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As much to be gained by merchandise as manufacture? The role of services as an engine of growth

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ABSTRACT

This article assesses the role of the services sector as an engine of growth during the 1985–2015 period. Results from testing services within a Kaldorian framework support the view that (a) manufacturing continues to remain important, but its contribution has weakened over time while that of services has become stronger, and (b) job creation is being driven predominantly by the services sector in countries at all income levels, although this is not always associated with productivity gains, raising concerns about its sustainability. In addition to the Kaldorian analysis, we use a shift-share decomposition of labor productivity to analyze the 2005–2015 decade for 11 economic activities. We find that the strongest contribution to overall productivity is provided by what we call "modern" services, mostly through labor reallocation from sectors with lower productivity levels. In contrast, the contribution of the manufacturing sector, although still positive, arises from "within"-sector changes in productivity, partially as a consequence of the sector's lack of job creation. In light of technological change, and the impact it may have on low- and middle-skill jobs, it is likely that the job creating effects of manufacturing may decline further. Modern services—such as business activities and transport and communications, which are linked to manufacturing—appear to have characteristics similar to those of manufacturing, and are becoming important for countries at all income levels for economic growth overall. However, although expanding quickly, their share of total employment remains small.

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Introduction

The relative importance of productive structures has a long tradition. Writing as early as the seventeenth century, Petty (1691) noted, "there is much to be gained by manufacturing than by husbandry, and by merchandise than by manufacture." This article revisits the manufacturing versus

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Color versions of one or more of the figures in the article can be found online at www.tandfonline.com/mjes.

services debate in light of recent developments, including the economic crisis of 2008/2009, which many believe was caused by excessive reliance on financial innovation. Furthermore, rapid technological change and automation are changing the nature of jobs, particularly in manufacturing. The key question remains: What is the economic structure that promotes job-rich, sustainable, and equitable economic growth? Is manufacturing still the engine of growth, as was the case for developed countries that experienced the Industrial Revolution and the East Asian economies in the 1980s and 1990s? Or do we need to look elsewhere—notably to services to play a dominant role in fueling economic growth and jobs in today's developing economies?

In modern economics, it was Kaldor (1966, 1967, 1968) who put emphasis on economic structure, arguing that the classical division of economic activities into agriculture, industry, and services was central to understanding the growth process in the modern economy. Each of the sectors had distinct characteristics; the dynamic interaction among these determined the time path and the nature of economic growth (Dasgupta and Singh 2005). Kaldor was of the view that manufacturing is the main engine of growth, and the empirical relationships he propounded came to be known as Kaldor's laws for the "manufacturing is special" hypothesis. However, the continued growth of the service sector in both developed and developing countries has led some to question whether services, or parts of the services sector, could replace manufacturing as the engine of growth, or at least become an additional one (Dasgupta and Singh 2005; Roncolato and Kucera 2014). More recently, manufacturing's pivotal role in development has enjoyed again a renaissance; the global community in 2015 adopted the Sustainable Development Goals (SDGs), with SDG Goal no. 9 focused on promoting inclusive and sustainable industrialization (in addition to building resilient infrastructure and fostering innovation).

The special role of manufacturing in development derives from the ability of the manufacturing sector, through its spillover effects, to raise overall productivity and employment in the economy. This is because of the operation of "Verdoorn's law," which suggests that the growth of output causally leads to the growth of overall productivity, a phenomenon Kaldor believed worked best in the manufacturing sector because of both static and dynamic economies of scale in the manufacturing sector. This was the basic premise of Kaldor's conceptualization: that demand constrains economic growth, not supply; and the growth of the manufacturing industry has the ability to create the positive externalities that can create the conditions for overall economic growth and improved living standards. According to Kaldor, because of disguised unemployment in agriculture, the growth of manufacturing would lead to a shift of the labor force from

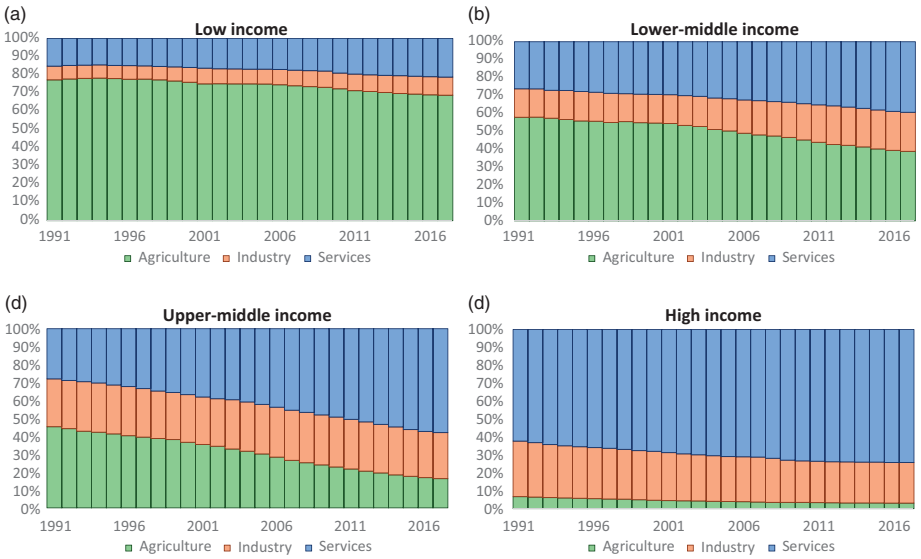

Figure 1. Distribution of employment by sector and income group, 1991–2017 (percentages). **Source:** ILO modeled estimates, available from ILOSTAT.

agriculture into industry without any reduction in output. By reducing employment in agriculture, it would raise overall productivity in agriculture as well. Through learning by doing, manufacturing production and productivity in manufacturing would rise. Another aspect of manufacturing Kaldor pointed to was its role in trade and balance of payments of economies (Singh 1977), as the greater part of international trade takes place in manufacturing products, and economic growth in many economies—especially the Asian economies—has been manufacturing export driven.

However, we have observed "a quiet revolution in the composition of economic activity" (Inman 1985: 1) which has resulted in services accounting for a larger share of employment, notwithstanding differences in levels of development (Figure 1). Services share of world trade has also increased, as has the share of services exports from developing countries, which is estimated to have increased from 3 percent in 1970 to over 20 percent in 2014 (Loungani et al. 2017). Furthermore, and not readily captured in services statistics, the services content of manufacturing has also increased, including through international outsourcing (often described as the "servicification of manufacturing"), with services value added accounting for almost a third of gross exports of manufacturing industries in developed countries and a quarter in developing countries (Lanz and Maurer 2015).

Services have been growing in developing countries as well. Dasgupta and Singh (2005, 2006) attributed this growth of employment in services for the lower-income countries in the early stages of development to

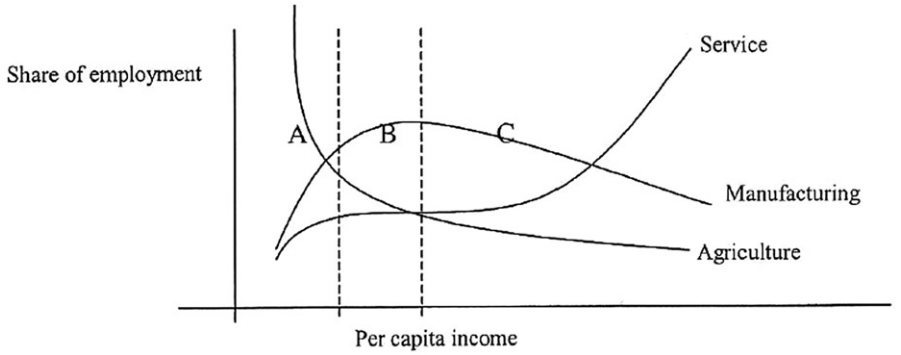

Figure 2. Changing structure of employment (adapted from Gemmell 1986).

"premature deindustrialization." This is quite different from the empirical evidence of the early industrializers on structural transformation, which tends to show that services grow rapidly only in the later stages of development. It is important to note, however, that in the late nineteenth century in the United States and the United Kingdom, services were a major employment-generating sector. As early as 1890, services accounted for 31 percent of employment in the United Kingdom and 30 percent of total employment in the United States (Bryson and Daniels 1998: xvii). Rowthorn and Wells (1987) and Daniels (1993) have also pointed out that in the early stages of development, when the share of the agricultural sector diminishes, there is rise in employment in both manufacturing and services. This growth of service employment is attributed to the demand for services to support industry and needs of the new industrial society, and because there is a shift from traditional agricultural activities to traditional service activities (as previously agricultural workers become unemployed). However, even if there is a rise in service employment during the early phases of industrialization, these authors noted that the period of industrialization is predominantly a period of expansion of manufacturing in employment. Employment in services really takes off at a later, "mature" stage of development (Rowthorn and Wells, 1987: 7–8).

Does this mean that developing countries that at low levels of per capita income have a large and growing service sector are at their first stage of industrialization? Are they therefore simply moving toward that critical level of productivity in manufacturing when employment in manufacturing falls? If that were so, the moderately high share of service employment would be accompanied by a fast rate of growth of manufacturing employment and manufacturing output at early stages of industrialization. According to the stylized facts of structural transformation, therefore, developing countries would be in the A or B section of the Figures 2 and 3. The difference between Figures 2 and 3 is that, in Gemmell's

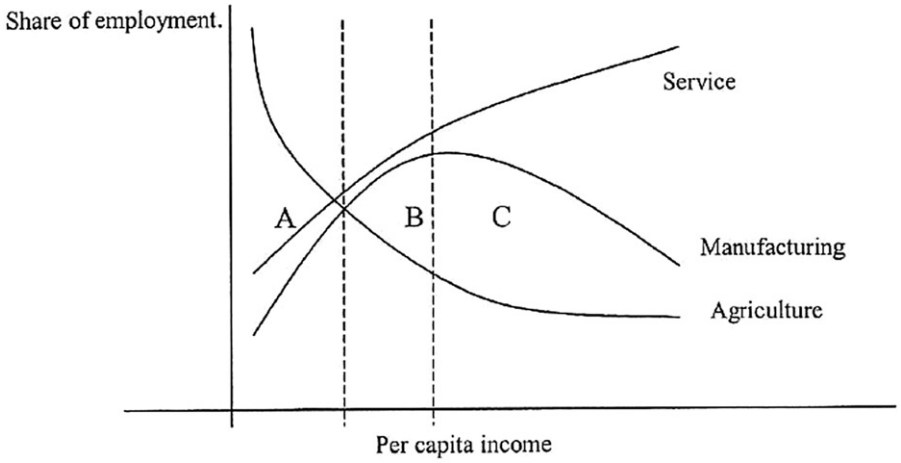

Figure 3. Changing structure of employment (adapted from Rowthorn and Wells1987).

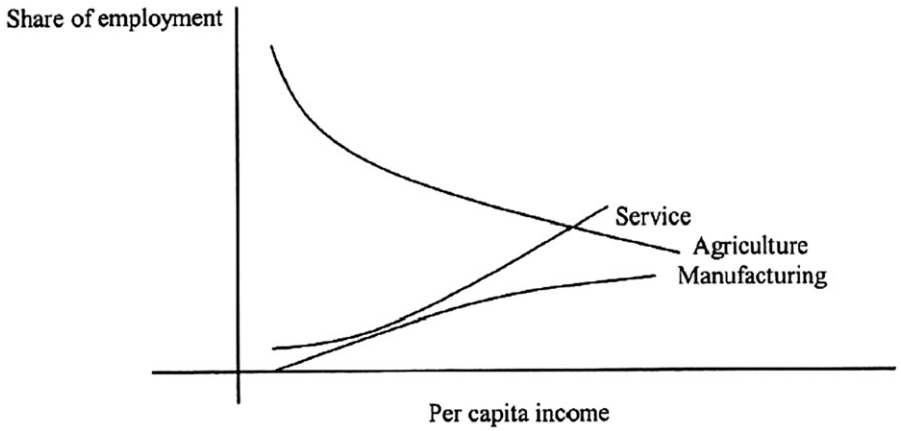

Figure 4. Changing structure of employment (authors' illustration).

conceptualization of structural transformation, in the early stages of development, the service sector not only grows at a lower rate it employs a smaller share than manufacturing (see Gemmell 1986: 18). Rowthorn and Wells (1987) noted that in the early stages of development it is possible for the service sector to have a higher employment share than manufacturing, but manufacturing employment grows at a faster rate in the initial phases of industrialization. So, the slope of the manufacturing curve in A or B is steeper than the slope of the service curve in A or B (Rowthorn and Wells 1987: 7–8). In reality, however, many developing countries instead present an experience such as is shown in Figure 4, in which the services curve lies above the manufacturing curve and has a steeper curve as well.

These pathways of development are based on the experience of present-day developed countries as well as the East Asian countries. In particular,

East Asian countries such as Korea hit the highest point of manufacturing employment more than 30 years ago, with industry employment reaching 36 percent of total employment in 1991, after which the manufacturing share started to decline. In China, we observe that the employment share of industry peaked during the 1990s, remaining stagnant for more than a decade before starting its decline, whereas in India the peak of industry's employment share is much more recent: it peaked in 2012 and has started to decline slowly ever since.

Still, the classical path of economic transformation is not observed in many present-day low- and lower-middle-income countries. These developing countries, instead, present an experience such as that shown in Figure 4, in which the shift has primarily been from agriculture to services, with the manufacturing sector failing to take off or remaining constant at low levels of income, as in Cameroon (stagnant at around 8 percent) or in Nigeria, where the share grew by 2.4 percentage points in the last three decades (9.2–11.6 percent). The service employment curve lies above the manufacturing employment curve and has a steeper curve as well.

Such experiences have led to concerns that the development trajectories of developing countries may be negatively impacted. Felipe, Mehta, and Rhee (2015) examined 53 economies and identified a significant relationship between the historical peak of manufacturing employment and ensuing levels of per capita income: a 1 percentage point difference in peak manufacturing employment share is associated with a subsequent GDP per capita that is 13 percent higher. In a sample of 118 countries, Rodrik (2013) found that there is no systematic tendency at the aggregate level for countries with lower levels of labor productivity to grow more rapidly, and hence converge over the long run to levels in more developed countries. However, he found such a tendency and convergence only in the manufacturing sector.

On the other hand, Ghani and O'Connell (2014) found labor productivity convergence in services, in addition to manufacturing. Dasgupta and Singh (2005), Roncolato and Kucera (2014), and Di Meglio, Gallego, and Savona (2018) similarly concluded that services can play both a leading and lagging sector, with information technology and business services in particular able to act as engines of growth. To further assess these issues, we follow Dasgupta and Singh (2005, 2006) in using a Kaldorian framework to empirically assess the role of manufacturing and services in countries at different levels of development. Based on a larger sample of countries and different time periods, our findings indicate that manufacturing continues to remain important, but its contribution has weakened over time, whereas that of services has become stronger. We complement this analysis with a shift-share decomposition to understand the within- and between-sector

productivity shifts. Specifically, we follow the threefold decomposition used by van Ark (1997), which, in comparison with the canonical two-fold decomposition into within- and between-sector components, also adds a residual component that can be interpreted in dynamic terms. Such a distinction enables a fairer comparison of the within- and between- contributions by using the same weights. We use this methodology to decompose labor productivity growth between 2005 and 2015 in 64 countries covering 84 percent of the world's current labor force. The results, in addition to confirming the intuition arising from the Kaldorian analysis, allows us to identify services activities responsible for productivity growth at all levels of income.

The structure of this article is as follows. Section 2 uses a Kaldorian framework to empirically assess the role of industry and services in countries at different levels of development. In Section 3, we complement the earlier analysis with a shift share decomposition. Section 4 concludes. Taken together, our research finds market services are generating employment, and whereas the traditional market services (such as trade and hospitality sectors) contribute only modestly to aggregate productivity growth, modern market services (such as business activities and transport and communication sectors) are acting as an additional engine of growth to manufacturing.

The services sector in a Kaldorian framework, 1985–2015

Kaldor's first law

Kaldor's first law of growth argues that there is a causal relationship between the growth of manufacturing output and the growth of GDP. Kaldor attributed this to the existence of static and dynamic returns to scale in manufacturing, as well as its strong linkages with other sectors.

We test this relationship econometrically with data on sectoral value added from 77 countries at different stages of development and at four points in times: 1985, 1995, 2005, and 2015. In addition, we carry out the analysis using a reduced sample of 57 countries for comparability with the results from the analysis undertaken Section 2.2, which is based on a smaller number of countries for comparable data on employment. (See Appendix A for more details on the data sources, the countries included in each sample, and their income classification.)

The relationship that is estimated to test Kaldor's first law regresses the annualized growth rate of agriculture/industry/services on the annualized growth rate of the economy's GDP,

$$GDP_g = \beta_0 + \beta_1 VA_{i,g} + \epsilon, \quad (1)$$

Table 1. Regression estimates, gGDP = f(gAgri.VA), gGDP = f(gIndu.VA), gGDP = f(gServ.VA).

		Reduced sample			Full sample		
Income	Period	Agriculture	Industry	Services	Agriculture	Industry	Services
High	*85–95*	0.106	0.815***	0.926***	0.138	0.812***	0.930***
	95–05	−0.075	0.545***	1.003***	−0.065	0.545***	1.009***
	05–15	0.281	0.506***	0.973***	0.290	0.509***	0.971***
Upper-middle	*85–95*	0.304*	0.534***	0.557***	0.297*	0.483***	0.538***
	95–05	0.257*	0.625***	0.746***	0.276*	0.646***	0.757***
	05–15	0.197	0.778***	0.807***	0.215	0.700***	0.815***
Lower-middle	*85–95*	0.454**	0.698***	0.753***	0.331*	0.665***	0.637***
	95–05	0.357**	0.491***	0.747***	0.332**	0.510***	0.634***
	05–15	0.184	0.516***	0.785***	0.121	0.584***	0.726***
Low	*85–95*		No data		1.008***	0.527***	0.683***
	95–05				0.402**	0.242	0.585*
	05–15				0.450	0.221*	0.642***

Source: MVAE dataset and authors' own calculations.
Notes: The table shows coefficients from linear regressions using the specification stated in Eq 1. The significance of the coefficients is summarized as follows: ***99%, **95%, *90%.

where *i* refers to the sector, industry, or services.[1] This relationship is estimated for three periods—1985–1995, 1995–2005, and 2005–2015—with the aim of understanding the evolution of the role played by each of the economic sectors in shaping overall economic growth. As countries at different stages of development are likely to show very different macroeconomic relationships, we run the regressions separately for four income groups as defined by the World Bank[2] for 2019.[3]

The results are provided in Table 1. The results for high-income countries are in line with what would be expected: no role played by the agricultural sector, a declining correlation between industry's value added growth and GDP growth for at least the last 30 years, and consistently higher coefficients shown by the services sector.

The regression estimates for upper-middle-income countries also seem to be in line with the classical industrialization hypothesis. For instance, the relationship between agricultural value added and GDP is positive and significant in the 1985–2005 period and remains until the 2005–2015 decade. Moreover, industry's value added growth correlation with GDP growth has been growing, as evidenced by the coefficient value, which shows a rise. At the same time, the coefficient of services growth on GDP growth has been increasing, showing convergence toward the observed relationship between services value added and GDP in high-income countries.

Results for lower-middle-income and low-income countries diverge somewhat from the classical industrialization development pattern. Although the coefficients for the correlation between agricultural value added growth and GDP growth has decreased between the 1985–1995 period and the 2005–2015 period (although the results are not statistically significant in the latter period for both lower-middle- and low-income countries), the relationship between industry value added and GDP growth

has weakened between the same two periods. At the same time, the estimated coefficients between services value added and GDP growth are significant and have strengthened. Overall, the results from lower-middle- and low-income countries suggest the existence of an income threshold below which industrialization, and thus the role of industry as the engine of growth, has yet to fully materialize. Another way of looking at it could be that these countries are undergoing a premature deindustrialization (Dasgupta and Singh 2005).

Structural change and economic growth

A key aspect behind Kaldor's third growth law is the vision of the nonmanufacturing sector as a source of labor for the higher-productive manufacturing sector. This way, an economy's labor productivity will grow faster not only because of the increasing returns to scale of the manufacturing sector but also because of the reallocation of labor into more productive economic activities.

Following Cripss and Tarlingm (1973), Dasgupta and Singh (2006) examined the relationship between industry's value added and nonindustry employment on overall productivity (Equations 2):

$$PR_g = \beta_1 + \beta_2 VA_{g,ind} + \beta_3(S_{t+1,non-ind} - S_{t,non-ind}) + \epsilon \qquad \text{and} \qquad (2)$$

where PR_g denotes the annualized growth rate of overall productivity, $VA_{g,ind}$ is the annualized growth rates of industry's value added, and $S_{non-ind}$ stands for the employment share of the nonindustry sector.

Dasgupta and Singh (2006), in turn, reformulated the above equation by substituting nonindustry employment with agricultural employment, under the assumption, sustained by the available empirical evidence, that services are a receiver of labor and not a source. In addition, because the hypothesis is that services may be showcasing similar characteristics as that of industry, they also estimate the same relationship substituting industry for services. These specifications are given by:

$$PR_g = \beta_1 + \beta_2 VA_{g,ind} + \beta_3(S_{t+1,agri} - S_{t,agri}) + \epsilon \qquad (3)$$

$$PR_g = \beta_1 + \beta_2 VA_{g,ser} + \beta_3(S_{t+1,agri} - S_{t,agri}) + \epsilon, \qquad (4)$$

where $VA_{g,ser}$ denotes the value added of the services sector and S_{agri} denotes the employment share of agriculture. As done for Equation 1, we estimate Equations 3 and 4 for three periods—1985–1995, 1995–2005, and 2005–2015—for each income level. It should be noted that low-income countries have been dropped from the sample due to the lack of employment data for this group (see Appendix A for detailed information on all the countries dropped), and results are estimated for the three remaining income groups: namely high, upper-middle, and lower-middle income.

Table 2. Adjusted employment and labor productivity growth rates, by income group.

		Industry		Services	
Income group	Period	Adj. employment	Productivity	Adj. employment	Productivity
High	85–95	−0.8	2.0	1.6	1.7
	95–05	−0.4	2.5	1.5	1.3
	05–15	−1.9	1.7	0.4	1.0
Upper-middle	85–95	0.2	0.6	1.7	1.9
	95–05	−0.1	1.5	1.5	0.5
	05–15	−0.4	1.0	0.6	1.7
Lower-middle	85–95	0.9	0.9	1.4	0.8
	95–05	1.1	1.0	0.5	2.0
	05–15	1.0	1.1	2.0	1.2

Source: MVAE and authors' own calculations.

Notes: The table shows, separately for industry and services, (1) adjusted employment growth rates consisting of the difference between the annualized growth rate (%) of the respective sectoral employment level and the country's working-age population and (2) sector-specific annualized growth rates (percentages) of labor productivity. The numbers shown are an unweighted average of the countries within a given income level.

Interpretation of the econometric test

In the last two centuries, economic development in current high-income economies has been strongly linked to labor flowing from agriculture to manufacturing activities, which would increase aggregate productivity. In terms of Equation 3, we would thus expect a negative coefficient capturing the change in the share of agricultural employment, which would be interpreted as a positive effect on overall labor productivity in the same way Kaldor had envisioned. In addition, although industry has continued to play an important role in driving overall productivity, its capacity to generate jobs has decreased significantly, with services becoming the primary employer of workers.

Some statistics in support of these trends are shown in Table 2: (a) the difference between the annualized growth rate of the employment level in industry/services and the annualized growth rate of the working-age population (what we call adjusted employment growth), and (b) the annualized growth rate of the sector-specific productivity. The statistics on adjusted employment growth and labor productivity growth are presented for three periods of time—1985–1995, 1995–2005, and 2005–2015—and for three income groups: high, upper-middle and lower-middle. The adjusted employment growth rate is the rate of employment less the growth of the working-age population and controls for demographic changes that could show inflated employment levels as the size of the working-age population is growing (supply driven). As such, annualized growth rates of the adjusted employment growth rate below zero suggest the existence of relative employment losses, whereas the contrary is also true.

Table 2 shows that for countries that are more developed, the more employment is declining in the industry sector, the higher the growth rate of labor productivity in the sector, representing, in high-income and upper-middle income countries, a clear example of jobless growth. The

Table 3. Regression estimates, gPr = f(gIndu.VA, agri.emp), gPr = f(gServ.VA, agri.emp).

		Industry as engine (Eq. 4)		Services as engine (Eq. 5)	
Income	Period	Industry VA	Agriculture Emp.	Services VA	Agriculture Emp.
High	*85–95*	0.497***	−0.004	0.603***	0.021
	95–05	0.308**	0.029	0.283	−0.075
	05–15	0.250***	0.041	0.487***	0.027
Upper-middle	*85–95*	0.339**	−0.025	0.385**	−0.114
	95–05	0.555**	−0.332***	0.586**	−0.297***
	05–15	0.277	−0.199***	0.586***	−0.139***
Lower-middle	*85–95*	0.761*	0.101	0.806**	−0.007
	95–05	0.567*	−0.069	0.841	−0.026
	05–15	0.392***	−0.214***	0.984***	0.095

Source: MVAE dataset and authors' own calculations.
Notes: The table shows coefficients from linear regressions using the specification stated in Eqs 3 and 4. The significance of the coefficients is summarized as follows: ***99%, **95%, *90%.

services sector, on the other hand, shows positive adjusted employment growth rates. However, the strength of this growth is decreasing over time in high-income and upper-middle-income countries, where it is close to zero in the 2005–2015 decade, perhaps pushed down by the net employment losses that resulted from the financial crisis.

In lower-middle-income countries however, there is positive employment growth in industry, with labor productivity growth rates as strong as the adjusted employment growths. Nonetheless, during the 2005–2015 decade, the services sector of these countries still generated employment at twice the rate of industry while still having similar productivity growth rates.

The estimates from Equations 3 and 4 are shown in Table 3 by decade and by income group. The results for high-income countries represent an example of lack of fit in countries where the employment share of the agricultural sector is almost nonexistent; there is, as a consequence, no relationship between the change in agricultural share and overall productivity, and the same applies to services for the same reason. In upper-middle-income countries, we find that the coefficients for the change in agricultural labor share are almost identical in both regressions (3 and 4), that is the one that assumes industry is the engine of growth and the one that does so for services. However, we also know that this excess labor is mostly flowing to services not to industry, meaning there exist three possibilities behind the gains in labor productivity: The gains are created either by more jobs in services or by having existing jobs becoming more productive in industry, or by both.

The picture for industry is similar for lower-middle-income countries with respect to industry (−0.214 vs. −0.199 in the 2005–2015 decade), but it changes radically with respect to services as, contrary to upper-middle-income countries, there are no increases in the growth rate of overall productivity associated with workers leaving the agricultural sector. This does not imply that services do not bring growth to the economy (the

relationship between services value added growth and productivity growth is strong); rather, it implies that agriculture's productivity is growing at a similar rate as services. The interpretation of this lack of relationship is mixed; on one hand, it means that agriculture is attesting positive productivity gains but, on the other hand, it may also indicate labor reallocation to relatively less dynamic services.

The econometric assessment of Kaldor's first and third laws of growth suggests the existence of a change in the path to development. We continue to observe that industry can explain economic growth; however, services have increased in importance, not only because their association with GDP growth has been increasing over time but also because it is the services sector that is creating the majority of jobs today. To sum up, the Kaldorian analysis suggests that the services sector might have become an additional engine of growth, in particular as the demand for certain type of services (transport and business services) is likely derived from industry.

Structural change and economic growth, 2005–2015

The analysis in Section 2, although indicative of a change in the role of services in creating growth, still leaves some questions unanswered, including (a) which are the services activities that are generating growth and employment? and (b) what is the exact role of manufacturing in this development path? This is because the analysis done for the 1985–2015 period uses the broad sectors, which lack the specificity necessary to narrow down its sources and causes.

This section carries out a disaggregation of these three sectors (agriculture, industry, and services) by subdividing industry into manufacturing and construction and services into transport and communication, trade and hospitality, financial services, real estate and business activities, public administration, education, health activities, and other services.[4] The aim is to study their individual contributions to labor productivity growth as well as its sources—that is, within-sector increases in productivity or between-sector labor reallocations.

Threefold decomposition

A common tool used to analyze and disaggregate sectoral contributions to labor productivity growth is the shift-share decomposition. This type of decomposition dates back at least to Fabricant (1942), and has been recently used by Timmer and de Vries (2009), McMillan and Rodrik (2011), and among others. In its original form, the decomposition consists of two components that split the sectoral contribution to the change in

labor productivity, a so-called "within" component, which evaluates the contribution of changes in sector-specific labor productivity, and a "between" component, which measures the contribution to overall productivity of changes in the sectors' share of workers. Although the classic form of the decomposition is simple and appealing, it evaluates changes in labor productivity using present employment shares and changes in employment shares using past sectoral productivities. We find that such a time inconsistency clouds the interpretation[5] of the findings and, therefore, we prefer to use a threefold decomposition in the spirit of van Ark (1997), Timmer and Szirmai (2000), and more recently de Vries and colleagues (2015). This decomposition allows the aforementioned weights to belong to the same period by adding what has been called a residual or cross-term effect.

Notation

We denote aggregate variables using capital letters; V for value added and L for the number of workers. In addition, sector-level variables are denoted with a subscript, $i \in \{1, I\}$, assuming the existence of $I \in \Re^{+}$ sectors in the economy. The use of sectoral subscripts results in the creation of V_i and L_i for, respectively, the i^{th} sector's value added and employment. Using these variables, we define value added per worker in an economy, p, (also known as average labor productivity) as:

$$p = \frac{V}{L} \tag{5}$$

Assuming an economy's value added and employment can be disaggregated into sectoral contributions, we obtain the following expression:

$$p = \frac{\sum_{i=1}^{I} V_i}{\sum_{i=1}^{I} L_i} \tag{6}$$

If we divide and multiply each of the terms of the summation by the corresponding number of workers in the i^{th} sector, we are able to define value added per worker as:

$$p = \sum_{i=1}^{I} s_i p_i \tag{7}$$

where $s_i = {}^{L_i}/_{L}$ and $p_i = {}^{V_i}/_{L_i}$ are, respectively, the employment share and the average labor productivity of the i^{th} sector.

Threefold decomposition

The starting point of the decomposition is the difference between average labor productivity between time $t+1$ and time t:

$$p_{t+1} - p_t = \sum_{i=1}^{I} s_{i,t+1} p_{i,t+1} - \sum_{i}^{I} s_{i,t} p_{i,t}. \tag{8}$$

This difference in average labor productivity, shown in Equation 8, can be decomposed into three terms as follows:

$$\begin{aligned} p_{t+1} - p_t = & \underbrace{\sum_{i=1}^{I} s_{i,t}(p_{i,t+1} - p_{i,t})}_{\textit{Within effect}} + \underbrace{\sum_{i=1}^{I} p_{i,t}(s_{i,t+1} - s_{i,t})}_{\textit{Reallocation effect}} \\ & + \underbrace{\sum_{i=1}^{I} (p_{i,t+1} - p_{i,t})(s_{i,t+1} - s_{i,t})}_{\textit{Dynamic effect}}. \end{aligned} \tag{9}$$

The first term quantifies the contribution of within-sector changes in labor productivity to the change in overall labor productivity. The second measures the role of structural change, understood as shifts of sectoral employment shares between sectors, on the economywide labor productivity. The third term (the cross-term, or residual), appears as we fix the weights of both the within and the reallocation effect to the first period, and quantifies the joint effect of changes in productivity and changes in sectoral employment shares. This term is usually negative to account for the offsetting effect, and a higher (or less negative) cross-term indicates that labor productivity is increasing as labor moves to sectors with higher productivity growth. Although in principle it is possible to eliminate the cross-term by using average weights (see, e.g., Timmer and de Vries [2009] for a discussion on this topic), we prefer to keep it so as to make the results comparable to other articles in the literature that use a similar threefold decomposition.

Data representativeness

We calculate sectoral contributions, Equation (9), using data for 64 countries at two points in time, approximately 2005 and 2015.[6] This allows us to assess the effect of the financial crisis of 2008/2009 on economic structure. Countries are selected with the objective of having representatives of all regions and all levels of economic development. In spite of some difficulties gathering datasets from low-income countries, the dataset of the sample of countries represents 84.3 percent of the world's labor force and 89.5 percent of the world's GDP.

Table 4. Threefold decomposition results, aggregate, by income level.

Income level	Within	Between	Residual	Net growth
High	0.74	0.61	−0.54	0.81
Upper-middle	1.34	0.89	−0.61	1.62
Low and lower-middle	3.21	1.68	−0.60	4.29

Source: MLFM-11 and authors' own calculations.

Notes: The table shows the within, between, and residual contributions to the overall annual growth rate of labor productivity measured in percentage points for three income levels. The results are based on the unweighted average of the countries within each of the income levels.

Sectoral contributions to productivity growth

The contributions from the calculation of each of the terms in Equation (9) are shown in Appendix C, in which tables are provided with results at the sectoral level for three groups of countries: high income, upper-middle income, low income, and lower-middle income. All of the results shown in this section are presented as annualized percentage points of the overall labor productivity growth rate, as is customary, instead of in $PPP levels, which would complicate the interpretation of the results.

The annual growth rate of labor productivity in high-income countries stands out as the lowest of all three income level groups (see Table 4) at .81 percentage points. Upper-middle-income countries had about double the growth rate of productivity, and the net rate of growth of productivity in low- and middle-income countries was roughly four times that of high-income countries.

It is also worth noting that, in spite of all three groups of economies displaying similar residual effects, they do so with very different levels of within and between contributions. For the low-income countries, we observe in Table 4 that the role of between-sector labor reallocations becomes more important in relative terms over the course of development, perhaps due to slower technological growth at the technological frontier and a catching up effect from less developed economies, at least during the 2005–2015 decade.

Manufacturing versus construction

Separating the contributions of the manufacturing and construction subsectors, we find that construction is the employment generator in low- and lower-middle-income economies (see Appendix C). In turn, manufacturing provides a strong contribution to overall productivity growth, but its source is almost exclusively from within-sector gains in productivity, lending support to the jobless growth hypothesis for the sector. The growth of the construction sector is also a consequence of the financial crisis on the employment structure of high-income countries: There was no contribution to labor productivity in the last decade, and this can be considered a mild effect resulting from (a) the averaging of several countries' experiences and

(b) the relative change in employment share is small as job creation in other sectors remains poor.

Services: Engine of growth or employer of last resort?

The analysis performed in Section 2 suggests that services are behaving very much like an engine of growth, at least in the tests performed for the first and third of Kaldor's growth laws and especially in terms of employment creation. However, these results open as many questions as they answer. First of all, the services sector is quite heterogeneous in terms of skills and tradability. We therefore cluster services into three groups: traditional services, encompassing trade, hospitality, and other services (including domestic personnel); modern services, which include transport and communications,[7] financial services, and business activities; and nonmarket services, including public administration, education, and health, even though education and health are increasingly becoming marketed in most economies.

The results of the threefold decomposition (Appendix C) are shown in Figure 5. It presents separately the within-sector productivity growth, the between-sector productivity growth arising from employment reallocation, and the residual effect. The total contribution of the sector to overall productivity growth in the economy is shown by the hat.

One of the regularities observed in this analysis is the above-average contribution to overall productivity of modern services, even though within-sector productivity growth is negative in the higher-income and middle-income countries. Moreover, irrespective of the income level, there is a positive between sector productivity growth, implying positive employment reallocation effect—this is a sector that is absorbing workers.

The manufacturing sector, on the other hand, shows positive contribution to within-sector productivity growth, but negative employment reallocation in higher- and middle-income countries. In the low-income countries, manufacturing has a positive employment reallocation effect, implying that it is still absorbing workers from other sectors, even though this change is smaller than that observed in the modern services sector.

A word of caution when interpreting the role of modern services should be exercised. First of all, these services are increasingly relying on nonstandard forms of work, with the percentage of formal permanent employees[8] going down from 44.7 percent in 2005 to 40.5 percent in 2015. In addition, despite the impressive growth performance showcased by modern services in countries at all levels of income, they still have relatively small shares of employment. The employment share of modern services increases with the level of income; as such, we can observe that in developed economies these services account for 21.8 percent of the total employment, down to 18.4

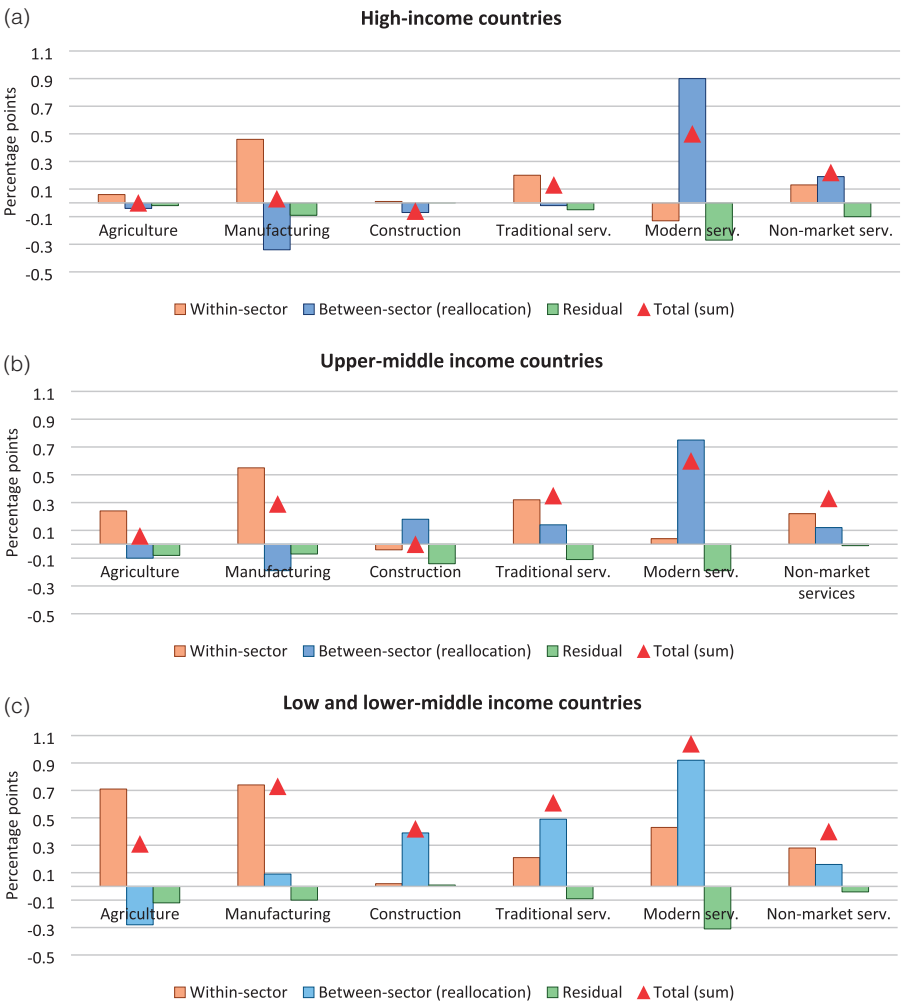

Figure 5. Threefold decomposition results, by sector. **Source:** MLFM-11 and authors' own calculations. **Notes:** The figure shows the within, between, and residual contributions to the annual growth rate of productivity by sector measured in percentage points for three income levels. The results are based on the unweighted average of the sectoral contributions of each of the countries within an income level. In terms of the ISIC rev.4 agriculture refers to section A; manufacturing to sections B, C, D, and E; construction to section F; traditional services to sections G, I, R, S, T, and U; modern services to sections H, J, K, L, M, and N; and nonmarket services refer to sections O, P, and Q. The net contribution is the sum of the three first components.

percent in emerging economies, and a much lower 7.2 percent in developing economies. In low-income countries, the majority of the employment gains are due to flows from agriculture to the construction sector and traditional services, reallocations that do not bring nearly the same productivity growth and in which working conditions are known to be, on average, relatively poor, with widespread informality. Examples of the latter for low- and lower-middle-income countries are self-explanatory; employee informality[9] rates are 83.5 and 61.7 percent among those employed in,

respectively, traditional and modern services. Moreover, monthly wages[10] in modern services roughly double the ones offered by the more traditional services (250 vs. 121 $USD).

Manufacturing: Still an engine growth?

In high-income and middle-income countries, manufacturing is shedding jobs. In low-income countries it is, at best, contributing moderately to job creation. However, its contribution to within-sector productivity is high. Do these mean that the importance of manufacturing is waning in high- and middle-income countries? It is clear that automation is leading to lower job absorption by the manufacturing sector. It was earlier noted by Dasgupta and Singh (2006) that the information technology (ICT) sector in services resembles manufacturing in many respects and has the potential to drive economic growth. Intuitively, too, much of the high-value-added services are based on servicing manufactured goods. Furthermore, the distinction between services and manufacturing has become more blurred. The international standard of classification of activities (the ISIC) assigns an activity based on the product line that generates the majority of the revenue for the company. In the past, manufacturing companies used to service their products: in particular, services like human resources, accounting, and other services related to a company's logistics. Allen and Chandrashekar (2000) reported that 90 percent of major U.S. companies had outsourced some service activities to service firms by 1997. In addition, relatively recent trends on new forms of outsourcing, like online freelance contractors,[11] suggest that the trend on the separation of services from the manufacturing activities within a firm is becoming stronger. As a result, some of the changes observed in employment shares and productivity contributions might be derived from the separation of manufacturing and service activities within a firm, due to the fragmentation of firms' internal organization. In addition, transport services, which are part of this group of high-value-added activities, have strong links with manufacturing, to the extent that their demand is derived from the production of the real sector.

The results obtained from the productivity decomposition (Figure 5) provide support for the notion that some services can act as an engine of growth. However, a careful analysis also suggests that modern services either have been separated from manufacturing (via outsourcing) or their demand is derived from the production of manufactured goods (transport). Nonetheless, the development of the Internet, the rise of online platforms of microjobs, and the improvement of communications technologies have increased the tradability and value added of some of these services (including financial intermediation services, digital media, and business-support activities), much like manufactured goods.

Conclusions and policy considerations

This article has analyzed the role that manufacturing and services have had on economic growth during the last decades, using econometric tests of Kaldor's first and third growth laws and a shift-share decomposition of labor productivity. According to the econometric specification used to test Kaldor's first law, the relationship between the growth of manufacturing and GDP is weakening in countries at all levels of income. In turn, services are taking over a higher share of GDP and are more closely related to economic growth in countries at all levels of development. Some low-income countries in which we observe this trend may be going through a premature deindustrialization, or indeed a "premature servicification," as they have not had a proper industrialization phase, raising concerns about the sustainability of their growth path Rodrik (2016); Andreoni and Chang (2016).

Testing for Kaldor's third law of growth confirms the growing importance of services. In the case of low-income countries, as Table 2 shows, there is a movement from agriculture to services. In other words, the disguised unemployment in the agriculture sector is absorbed by the services sector. Contrary to the classical pattern of labor reallocation, which assumes that excess labor moves from agriculture to industry activities, we find that, especially in low-income countries, labor appears to be moving from agriculture to services. However, in low- and middle-income countries, manufacturing is still absorbing workers, which is not the case in upper-middle-income and high-income countries.

In the shift-share decomposition analysis, we split services into three groups: traditional, modern, and nonmarket services. Modern services (business support activities, transport and communication, and financial intermediation) make the strongest contribution to overall productivity growth in all country groups, overall. They also present a positive employment reallocation effect, implying that the sector is absorbing workers. In lower-middle- and low-income countries, traditional services and the construction sector are more likely to act as a sponge, absorbing workers from low-productivity agriculture. Indeed, the employment share of these service activities in low- and lower-middle-income countries increased by 4.6 percentage points, from 22 to 26.6 percent, compared to the 1.2 percentage point (from 6 to 7.2 percent) increase in the employment share of modern services, during the period. Furthermore, traditional services are the largest employers and are characterized by low productivity levels and often poor job quality.

However, one cannot conclude from this that manufacturing is no longer an engine of growth. Clearly, however, the link between service employment and growth is much stronger today than it was in the past, in all

country groups. Those services, such as transport and communications, that have strong links with overall economic growth appear to be closer in their characteristics to manufacturing and also have strong links with the manufacturing sector. The demarcation between modern traded services and manufacturing is also becoming increasingly blurred, as more and more services are traded. Notwithstanding the analysis in this article, it is not clear that the service sector can play a role similar to manufacturing as noted by Kaldor, which is characterized by increasing returns to scale. We can only say that some service subsectors—especially the high-value-added modern service subsectors, which include transport, communications, finance, and business services—are creating positive growth externalities, given their impact on productivity as well as their ability to absorb workers. These services are also most linked to manufacturing and likely have a symbiotic relationship with the manufacturing sector. However, it must also be pointed out that some of the growth of finance, as noted by the ILO (2017b), has been delinked from the real economy. This can have potential distributional consequences, contributing to reductions in the labor share of growth and thus increased income inequality.

What are the implications of this analysis for present-day developing countries? Is Kaldor's articulation of "manufacturing is special" still relevant? Clearly, the world of work has changed since the late 1960s when Kaldor stated his laws, in particular with the rapid diffusion of information technology that now pervades all aspects of life and work. Our analysis shows that for low-income countries, manufacturing is still important for both overall productivity growth and employment reallocation. However, in the context of the future of work, low/middle-skilled manufacturing sector jobs (encompassing routine tasks) could be substituted by machines (Frey and Osborne 2013; Arntz, Gregory, and Zierahn 2016; United Nations Conference on Trade and Development 2016). These industries provided the impetus for industrialization to the present-day advanced countries and the East Asian economies, drawing in large numbers of workers from agriculture. This pathway of productive transformation may have limitations if productivity growth in these industries does not lead to the kind of employment growth we saw in the past, as manufacturing is more and more associated with jobless growth. On the other hand, some service subsectors have rapid productivity growth rates and display similar increasing returns to scale, although employment in these sectors is still relatively small in low- and middle-income countries.

To relieve the demand constraints on economic growth, a more nuanced sectoral strategy that includes agriculture, manufacturing, and services is more likely to generate productivity increases along with decent jobs for a

growing workforce of young workers in developing countries. The balance between the sectors will depend on the country context.

Judging by present trends, more and more workers of the future are likely to be engaged in service sectors in all country groups. Some service subsectors, however, are linked to poor job quality. Services are a large proportion of total employment in the informal economy in developing countries, especially in retail trade and hospitality, and these represent challenges with working conditions. In high-income countries, the growth of the services sector in the past decades has coincided with an increase in part-time and temporary work and job instability. New forms of employment, such as on-call work and crowd work, have blossomed in the services economy, and institutions for regulating such work remain limited (ILO 2018). Consequently, such forms of employment may also increase in developing countries as their services economy expands, pointing to a need to strengthen labor market institutions around services, both modern and traditional, in all countries.

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Notes

1. Industry includes current ISIC rev.4 codes 5–43, i.e., mining and quarrying, manufacturing, electricity, gas, steam and air conditioning supply, water supply; sewerage, waste management and remediation activities, and construction. This is similar to the approach followed by Kaldor (1966) with one exception, in Kaldor's data mining goes together with agriculture; see Tables 3 and 4, pages 28 and 29 of Kaldor (1966).
2. The World Bank's 2019 classification using 2017 gross national income (GNI) per capita. High income includes greater than $12,055; upper-middle income includes between $3,895 and $12,055; lower-middle income includes between $995 and $3,895; and low-income includes less than $995.
3. We chose the current income level of the country as defined by the World Bank for 2019 using 2017 GNI per capita data.
4. See Appendix B for the exact match between these sectors and the ISIC rev.4 classification.
5. This is the specification commonly used in the literature. Still, the time inconsistency can be addressed using a different weighting scheme, see the end of this subsection for a discussion.
6. See Appendix B for the exact years, the sources, and the name of the countries included in the dataset.

7. Ideally, we would have liked to compare the performance of the transport and communication sectors separately before putting them together. However, the classification used for most of the 2005 data, the ISIC rev.3.1, aggregates them together, forcing us to do the same for the year 2015 (when the ISIC rev.4 is generally available and, thus, these two activities could have been separated) for consistency.
8. Weighted average of formal workers with indefinite contracts in activities included in ISIC rev.4 codes 49–53 and 64–75. Countries included are the EU-28 members (minus Croatia, Denmark, and Malta), Brazil, Canada, Chile, China, Colombia, Ecuador, Egypt, Guatemala, India, Mexico, Pakistan, Peru, South Africa, the Rep. of Korea, Tanzania, Turkey, Vietnam, and Zambia.
9. Sector-specific formality rates (weighted) are defined as having a written contract or access to social security (depending on data availability). Information available for 11 low- and lower-middle-income countries, latest year available, see Appendix B.
10. Sector-specific average (weighted) monthly wage expressed in 2011 $USD. Information available for 17 low- and lower-middle-income countries, latest year available, see Appendix B.
11. See Beerepoot and Lambregts (2015) or Berg et al. (forthcoming) for arguments in favor of the existence of a global labour market in outsourcing online platforms.
12. Note industry includes current ISIC rev.4 codes 5 to 43: i.e., mining and quarrying, manufacturing, electricity, gas, steam and air conditioning supply, water supply, sewerage, waste management and remediation activities, and construction.
13. The need for empirical correspondences is based on the multiplicity of links held by certain codes. The empirical correspondences affect the third and the fourth digits of the classification and are based on Indonesia's empirical splits from the 2015 LFS.
14. This regional grouping makes reference to two of the three subregions of the Europe and Central Asia ILO region, Eastern Europe, and Central and Western Asia, with the third subregion being Northern, Southern, and Western Europe (shown separately).

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Appendix A. Data on value added and employment for three sectors

The database used in Section 2 brings together data on value added and employment at the sectoral level (agriculture, industry and services)[12] as well as GDP and the working-age population for 77 countries at four points in time: 1985, 1995, 2005, and 2015.

Data on value added comes from the World Bank and UNdata. In addition, data on GDP and working-age population is retrieved from the World Bank. Finally, the source for data on employment shares by broad sector is ILOSTAT, although other sources are used to fill in the gaps due to the existence of extensive missing values, especially for the year 1985.

Despite the effort put to minimize the number of missing values, several countries need to be dropped from the analysis whenever data on employment are needed. In total, 77 countries are used for the full-sample analysis shown in Table 1 (i.e., they have data on value added for all four years) and 56 countries in the reduced-sample analysis carried out in Table 2 and 3 (i.e., they have data on value added and employment shares for all four years). The countries used are shown in Table A.1.

Finally, we would like to remark that no specific criteria have been used when selecting countries other than data availability, thus eliminating potential bias due to sample selection.

Table A.1. Countries used in the analysis of Tables 1 to 3, MVAE, 1985–2015.

Income group	Reduced sample (VA and employment)	Full sample (only value added)
High income (27)	Austria, Belgium, Canada, Chile, Cyprus, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, Norway, Panama, Portugal, Singapore, Rep. of Korea, Spain, Sweden, Switzerland, Trinidad and Tobago, United Kingdom, United States, Uruguay	Barbados
Upper-middle income (22)	Belize, Brazil, Bulgaria, China, Colombia, Costa Rica, Ecuador, Guatemala, Jamaica, Malaysia, Mauritius, Mexico, Namibia, Paraguay, Peru, South Africa, Suriname, Thailand, Turkey	Dominican Rep., Jordan, Saint Lucia
Lower-middle income (18)	Bangladesh, Bolivia, Egypt, El Salvador, Honduras, India, Indonesia, Nicaragua, Pakistan, Philippines, Vietnam	Cameroon, Cote d'Ivoire, Kenya, Mongolia, Sri Lanka, Tunisia, Zambia
Low income (10)		Burkina Faso, Dem. Rep. of Congo, Malawi, Mozambique, Nepal, Rwanda, Senegal, Sierra Leone, Tajikistan, Uganda

Appendix B. MLFM-11

The Macro Labor Force Micro-database (MLFM-11) combines macroeconomic data on value added with employment data with a microdata origin. The microdata have roots in the ILO's Labor Force Micro Database (LFM), originally developed for the Global Employment Trends for Youth (ILO 2017a). This article uses an updated version (v1.5) of the LFM that contains harmonized variables from household and labor force surveys of 64 countries at two points in time: a year close to 2005 and a year close to 2015. We refer

Table B.1. Economic activities, MLFM-11 (ISIC Rev.4).

Order	Code	Content
1	A	Agriculture
2	B, C, D, E	Mining and quarrying, manufacturing, electricity, and water supply
3	F	Construction
4	G, I	Wholesale and retail, accommodation, and food services
5	H, J	Transportation, storage, information, and communication
6	K	Financial and insurance services
7	L, M, N	Real estate, professional, scientific, and administrative activities
8	O	Public administration
9	P	Education
10	Q	Human health and social work
11	R, S, T, U	Arts, entertainment, other services, domestic personnel

readers to Table B.2, in which the countries, the data sources, and the exact years are shown.

A key variable found in the database is employment by economic activity (11 ISIC rev.4 sectors). The construction of this variable is particularly challenging, as the harmonization process has to take into account the existence of national classifications in certain countries. The countries for which conversion tables need to be used/constructed to adapt their national classification to the ISIC are the United States, Mexico, Brazil, South Africa, Cameroon, and Côte d'Ivoire. In other cases (mostly due to the timing of the chosen years), we have to deal with conversions from the ISIC rev.3 to the ISIC rev.4, for which we use a combination of official theoretical correspondences together with empirical linkages.[13] The 11 economic activities defined for all countries can be found in Table B.1.

In order to produce the MLFM-11, we upgrade the LFM with data on nominal sectoral value added in local currency for the 11 economic activities shown in Table B.1. The primary source of this variable is UNdata, although in some cases, due to the data not being disaggregated enough, we have to rely on other sources. This is the case for China (National Bureau of Statistics), the European countries (EUROSTAT), the United States (Bureau of Economic Analysis), Canada (Statistics Canada), Egypt, and the Republic of Korea (Trading Economics). Value added is converted to constant 2011 $PPP using the World Bank's PPP conversion factors and GDP deflators.

LFM v1.5 sources and coverage

In total 128 microdatasets from 64 countries have been used in creating this database. Fifty-two of these datasets come from the European Union Statistics on Income and Living Conditions (EU-SILC); for the purposes of this research, we use the years 2005 and 2015 for Austria, Belgium, Cyprus, the Czech Republic, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom; the years 2007 and 2015 for Romania; the years 2008 and 2015 for Bulgaria; and the years 2008 and 2014 for Switzerland.

In terms of country coverage, Africa is represented by 14 countries—Angola, Côte d'Ivoire, Cameroon, the Democratic Republic of Congo, Egypt, Ethiopia, Ghana, Mozambique, Nigeria, South Africa, the United Republic of Tanzania, Tunisia, Uganda, and Zambia—totaling 64 percent of the region's labor force. Jordan is the only representative from the Arab countries, totaling 4 percent of the region's labor force. Asia and the Pacific are represented by Bangladesh, China, Indonesia, Japan, Pakistan, Philippines, the Republic of Korea, Thailand, and Vietnam, totaling 91 percent of the region's labor force. Latin America and the Caribbean are represented by Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico, and Peru, totaling 78 percent of the region's labor force. Eastern

Table B.2. Microdata years and sources.

Country	Years	Source	Survey name
China	2002 2014	China Institute for Income Distribution	Chinese Household Income Project (CHIP)
India	2005 2012	ILO microdata repository	Employment and Unemployment (NSSO 61, 68)
26 European countries	2005 2015	EUROSTAT	Statistics on Income and Living Conditions (SILC)
United States	2006 2016	US Bureau of Labor Statistics	Current Population Survey (CPS)
Indonesia	2005 2015	ILO microdata repository	National Labor Force Survey (SAKERNAS)
Brazil	2005 2015	Brazilian Institute of Geography and Statistics	National Household Sample Survey (PNAD)
Bangladesh	2005 2016	ILO microdata repository	Labor Force Survey (LFS)
Russian Fed.	2005 2015	University of North Carolina at Chapel Hill	Russia Longitudinal Monitoring Survey (RLMS)
Japan	2002 2012	Research Center at Osaka University of Commerce	Japanese General Social Survey (JGSS)
Pakistan	2005 2014	ILO microdata repository	Labor Force Survey (LFS)
Nigeria	2007 2016	IPUMS World Bank	General Household Survey (GHS)
Vietnam	2007 2014	ILO microdata repository	Labor Force Survey (LFS)
Mexico	2006 2016	National Institute of Geography and statistics	National Survey of Occupation and Employment (ENOE)
Ethiopia	2005 2016	Central Statistical Agency World Bank	Household Income Survey (HICE) Ethiopian Socio-Economic Survey (ESS)
Germany	2005 2015	DIW-Berlin	German Socio-Economic Panel (SOEP)
Philippines	2003 2013	ILO microdata repository	Labor Force Survey (LFS)
Thailand	2007 2015	ILO microdata repository	Labor Force Survey (LFS)
Egypt	2006 2016	Economic Research Forum	Labor Market Panel Survey (LMPS) Labor Force Survey (LFS)
D.R. Congo	2004 2012	ILO microdata repository	Enquête 1-2-3
Turkey	2005 2015	Turkish Statistical Institute	Household Labor Force Survey (HIA)
Rep. of Korea	2006 2016	Korea Statistics Department	Economically Active Population Survey (EAPS)
Tanzania	2006 2014	ILO microdata repository	Labor Force Survey (LFS)
Colombia	2005 2015	National Administrative Department of Statistics	Continuous Household Survey (ECH) Great Integrated Household Survey (GEIH)
Canada	2005 2015	Statistics Canada	Labor Force Survey (LFS)
South Africa	2003 2015	Data First	Labor Force Survey (LFS) Labor Market Dynamics (LMD)
Uganda	2002 2014	IPUMS World Bank	Census Uganda National Panel Survey (UNPS)
Country	**Years**	**Source**	**Survey name**
Peru	2006 2016	ILO microdata repository	National Household Survey (ENAHO)
Ghana	2006 2015	ILO microdata repository	Ghana Living Standards Survey (GLSS) Labor Force Survey (LFS)
Mozambique	2007 2015	IPUMS ILO microdata repository	Census Family Budget Survey (IOF)
Chile	2006 2015	Ministry of Social Development	Chile National Socioeconomic Characterization Survey (CASEN)

(*continued*)

Table B.2. Continued.

Country	Years	Source	Survey name
Cote d'Ivoire	2002	ILO microdata repository	Household Living Conditions Survey (ENV)
	2016		Employment Situation Survey (ENSESI)
Angola	2005	Institute of National	Well-Being Indicators Survey (QUIBB)
	2014	Statistics	Census
Cameroon	2007	ILO microdata repository	Cameroon Household Survey (ECAM)
	2014		
Ecuador	2005	ILO microdata repository	National Survey of Employment and
	2015		Unemployment (ENEMDU)
Zambia	2008	ILO microdata repository	Labor Force Survey (LFS)
	2014		
Guatemala	2004	ILO microdata repository	National Survey of Employment and Income
	2015		(ENEI)
Tunisia	2005	Economic Research Forum	Household Living Conditions Survey (EBCNV)
	2014		Labor Market Panel Survey (LMPS)
Jordan	2006	Economic Research Forum	Employment and Unemployment Survey (EUS)
	2016		
Armenia	2008	ILO microdata repository	Labor Force Survey
	2016	Armenia Statistics Authority	

Europe and Central and Western Asia[14] are represented by Armenia, Bulgaria, Cyprus, the Czech Republic, Hungary, Poland, Romania, the Russian Federation, Slovakia, and Turkey, covering 68 percent of the region's labor force. Northern, Southern, and Western Europe are represented by Austria, Belgium, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland, and the United Kingdom, covering 95 percent of the region's labor force. Finally, Northern America is represented by Canada and the United States of America, covering 100 percent of the region's labor force.

Moreover, we use the World Bank's 2019 income classification to summarize findings. High-income (> $12,055) countries include Austria, Belgium, Canada, Finland, France, Germany, Ireland, Japan, Luxembourg, the Netherlands, Norway, Sweden, Switzerland, the United Kingdom, the United States, Chile, Cyprus, the Czech Republic, Estonia, Greece, Hungary, Italy, Latvia, Lithuania, Poland, Portugal, the Slovak Republic, Slovenia, the Republic of Korea, and Spain. The countries classified as upper-middle-income (between $3,896 and $12,055) are Armenia, Brazil, Bulgaria, China, Colombia, Ecuador, Guatemala, Jordan, Mexico, Peru, Romania, Russia, South Africa, Thailand, and Turkey. Lower-middle-income (between $996 and $3,895) countries include Angola, Bangladesh, Cameroon, Egypt, Ghana, India, Indonesia, Côte d'Ivoire, Nigeria, Pakistan, the Philippines, Tunisia, Vietnam, and Zambia. Low-income (< $996) countries are represented by the Democratic Republic of Congo, Ethiopia, Mozambique, Tanzania, and Uganda.

Appendix C. Three-fold decomposition results.

Table C.1. Threefold decomposition results for high-income countries, by sector.

Economic sector	Within effect	Between (static)	Between (dynamic)
Total	0.74	0.61	−0.54
Agriculture	0.06	−0.04	−0.02
Manufacturing	0.46	−0.34	−0.09
Construction	0.01	−0.07	0.00
Transport & comm.	−0.13	0.35	−0.10
Trade, hospitality	0.10	0.02	−0.02
Financial serv.	0.02	0.05	−0.04
Business act.	−0.02	0.50	−0.13
Public admin.	0.12	−0.01	−0.06
Education	0.00	0.06	−0.02
Health	0.01	0.14	−0.02
Other servicers	0.10	−0.04	−0.03

Source: LFM v1.5 and authors' own calculations.

Note: The table shows percentage point contributions to the labor productivity annualized growth rate of high-income countries (GNI per capita greater than $12,055), 2005–2015.

Table C.2. Threefold decomposition results for upper-middle-income countries, by sector.

Economic sector	Within effect	Between (static)	Between (dynamic)
Total	1.34	0.89	−0.61
Agriculture	0.24	−0.1	−0.08
Manufacturing	0.55	−0.19	−0.07
Construction	−0.04	0.18	−0.14
Transport & comm.	0.00	0.06	−0.01
Trade, hospitality	0.16	0.14	0.00
Financial serv.	0.15	0.07	−0.01
Business act.	−0.11	0.62	−0.17
Public admin.	0.08	0.06	−0.01
Education	0.09	0.02	0.00
Health	0.05	0.04	0.00
Other servicers	0.16	0.00	−0.11

Source: LFM v1.5 and authors' own calculations.

Note: The table shows percentage point contributions to the labor productivity annualized growth rate of upper-middle-income countries, 2005–2015. Upper-middle-income countries are defined as those with a GNI per capita between $3,896 and $12,055 in 2017.

Table C.3. Threefold decomposition results for low- and lower-middle-income countries, by sector.

Economic sector	Within effect	Between (static)	Between (dynamic)
Total	2.4	1.75	−0.64
Agriculture	0.71	−0.28	−0.12
Manufacturing	0.74	0.09	−0.1
Construction	0.02	0.39	0.01
Transport & comm.	0.18	0.28	−0.1
Trade, hospitality	0.17	0.43	−0.04
Financial serv.	0.15	0.13	−0.02
Business act.	0.1	0.51	−0.19
Public admin.	0.21	0.01	−0.02
Education	0.04	0.11	0
Health	0.03	0.04	−0.02
Other servicers	0.04	0.06	−0.05

Source: LFM v1.5 and authors' own calculations.

Note: The table shows percentage point contributions to the labor productivity annualized growth rate of low- and lower-middle-income countries, 2005–2015. Lower-middle-income countries are defined as those with a GNI per capita between $996 and $3,895 in 2017; low-income countries are those with a GNI per capita lower or equal than $995.