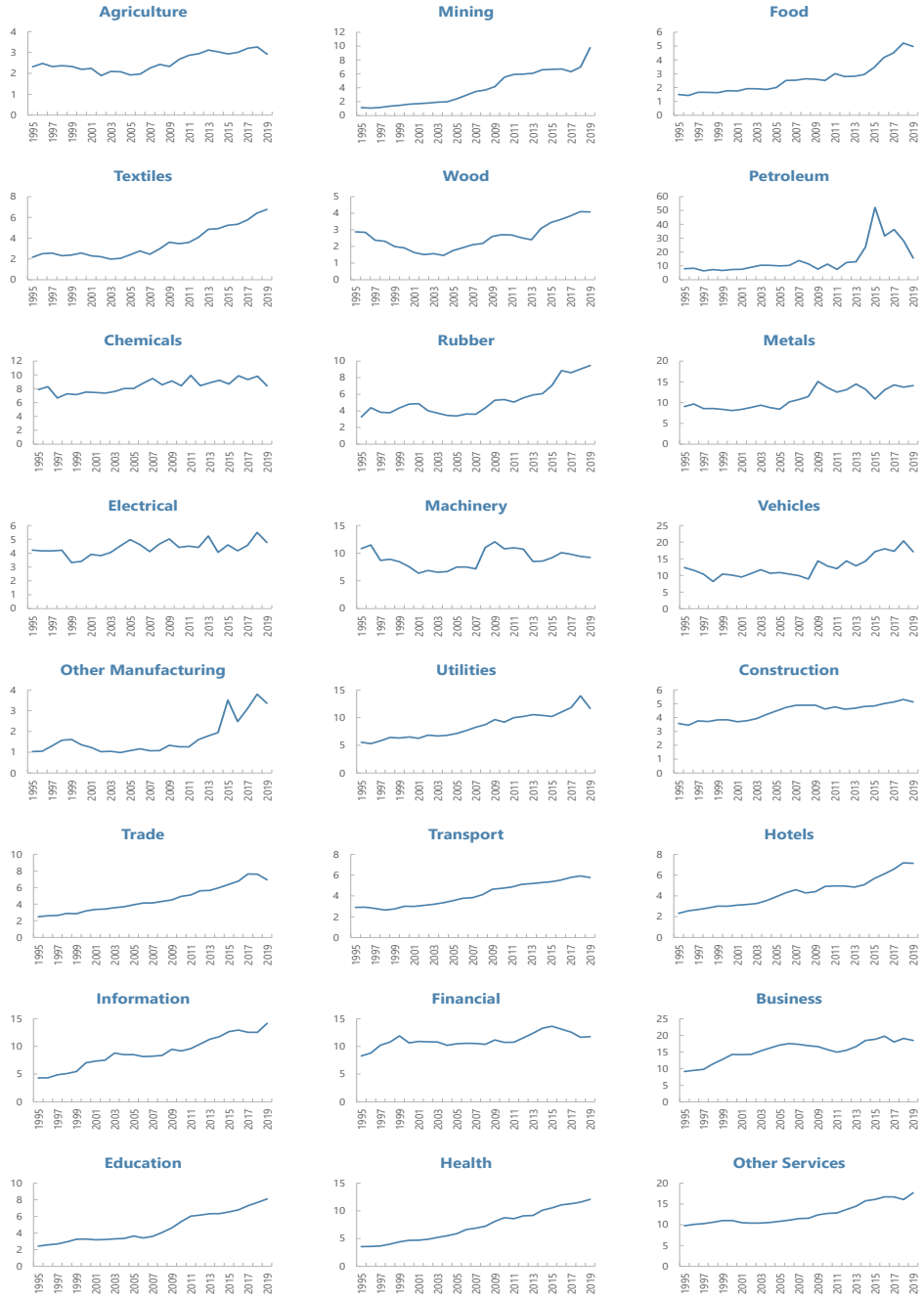
$$TFP_{i,t,c} = \frac{Y_{i,t,c}}{\left(L_{i,t,c}\right)^{\alpha_{i,t,c}}\left(K_{i,t,c}\right)^{1-\alpha_{i,t,c}}}$$

Where $Y_{i,t}$, $L_{i,t,c}$, and $K_{i,t,c}$ are value added, number of people employed, and capital stock in industry i at time t in country c. The parameter $\alpha_{i,t,c}$ is computed as the average labor compensation as a share of value added between in years $t-1$ and t.[8] Data on labor and capital composition or number of hours worked are disregarded for this exercise because they are not consistently available across the two KLEMS databases.

The use of TFP as a measure of productivity is attractive because it allows to abstract from the increase in labor productivity induced by higher capital accumulation. However, it requires more assumptions to be met and more data to compute it, which significantly restricts the number of countries available to define the technological frontier. In balance, we prefer to include these results as a robustness check.

[8] Labor compensation in EUKLEMS is computed by assuming the compensation of self-employed workers is the same as that for employees as advised in Bontadini and others (2023).

Figure 5. India's Labor Productivity by Industry Over Time
(Percent of the frontier)

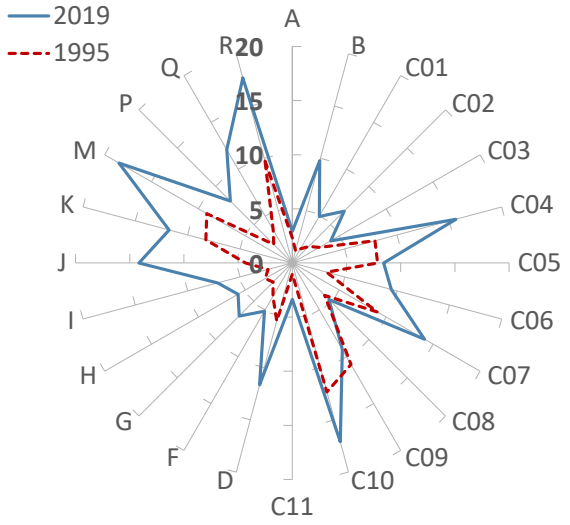


Source: Country authorities, EU KLEMS, and IMF staff estimates.
Notes: Labor productivity defined as value added (in constant U.S. dollars) per employee at the 2-digit industry level. Frontier is defined as the 90th percentile among advanced economies.

Results

The catch up of Indian industries to the technological frontier has been uneven (Figure 6). Agriculture has remained stuck at low relative productivity levels since 1995. In 1995, the productivity of a worker in agriculture in India was only 2.3 percent of that observed for a country at the technological frontier. By 2019, it had increased to only 2.9 percent. This reflects that agriculture in India remains a safety net as was evidenced by the reverse migration wave at the beginning of the COVID-19 pandemic. Excess labor is allocated to agriculture, which keeps productivity depressed in the sector. Catch up to the frontier was also weak for several manufacturing industries (wood and paper, chemicals, electrical and optical equipment, and other manufacturing). Manufacturing of machinery regressed over this period, moving backwards by 2 percentage points in terms of distance to the labor productivity frontier. Productivity in construction improved marginally, catch up to the technological frontier was much faster in mining and petroleum refining, as well as information and business services, health, and other services. Overall, services have been more dynamic in catching up to the technological frontier. Labor productivity in business services is at 18 percent of the frontier.

Figure 6. India's Labor Productivity
(Percent of the frontier)

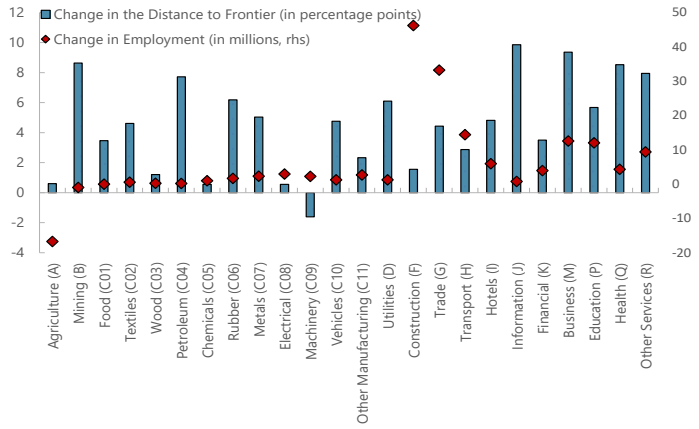


Source: Country authorities, EU KLEMS, and IMF staff estimates.
Notes: Labor productivity defined as value added (in constant U.S. dollars) per employee at the 2-digit industry level. Frontier is defined as the 90th percentile among advanced economies. Industry names detailed in the next figure with A = Agriculture, B= Mining, etc.

The shift of workers towards more dynamic sectors of the economy has been limited so far (Figure 7). Employment in agriculture declined by 17 million between 1995 and 2019, which is encouraging. But with agriculture still accounting for 43 percent of the workers in the country, significantly more shift of workers towards higher value-added jobs would be needed. Employment grew the most in construction (46 million) and trade (33 million), both relatively low productivity industries that exhibited limited catch up to the technological frontier over the last two and a half decades. Manufacturing added only 15 million jobs over this period, a tenth of the net job creation. Employment in business services did increase significantly by 13 million workers from just 1.6 million in 1995 to 14 million in 2019, while the industry narrowed the distance to the technological frontier by 9 percentage points—a very positive outcome.[9] Other industries with fast catch up such as mining, petroleum refining, and information services, have added relatively fewer jobs. This is not unexpected given their relatively low labor intensity.

[9] Labor productivity was 9 percent of the technological frontier in 1995 and rose to 18 percent of the technological frontier in 2019.

Figure 7. Change in Employment and Productivity: 1995 – 2019

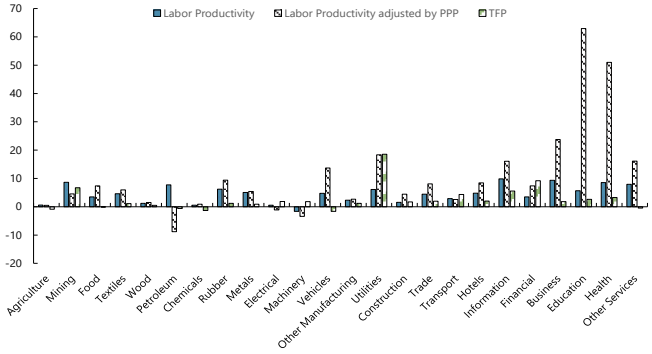


Source: Country authorities, EU KLEMS, and IMF staff estimates.
Notes: Labor productivity defined as value added (in constant U.S. dollars) per employee at the 2-digit industry level. Frontier is defined as the 90th percentile among advanced economies.

The uneven catch up to the technological frontier is robust to the use of alternative measures of productivity:

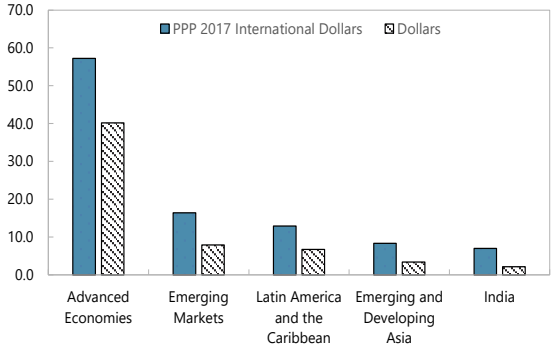
- *Agriculture.* The relatively weak performance of agriculture is consistent across metrics. The catch up to the technological frontier in agriculture was 0.6 percentage points based on labor productivity, 0.5 percentage points when labor productivity is adjusted by PPP at the industry level, and -0.9 percentage points in terms of TFP.
- *Mining.* In mining, the catch up to the frontier in labor productivity (8.6 percentage points) is not just explained by higher capital accumulation because TFP catch-up amounted to 6.7 percentage points, although when adjusted by PPP the catch-up in labor productivity declines to 4.5 percentage points reflecting convergence with international prices.
- *Manufacturing.* For most of manufacturing, the limited increases in labor productivity appear to be explained mostly by higher capital accumulation with TFP-based catch up being negative or barely positive. On average, TFP-based catch up in manufacturing was just 0.5 percentage points. PPP adjustments make a significant difference only in assessing the catch up to the frontier for the manufacturing of petroleum and of vehicles.
- *Utilities.* The catch up to the frontier in utilities is larger when measured in PPP-adjusted productivity or in TFP reflecting significant improvements in the sector beyond capital accumulation.
- *Construction.* The catch up to the frontier in construction is fairly stable, and low, across metrics.
- *Services.* On services, the average catch-up in labor productivity (6.3 percentage points) appears partly explained by capital accumulation given that TFP-based catch-up averaged 3.4 percentage points. PPP-adjusted labor productivity does suggest a much larger catch-up to the technological frontier in services; however, this needs to be interpreted with caution due to the lack of producer price indexes for services in India, with the GDP deflator for those sectors instead relying on other price data, such as wholesale price indexes for goods.

Figure 8. Change in the Distance to Frontier Employment for Alternative Definitions of Productivity: 1995 – 2019
(Percentage points)



Source: Country authorities, EU KLEMS, and IMF staff estimates.
Notes: Labor productivity defined as value added (in constant U.S. dollars) per employee at the 2-digit industry level. Labor productivity adjusted by PPP uses instead value added in PPP-adjusted U.S. dollars at the industry level for the numerator. TFP is total factor productivity and is computed as a residual as discussed in the methodology subsection. In all cases, frontier is defined as the 90th percentile among advanced economies.

Figure 9. Labor Productivity in Agriculture
(Thousand dollars per worker)



Source: World Development Indicators, World Economic Outlook, and IMF staff estimates.
Notes: Median labor productivity for each country group. Country level observation reflects five years of available data before the COVID-19 pandemic: 2015-2019.

India's agricultural productivity is low compared to less advanced peers (Figure 9). Combining the share of agriculture in value added and employment from the World Development Indicators with employment and GDP from the World Economic Outlook, we can estimate labor productivity in agriculture measured in dollars at current prices and at 2017 PPP-adjusted prices. India's PPP-adjusted labor productivity is only 12.2 percent of the median productivity in advanced economies, but also just 42.6 percent of the median productivity in emerging markets. India's labor productivity in agriculture is 54.3 percent of the median productivity in Latin America and the Caribbean and even 84.4 percent of the median productivity in emerging and developing Asia. Distance is even larger when measured in dollars at current prices, without the PPP adjustment. Thus, India's agricultural sector has substantial room to catch up even when compared to peers at closer stages of economic development.

Catching up to the Technological Frontier: Evidence from Firm-Level Data

Methodology

We use firm-level data to study Indian productivity compared to the technological frontier at a more disaggregated industry level. We use ORBIS data collected by Bureau van Dijk, which provides comparable financial data for public and private firms around the world, including industry classification following NACE (Nomenclature of Economic Activities) Rev. 2 at the 4-digit level. The data is not limited to publicly-listed firms as data is also retrieved from company registrars.

We clean up the data to mitigate concerns of uneven coverage across countries. We select all firms with sales and employment data at some point in the past 5 years. We broadly follow Diez and others (2019) in cleaning up the data in the case of duplicates.[10] We average sales and employment data per firm across years. Because different countries have different reporting requirements, we focus only on firms with more than 20 employees to ensure that sample coverage is relatively similar and tilted towards medium and large firms.[11] We exclude firms with negative sales. We end up with a sample of 731,916 firms, of which 2,071 are Indian (Table 1). Table 1 presents summary statistics. To determine whether a firm is domestically- or foreign-owned, we compare the firm's country with that of its Global Ultimate Owner. We use sales per employee to proxy for labor productivity. Sales per employee is not an ideal measure of productivity. Unlike value added, it does not exclude materials. And the measure of employment is also imperfect as different countries have different reporting requirements. Nevertheless, sales per employee is an attractive metric because it is simple, can be calculated with little data, and allows us to explore productivity for more finely defined industries and to study heterogeneity in productivity within those finely defined industries.

Table 1. Number of Firms by Country

Country	Ranking	Number of Firms	Percent
U.S.	1	264,164	36.1
China	2	108,901	14.9
United Kingdom	3	38,279	5.2
Brazil	4	37,587	5.1
Italy	5	35,998	4.9
Russia	6	30,437	4.2
Germany	7	29,148	4.0
France	8	19,474	2.7
Spain	9	17,978	2.5
Japan	10	15,501	2.1
India	30	2,071	0.3
Other Countries	-	132,378	18.1
Total		731,916	100.0

Source: ORBIS and IMF staff estimates.
Notes: The analysis uses all the firms with sales and employment data for at least one year over the past five years and with more than 20 employees.

[10] First, we keep company accounts that are unconsolidated or unknown. Second, we remove duplicates that are not "annual reports." Third, we remove duplicates where the accounts cover less than 12 months. Fourth, we keep the duplicates with the closest reporting date to Dec. 31st in the corresponding year.

[11] Naturally, the sample is not representative of the average Indian firm as it excludes most small firms and does not capture any informal firms. However, those firms are likely to be even further from the technological frontier as their low productivity has been documented previously in the literature (Mehrotra and Giri, 2023; Krishna and others, 2018).

We define the technological frontier as the 95th percentile of sales per employee across non-Indian firms by industry.[12] For the results below comparing Indian firms' distance to the frontier, we keep industries in which there are at least 5 Indian firms. This restricts the sample to 109 industries.

Table 2. Summary Statistics

	Sales	Employees	Sales per Employee
5th Percentile	490.0	21.0	9.8
10th Percentile	946.3	23.0	19.6
25th Percentile	2,710.0	32.0	50.0
Median	8,752.4	60.0	137.6
Mean	155,788.7	504.8	447.0
75th Percentile	33,900.0	162.6	274.4
90th Percentile	134,334.8	530.5	622.3
95th Percentile	333,564.3	1,178.6	1,035.8
Standard Deviation	2,217,519	6,553	6,558
Number of observations	731,916	731,916	731,916

Source: ORBIS and IMF staff estimates.
Notes: The analysis uses all the firms with sales and employment data for at least one year over the past five years and with more than 20 employees. Sales and sales per employee are measured in thousands of U.S. dollars. Employees are measured in units.

Results

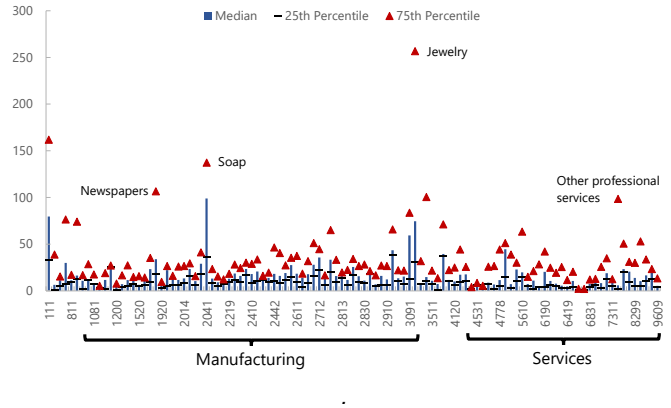
We find that sales per employee among Indian firms are low on average, but with exceptions (Figure 10). In line with the results at the industry level, the median productivity of Indian firms is low, averaging 17 percent of the sales per employee by frontier firms across industries. But there are some sectors with firms exhibiting sales per employee closer or even above the frontier, such as manufacturing of jewelry and soap, printing of newspapers, and other professional services.

There are some strong Indian performers (Figure 11). There are 126 Indian firms already operating at the technological frontier in the sense that their sales per employee are above that of the 95th percentile for non-Indian firms. Twelve of those Indian firms at the frontier operate in computer programming or other information technology services, and another seven engage in jewelry manufacturing.

[12] In this section, we define the technological frontier at the 95th percentile, rather than the 90th percentile as in the previous section, because we have more observations available using firm level data (more than 700,000 firms compared to 30 countries previously), so that we can set the frontier at a higher percentile to identify strong performers, while still excluding outliers. Results in this section are nevertheless robust to defining the frontier at the 90th percentile.

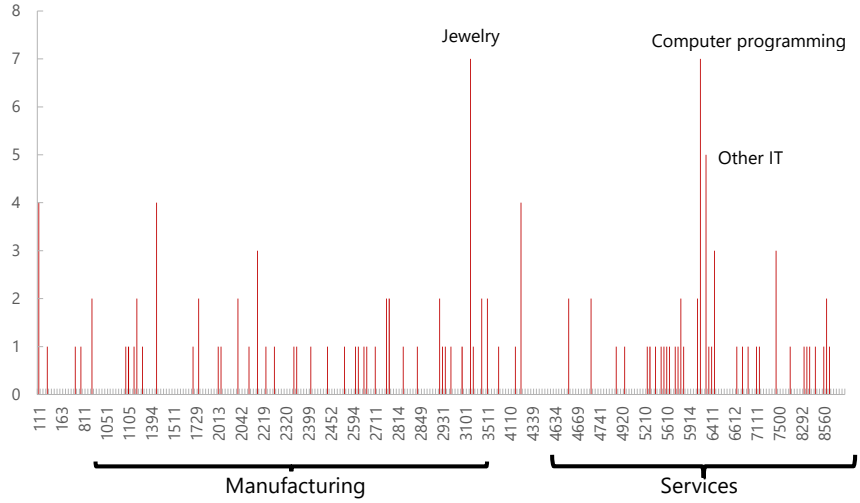
These strong Indian performers tend to be large firms (Figure 12). Three quarters of the Indian firms operating at the frontier have assets greater than $100 million whereas only half of the Indian firms not at the frontier have such level of assets. They are also slightly more likely to be foreign owned, with 10 percent of the Indian firms at the frontier being foreign owned compared to 7 percent for non-frontier Indian firms. This correlation is in line with previous literature that has found that FDI can increase productivity (Smarzynska Javorcik, 2004; Zhao and Zhang, 2010: Li and Tanna, 2019). The success of these Indian firms stresses the importance of removing obstacles preventing firms to grow and fostering foreign direct investment. In addition, the presence of these strong performers across industries is consistent with India's increasing diversification and complexity of exports (Nageswaran and Unnikrishnan, 2023; Harvard's Growth Lab, 2023).

Figure 10. Sales per Employee for Indian Firms
(Percent of the frontier)



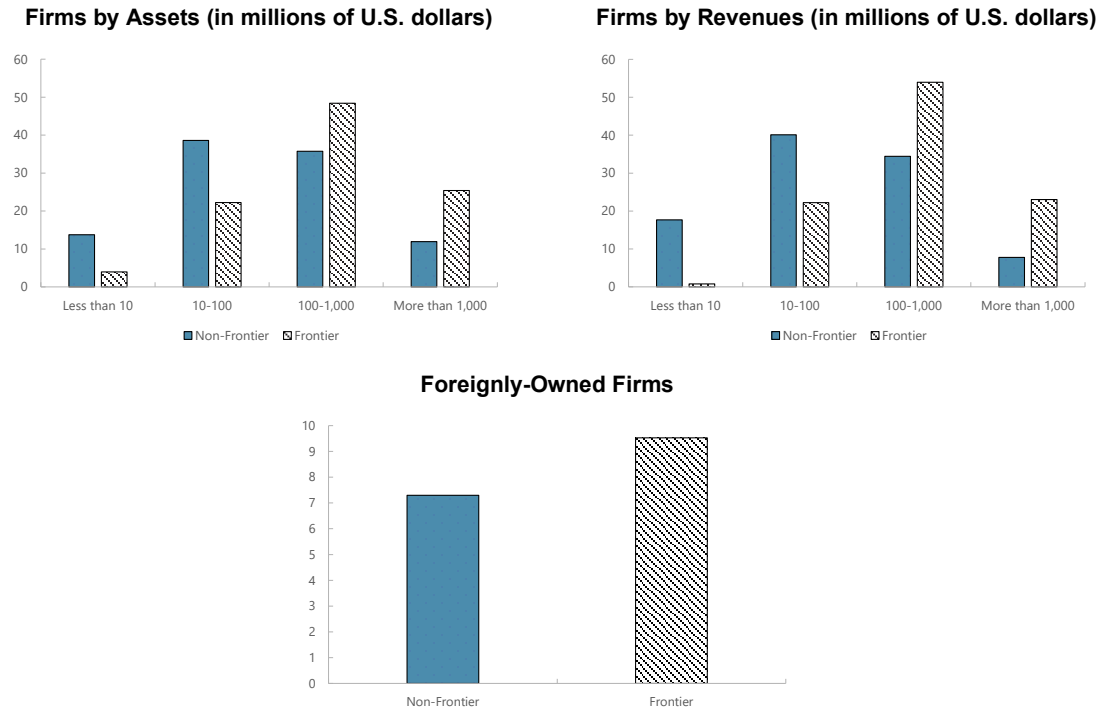
Source: ORBIS and IMF staff estimates.
Notes: The analysis uses all the firms with sales and employment data for at least one year over the past five years and with more than 20 employees. Frontier is defined at the industry level as the 95th percentile for non-Indian firms.

Figure 11. Number of Indian Firms at the Technological Frontier by Industry



Source: ORBIS and IMF staff estimates.
Notes: The analysis uses all the firms with sales and employment data for at least one year over the past five years and with more than 20 employees. Frontier is defined at the industry level as the 95th percentile for non-Indian firms.

Figure 12. Frontier and Non-Frontier Indian Firms by Characteristic
(Share of firms, in percent)



Source: ORBIS and IMF staff estimates.
Notes: The analysis uses all the firms with sales and employment data for at least one year over the past five years and with more than 20 employees. Frontier is defined at the industry level as the 95th percentile for non-Indian firms.

Employment Needs and Impact on Growth

Methodology

India's growing population implies that it needs to create a large number of jobs in the coming years. Estimates of the number of jobs needed vary according to the underlying assumptions. For example, McKinsey (2020) puts the number of non-farm jobs needed by 2030 at 90-145 million while Mody (2023) estimate 200 million by 2033. In this section we calculate the number of jobs needed from 2023 to 2050 accounting for rises in population, potential changes in labor force participation rates, and government job schemes.

We use data from India's Periodic Labour Force Survey (PLFS) and the United Nations population projections as the basis for our estimation. According to the PLFS, the working age population (defined as 15 years and older) stood at just over 1 billion in 2022, of which 50 percent were working (the labor force participation rate was 53 percent, and the unemployment rate was 5.7 percent).[13] The UN projects that by 2050 India's working age population will reach 1.337 billion. With this underlying data, we estimate the number of jobs needed as follows:

[13] Based on current weekly status and aggregating for the calendar year. The unemployment rate based on usual status was 3.6 percent in 2022. Usual status is determined based on principal and subsidiary status.

- *Estimate the lower bound of the number of jobs needed in 2022*: We assume that India was at full employment at its 2022 unemployment rate, meaning that the number of individuals who are unemployed are not counted in the missing jobs total.[14]
- *Estimate the upper bound of the number of jobs needed in 2022:* For our upper bound estimate, we consider the number of jobs needed if the labor force participation was higher. Specifically, we consider a LFPR of 60 percent which was the LFPR in 2005 and is approximately the average LFPR across the G20 emerging market economies.[15] We believe these two benchmarks are reasonable assumptions for approximately where India's LFPR should be and assume the difference between the current LFPR and this target are discouraged workers. Under these assumptions, we estimate that there were 80 million missing jobs in 2022.
- *Estimate the number of jobs needed in 2030:* We assume that working age population grows at the rate projected by the UN population, who estimate there will be 1,169 million Indians 15 years and older in 2030. We further assume that the unemployment rate of 5.7 percent remains constant, given our earlier assumption that this is the natural rate of unemployment. We estimate an upper and lower bound of jobs needed based on the current and targeted LFPR, as described above. With these assumptions, the lower bound estimate of jobs needed is 60 million and the upper bound estimate is 148 million.
- *Estimate the number of jobs needed in 2050:* Under the same assumptions as our 2030 projections, with an underlying working age population assumption of 1,337 million, we estimate again a lower and upper bound of jobs needed based on the two LFPR measures. The lower bound estimate of jobs needed is 83 million and the upper bound estimate is 96 million.
- *Finally, we sum the estimates from 2022-2050.* This gives us a lower bound estimate of 143 million jobs needed and an upper bound estimate of 324 million.[16]

Finally, we conduct a simple counterfactual exercise on India's aggregate growth decomposition to see what would happen to growth if labor became a more important contributor. To do this, we start with our baseline growth decomposition, which is based on the production-function approach using India KLEMS data at the industry level (with a total of 27 industries). We assume this baseline growth and its decomposition is the average contribution of each component over the 2010-19 period. This implies a growth rate of 6.2 percent with the contribution from employment 1.1 percentage points, from labor quality 0.2 percentage points, from capital stock 3.8 percentage points, from capital composition 0.4 percentage points, and from total factor productivity

[14] It may be the case that some workers in the MNREGA government work guarantee scheme would prefer to take an alternative job (either with more hours, full time, or formal) if it were available. In which case these workers could be considered as underemployed and should be counted in the baseline for the number of jobs needed. However, based on the PLFS it is not possible to determine which share of MNREGA workers are underemployed and which have a preference for MNREGA work (for instance, if they are otherwise employed in the agriculture sector and join MNREGA only during off-seasons). As such, we abstract from these workers in the calculation of jobs needed.

[15] The LFPR in 2005 was based on the Employment Unemployment Survey, and thus not strictly comparable to the PLFS rate.

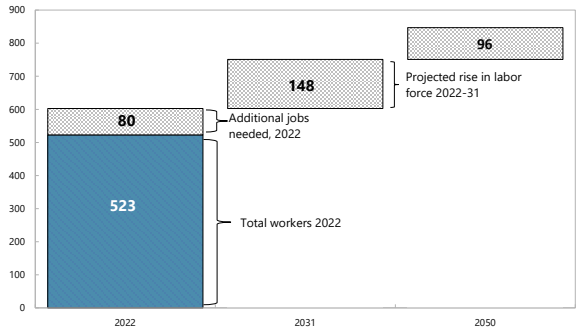
[16] We have also performed the calculations using population projection data from the National Commission on Population in India. This cites the Indian population at 1,363 million in 2020, with 1,013 million 15 years and older. It projects a population of 1,522 million in 2036, of which 1,216 million will be 15 years and older. Using the same methodology for the upper and lower bound assumptions, and assuming a 5.7 percent unemployment rate in 2036, we estimate a range of 101 to 193 million jobs need to be created between 2020-2036. We excluded from these totals the 32 million jobs that we would categorize as missing in 2020 due to the COVID-19 pandemic (that is, the difference in the number of workers under the actual 9 percent unemployment and our baseline assumption of a 5.7 percent unemployment rate and the difference in the LFPR in 2020 of 51 percent with our baseline assumption of 53 percent). This is equivalent to between 6 to 12 million jobs per year.

0.7 percentage points. We then conduct two counterfactual scenarios where labor plays an increasing role in output. In the first scenario, we fix the total number of workers in the economy and assume that 5 percent of the workforce shifts from agriculture to construction and the ten services sub-sectors in the KLEMS data, in equal proportions (we assume all workers find jobs). We then estimate the impact that this increase in employment in services and construction sectors would have on gross value added (GVA) based on the historical elasticity of the growth of GVA to employment growth, which we estimate using ordinary least squares and data from 2010-19 for each aggregate sector. We assume agriculture workers are replaced by machinery and therefore value added does not decline in the sector and labor productivity rises. We then calculate the labor income for each sub-sector based on the estimated GVA growth rate and the 2010-19 average labor share of income for each sub-sector. Finally, we follow the methodology of India KLEMS using the Tornquist aggregation to calculate the new aggregate employment contribution to growth from the rise in employment in the construction and services sub-sectors (see Chattopadhyay, Nath, Sengupta and Joshi (2023) for details). In the second scenario we take the same approach, but instead assume 5 percent of the workforce shifts from agriculture to the 13 manufacturing sub-sectors, and again all workers find jobs.

Results

As previously described, we assume India was at fully employment in 2022 and thus there is no need to create additional jobs. This is our lower-bound estimate. We add to that the number of workers estimated to be discouraged, which we measure as the difference in LFPR between 2005 and 2022 (or, equivalently the difference in LFPR between the G20 emerging market average and India). This is an additional 80 million to the missing jobs in 2022, giving us a range of 0 to 80 million missing jobs in 2022 (Figure 13).

Figure 13. Missing Jobs – Upper Bound Estimate
(millions)



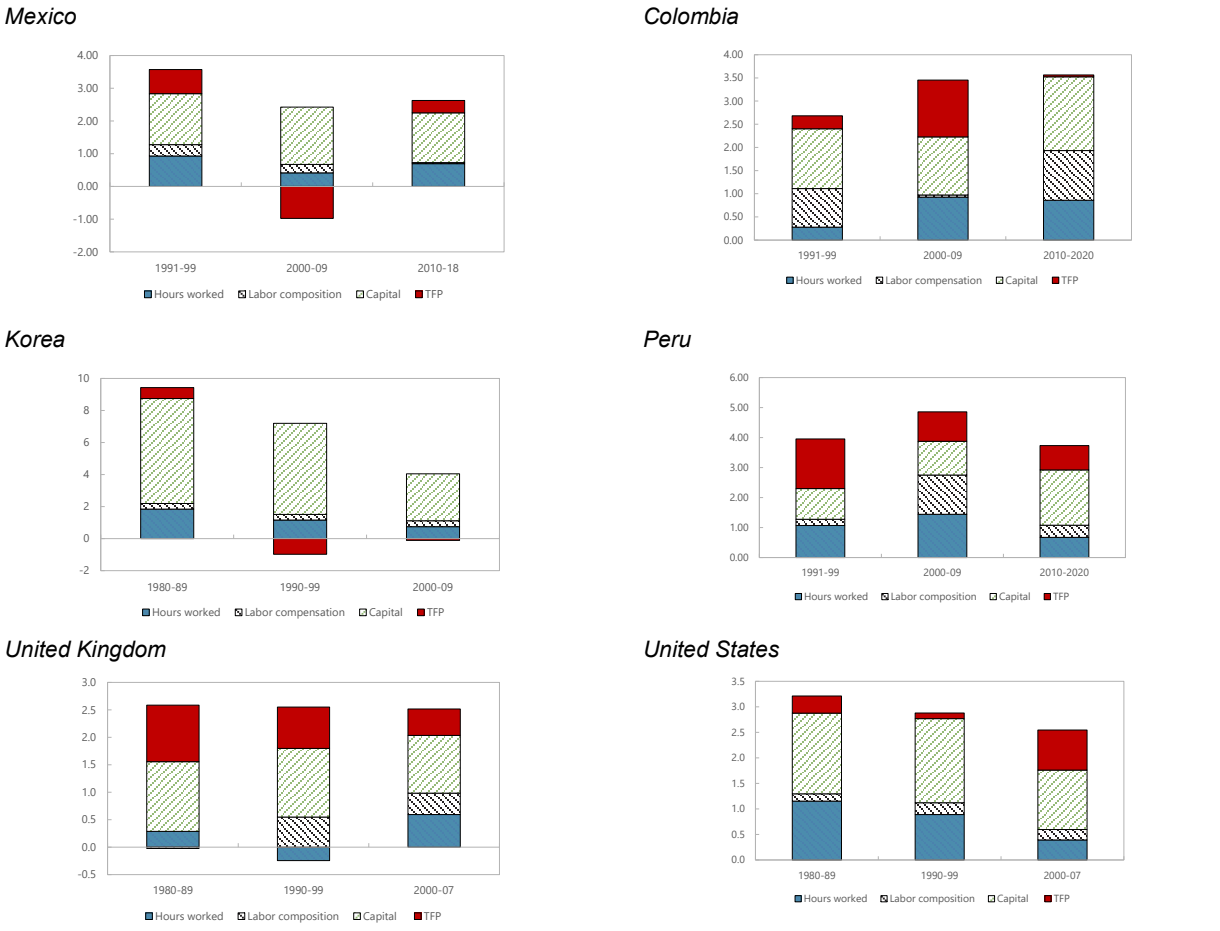
Source: MoSPI, UN and IMF staff calculations.
Note: Numbers cited are rounded to nearest million. Data is based on Current Weekly Status reported in PLFS/NSS.

Using the UN population projections and the upper bound of our assumptions on LFPR (60 percent), we calculate that India will need to create 148 million jobs by 2030 and 324 million by 2050, cumulatively (that is, 80 million today + 148 million by 2031 + 96 million from 2031-2050, or on average 11.6 million jobs per year between 2022 and 2050). If we instead assume a constant LFPR – which would leave a large share of the population, especially women and youth, without meaningful employment – India would need to instead create 60 million jobs by 2030 and 143 million jobs by 2050, cumulatively, or about 5 million per year. Note that these estimates represent the total number of jobs to be created in the economy, not the additional number of jobs to be created over and above the baseline expectation for job creation that is expected to take place with economic growth. Indeed, India created 12 million jobs annually on average between 2012-23, suggesting that the upper bound estimate, which would bring significantly more working age individuals into the labor force, is within reach if India can sustain the GDP growth rates it saw during this period (averaging around 6 percent).

Underemployment is an important problem in India as it is in many emerging market economies, but it is difficult to quantify. Our estimate of missing jobs may be a lower bound if one also considers underemployment.

The latter includes, for example, those working part time but desiring full-time work, those over skilled for their jobs (see the policy option section), those working in government job guarantee schemes (MNREGA) and those working as unpaid family labor. It would also be important to take into consideration the number of non-farm jobs needed to be created. As the Indian economy continues to shift from farm to non-farm work, employment in the categories of unpaid family worker, own account workers, and casual workers will decline, and more regular wage jobs in urban areas will be needed to absorb this extra labor. Finally, another important determinant of the number of jobs India needs to create also depends on outward migration of workers. Skilled migration from India and the contribution of those workers to the India economy through remittances has been rising over time. If a greater share of the working age population emigrates than was projected in the UN population projections used here, then less jobs will need to be created domestically.

Figure 14. Growth Decomposition: Other Emerging Markets and Advanced Economies
(Percent)



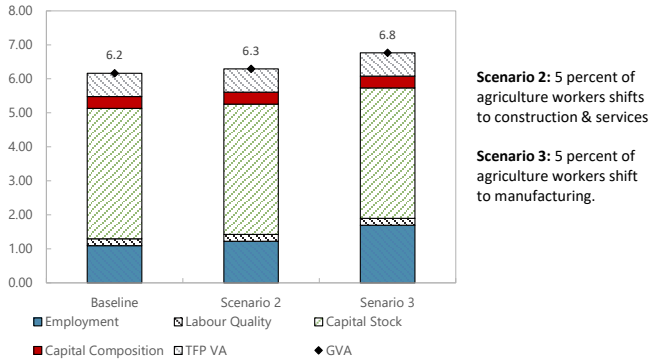
Source: LA KLEMS; Asia KLEMS; EU KLEMS; and IMF staff estimates.
Note: The different KLEMS databases use different measures which attempt to capture labor quality. In the U.S. Mexico, UK, and Peru it is labor composition which is defined as the ratio of labor input to total hours worked. In Korea, and Colombia, it is labor compensation which is based on wage data.

We next put India's employment needs in a macro and international context. To do so, we start by conducting a growth decomposition for emerging market peer countries (Mexico, Colombia, and Peru) and three advanced economies (United States, Korea, and United Kingdom) using EU and World KLEMS data and assuming a Cobb-Douglas production function.[17] This will give us perspective for the role that labor plays in contributing to economic output in India versus other countries.

Because of the potentially large number of missing jobs (Figure 13) and large number of low-productivity jobs (see Figure 3), labor's contribution to growth in India is small relative to other emerging market economies. Emerging market economies tend to have labor inputs as an important driver of growth, as shown in our growth decomposition of peer emerging markets and advanced economies (Figure 14). India's growth recently has however been more capital driven (see Figure 4 and Kotera and Xu, 2023). Like many other emerging markets, India has a large population of low skilled workers. Unlike other emerging markets, however, growth in India is driven in large part by capital and TFP, making it more comparable to advanced economies. By supporting the growth of large, productive sectors like manufacturing much of India's labor could be absorbed—and thereby making labor a more important contributor to growth. Furthermore, stronger education and training would help boost the contribution from labor quality, as has been observed in other emerging markets.

Our simple counterfactual exercise based on growth decompositions attempts to show the impact of an employment rebalancing on growth (Figure 15). As described above, our baseline scenario is the historical average growth decomposition in India. Under the alternative scenarios, we find that polices that allow a shift of labor out of agriculture boost growth by 0.2-0.5 percentage points. In scenario 2, where 5 percent of the workforce currently in the agriculture sector shifts to the construction and services sectors), we find growth would increase modestly to 6.3 percent. This estimate relies on a few important, but probably unrealistic assumptions. The first is that we assume no increase in unemployment. We also do not assume any endogenous impact on TFP growth from this labor shift. The direction of error from this second assumption is ambiguous – on the one hand, more employed workers in sectors with already higher productivity may help boost TFP further; on the other hand, if there is some initial skill mismatch between jobs and workers, even if workers are employed there may be a drag on productivity (at least temporarily). Scenario 3 assumes the manufacturing sector absorbs the full 5 percent of shifting agriculture

Figure 15. Growth Decomposition – Counterfactual Scenarios
(percent)



Source: India KLEMS (RBI); UN; and IMF staff calculations.
Notes: Baseline is the 2010-19 average. All scenarios are relative to the baseline. It is assumed that in scenarios 2 and 3 the shift of workers towards construction, services, and manufacturing maintains the 2010-19 average distribution of workers across sub-sectors. Scenarios assume capital, labor quality, and TFP remain constant, and notably do 'not include the possible endogenous impacts on TFP from labor shifting.

[17] See previous section for details on sources and accessing KLEMS data. As in the previous section, we disregard the most recent observation as it was the first year of the COVID-19 pandemic and it also disproportionately affected the Indian data. Comparator countries are limited by availability of World KLEMS data.

workers. Under this assumption, because manufacturing tends to be both more labor intensive and productive, growth would rise further to 6.7 percent. However, the caveats on unemployment and TFP estimates remain.

To realize these gains would require an increase in supply of jobs in more productive sectors like manufacturing, which itself would require additional reforms. This could include reforms to land use, for promoting larger firm sizes and for hiring of more female workers, among others. Furthermore, because workers cannot shift seamlessly between most occupations, this may involve some extent of re-skilling, which could further boost growth via increases in human capital.

Policies to Advance the Structural Transformation

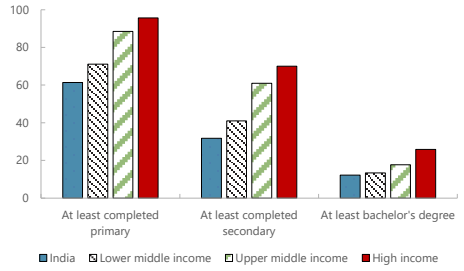
Structural reforms can help India accelerate growth and create high-quality jobs by leveraging its promising demographic dividend. While sometimes the debate has been on whether to promote manufacturing or services in India, that may pose a false dilemma. Instead, India would be better served by advancing structural reforms that would provide the basis for strong, durable, and job-rich growth for all sectors, so that resources shift to wherever they are most productive, be that in manufacturing or services. Without a strong focus on structural reforms, there would be a high risk of missing out on reaping the demographic dividend. In this section, we discuss critical structural reforms needed.[18]

Strengthening education and skilling

Despite significant investments in education and some progress in educational enrollment, India's labor force still has fewer years of formal education than peers and the quality of its education remains low (ASER, 2023).[19] Only 61 percent of the population aged 25 and older have at least completed primary education, compared to an average of 71 percent among lower-middle income peers and 89 percent among upper middle-income countries (Figure 16). This translates into skill shortages in the labor force.

Figure 16. Educational Attainment

(Percent, population aged 25 years or more, most recent observation since 2017)



Source: World Development Indicators and IMF staff estimates.

Skill mismatch is large in India, with most of the labor force having less formal education than what it would be desirable for the current occupation (Figure 17). We use the PLFS microdata and compute the level of skill mismatch in 2021/22 by comparing worker's education with the level of formal education that would be

[18] IMF (2023) reflects on the appropriate sequencing of structural reforms.

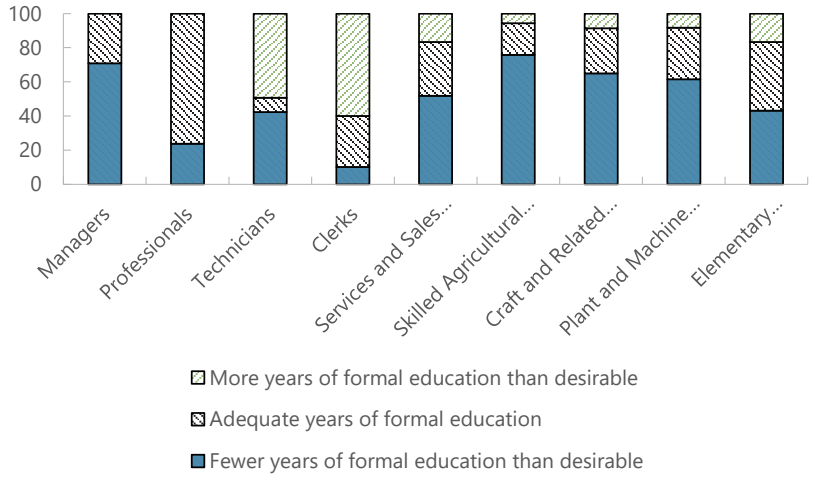
[19] The share of India's population aged 25 years or more who have at least completed primary education has increased from 51.4 percent in 2011 to 61.4 percent in 2020. The share of population with completed secondary education also rose from 26.9 percent to 31.7 percent between 2011 and 2020.

desirable given their primary occupation as proposed by ILO's Education and Mismatch Indicators methodology (ILO, 2023). We find that three quarters of India's skilled agricultural workers have fewer years of formal education than desirable because they have not completed primary education. Over 60 percent of craft and related workers and plant and machine operators and assemblers and 52 percent of services and sales workers have similarly had too few years of formal schooling. There are also some pockets of overeducation with workers having more years of formal education than what would be desirable for their occupation. This is the case for clerks and technicians, and appears particularly prevalent in Chandigarh, Puduchery, Andaman & N. Island, Haryana, and Delhi.

The Indian authorities are working on addressing these challenges and strengthening education and skilling. The 2020 National Education Policy aims to revamp the education system towards meeting their aspirational goals for the 21st century (GoI, 2020). The authorities are also working on a dynamic, industry-centric, and forward-looking skilling ecosystem, including through technologically-equipped Industrial Training Institutes with a combined annual enrollment of 1.24 million students, Technical and Vocational Education and Training integration in schools and higher education institutes, apprenticeship for 740 thousand trainees, industry-aligned short-term training, and catalyzing entrepreneurship. They have launched Skill India Digital as a platform for skilling and job matching and have designed courses for new skills such as coding, AI, robotics, mechatronics, IOT, 3D printing, and drones piloting and maintenance. Further efforts in this area can ensure that Indian workers are well equipped to meet the demands of the labor market. Facilitating migration would also help address skill mismatch around the country.

Figure 17. Worker's Skill Mismatch by Occupation

(percent)



Source: PLFS and IMF staff estimates.

Notes: A worker is defined to have few/more years of formal education than desirable if their education level is lower/greater than usually required for their primary occupation as per the ILO's Education and Mismatch Indicators methodology. Skill mismatch is determined by using ILO's Education and Mismatch Indicators methodology (ILO, 2023) on employment and occupation data by worker from the PLFS. For instance, a worker employed in an elementary occupation is considered to have adequate years of formal education if s/he has completed primary education and is considered to have more/fewer years than desirable if s/he has more/fewer years of formal education than completed primary.

Advancing labor market reforms

India approved four new labor codes at the federal level, which streamline significantly labor regulations in the country. However, implementation of these reforms has not been completed yet as notification of the rules by the Centre and state governments is still pending. Evidence shows that in India, these strict labor market regulations have contributed to a misallocation of labor (Mohommad and others, 2021; Besley and Burguess, 2004; Dougherty and others, 2014). Furthermore, loosening restrictive employment protection legislation would lead to an increase in total employment over time (including female employment), though it may briefly cause a decline in employment during the initial shift of labor across sectors or jobs (Agarwal and others, 2022). As such, working with states to accelerate the reform momentum in this area would be essential to further enhance labor market flexibility while still providing adequate protection for workers.

Fostering trade integration

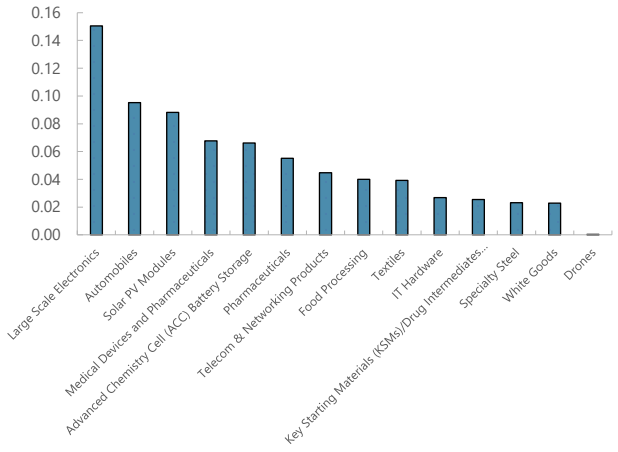
Removing trade barriers remains a key priority to further advance trade integration and boost productivity, labor market outcomes, and ultimately, growth (Salgado and Anand, 2022). The authorities are making steady progress in negotiating new bilateral trade agreements that would open new markets for Indian exports, but tariff and non-tariff import and export restrictions remain high and extensive. Removing trade restrictions would subject Indian producers to healthy competition that would help them move closer to the technological frontier (Dabla-Norris and others, 2023, Topalova and Khandelwal, 2020) and provide for better allocation of resources.

Removing red tape and other obstacles to private sector growth

The authorities' efforts to remove bureaucratic inefficiencies and improve the business climate are supported by their digitalization push. For example, the launch of the Udyam Portal aims to streamline registration for MSMEs. In addition, their Production Linked Incentive schemes (PLIs) are being perceived by market participants as a signal of the government's intention to work with the private sector to remove obstacles holding back investments and employment. PLIs provide subsidies to firms that meet investment and employment targets in specific sectors. The multiyear cost of the existing PLIs assuming full implementation is relatively low at 0.72 percent of FY 2022/23 GDP and the authorities estimate they may help create up to 6 million jobs (Figure 18; GoI, 2022). While it is too early to assess these schemes and the data is not available yet, targeted and temporary industrial policy could help address market failures. At the same time, however, it would be important to subject these schemes to rigorous cost benefit analysis, to keep them time bound, and to ensure competition is fostered. Importantly, PLIs do not replace broader market reforms, which should continue to be prioritized.

Figure 18. Fiscal Cost of Production-Linked Schemes

(Percent of 2022/23 GDP)



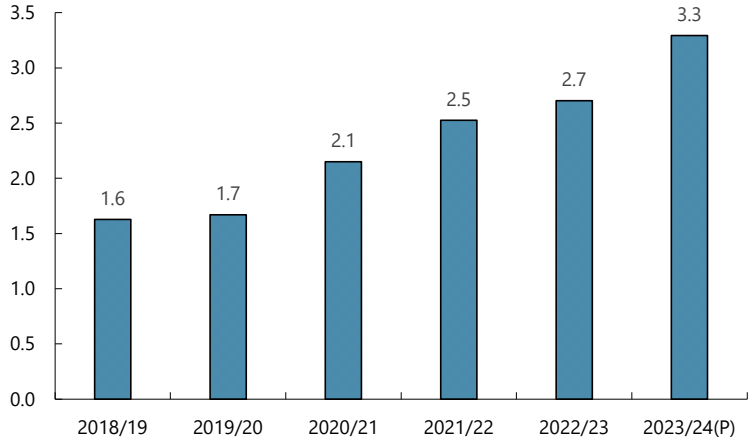
Source: Indian authorities and IMF staff estimates.

Continuing the public investment push

Efforts by the Union government are expected to raise public investment by the center to 3.3 percent of GDP in 2023/24, twice as much as in 2018/19 (Figure 19). Stronger physical public infrastructure, together with India's world class digital public infrastructure, will help increase the productivity of the private sector.

Figure 19. Central Government Public Investment

(Percent of GDP)



Source: Indian authorities and IMF staff estimates.
Notes: Net acquisition of nonfinancial assets by the central government. 2023/24(P) reflects IMF staff projections.

Strengthening the social safety net

A more flexible and targeted social safety net can help support the structural transformation of India's economy and facilitate migration of workers from rural to urban areas in search of better paying jobs (Alonso and others, 2023). For example, the rollout of "One Nation, One Ration Card" during the COVID 19 pandemic allowed migrant workers to benefit from their food subsidies wherever they were at the time.

Facilitating access to credit

Channeling credit to the most productive firms and sectors of the economy is key to foster growth and employment. The health of the financial and corporate sector has improved significantly over the last few years, but continued nimble and vigilant supervision would be needed to ensure healthy credit growth, supporting a rise in private investment (Schipke and others. 2023). In addition, facilitating the exit of non-viable firms and promoting asset resolution remain core priorities.

Conclusion

India's strong growth in recent decades has lifted millions of people out of poverty and transformed the economy from mainly rural-based towards an important global, services-led economy. The transformation is not yet complete and important reforms will be needed to further lift India towards upper middle income status.

First, India has faced relatively weak productivity. In an analysis of India's movement towards the global technological frontier, as measured by labor productivity and TFP, we find limited progress in key industries, including agriculture, construction, and trade. At the same time, certain services sectors have performed relatively better. The strong performance in most industries, however, is supported by only a small number of firms at the cutting edge.

Second, India needs to create sufficient jobs to meet the demands of its growing population. We estimate that as the population continues to grow, India will need to create up to an additional 324 million jobs by 2050. This excludes accounting for underemployment, which remains an important problem. We further find policies that would induce a shift of workers from relatively low productivity sectors to those with higher productivity could boost GDP growth by 0.2-0.5 percentage points.

In order to realize gains from its demographic dividend, India needs to implement wide ranging structural reforms. To improve labor productivity, employment, and labor market function will require strengthening education and skilling, advancing labor market reforms and strengthening social safety nets. To boost business creation, productivity, and investment will require removing red tape and obstacles to private sector growth, facilitating access to credit, and fostering trade integration. A continued publish investment push will also help support lowering logistics costs and crowding in private investment.

Annex I. Mapping of Industries in KLEMS Databases

In this annex, we describe how we map industries across the two KLEMS databases. The first two columns of Table A1 show our industry names and codes. The last two columns show the specific industries in the RBI and EU KLEMS datasets that correspond to each of our industries. While acknowledging that the mapping is not perfect, a more precise mapping is not possible due to lack of more granular data and methodological differences. For example, study industry "Other Services" includes "Real Estate Activities" in the RBI KLEMS database (RBI, 2023), but "Real estate activities" in the EU KLEMS incorporates imputed rents of owner-occupied dwellings, which the Indian data does not cover. Given the large size of this imputation, we decide to drop it from the analysis, even when we cannot drop the "Real Estate Activities" component from "Other Services" in the RBI KLEMS database.

Table A1. Mapping of Industries Across KLEMS Databases

Code	Industry	RBI KLEMS Industries	EU KLEMS Industries
A	Agriculture	Agriculture, Hunting, Forestry and Fishing	Agriculture, forestry and fishing
B	Mining	Mining and Quarrying	Mining and quarrying
C01	Food	Food Products, Beverages and Tobacco	Manufacture of food products; beverages and tobacco products
C02	Textiles	Textiles, Textile Products, Leather and Footwear	Manufacture of textiles, wearing apparel, leather and related products
C03	Wood	Wood and Products of wood Pulp, Paper,Paper products,Printing and Publishing	Manufacture of wood, paper, printing and reproduction
C04	Petroleum	Coke, Refined Petroleum Products and Nuclear fuel	Manufacture of coke and refined petroleum products
C05	Chemicals	Chemicals and Chemical Products	Manufacture of chemicals and chemical products Manufacture of basic pharmaceutical products and pharmaceutical preparations
C06	Rubber	Rubber and Plastic Products Other Non-Metallic Mineral Products	Manufacture of rubber and plastic products and other non-metallic mineral products
C07	Metals	Basic Metals and Fabricated Metal Products	Manufacture of basic metals and fabricated metal products, except machinery and equipment
C08	Electrical	Electrical and Optical Equipment	Manufacture of computer, electronic and optical products Manufacture of electrical equipment
C09	Machinery	Machinery, nec.	Manufacture of machinery and equipment n.e.c.
C10	Vehicles	Transport Equipment	Manufacture of motor vehicles, trailers, semi-trailers and of other transport equipment
C11	Other Manufacturing	Manufacturing, nec; recycling	Manufacture of furniture; jewellery, musical instruments, toys; repair and installation of machinery and equipment
D	Utilities	Electricity, Gas and Water Supply	Electricity, gas, steam and air conditioning supply Water supply; sewerage, waste management and remediation activities
F	Construction	Construction	Construction
G	Trade	Trade	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	Transport	Transport and Storage	Land transport and transport via pipelines Water transport Air transport Warehousing and support activities for transportation
I	Hotels	Hotels and Restaurants	Accommodation and food service activities
J	Information	Post and Telecommunication	Postal and courier activities Information and communication
K	Financial	Financial Services	Financial and insurance activities
M	Business	Business Service	Professional, scientific and technical activities Administrative and support service activities
O	Government	Public Administration and Defense; Compulsory Social Security	Public administration and defence; compulsory social security
P	Education	Education	Education
Q	Health	Health and Social Work	Human health and social work activities
R	Other Services	Other Services	Arts, entertainment and recreation Other service activities

Source: IMF staff estimates.

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