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SECTORAL AND SKILL CONTRIBUTIONS TO LABOR PRODUCTIVITY IN ASIA

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Abstract

Using a decomposition approach on data collected by the Asian Productivity Organization (APO) as well as World Input-Output data, we show that in most Asian economies the services sector makes the largest contribution to labor productivity. Furthermore, we find evidence of a major reallocation of labor from agriculture directly to services, bypassing the manufacturing sector. This finding challenges the traditional view that countries in their economic development need to have their workforce employed first in manufacturing before switching to services. Lastly, the paper studies how different skill levels contribute to labor productivity growth. We find that high-skilled workers have contributed most to overall labor productivity growth in developing Asia. In services, high-skilled workers have mainly driven labor productivity, indicating that upskilling and training are instrumental in services-led development.

Keywords: labor productivity, manufacturing, services, skills

JEL Classification: O11, J21

Contents

1. INTRODUCTION

Economic development has progressed rapidly in Asia in recent decades, moving many people out of subsistence agriculture into more productive jobs in manufacturing and services. However, there have been worries in many countries in Asia as to whether enough jobs are being created to absorb new workers entering the labor market or existing workers moving across sectors. In India, it is estimated that the labor force increases by over 10 million every year. The challenge is how to bring these workers into jobs, and more particularly into productive jobs.

It is a well-established fact that in today's advanced economies a large number of jobs were created in the manufacturing sector during their rapid economic development. Typically, around a quarter to a third of all jobs were found in manufacturing industries during the peak in manufacturing. In contrast, in many Asian economies the number of jobs in the manufacturing sector reached its peak well below that level. Dani Rodrik (2013) calls this phenomenon "premature deindustrialization." Technological progress and other factors, such as trade, limit the potential of the manufacturing sector to create jobs. As a consequence, many developing countries cannot rely any longer on the manufacturing sector as a source of new and productive jobs.

In many lower-income developing countries in Asia, employment in the agricultural sector is continuously shrinking, but the sector still employs a considerable share of workers. For example, 43% of employment in India was in agriculture in 2017, while in Indonesia it reached 31% and in the Philippines 26% (World Bank, WDI). However, the productivity of these workers is typically low. Mechanization and land reform will further reduce the demand for labor. The best bet to create new jobs is therefore in the services sector. Already today, the services sector is outpacing the manufacturing sector in terms of share of economic activity as well as growth in many Asian economies. Overall, services contribute to about 60% of the region's economic activity and employ 45.5% of labor (World Bank, WDI).

As services are continuously replacing jobs in agriculture and manufacturing, the question is what growth perspective this structural transformation offers. The main obstacle when analyzing this question is that we still lack a sound understanding of the productivity of the services sector in developing countries. This chapter therefore aims to provide new evidence on the labor productivity of the services sector in developing Asia. We exploit the data provided by the Asian Productivity Organization (APO) as well as World Input-Output data for the last few years to estimate the contribution of services to aggregate labor productivity.

Our main results show that in many economies services already make a substantial contribution to labor productivity growth. Furthermore, we evidence that a major reallocation of labor directly from agriculture to services is taking place, bypassing the manufacturing sector. This finding challenges the traditional view that countries in their economic development need to have their workforce employed first in manufacturing before switching to services. Lastly, we study how different skill levels contribute to productivity growth. Our findings suggest that medium- to high-skilled workers have contributed most to labor productivity growth in general as well as in services in particular.

Our contribution to the literature is that we provide the first detailed analysis on services labor productivity for a large number of Asian economies. In 2018, the IMF (2018) published new estimates on labor productivity in services for emerging and advanced economies. However, most Asian economies still do not fall within either

category, as they are still in an early stage of structural transformation. In this context, having a better understanding of the role of services in their development gives us important clues that can feed the policy discussion and enable the design of better development strategies.

The second contribution is to extend the methodology developed by the IMF in two ways. First, we dissect the contribution of services in a more holistic way by studying the contribution of each industry in aggregate labor productivity growth. Second, we provide a detailed analysis of productivity growth accounting by categorizing labor into low-, medium-, and high-skilled labor.

The chapter is divided into four parts. We first describe the data used in our analysis. We then decompose the productivity growth following two complementary methods. Before concluding, we analyze the role of different skill levels to explain productivity growth.

2. DATA AND METHODOLOGY

2.1 Data

In this chapter we exploit data from two sources. First, the database provided by the Asian Productivity Organization (APO). It contains the contributions of nine sectors to the gross domestic product (GDP). The database holds the employment shares (number of jobs) in every sector. The nine sectors correspond to EU KLEMS[1] and are:

I. Agriculture, hunting, forestry, and fishing
II. Mining and quarrying
III. Manufacturing
IV. Electricity, gas, and water supply
V. Construction
VI. Retail
VII. Transport and storage
VIII. Financial intermediation, real estate, renting, and business
IX. Other services

The data are based on national accounts and made comparable by the APO in a joint research effort together with the Keio Economic Observatory (KEO) at Keio University, Tokyo. The System of National Accounts 2008 (2008 SNA), which is the latest version of the international statistical standard for national accounts developed by the United Nations (2009), has been introduced in 21 economies in Asia. Some economies, such as Cambodia, the Lao PDR, and Nepal, are still working with earlier versions of national accounts, which makes data harmonization necessary for comparative productivity analyses. More details about the GDP harmonization process, including capitalization of software and research and development (R&D), can be found in the APO Productivity Databook (2018).

[1] The EU KLEMS project started in the late 1990s with the objective of developing new productivity measures at the industry level for the European Union (EU). “KLEMS” refers to the decomposition of output growth into contributing factor inputs: capital (K), labor (L), energy (E), materials (M), and service inputs (S).

The APO database covers around 30 economies in the Asia and the Pacific region in the period from 1970 to 2015. For our subsequent analysis, we only use 19 economies. We decided to drop Australia and New Zealand as they do not fall under the category of developing or emerging economies in the Asia and the Pacific region. We also ignored several small economies because their data were incomplete during the period that we cover.

Our second data source is the World Input-Output Database (WIOD). We use the World Input-Output Tables (July 2014 version), which cover 40 economies and 35 sectors (Timmer et al. 2015). We use the 2014 version, which divides the economy into 35 sectors and covers the years 1995 to 2009. The industry classification follows the International Standard Industrial Classification (ISIC) revision 3[2]. The database contains industry-level data on employment, skill levels, capital stocks, gross output, and value added at current and constant prices. For some economies, the data run up to 2011, but for the sake of comparability, we only use data from 1995 to 2009.

We use the APO data to estimate the contribution of each sector to aggregate the labor productivity in Asia in Sections 3 and 4. Since in the WIOD database we have information on skill levels, we can gauge the role of skills and skill distribution in aggregate labor productivity. This will be our analysis in Part 5.

2.2 Methodology

The main objective of this paper is to estimate the contribution of services to labor productivity growth. We therefore apply decomposition methods that separate the growth of aggregate productivity into sectoral contributions.

First, we follow Fernández and Palazuelos (2018), who use the following approach:

$$q = \sum_{j=1}^{N} \left[q_j \frac{V_j}{V} + e_j \left(\frac{V_j}{V} - \frac{E_j}{E} \right) \right]$$

wherein q stands for the growth rate of aggregate productivity, q_j is the productivity growth of sector j, and e_j measures the employment growth of sector j. V captures the aggregate value added (VA) and Vj is the value added in sector j. E captures the total employment and Ej the employment in sector j.

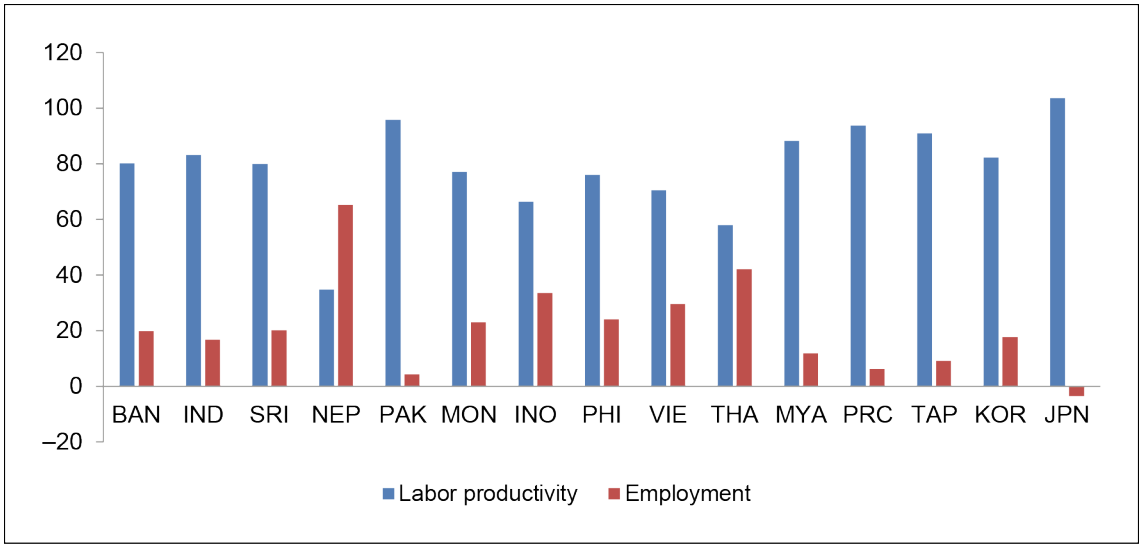
The growth in productivity is the aggregation of productivity changes across N sectors in the economy. In each sector j the change in productivity can have two sources: first, the sector productivity growth rate weighted by the contribution of the sector to total value added; second, the change in employment of sector j weighted by the difference in the contribution of sector j and the employment in the whole economy. If that difference is positive, the productivity level of the sector is higher than the average for the entire economy. This then implies that an increase in employment in this sector makes a positive contribution to aggregate productivity growth.

[2] Please refer to the Appendix for the list of industries and industry categories.

3. RESULTS: DECOMPOSITION OF AGGREGATE LABOR PRODUCTIVITY GROWTH

Applying the method of Fernández and Palazuelos (2018) for the selected Asian economies, we obtain the results summarized in Figure 1. Figure 1 shows the contribution of both labor productivity growth and employment growth to aggregate labor productivity across 15 Asian economies from 1990 to 2015. We see that in all economies, except Nepal, the increase in labor productivity was higher than the increase due to a reallocation of labor across sectors. The strongest increase in labor productivity is observed in Japan. Other higher performers with labor productivity growth rates above 80% are India; Pakistan; Malaysia; the People's Republic of China (PRC), Taipei,China, and the Republic of Korea. Overall, there seems to be a tendency for more developed economies to experience higher increases in labor productivity and small changes in productivity due to employment changes. In contrast, in the developing economies of Southeast Asia, reallocation of jobs significantly helped to increase productivity. For example, Indonesia, Viet Nam, and Thailand had high rates of productivity growth due to the reallocation of labor across sectors.

Figure 1: Contribution of Labor Productivity Growth and Employment Growth to Aggregate Labor Productivity, 1990–2015
(%)



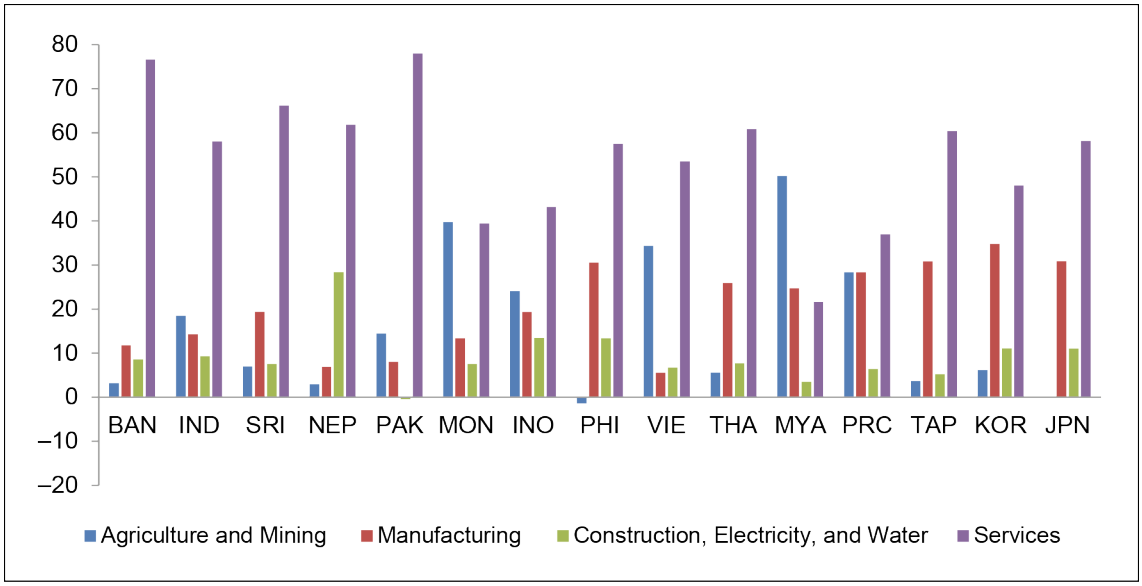
Source: Authors.

More relevant for our paper is the question of the contribution of industry. For this purpose we divide all sectors into four industries: (i) agriculture and mining; (ii) manufacturing; (iii) construction, electricity, and water supply; (iv) services. Services include sectors VI to IX in the EU KLEMS classification, listed above. (As we will see later, within the four services sectors, the productivity can be rather different, but to keep it simple, we first use the division into four industries.)

The results for all 15 economies and the same time period are summarized in Figure 2. As we can easily see, services made the largest contribution to productivity growth in Asia, except for the case of Malaysia and Mongolia. In both cases, the mining sector makes a large contribution to national GDP and has developed strongly over the period covered in our analysis.

The contribution of services to aggregate labor productivity growth was particularly large in South Asia. In the case of Bangladesh and Pakistan, the growth in services' labor productivity accounted for almost 80% of the total productivity growth. In other Asian economies, services also played a significant role. In the Philippines; Viet Nam; Thailand; Taipei,China; and Japan, services growth accounted for more than half of overall productivity growth. This clearly shows that productivity growth in services has been the main source of labor productivity growth in many Asian economies.

Figure 2: Sectoral Contribution to Aggregate Labor Productivity Growth, 1990–2015
(%)

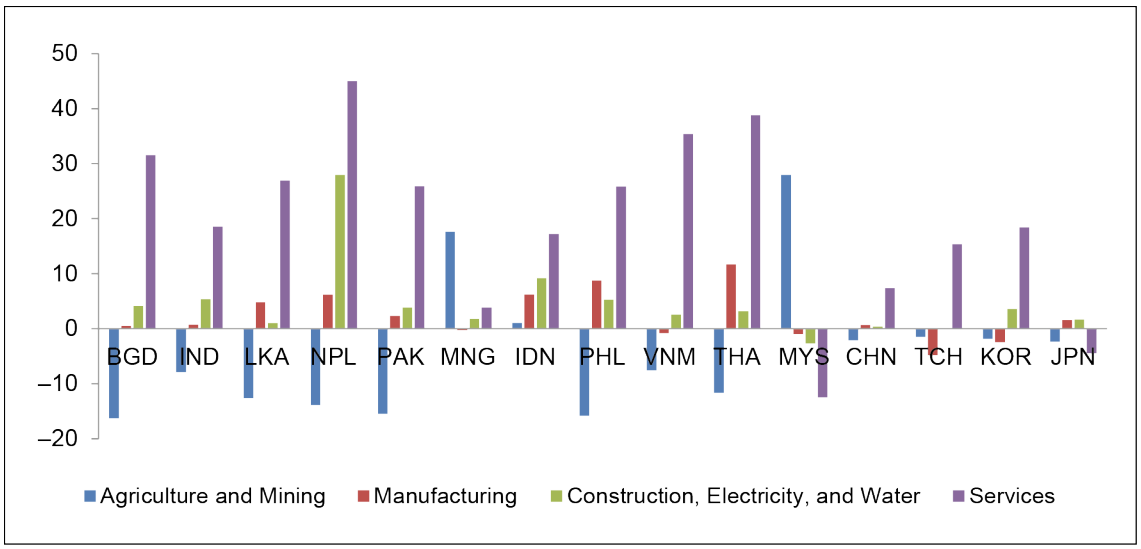


Source: Authors.

Increases in manufacturing productivity were particularly high (above 30%) in the Philippines; Taipei,China; the Republic of Korea, and Japan. Productivity growth in manufacturing was between 20% and 30% in Thailand, Malaysia, and the PRC. It is somehow surprising that the Viet Nam labor productivity growth in manufacturing was small. Equally, in South Asia, the productivity of manufacturing only increased slowly.

Our method above requires separate calculation of the employment component in aggregate labor productivity. In Figure 3 we depict how the employment shares have changed and thereby contributed to aggregate labor productivity. We see that throughout South Asia agriculture and mining witnessed a fall in their labor share contribution, except again for Malaysia and Mongolia with their strong mining sectors. At the same time, the employment component in services increased. In other words, we observe a reallocation of labor away from agriculture and mining towards services. We see a similar pattern in the Philippines, Viet Nam, and Thailand. East Asia behaves somewhat differently. The employment change in the primary sector was negligible. The employment changes in services (except for Japan) were the main drivers of higher aggregate labor productivity. One interpretation could be that the expansion of services was not accompanied by an equal contraction of employment in the primary sector.

Figure 3: Contribution of Employment Component in Aggregate Labor Productivity, 1990–2015
(%)



Source: Authors.

4. INDUSTRIAL STRUCTURE AND AGGREGATE LABOR PRODUCTIVITY IN ASIA

An alternative way to gauge productivity growth is the method proposed by Tang and Wang (2004) and Zhao and Tang (2015):

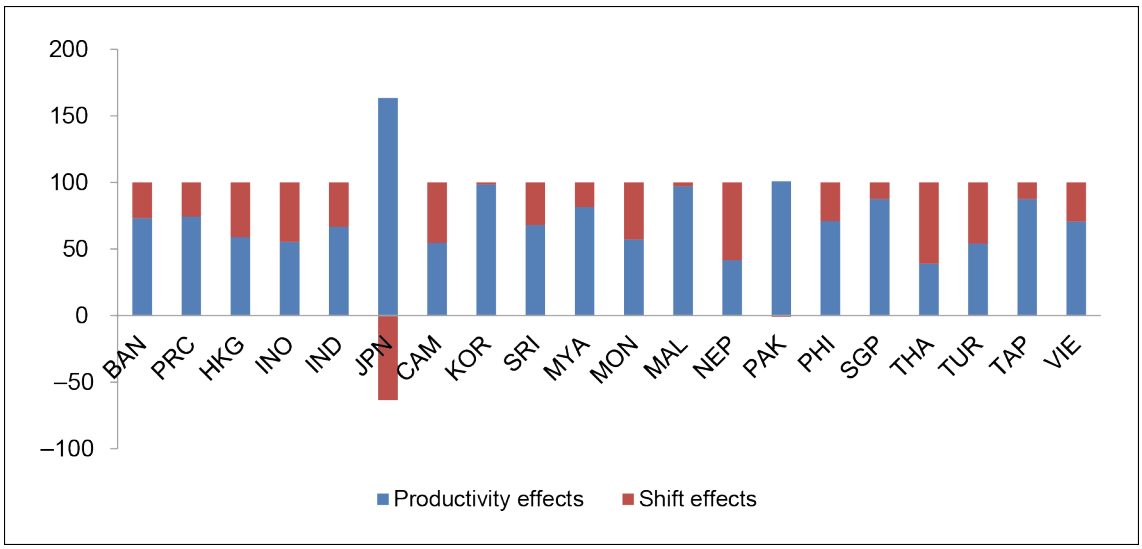
$$\Delta X = \frac{X_t - X_s}{X_s} = \sum_i w_{is}\Delta x_i + \sum_i w_{is}[(1+\Delta x_i)\Delta \tilde{s}_i]$$

wherein w_{is} stands for the nominal value-added share in total GDP, and Δx_i is the labor productivity growth of industry *i* between year t and year t-1. $\Delta \tilde{s}_i$ is the percentage of change in the relative size of industry *i* between year t and year t-1.

The first term captures the industry's contribution to the improvement of labor productivity. It can therefore also be called "pure productivity effect." The second term reflects the change in the economic significance of the industry in terms of employment and the ability to create economic value. It can be labeled "shift effect" as the sum of the shift effects is positive if the economy shifts towards industries with a relatively high value-added share or relatively high labor productivity growth.

The results in Figure 4 show that in all economies, except Japan, the productivity effect and shift effect were both positive. In the case of Japan, the productivity effect was largely positive and indicates that Japanese industry improved its productivity substantially. However, in Japan the economy shifted to less productive sectors and therefore the value of the shift effect became negative. The negative value can be explained by the fact that in Japan we witnessed a shift of labor toward sectors with lower productivity.

Figure 4: Contribution of Productivity Effects and Shift Effects on Aggregate Labor Productivity (From 1990 to 2015)
(%)



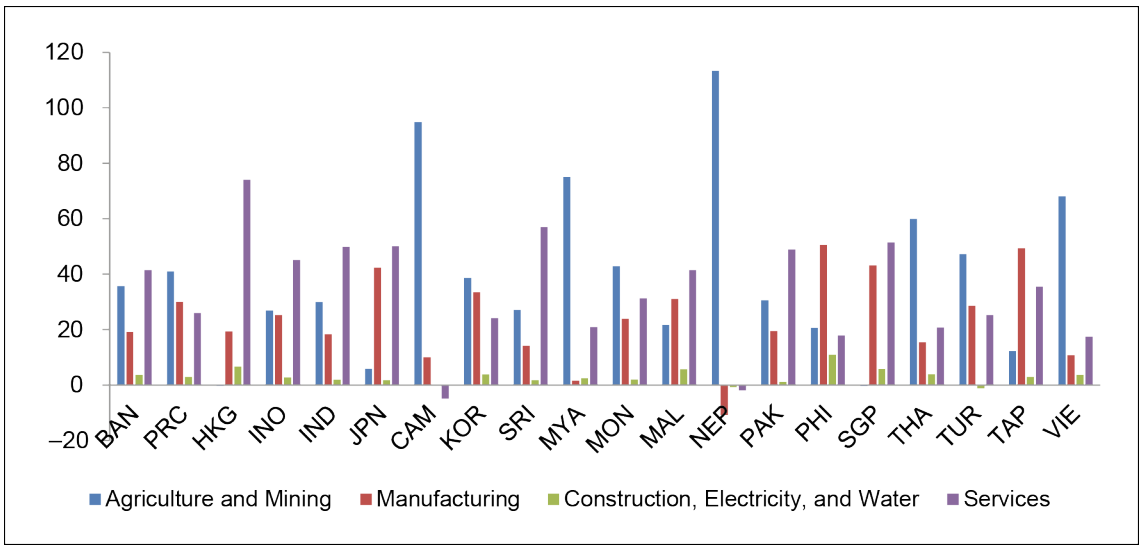
Source: Authors.

In three economies we observe almost no shift effect, but a pure productivity effect, namely in the Republic of Korea, Malaysia, and Pakistan. In these three economies productivity mainly increased thanks to an increased productivity of existing sectors. Almost no shift from low- to high-productivity sectors can be observed. Singapore and Taipei,China also show high levels of the pure productivity effect. On the other end, the cases of Nepal and Thailand stand out. In both economies productivity grew predominately because of the "shift effect." Sectors with relatively high productivity were able to attract labor and therefore boosted the overall productivity of the economy. In all other economies the "pure productivity effect" dominated and the "shift effect" played a relatively smaller role in explaining productivity growth.

When we calculate the sectoral contribution to aggregate labor productivity growth a more nuanced pictures emerges, as depicted in Figure 5. We observe that agriculture contributed to more than 50% of aggregate labor productivity growth in only four economies, namely Cambodia, Nepal, Thailand, and Viet Nam. In nine out of twenty economies, the productivity growth was mainly generated by productivity growth in services. The economy with the highest growth in productivity of services is Hong Kong, China, where almost 74% of productivity growth stems from services, while 50% or higher applies to India, Japan, Sri Lanka, and Singapore. Except for Sri Lanka, it is well-known that these economies have shifted towards the services industries in recent years. It is interesting to see that even in economies with a relatively low per capita income, services have been the main driver of services growth, for example in Bangladesh, Indonesia, and Pakistan.

The contribution of services remained below 20% only in Cambodia, Nepal, the Philippines, and Viet Nam. The case of the Philippines might be explained by the fact that the shift towards a services industry is relatively recent. As we will find out in the next section where we study a shorter and more recent time period, the services sector in the Philippines strongly helped to boost productivity.

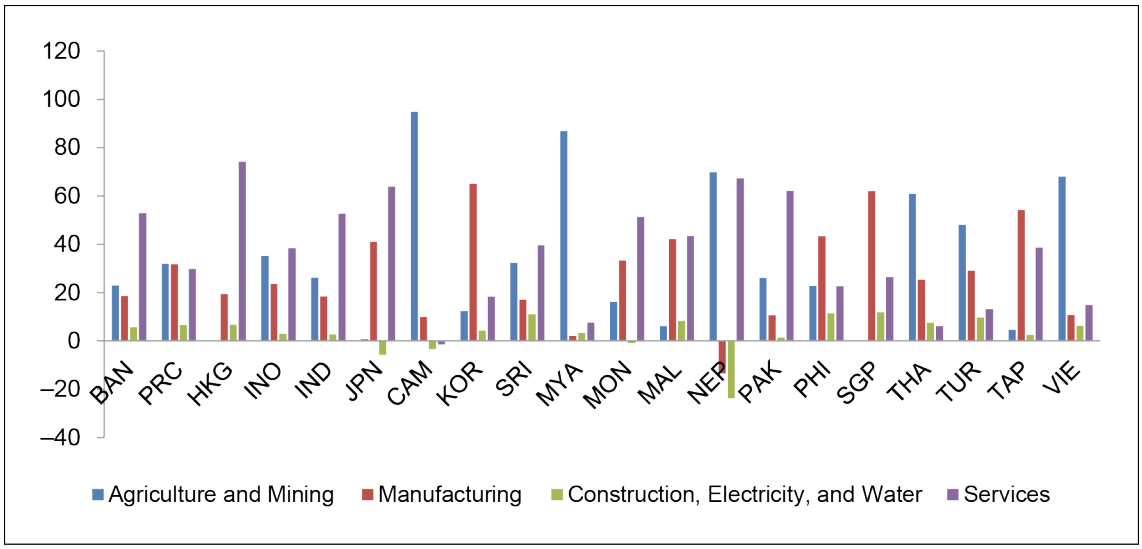
Figure 5: Sectoral Contribution to Aggregate Labor Productivity Growth (from 1970 to 2015)
(%)



Source: Authors.

Figure 6 shows the results when restricting the period to between 1990 and 2015. We can see that overall the contribution of services increased in most economies compared to the longer time period. This indicates that the productivity in services has grown faster in recent years. Comparing Figures 5 and 6, we also notice that the contribution of agriculture has been declining. This again indicates that a structural transformation from agriculture to services-based growth has been happening.

Figure 6: Sectoral Contribution to Aggregate Labor Productivity Growth (from 1990 to 2015)
(%)



Source: Authors.

5. ROLE OF SKILLS AND SKILLS DISTRIBUTION

In the sections above we have seen that services have been one of the major sources of labor productivity growth in Asia. An interesting question to ask is whether this growth was mainly generated by low- or high-skilled workers. Unfortunately, data on the productivity by skill level are not available in the APO database and only for a handful of Asian economies in the WIOD database, namely India; Japan; the PRC; the Republic of Korea; and Taipei,China. As a benchmark, we also include data for the United States.

In Table 1 we list in the first two columns the change in overall labor productivity (across all sectors) as well as in employment between the years 1995 and 2009. We see that labor productivity grew most strongly in the PRC and India, which is intuitive, as both economies were the furthest from the international productivity frontier. In Japan and the United States, the labor productivity increased by 24% and 34%, respectively. The Republic of Korea and Taipei,China lie in between. We can thus observe a trend towards convergence of labor productivity in the six economies included in the sample.

The economy with the highest employment growth is the PRC, whereas Japan saw its labor force shrink by 13%. Interestingly, India, despite its high population growth rate, experienced a relatively modest increase of its labor force of only 13%. One reason might be that the WIOD data are based on formal employment. In India, the overwhelming majority of the workforce is still in the informal sector and only relatively few formal jobs have been added.

Table 1: Labor Productivity Growth, Employment Growth, and Skill Groups (1995 to 2009)

	Labor Productivity Growth	Employment Growth	Low-skilled Workers		Medium- and High-Skilled Workers	
			1995	2009	1995	2009
PRC	192%	28%	72%	62%	27%	37%
India	139%	13%	71%	63%	29%	36%
Japan	24%	–13%	16%	8%	84%	92%
Rep. of Korea	78%	13%	22%	9%	78%	91%
Taipei,China	39%	11%	50%	30%	50%	70%
US	34%	8%	11%	9%	89%	91%

Source: Authors.

The following two columns list the percentage of workers that are classified as low-skilled or high-skilled. In this study, we adopt the skills classification of the WIOD SEAs, which define skills based on educational attainment levels (Erumban et al. 2012). The WIOD SEAs divide skills into three groups: low-skill-level workers have a lower-secondary or second-stage level of basic education; medium-skill-level workers are those with (upper) secondary education and post-secondary nontertiary education; and finally high-skill-level workers are those with tertiary education. In all economies we observe a shift from low-skilled workers to medium- and high-skilled workers over time. As education and vocational training have improved, more and more workers have moved out of the low-skilled category. Interestingly, the PRC and India show very similar patterns. The number of low-skilled workers was above 70% in 1995 and

had fallen by about 10% by 2009. The number of medium- and high-skilled workers increased respectively.

Taipei,China was most successful in raising the skill level of its workers. In 1995, the proportion of low-skilled workers was at 50%, but dropped to 30% in 2009. The Republic of Korea also achieved a rapid increase in its skilled workforce. The number of medium- and high-skilled workers increased from 78% to 91% between 1995 and 2009 and now equals the level of the United States. Japan already enjoyed a highly qualified workforce in 1995, but further pushed up the share of medium- and high skilled workers to 92%.

6. METHODOLOGY

Given the information on the skill levels, we analyze how the labor productivity growth and employment growth differed across four sectors: (i) agriculture and mining; (ii) manufacturing; (iii) electricity supply and construction; and (iv) services. We follow Tang (2016), who proposes a decomposition method to estimate the impact of an improvement in skills and of productivity by skill level on overall productivity. We decompose labor productivity growth as follows:

$$g = \sum_i \left[\bar{\theta}_i(\tilde{s}_i^1 - \tilde{s}_i^0)\right] +$$

$$+ \left\{\sum_i \left[\bar{\phi}_i^L(w_{i,L}^1 - w_{i,L}^0)\right] + \sum_i \left[\bar{\phi}_i^H(w_{i,H}^1 - w_{i,H}^0)\right]\right\}$$

$$+ \sum_i \left[\bar{\varphi}_{i,L}\,(\tilde{q}_{i,L}^1 - \tilde{q}_{i,L}^0)\right] + \sum_i \left[\bar{\varphi}_{i,H}(\tilde{q}_{i,H}^1 - \tilde{q}_{i,H}^0)\right]$$

The three components on the right-hand side reflect four different factors determining the labor productivity growth from year 0 (1995) to 1 (2009). The first term measures the change in industry composition and is called the “industry composition effect.” The second term, consisting of two sub-terms in { }, captures the changes in the skill distribution over time and is called the “skill distribution effect.” Finally, the remaining terms gauge the change in productivity of low-skilled workers (the third term) and medium- and high-skilled workers (the fourth term) from year 0 to 1. They capture an improvement or deterioration in productivity in the two skill groups.

Please note that $\bar{\theta}_i$ is the pseudo average labor productivity:

$$\bar{\theta}_i = \left[\tfrac{1}{2}\left(w_{iL}^1\tilde{q}_{iL}^0 + w_{iL}^1\tilde{q}_{iH}^0 + w_{iL}^0\tilde{q}_{iL}^1 + w_{iL}^0\tilde{q}_{iH}^1\right)\right].$$

$\bar{\varphi}_{i,L}$ and $\bar{\varphi}_{i,H}$ are the average employment shares of low- and high-skilled employees:

$$\bar{\varphi}_{iL} = \frac{1}{2}\left(\tilde{s}_i^1 w_{iL}^1 + \tilde{s}_i^0 w_{iL}^0\right)$$

$$\bar{\varphi}_{iH} = \frac{1}{2}\left(\tilde{s}_i^1 w_{iH}^1 + \tilde{s}_i^0 w_{iH}^0\right)$$

7. EMPIRICAL RESULTS

Applying the method above to the six economies for which we have detailed information by skill level, we obtain the results summarized in Tables 2 and 3. Table 2 shows the results for the four elements included in the decomposition. We observe that in India the industrial restructuring contributed to 28% of the labor productivity growth. In the Republic of Korea and Taipei,China the contribution reached almost 20%, whereas in the remaining economies it was much lower. In terms of skill distribution, the investment in education and retraining in Taipei,China and Japan helped them to increase their labor productivity significantly. Finally, when we analyze the contribution by skill level, we find that in the PRC and India low-skilled workers made an important contribution to raising labor productivity. However, as we move up in terms of level of economic development, the contribution of low-skilled workers declines and falls to only 5% in the case of Japan and 3% for the United States. We also clearly see that medium- to high-skilled workers made the largest contribution to labor productivity growth across all economies in the sample. Their contribution grew larger the more advanced the economy is, reaching 83% in the case of the United States.

Table 2: Decomposition of Labor Productivity Growth by Industrial Structure, Skill Distribution, and Skill Level (1995–2009)

	Industrial Structure	Skill Distribution	Low-skilled Workers	Medium- and High-skilled Workers	Total
PRC	10%	3%	36%	51%	100%
India	28%	8%	21%	44%	100%
Japan	7%	20%	5%	68%	100%
Rep. of Korea	19%	14%	9%	58%	101%
Taipei,China	19%	21%	16%	43%	100%
US	-2%	15%	3%	83%	100%

Source: Authors.

In Table 3, we go one level deeper and decompose the contributions at the industry level. In column one we list the contributions to a change in labor productivity due to a change in the industrial structure. In all six economies the structural transformation towards services has driven labor productivity growth. In the PRC, which is widely known to have become the world powerhouse for the manufacturing industry, the contribution of manufacturing was surprisingly small, amounting to only 1.1%. In contrast, labor productivity growth in services helped to increase labor productivity by almost 20%. For the other economies a similar pattern emerges; however, manufacturing always has a negative sign, implying that industrial restructuring has lowered the labor productivity growth.

The second component of the decomposition captures the effect of differences in skill composition over time. This effect played a minor role and only surpasses 1% for services in certain economies.

Table 3: Decomposition of Labor Productivity Growth by Sector, Industrial Structure, Skill Distribution, and Skill Level (1995–2009)

Economy	Sector	Industrial Structure	Skill Composition	Low-skilled	Medium- and High-skilled
PRC	Agriculture and Mining	–8.8%	0.2%	20.7%	6.9%
	Manufacturing	1.1%	0.6%	29.4%	29.6%
	Electricity and Water	4.0%	0.3%	6.1%	8.7%
	Services	19.9%	0.8%	14.4%	58.8%
India	Agriculture and Mining	–1.8%	0.9%	13.6%	5.6%
	Manufacturing	–3.0%	0.8%	4.9%	16.0%
	Electricity and Water	9.8%	0.4%	2.5%	3.4%
	Services	35.1%	1.7%	8.5%	40.4%
Taipei,China	Agriculture and Mining	–1.1%	0.1%	0.0%	1.2%
	Manufacturing	–1.0%	1.4%	1.6%	1.8%
	Electricity and Water	–0.9%	0.2%	–0.7%	–1.4%
	Services	10.8%	2.1%	5.6%	19.1%
Rep. of Korea	Agriculture and Mining	–3.9%	0.3%	0.6%	1.6%
	Manufacturing	–25.5%	1.4%	6.7%	39.6%
	Electricity and Water	0.2%	0.1%	0.0%	3.4%
	Services	43.1%	2.1%	0.1%	7.9%
Japan	Agriculture and Mining	–0.4%	0.0%	0.1%	0.1%
	Manufacturing	–10.4%	0.2%	1.1%	7.9%
	Electricity and Water	–0.8%	0.2%	0.0%	0.1%
	Services	13.1%	1.0%	0.0%	11.3%
US	Agriculture and Mining	1.0%	0.1%	0.0%	0.2%
	Manufacturing	–11.4%	0.2%	0.3%	10.6%
	Electricity and Water	2.8%	0.0%	–0.2%	–1.1%
	Services	6.7%	0.6%	1.1%	23.2%

Source: Authors.

The focus of our analysis is the last two columns. They summarize how much low-skilled and medium- and high-skilled workers contributed to the labor productivity growth across the four industries. For the PRC, low-skilled workers were mainly responsible for productivity growth in agriculture, mining (20.7%), and manufacturing (29.4%). In contrast, medium- and high-skilled workers pushed the productivity mainly in services (58.8%), but also in manufacturing (29.6%). The services sector is thus the sector where medium- and high-skilled workers make the largest difference.

For India, low-skilled workers helped to increase the productivity most in agriculture and mining (13.6%) and then in services (8.5%). Similarly to the PRC, in India medium- and high-skilled workers contributed most to productivity growth in services (40.4%) and manufacturing (16.0%). In Taipei,China the first three sectors recorded very modest labor productivity growth. Only services' productivity increased, carried mainly by medium- and high-skilled workers.

In the Republic of Korea, Japan, and the United States low-skilled workers contribute little to labor productivity growth across all sectors. This might be explained by the fact that low-skilled workers have been systematically replaced by technological advances, as documented for the United States by Autor and Dorn (2013). Medium- and high-skilled workers manage the machines and production process, which is reflected

in their relatively high contribution to productivity growth, especially in the case of the Republic of Korea. Medium- and high-skilled workers have contributed to a large extent to labor productivity growth in Japan (11.3%) and the United States (23.3%). In a recent paper by Trinh (2019), the author differentiates between medium- and high-skilled workers for the United States and finds that medium-skilled workers made the highest contribution to labor productivity growth.

In summary, and looking across the six economies, we find robust evidence that the high labor productivity growth of services was mainly driven by industrial restructuring as well as by the higher productivity of high-skilled workers. The former effect underscores the earlier finding in this chapter, namely that the structural transformation towards services does not lead to lower overall productivity, but rather the opposite. Our analysis further demonstrates that the labor productivity growth in services is driven to a large extent by highly skilled workers. It thus highlights the need for governments to ensure that a successful move towards services requires a corresponding increase in skills.

8. CONCLUSION

The first objective of this paper was to come up with a first estimate of the contribution of services to labor productivity growth in Asia. Applying different decomposition methods, we find strong evidence that services have contributed substantially to labor productivity growth in Asia. Our analysis also shows that in most Asian economies we observe a major reallocation from agriculture to services, skipping the manufacturing phase. This switch does not necessarily lead to a fall in productivity. We find that the labor reallocation from agriculture to services helped to increase labor productivity.

The second objective of the paper was to study the contribution to labor productivity growth by skill level. Due to data constraints, we had to limit the analysis to five major economies. We first find that in these economies the skill levels increased substantially between 1995 and 2009. When we decompose the labor productivity growth, we find that in all economies the high-skilled workers made the biggest contribution to increased labor productivity. The numbers are especially high in Japan, the Republic of Korea, and the United States. This finding is rather intuitive. Technological progress increases the skill level needed. Or, expressed differently, higher-skilled workers can make better use of existing technology to boost productivity. When we dissect the growth by industry, we notice that the labor productivity has grown fastest in the services sector in all economies in our sample. The growth is mainly driven by two sources, the first being the change in industrial structure and the second the increased labor productivity of high-skilled workers.

Overall, our results provide evidence that the services sector has become one of the main sources of labor productivity growth in Asia. Our results are contrary to the argument of Rodrik (2016) that premature deindustrialization cannot generate sustained growth. The Asian economies in our sample show that the services sector has become a driver for sustained growth, exhibiting high growth rates in labor productivity. The trend towards services is thus not a worrying development, necessarily implying that economic growth is slowing down. On the contrary, as our paper shows, moving towards services can become an engine of sustained growth.

At the same time, our results indicate that labor productivity growth stems largely from an increase in skills. Governments need to increase their investment in the education and training of their workforce. Low-skilled labor will be stuck in low-productivity jobs irrespective of the sector. Manufacturing no longer absorbs a large number of low-skilled workers as technological advances are making them increasingly redundant.

One area of future research is to show which services sectors are particularly likely to have high labor productivity growth. In our paper we aggregated across all services sectors. However, we know from studies in other economies that among services the differences in labor productivity can be large. Another important research question is about the compensation of services workers across skill levels. There is emerging evidence that high-skilled workers in services earn a higher premium than high-skilled workers in manufacturing (IMF 2018). In order to ensure that services-led development generates inclusive growth, we need to better understand how the gains in labor productivity are distributed across skill levels. The list of open questions is long and requires renewed efforts by scholars.

Governments in the region can no longer choose between manufacturing-led and service-led development. Technological progress and trade have put most economies on the path of service-led development. It would be extremely costly and inefficient to reverse it and artificially engineer a manufacturing-led development. The question of today is how to embrace a service-led development in order to transform it into a process that leads to sustained, inclusive, and sustainable economic growth.

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APPENDIX: LIST OF INDUSTRIES BY ISIC CODE (REV. 3)

ISIC Section	ISIC Division	Industry	Sector
A & B	01, 02, and 05	Agriculture, hunting, forestry, and fishing	Agriculture
C	10–14	Mining and quarrying	Mining
D	15 and 16	Food, beverages, and tobacco	Manufacturing
D	17 and 18	Textiles and textile	Manufacturing
D	19	Leather, leather, and footwear	Manufacturing
D	20	Wood , products of wood and cork	Manufacturing
D	21 and 22	Pulp, paper, printing, and publishing	Manufacturing
D	23	Coke, refined petroleum, and nuclear fuel	Manufacturing
D	24	Chemicals and chemical	Manufacturing
D	25	Rubber and plastics	Manufacturing
D	26	Other nonmetallic minerals	Manufacturing
D	27 and 28	Basic metals and fabricated metal	Manufacturing
D	29	Machinery, not classified elsewhere	Manufacturing
D	30–33	Electrical and optical equipment	Manufacturing
D	34	Transport equipment	Manufacturing
D	35, 36, and 37	Manufacturing, not classified elsewhere; recycling	Manufacturing
E	37–41	Electricity, gas, and water supply	Electricity and Water
F	45	Construction	Electricity and Water
G	50	Sale, maintenance, and repair of motor vehicles and motorcycles; retail sale of fuel	Services
G	51	Wholesale trade and commission trade, except for motor vehicles and motorcycles	Services
G	52	Retail trade, except for motor vehicles and motorcycles; repair of household goods	Services
H	55	Hotels and restaurants	Services
I	60	Other inland transport	Services
I	61	Other water transport	Services
I	62	Other air transport	Services
I	63	Other supporting and auxiliary transport activities; activities of travel agencies	Services
I	64	Post and communications	Services
J	65, 66, and 67	Financial intermediation	Services
K	70	Real estate activities	Services
K	71–74	Renting of m&eq and other business activities	Services
L	75	Public admin and defense; compulsory social security	Services
M	80	Education	Services
N	85	Health and social works	Services
O	90–93	Other community, social, and personal services	Services