



Deindustrialization? A global perspective



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HIGHLIGHTS

- We gather manufacturing employment and output shares for 82% of the world's population, 1970–2010.
- Manufacturing's share in global employment and output did not decline.
- In contrast, both shares tended to decline within countries ("premature industrialization").
- Within countries, productivity grew much faster in manufacturing than in non-manufacturing.
- This difference is much smaller globally because factory jobs moved to less productive countries.

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ABSTRACT

Recent studies show that, *within countries*, manufacturing labor productivity growth has outstripped aggregate labor productivity growth, putting significant downwards pressure on national manufacturing employment shares. We compile the first (nearly) global database of national manufacturing employment and output levels over time, and use it to document two facts seemingly at odds with these results: (1) the manufacturing sector's share of global employment did not fall between 1970 and 2010; and (2) manufacturing and aggregate labor productivity at the global level grew at similar rates. We show that these trends occurred because rapid within-country manufacturing productivity growth was counterbalanced by a shift of manufacturing jobs towards lower productivity economies.

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1. Introduction

Recent studies show that industrialization has become more difficult¹: the per capita GDP at which countries might expect to see their manufacturing employment shares begin to decline has fallen over time, as have the highest manufacturing employment shares that countries achieve before beginning to deindustrialize. Manufacturing shares in national value added display the same declining trends, but much less acutely. Within countries, output per worker has therefore risen much faster in manufacturing than

in non-manufacturing. This has given rise to speculation, some of it fearful, that technology is depriving the world of manufacturing jobs.

We argue that these trends must be placed in a global context. After all, manufacturing supply chains have globalized during the period that these concerns arise, and now involve far more and different countries than they once did. Any sensible assessment of past manufacturing employment trends and future possibilities must take this into account. We do so by assembling a dataset of manufacturing employment and output levels covering 64 countries accounting for 82% of the world's population, and the years 1970–2010. This appears to be the most comprehensive database of manufacturing employment shares available to date. Using this "global" database, we document two trends that appear paradoxical in light of the national trends described above: the manufacturing sector's shares of both global employment and

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¹ For example: Dasgupta and Singh (2007), Felipe et al. (2014), Amirapu and Subramanian (2015), and Rodrik (2016).

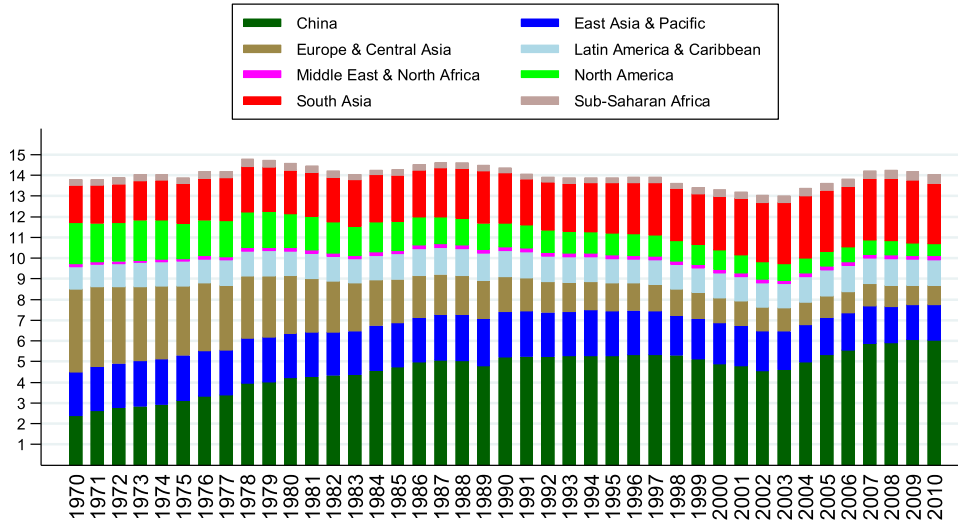


Fig. 1. Share of manufacturing in global employment with regional contributions (64 countries that have all necessary employment data). Note: GGDC employment data, excluding West Germany, augmented with 23 non-GGDC countries from Felipe et al. (2014).

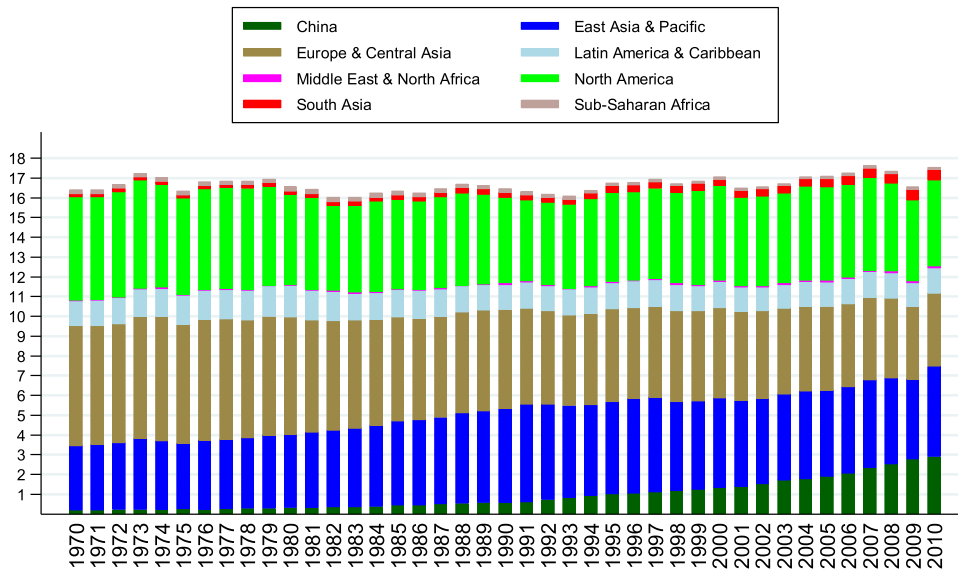


Fig. 2. Share of manufacturing in global output with regional contributions (64 countries that have all necessary employment data).

value added did not change over these four decades. This implies that, globally, manufacturing labor productivity did not grow faster than aggregate labor productivity—a finding sharply at odds with the within-country evidence. We resolve this paradox by showing that massive within-country labor productivity growth was counteracted by a continual shift of manufacturing jobs towards more populous, but lower productivity economies. This in turn reduced the average manufacturing employment shares that industrializing economies could hope to achieve. Thus, even as former industrial powers deindustrialized, and new industrializing economies began to deindustrialize earlier than they used to, the world did not deindustrialize.

2. Data

We began with data on manufacturing employment levels for 41 countries from the Groningen Growth and Development Center’s Ten Sector Database (Timmer et al., 2015). We augmented this with data on the manufacturing employment shares of 23 non-GGDC countries that we previously compiled for Felipe

et al. (2014).² To obtain these countries’ total manufacturing employment levels, we multiplied these employment shares by total national employment, which we calculated by combining WDI data on population, the share of the population aged 15–64, and the employment rate within that age group. Manufacturing and aggregate value added data (in constant 2005 dollars) come from the UN Statistics Division.³ In order to be able to compare

² Where GGDC and Felipe et al. (2014) both have data on a country, we have compared the employment share series and found them to be similar in levels, trends and turning points. GGDC provides data on 42 countries. We do not include West Germany, due to reunification.

³ We would ideally use purchasing power parity (PPP) corrections when comparing manufacturing value added across countries (O’Mahony and Timmer, 2009). However, PPP correction factors specific to the manufacturing sector do not exist for many of the countries in our dataset. PPP corrections for expenditures produced through the International Comparisons Project emphasize differences in the prices of labor-intensive, non-tradable products across countries, and would likely overstate differences in the prices of more tradable manufactured goods between higher and lower-income countries.

employment and output trends over time, we restrict attention to the 64 countries for which we have usable employment data over time. We are compelled by missing observations to apply log-linear interpolation (and extrapolation for some smaller countries) to fill in missing values. Results using only those countries that do not require extrapolation are not qualitatively different.

3. Analysis

Fig. 1 depicts the manufacturing sector's share of global employment over time, and the contributions of eight regions of the world to it. A region's contribution is simply the estimated number of manufacturing jobs in that region divided by global employment. One striking feature of this chart is the near constancy of the global manufacturing employment share over time, at roughly 14% of global employment. This implies that the declines in national manufacturing employment documented by previous studies are not caused by declines in labor utilized by the global manufacturing sector. Another feature, which suggests increasing competition from populous lower-income countries is more likely to be the culprit, is the large continual shift in the location of manufacturing jobs. In particular, relative to growing global employment, Europe and North America lost roughly as many manufacturing jobs as China and South Asia gained.

Fig. 2 provides analogous charts for value added shares. Here a country's contribution is that country's estimated manufacturing value added divided by global value added, all measured in constant 2005 US\$. Both features observed in Fig. 2 reappear. The manufacturing sector's share in global value added remains roughly constant over time, though at 17%, rather than 14%. And, the European and North American manufacturing sectors' combined contribution to global value added fell by as much as that of South Asia, East Asia and China rose.⁴

The constancy of both the global manufacturing employment and value added shares together imply that global labor productivity (value added per worker) in manufacturing has grown no faster than global labor productivity in aggregate. This contrasts with the within country trends reported by other studies, wherein manufacturing labor productivity typically grew much faster than aggregate labor productivity. Our data confirm this finding (not shown), and Figs. 1 and 2 tell a similar story: China's value added contribution, for example, grew by 1650%, while its employment contribution grew by 250%, implying that Chinese manufacturing labor productivity grew 6.6 times faster than global aggregate labor productivity. Similarly, South Asia's value added contribution grew by 350%, while its employment contribution grew by 60%; the European and North American value added contributions shrank much more slowly than their employment contributions; and East Asia's output contribution grew slightly, while its employment contribution fell.

Why did manufacturing productivity so dramatically outpace non-manufacturing productivity at the national level, but not the global level? The obvious explanation is that even as manufacturing labor productivity steamed ahead of aggregate productivity within countries, this was counteracted by a continual movement of manufacturing jobs from higher to lower labor productivity economies. To study the contributions of these two opposing forces, we adapt a standard labor productivity decomposition, traditionally used to obtain the contributions to labor productivity growth of labor reallocations across sectors and labor productivity growth within sectors (e.g., Maroto-Sánchez

and Cuadrado-Roura, 2009). Here we utilize it to break out the contributions of reallocations of employment between countries and productivity growth within countries. This exercise has not, to our knowledge, been conducted in the literature before. Let λ_m^0 , λ_m^1 and $\bar{\lambda}_m$ be global manufacturing value added per worker in an initial year, in a subsequent year, and the average of the two. Let $\lambda_{m,c}^0$, $\lambda_{m,c}^1$ and $\bar{\lambda}_{m,c}$ be the analogous country-level measures. Finally, let $\alpha_{m,c}^0$, $\alpha_{m,c}^1$ and $\bar{\alpha}_{m,c}$ indicate country c 's share of global manufacturing employment initially, subsequently, and on average. Then, the growth rates of manufacturing (or, dropping the m subscript, aggregate) labor productivity can be decomposed as follows:

$$\hat{\lambda}_m \equiv \frac{\lambda_m^1 - \lambda_m^0}{\lambda_m^0} \equiv \frac{1}{\lambda_m^0} \sum_{c=1}^C \bar{\lambda}_{m,c} (\alpha_{m,c}^1 - \alpha_{m,c}^0) + \frac{1}{\lambda_m^0} \sum_{c=1}^C \bar{\alpha}_{m,c} (\lambda_{m,c}^1 - \lambda_{m,c}^0). \quad (1)$$

The first summation captures the effects of labor reallocations across countries. It is negative when manufacturing employment moves towards countries with lower levels of manufacturing labor productivity. The second summation captures the effects of labor productivity growth within countries, weighted by their shares of global manufacturing employment. The sum of the terms for a given country is the country's contribution to global labor productivity growth.

Table 1 provides the detailed decompositions of global aggregate and manufacturing labor productivity growth using identity (1), across the eight regions represented in Figs. 1 and 2. It also provides the analogous bottom line results for manufacturing when the decomposition is conducted across 64 countries. It confirms, as expected from the sector's nearly constant shares in global value added and employment, that aggregate and manufacturing labor productivity grew at a fairly similar pace globally between 1970 and 2010 (64.2% vs. 92.9%).

It also shows that dramatic productivity growth within countries was offset by a continual reallocation of manufacturing jobs to lower productivity countries and regions. Counterfactually, if manufacturing jobs had not moved, within-region productivity growth would have lifted output per worker 210% during this 40 year period (and aggregated productivity by only 110%). However, the reallocation of manufacturing jobs from higher productivity manufacturing sectors in Europe and North America to lower productivity sectors in China and South Asia dragged productivity down by an estimated 138%. The decomposition across 64 countries shows starker results, with within-country productivity growth pulling manufacturing productivity up 234% and relocation pulling it down 161%. Thus, rising productivity within countries and greater competition between countries, in combination, lead to global manufacturing productivity growth that operates at par with the rest of the world economy.

Table 1 also shows some important shifts in productivity trends and regional roles over time. Globally manufacturing productivity grew more slowly than aggregate productivity between 1970 and 1990. During 1990–2010, manufacturing labor productivity grew 12.2 percentage points faster than aggregate productivity and nearly two and a half times faster than it had grown during 1970–1990 (45.4% vs. 18.9%). The later period also saw a dramatic increase in China's contribution to global manufacturing productivity growth. Between 1970 and 1990, three quarters of global manufacturing labor productivity growth came from East Asia and the Pacific (14.5%/18.9%). North America's contributions were negligible in the earlier period, as job losses and productivity growth within this high productivity region offset each other ($-20.3\% + 20.0\% = -0.3\%$). However, the region's contributions

⁴ These results are consistent with Haraguchi's (2014) finding that, aggregating across developing economies only, the manufacturing sector's employment share increased since 1970.

Table 1
Decomposing shifts in “Global” manufacturing and aggregate labor productivity.

	1970–2010			1970–1990			1990–2010		
	Relocation	Within region	Total	Relocation	Within region	Total	Relocation	Within region	Total
<i>Aggregate</i>									
China	0.3%	13.2%	13.5%	0.2%	1.4%	1.6%	−0.7%	10.4%	9.6%
East Asia & Pacific	−1.1%	17.7%	16.6%	−0.1%	10.7%	10.7%	−1.0%	5.8%	4.8%
Europe & Central Asia	−35.3%	42.3%	7.0%	−24.5%	26.9%	2.4%	−5.7%	9.4%	3.7%
Latin America & Caribbean	3.2%	2.1%	5.3%	1.4%	0.5%	1.8%	1.4%	1.4%	2.8%
Middle East & North Africa	0.2%	0.4%	0.6%	0.0%	0.2%	0.2%	0.2%	0.1%	0.3%
North America	−14.4%	30.8%	16.5%	−7.3%	13.2%	5.9%	−4.9%	13.5%	8.6%
South Asia	0.6%	3.4%	4.0%	0.1%	0.5%	0.7%	0.3%	2.4%	2.7%
Sub-Saharan Africa	0.5%	0.3%	0.8%	0.0%	0.0%	0.0%	0.4%	0.3%	0.6%
<i>World (decomposed by region)</i>	−45.9%	110.1%	64.2%	−30.1%	53.3%	23.2%	−10.0%	43.2%	33.2%
<i>Manufacturing</i>									
China	9.4%	18.0%	27.4%	1.6%	1.2%	2.8%	2.2%	18.5%	20.7%
East Asia & Pacific	−8.1%	33.0%	24.9%	−0.4%	14.9%	14.5%	−7.5%	16.2%	8.7%
Europe & Central Asia	−77.8%	77.7%	−0.1%	−38.0%	37.3%	−0.7%	−18.9%	19.4%	0.5%
Latin America & Caribbean	1.5%	3.0%	4.5%	1.5%	−0.1%	1.5%	−0.3%	2.8%	2.6%
Middle East & North Africa	0.2%	0.4%	0.5%	0.0%	0.1%	0.2%	0.1%	0.2%	0.3%
North America	−64.4%	75.4%	11.0%	−20.3%	20.0%	−0.3%	−22.5%	32.0%	9.5%
South Asia	1.3%	3.1%	4.4%	0.4%	0.6%	0.9%	0.6%	2.3%	2.9%
Sub-Saharan Africa	0.4%	−0.1%	0.4%	−0.2%	0.3%	0.1%	0.6%	−0.4%	0.2%
<i>World (decomposed by region)</i>	−137.5%	210.4%	72.9%	−55.4%	74.3%	18.9%	−45.7%	91.1%	45.4%
<i>World (decomposed by country)</i>	−160.8%	233.7%	72.9%	−58.9%	77.9%	18.9%	−58.5%	103.9%	45.4%

Note: Results of a between–within country/region decomposition of the percentage change in “global” aggregate and manufacturing labor productivity. “Global” refers to the aggregate of the 64 countries for which we have employment share data.

picked up in the later period, despite continuing job losses, as productivity boomed. European productivity growth was offset almost exactly by job losses over the four decades.

Indeed, the contribution of relocation across countries to productivity is similar in both periods (negative 59%). The difference in manufacturing productivity growth between the later and earlier periods is driven entirely by the increased contributions from within-region productivity growth ($45.4\% - 18.9\% \approx 91.1\% - 74.3\%$), which is explained almost exclusively by the contributions of faster productivity growth in China (18.5% vs. 1.2%) and North America (32% vs. 20%), offset by slower productivity growth in Europe.

4. Conclusions

We have shown that, in contrast to trends at the national level, manufacturing employment and output shares have not declined globally. Rather, the headline story has been a massive reconfiguration of supply chains, which formerly involved richer economies, but now run through more populous, and (initially) lower productivity economies—most notably China. This spreads manufacturing jobs more thinly, so that individual countries find it difficult to sustain high levels of manufacturing employment. Studies of deindustrialization in which countries are the basic unit of observation provide an incomplete picture of the structural trends at play.

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