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Manufacturing still matters for developing countries

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ABSTRACT

The "rise of the Rest" and almost all successes in economic development have relied on late industrialization. However, the consensus that manufacturing was the strategic road for development has recently been challenged. This paper addresses the issue of the status of manufacturing for economic development in the current period. To clarify whether the importance of manufacturing in developing countries has declined or not in the 21st Century, we constructed an original and extensive database on the world manufacturing production, that provides information about value added and employment for 200 countries, of which 160 Developing countries, for the 1970–2018 period.

The study does not reveal evidence of a recent decline of manufacturing in developing countries, including or not China. Rather we document a continuous expansion of manufacturing employment in the developing world, that accounts now for 82 % of the world employment, while the share of the developing economies in the world output has doubled over the period. Since 2010, we observe and we quantify a new pattern. Manufacturing employment does not increase any more in China, while it has continued to grow at the same pace in the rest of the developing world. Our findings show that manufacturing has continued to play a key role in economic development. Thus, low-income countries should not give up industrialization strategies and should learn from the recent experiences of rapid industrialization and growth. In the near future, the upgrading of China's industrial structure will enlarge the windows of opportunities in manufacturing for late-comers.

1. Introduction

Since the early take off of the manufacturing sector in England, industrialization has become the engine of economic development and catching-up.[1] It has been associated with wealth, technological advance, political power and international dominance. The world economy has long been divided into rich – industrialized –economies and poor countries. After World War II, a small number of countries entered the catch-up phase of industrial development, while economies unable to industrialize were perceived as lagging behind. Fifty years ago, in 1975, the second general conference of the United Nations on industrial development, in Lima, announced that the share of developing countries (DC) in the world industrial production should be increased to 25 % by 2000. This goal was then considered as unrealistic. It nevertheless was reached in 2003 and, in 2018, the developing economies at the aggregate, the South,[2] produced 51 % of the world manufacturing value added.

The "rise of the Rest" (Amsden, 2001) and almost all historical examples of success in economic development and catch-up have relied on late industrialization (Szirmai, 2012).[3] However, the consensus that manufacturing was the high road of economic development seems to be weakening. Although the shares of DC in world manufacturing output and employment have not declined, concentration of industry within the developing world has led to more differentiation between countries growth patterns, and to discussions about the remaining potential of manufacturing growth.

This paper addresses the question of the status of manufacturing for economic development in the current period. Its objective is to clarify whether the importance of manufacturing in developing countries has declined or not in the 21st Century. To achieve this objective, we analyze the dynamics of manufacturing in DC, based on a comprehensive set of value added and employment data. The paper is organized as follows. The discussion on manufacturing as the engine of growth is presented and analyzed in Section 2. Section 3 explains the data and the

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[1] When we speak about industry and industrialization in this paper we strictly consider the manufacturing sector and its role.

[2] See below for countries grouping and classification.

[3] According to Thirlwall (1999, p 78), only three countries have become rich on agriculture alone: Australia, New Zealand and Canada.

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methodology and presents the change in the world structure of the manufacturing output during the last 50 years. Section 4 estimates the structure of the world manufacturing employment, including the informal sector, and studies changes in employment manufacturing in the world and in DC. Section 5 concludes.

2. The role of manufacturing in economic development

2.1. The engine of growth and structural change

No country has achieved and maintained a high income level without developing its manufacturing sector, except for a few exceptions such as oil rich countries and small financial havens. The historical evidences show a strong relationship between industrialization and economic development (Amsden, 2001; Bairoch, 1982; Landes, 2000; Reinert, 2007). The advanced economies are the countries that first industrialized. All economies that are rich today have enjoyed high manufacturing employment shares, and countries that remain poor have failed to diversify away from agriculture into manufacturing activities (Lin, 2012; UNIDO, 2013).

As a consequence, there is an empirical correlation between manufacturing value added and income per capita, at least up to a certain point (Fig. 1). The developing countries which now have higher per capita incomes have increased the share of manufacturing in GDP and employment, as well as in exports. The poorest countries are systematically countries that have failed to industrialize and that still have very low level of manufacturing value added per head. As Felipe et al. (2014) put it, "manufacturing employment has therefore been, as a matter of historical record, necessary but not sufficient for eventual prosperity".

Arguments in favor of industrialization as the engine of economic development come from empirical and theoretical observations. They essentially rely on the power of structural change, i.e.: the successful process of diversification from low-productivity traditional sectors to manufacturing and more productive activities. Economic development is fundamentally linked to the changes in the structure of economic activities that generate the potential for incomes rise. Manufacturing has a catalytic role in the transformation of the structure of traditional economies. It results from intrinsic characteristics of the manufacturing sector that make its contribution instrumental to economic growth.

The answer to the question "what is special about manufacturing which explains for these empirical association ?" was early given by Kaldor (1966, 1967). Kaldor's laws state that there exist strong, and positive, correlations between the growth of manufacturing output and : the growth of GDP (first law), the growth of productivity in the manufacturing sector (second law[4]), and the growth of productivity in the non-manufacturing sectors (third law). The arguments to support Kaldor's conclusions have been presented in numerous papers and studies.[5] They can be summarized as follows.

In the first place, the manufacturing sector offers special opportunities for economies of scale, which are much lower in agriculture or services, and thus it has a high potential for productivity improvement. Moreover, manufacturing growth generates externalities in technology development and skill creation. Linkage effects are also particularly powerful in manufacturing (Hirschman, 1958). Therefore, growth of the manufacturing output induces productivity and technology progress in the manufacturing sector as well as in other sectors through direct production linkages and indirect effects. Manufactured goods have high income elasticities of demand (Felipe et al., 2014) and, in addition, they are tradable, which implies that output growth is not limited by the (often small) size of the domestic market (Rodrik, 2013). As a result, in a DC manufacturing draws resources from traditional sectors, habitually without significantly reducing output in these sectors (Lewis, 1954). It can absorb and increase the productivity of large quantities of unskilled labor, which is not the case of other higher-productivity sectors, such as mining or modern services. This set of self-reinforcing mechanisms explains the leading role of manufacturing growth in the development process.

Since Kaldor's (1967) early test of the influence of the manufacturing sector on the rate of growth, a large body of empirical studies has confirmed the robust positive link between growth and structural change towards manufacturing. For example, Fagerberg and Verspagen (1999) regress real growth rates of GDP on growth rates of the manufacturing output. They conclude that manufacturing was typically an engine of growth in DC in East Asia and Latin America but they find no effect in rich countries. Necmi (1999) verified whether Kaldor's conclusion remain valid for 45 mostly developing countries for the period 1960–1994 and he confirmed it, except for a few sub-Saharan economies. A larger econometric study, based on 131 DC in 2000–2005, shows that growth is correlated with the expansion of manufacturing value-added (UNIDO, 2009). In a first paper Szirmai and Verspagen (2010) observed that the share of manufacturing and economic growth are correlated and that the link is stronger for poorer economies. In a second study Szirmai and Verspagen (2015) confirm their initial result and they show that the leading role of manufacturing on growth is conditional to the levels of education and income. They find that a higher level of education has become necessary to benefit from the growth effect of manufacturing in DC in the more recent period. Effects on growth are not found in the service sector. Marconi et al. (2016) used a dynamic panel data for a sample of 63 countries to evaluate Kaldor's two first laws. They reaffirm their validity, showing that higher growth in manufacturing production generate higher economic growth (first law) and higher productivity in manufacturing (second law). They find stronger effects for low-income countries. Finally, Rodrik (2013) has re-examined the nature and the leading role of manufacturing in the growth process and, in line with the early arguments of Hirschman and Kaldor, he shows that the manufacturing sector exhibit unconditional labor productivity convergence, unlike other productive activities.

2.2. Premature deindustrialization : a disputable thesis

While historical and empirical evidences show that industrialization has led growth and catching-up, the possibility to continue to follow this pattern of economic development was recently challenged by a new narrative on deindustrialization in DC.

The term deindustrialization usually designates the traditional path of structural transformation of advanced economies. For rich countries, the process of deindustrialization is characterized by a fall of the shares of manufacturing employment and value added and the expansion of high-productivity services. Employment deindustrialization is often faster than output deindustrialization (Atolia, 2020). The process is fueled by the continuous productivity growth in the manufacturing sector and the high income elasticity of demand for services.

Following Dasgupta and Singh (2006) early work on "premature deindustrialization", Rodrik (2016) examines the evidence of deindustrialization in countries at low or middle levels of income. He reports that since the 1990s the shares of manufacturing in the employment and output of DC has declined, and he observes that the peak, the maximum, of manufacturing shares occurs at a lower level of income than it has been the case before for advanced economies. Rodrik estimates that economies that deindustrialized since 1990 had a peak of manufacturing's share of employment below the economies that began deindustrializing before 1990, and their level of income per capita was half the pre-1990 economies level (4 273 constant 1990 dollars against 11 048 constant 1990 dollars). These findings lead to assess that premature deindustrialization "could well remove the main channel through which

[4] Also known as the Verdoorn's law.

[5] Including, for the last decade: Felipe et al. (2014), Haraguchi et al (2017), Kruse et al (2021), Rodrik (2013), Szirmai (2012), Szirmai and Verspagen (2015), UNIDO (2013).

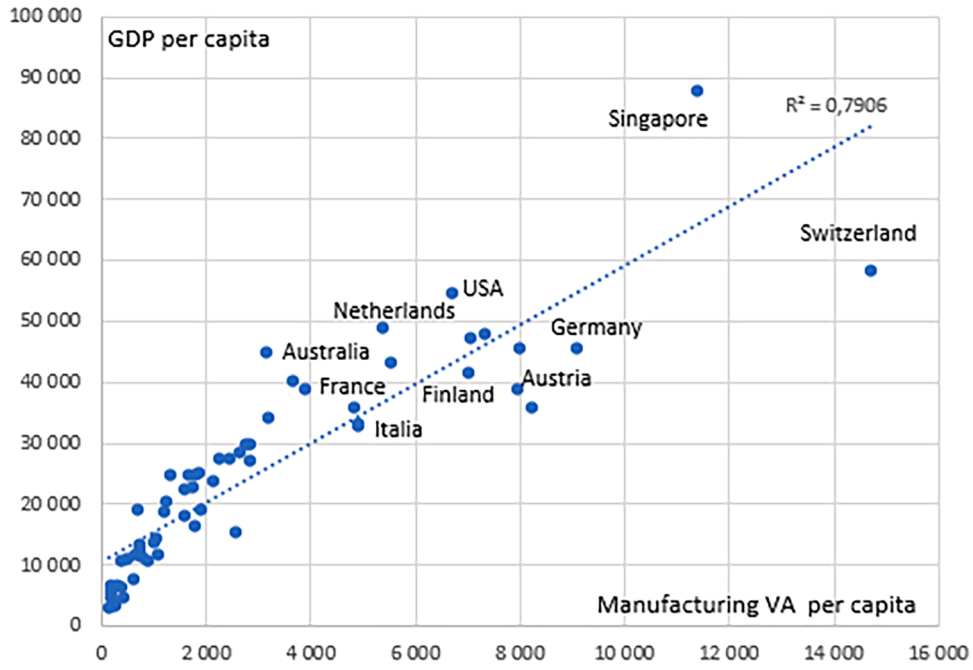

Fig. 1. Manufacturing value added and GDP per capita ($)
Source: Data from World Bank WDI. GDP per capita in PPP constant 2011 international $; Manufacturing VA per capita in current 2017 $.

rapid growth has taken place in the past" (Rodrik 2016). Accordingly, manufacturing may no longer be the engine of growth and catching up it was. Early deindustrialization would reduce the role of manufacturing in the future.

While the success of economic development was seen as synonymous with manufacturing growth, the premature deindustrialization thesis provides new insights. It stimulates a debate about the importance of industrialization and it offers more pessimistic prospects on the strategic role of manufacturing for DC and its capacity to grow, absorb workers and reduce poverty (Dasgupta and Singh, 2006; Palma, 2005; Rodrik, 2016). However, a number of other studies asserts that it is too early to conclude that the potential of DC manufacturing growth has declined (Chang et al., 2020; Diao et al., 2017; Haraguchi et al. 2017; Kruse et al. 2021; Mensah 2020; Nguimkeu and Zeufack 2019). In the context of this discussion, we now point out to three empirical arguments that may reduce the determinism of the premature deindustrialization thesis.

First, the industrialization and deindustrialization trends identified are sensitive to the size and the structure of the samples. The one used by Rodrik (2016), for instance, is small. It covers 42 countries, of which 28 only are DC: 11 countries in Sub-Saharan Africa; 2 countries in North-Africa; 6 in Asia; 9 in Latin America. It offers the general conclusion that "countries are running out of industrialization opportunities sooner and at much lower levels of income compared to the experience of early industrializers", while simultaneously isolating the case of "Asian countries and manufactures exporters (that) have been largely insulated from those trends". Who is left then? The average is built on a set of non-competitive manufacturing producers. Thus the significance of the trend seems to be limited. Relying on a larger group of DC and a different approach, Haraguchi et al. 2017 do not confirm the decrease in the importance of manufacturing for development. In a recent study where they use Rodrik's methodology, Kruse et al. (2021) find that for many DC the peak of the manufacturing share in employment has not yet been reached. In the case of Africa, they use a larger sample and they find a significant industrialization trend in the recent period, contrary to Rodrik (2016).

Second, a key argument of the deindustrialization thesis is the decrease of the peak of the manufacturing shares. Rodrik (2016) estimates that the maximum of manufacturing shares of employment and value added in DC since 1990 has fallen 3 to 4 percentage points below the maximum shares that were reached by countries that began to deindustrialize before 1990. However, manufacturing output relies to a growing extent on inputs from services. The consequence of the fragmentation of manufacturing production is that various activities and tasks[6] formerly integrated within the manufacturing firm have been outsourced to services producers. Thus, services account for an increasing share of the total value of manufactured goods— the so-called "servicification" of manufacturing (Baldwin, 2016). While it is difficult to precisely measure this trend, it has been soundly established. For instance, UNIDO (2013) estimates that if we add jobs outsourced or in manufacturing-related services, the share of manufacturing in total employment would increase by around 20 % worldwide. Studies measuring the degree of servicification of the manufacturing sector at the country level have been limited but they all conclude to its intensification.[7] In a comprehensive survey that covers 40 countries accounting for 85 % of the world GDP (IMF 2018), it was estimated that the non-manufacturing value added content in the global manufacturing output increased from 42 % in 1995 to 47 % in 2011; a 5 percentage points change; A trend identified in all manufacturing industries. Thus, if we take employment and value added in manufacturing-related services into account, the contribution of manufacturing may be more resilient. As Felipe et al. (2014) put it, there is a possibility that the deindustrialization argument simply captures the increase of outsourcing in the manufacturing sector.

Third, the analysis of premature deindustrialization relies on decline of manufacturing shares over 1990–2010. The major change in the world economy during this period has been the explosive rise of China. It became the 1st largest exporter in the world in 2009, and in 2010 it overtook the US, becoming the 1st manufacturing producer. The speed and the magnitude of China's growth produced a demand shock and a

[6] Such as accounting, marketing, legal services, logistics, etc.

[7] For instance, in the case of Sweden Lodefalk (2013) shows that the services share of inputs used in manufacturing production doubled over 1975–2005. In France, outsourcing explains 25 %of the fall of the share of manufacturing in GDP over 1980-2007, according to Demmou (2010) estimate.

supply shock. Both tended to reduce the relative share of manufacturing in GDP for a number of DC.

On the demand side, primary products exporters benefited from the commodity boom that was driven by the fast increase of raw materials imports by China and from the resulting improvement in their terms of trade. China contributed for instance for 48 % to the growth of the global demand for oil, 78 % for copper, or 71 % for zinc over 2002–2007. At the same time oil price increases by 185 %, copper price by 356 % and zinc price by 316 % (Jenkins, 2011). Between 1993 and 2010, the IMF energy price index grew by 298 % and the metal price index by 360 %.[8] As a result of this surge in price and world demand, export earnings of primary producers jumped to impressive heights and the primary sector contribution to GDP increased.[9] Accordingly, the manufacturing value added share declined, irrespective of the real change in manufacturing production. The Chinese demand shock for primary products push downwards the manufacturing share of the national incomes in these economies; A relative impact different from an absolute decline of manufacturing activity. As Rodrik (2016) eventually puts it, "resource booms magnify the deindustrializing consequences that trade has on countries with comparative advantage in primary products".

In addition, China increased its market shares in manufacturing at an impressive speed. Between 1990 and 2010, China's manufacturing value added grew from 2 % of the world total to 19 % and its share of world manufacturing exports from 2 % to 15 %.[10] Such a fast expansion reduced the opportunities for production and export growth for other DC. Haraguchi et al. (2017) measure a significant increase of concentration of manufacturing activities in DC since the early 1990s. They show that the change is mainly due to the growth of China. When they exclude China from their sample, they do not identify a change in industrial concentration in the developing world. In other words, the recent concentration increase is not due to the domination of a small number of large developing countries in manufacturing. It results from the growth of one unusually big late-comer, China.

Historically manufacturing moved from England to the rest of Europe and the United States, later to Japan and more recently to East Asia. The rise of China does not mean the end of the manufacturing History. Several late-comers had previously taken the lead in manufacturing, or a dominant position, before declining. After the UK reached a peak at 22 % of world manufacturing output in the 1880s, the US started to dominate the industry until its share fall in the 1960s, while Germany and Japan reached a maximum share, respectively, at 10 % in 1980 and 19 % in 1990.[11]

Industrialization is a process of structural change, followed by deindustrialization. There is no evidence, and no reason to believe, that China will not develop a similar pattern of economic transformation, led by a growing role of modern services, both in income and in employment creation. Manufacturing wages in China have already increased to 1100 US$ / month.[12] Although China will remain the biggest manufacturer for long, its global share will decrease. This structural change (re) open windows of opportunities (Perez and Soete, 1988) for DC. According to export trends, China seems to have already reached the peak, at least in several labor-intensive industries such as garments, shoes and leather products (Fig. 2). As China upgrades its economic structure space for manufacturing production will open further for developing countries.

These findings show limitations on the premature deindustrialization perspective. They suggest to analyze manufacturing activity changes in the developing world over a longer period and, above all, with a larger set of countries. We follow this alternative direction of research in the next sections.

3. The changing location of manufacturing value added

Since 1800, manufacturing production has expanded 1,5 time faster than world output and three times faster than the population. In the current period, the growth rate has declined, from + 5 % a year from 1958 to 1973, to + 2 % in the 2000s, and + 1,7 % since 2010. However this global trend aggregates different patterns in developed and developing countries.

3.1. Data and categories

To extend the sample size and the period length, we constructed an extensive database on the world manufacturing production for the period 1970–2018, as follows. The main data source for manufacturing value added (VA) is the United Nations national accounts database maintained by the United Nations Statistics Division (UNStats). The great advantage of this database is that it provides information about the value added at current prices for more than 200 countries for the period 1970–2018. Yet, a few gaps remain. We complemented the UNStats data set with data from additional sources : the Groningen Growth and Development Centre database, which presents manufacturing data for 42 countries, including 32 developing countries; Complementary data from the World Bank, World Development Indicators (WDI); The UNIDO Industrial Statistics database (CD ROM Indstat 2019) which contains information about the manufacturing sector (VA, employment) since 1970, but with missing data/period for several countries; Data from the Asian Development Bank (ADB), which provides an almost complete set of information for all Asian countries; In addition, country sources were used to fill gaps in the international databases. After we complemented the initial dataset, figures were checked to avoid discrepancies and the remaining missing observations in the series were linearly interpolated.

In sum, we have output data for more than 200 countries; We provide estimates on the world manufacturing industry production structure since 1970, based on consistently compiled data of all countries. There is a trade-off between the size of the sample and the period of observation, and the degree of breakdown. Here we choose to include the largest number of economies, because the aim is to identify the developing world specific trends and positions in the manufacturing industry over a long period of time. To present this global picture of structural change, we use aggregates of (i) developed and (ii) developing country groups: (i) "North" include Europe (incl USSR-Russia) + USA + Canada + Australia + New-Zealand + Japan; (ii) "South" is the World less North. Thus "North" correspond to the "industrialized world" in the late 1960s, when our exam starts; "South" is the "rest" of the world (cf: Amsden, 2001).

3.2. Manufacturing decline in the North versus industrialization in the South

While manufacturing output has declined in Europe, USA and Japan since 1970, it has increased in the South. The broad-based decline of manufacturing activity in advanced economies has been partly compensated by rapid changes in manufacturing geography. As a result, after a fall of the share of manufacturing output in global GDP, from 26 % at current prices in 1970 to 17 % in 2001, the global ratio has been remarkably stable over the last two decades (Table 1).

All large advanced economies experienced declines in the share of manufacturing in GDP. It has rapidly fallen in the US, from 21 % to 11 % between 1970 and 2018, and more progressively in countries such as Germany and Japan (from 30 % to 21 %). The "North" economies have entered a post-industrial phase of growth, led by the service sector

[8] Source : Primary price product system, IMF.

[9] In Brazil for instance, fuel exports grew from 0,9 % of merchandise exports to 11 % over 1995–2011(based on WDI data).

[10] Trade data from Chelem-Cepii database; Manufacturing data, see below.

[11] Figures from Bairoch (1982) and UNStats.

[12] Data for December 2022. Source : tradingeconomics.com, wages-in-manufacturing. According to *The Economist* (25/2/23), hourly manufacturing wage reach 827 US$ early 2023.

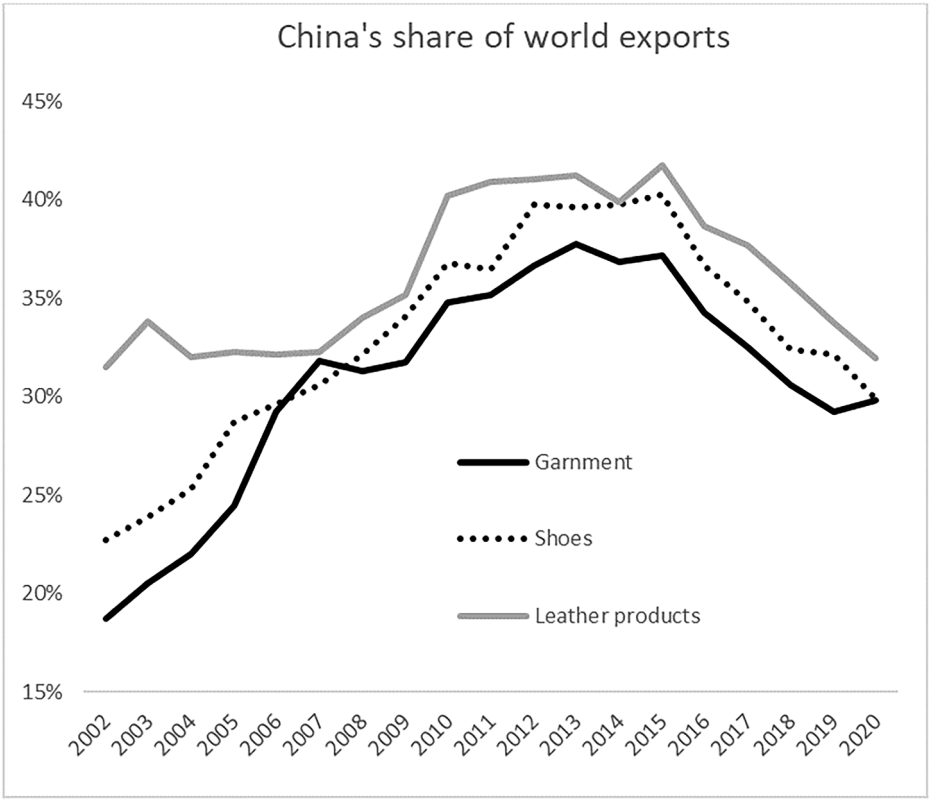

Fig. 2. The decline of China on world markets
Source: data from Intracen.

Table 1
Manufacturing VA in GDP (1970–2018; current prices).

	1970	1975	1980	1985	1990	1995	2000	2005	2010	2018
South	13,5 %	14,2 %	17,3 %	17,7 %	17,9 %	17,8 %	17,0 %	18,7 %	19,3 %	20,4 %
North	28,5 %	26,5 %	25,2 %	23,1 %	21,9 %	19,7 %	18,1 %	15,9 %	14,6 %	13,9 %
World	25,9 %	24,1 %	23,6 %	22,2 %	21,4 %	19,6 %	18,1 %	17,0 %	16,6 %	17,0 %
by Developing Area										
SS Africa	16,2 %	18,1 %	18,3 %	18,3 %	16,9 %	16,7 %	14,6 %	13,2 %	10,3 %	10,6 %
South Asia	14,1 %	16,2 %	17,1 %	17,1 %	17,9 %	18,2 %	16,7 %	16,9 %	17,7 %	16,2 %
S-East Asia	15,3 %	16,0 %	18,5 %	19,0 %	23,1 %	24,1 %	25,8 %	25,6 %	23,2 %	21,4 %
Latin America	22,7 %	23,6 %	21,8 %	22,5 %	21,8 %	18,3 %	18,0 %	17,2 %	15,5 %	14,2 %
MENA	7,7 %	7,1 %	6,7 %	7,9 %	9,8 %	10,5 %	9,1 %	8,5 %	8,5 %	9,5 %
China	na	na	31,0 %	27,1 %	24,5 %	21,6 %	20,9 %	32,1 %	31,6 %	29,1 %

SS Africa : Sub-Saharan Africa; MENA : Middle-East and North Africa. Source: Based on data from UNStats plus author's completion. "na" : no reliable figure available.

(Atolia, 2020). At the same time labor productivity in manufacturing has increased faster than in all the other sectors taken together. Consequently, the relative price of manufacturing goods has continuously decreased and this process has sped-up the fall of the manufacturing VA share at current prices. As Haraguchi et al. (2017) pointed out, at constant prices there has been much less variation of the manufacturing output share since the 1970.

For developing economies at the aggregate the industrialization process has not stopped. The manufacturing VA share at current prices has increased on average in the South, from 14 % in the 1970s to 18 % in the 1980s and 19–20 % since the early 2000s (Table 1). While in many developing countries, manufacturing shares peaked around the middle of the period, a number of economies have experienced growing manufacturing VA ratio since the beginning of the 21st century (Bangladesh, Vietnam, Cambodia, Ethiopia,… as well as China).

Based on a sample of 158 DC, our data confirm the growth of manufacturing output in the South over a long period. This conclusion is in line with the findings of other recent studies covering a large number of countries (Haraguchi et al., 2017; Kruse et al., 2021); The trend is coherent with the deindustrialization process in the North.

3.3. *Industrialization diffusion and concentration in the South*

Historically the diffusion of manufacturing outside the Western economies began in the 19th century in Latin America and in the Middle East (Turkey, Egypt), then the process reached Japan and in the late quarter of the century China, the Japanese colonies (Korea, Taiwan) and the European colonies in South-East Asia (Benedix et al., 2017; Landes, 2000). A new phase of industrialization in DC began after World War 2. A number of countries succeed to build up small manufacturing basis during the 1950s and 1960s under policies of trade protection and import substitution. Few of them, mostly in East Asia, started to promote export of manufacturing products to consolidate their industrialization process. In 1975 developing economies at the aggregate, the South, produced 15 % of the world manufacturing VA. While the target fixed by the UNIDO Conference in Lima - reach 25 % of the world total in 2000-

seemed then unrealistic, this goal was achieved in 2003, and 15 years later, in 2018, the South produced 51 % of the world manufacturing output (Fig. 3).

The manufacturing industry has always been geographically highly concentrated, with the three leading countries producing about 50 % of the world output. The share of the top five producers has been around 60 % since the 19th century (Table 2). It is in the nature of the manufacturing production to accumulate economies of scale and to aggregate in the most productive location.

After the United Kingdom and the United States, China became the largest manufacturing producer in 2010. As a result of the fast industrialization of China, manufacturing concentration has increased in the developing world during the last decades. While, in 1990, 14 % of DC manufacturing output was produced in China, this share reached 44 % in 2010. To isolate China's impact on the average and to better identify global trends in the developing economies, we distinguish China in the following analysis. The developing world has been split in two parts, China and the developing economies ("South without China"). The figure excluding China do not indicate an increase in concentration since 1990.

The share of the developing economies (excl China) in the world output has doubled over the period, from 11 % in 1970 to 22–24 % in the last decade. Most of this expansion came from East and South-East Asian emerging economies, that rose from 4 % of the world total in 1975 to 16 % in 1995. Since 2000, the DC share has kept growing, by 5 percentage points, despite the impressive rise of China, from 6 % of the world output to 29 % in 2018. Since then, the Chinese growth has slowed down. In comparison, manufacturing growth has been less dynamic in Latin-America, which still produced about 6 % of the world manufacturing VA in 2018, the same share as in the early 1980s, and in Africa, whose share has remained below 2 %, while South-Asia has grown in 2018 to 4 % of the world output, from 1,5 % in 2000.

The increasing differentiation in the growth patterns of DC explains the disparity between the aggregate trends and those of specific developing countries or regions. Since 1980 industrialization has expanded in East and South-East Asia, in China, and it has been consolidated in South-Asia, while it has stabilized at a low level in MENA. A pattern of deindustrialization can be observed in Latin-America (Table 1). In Sub-Saharan Africa, the manufacturing output share fall, but the size of the manufacturing sector was initially so small that this trend illustrates the lack of industrialization rather than a deindustrialization process (Chaponnière, Lautier, 2022).

4. Structural shifts in world manufacturing employment

4.1. Data and categories

Our manufacturing employment database is based on different sources. The first data source for manufacturing employment is the UNIDO Industrial Statistics database (CD ROM Indstat 2019), which gives data based on industry surveys for more than 150 countries. Yet, a number of gaps remains. Firstly, the figures provided by this database are formal manufacturing jobs, because data collection is usually implemented in the formal sector. Thus, we rely on additional data from ILO, the Groningen Growth and Development Centre, the Asian Development Bank, as well as from population and manufacturing censuses and Labor Force Survey (LFS) at countries level. These complementary data fill some gaps in the UNIDO base, and they allow to evaluate the number of manufacturing jobs not captured by this initial source. For every country with available data, this method gives an estimate of informal manufacturing employment. By nature, these jobs are difficult to capture and these figures are only approximation. To finalize the database, figures were checked to avoid discrepancies and the missing observations were either linearly interpolated using the closest available data (notably for the formal–informal ratio) from the same country, or estimated from a different country with similar manufacturing characteristics. In sum, we have initially manufacturing employment data for 145 countries, and we can provide reliable estimate of the structure of manufacturing employment from the late 1970s.

The break-up of the USSR and Yugoslavia in 1990 created critical discontinuities in data trends, firstly because of the former Nation-States disaggregation and the changes of the economic perimeters that followed. A second reason was the huge over-estimation of output values in the former Communist countries during the pre-transition period, especially in USSR. Consequently, while figures were difficult to evaluate for the transition period, pre-transition output data were not accurate as well. Labor productivity was in most cases so low that the diffusion of the market system led to the collapse of millions of (unproductive) manufacturing jobs. Thus, we choose not to include ex-USSR and East-European economies[13] from our manufacturing employment assessment, from the beginning of the period. These exclusions do not influence our results, as we firstly focus on the variation of the developing countries share in the world manufacturing employment.

Our picture of global change in manufacturing employment is based on the following aggregate definitions of (i) developed and (ii) developing country groups: (i) "North" include West-Europe + USA + Canada + Australia + New-Zealand + Japan; (ii) "South" is the World less North; ex-USSR and East-European economies are excluded.

4.2. The growth of world manufacturing employment and North-South divergence

In 1995 manufacturing jobs employed 300 million workers, including formal and informal employment. According to our estimate, the number of manufacturing jobs has increased from 120 million in 1964 to 200 million in 1979. Over 1995–2017, manufacturing employment grew then to 420 million (Table 3).

Employment in the formal manufacturing sector has regularly increased during the 1970s and 1980s. It has grown slower since the 1990s, reaching 224 million by 2017. In comparison, informal jobs grew faster than formal manufacturing, reaching about 200 million by 2017. This relative expansion results from the rise of the South in the manufacturing sector and the higher share of informal employment in DC, notably due to the wide networks of local outsourcing. The informal/formal ratio in the manufacturing sector is for instance estimated at 3,5 in India, 2 in Indonesia or 1 in Bangladesh (See Appendix 1).

The aggregate share of world manufacturing employment in total employment (including both the formal and informal sectors) has not changed since the early 1990s, at 13-14 % (Table 3). At the global level, 1 out of 7 jobs is in manufacturing. This average pattern has been identified in other studies (Haraguchi et al., 2017; IMF, 2018). The stability of the world ratio results however from diverging trends in North and South. The North share of manufacturing employment has continuously declined during the period, from 17 % in 1991 to 10 % in 2017, while the South share has increased from 11 % to 14 %.

The distinctive movements of the manufacturing shares of the world GDP at current prices (decreasing) and of the world employment (stable) are not contradictory. The gap is consistent with the shift in employment from North to the South, where workers' productivity is lower.

4.3. The steady rise of manufacturing jobs in the South

Formal manufacturing employment increased in the so-called "industrialized" countries (our North) until 1973–1974, when it reached 72,5 million (excl USSR and East-Europe). Since then, it has rapidly declined, to 46 million in the 2012–2017 period, to which we

[13] Bulgaria, Croatia, Bosnia, Serbia, Hungary, Poland, Romania, Czech Rep., Slovenia, Slovakia.

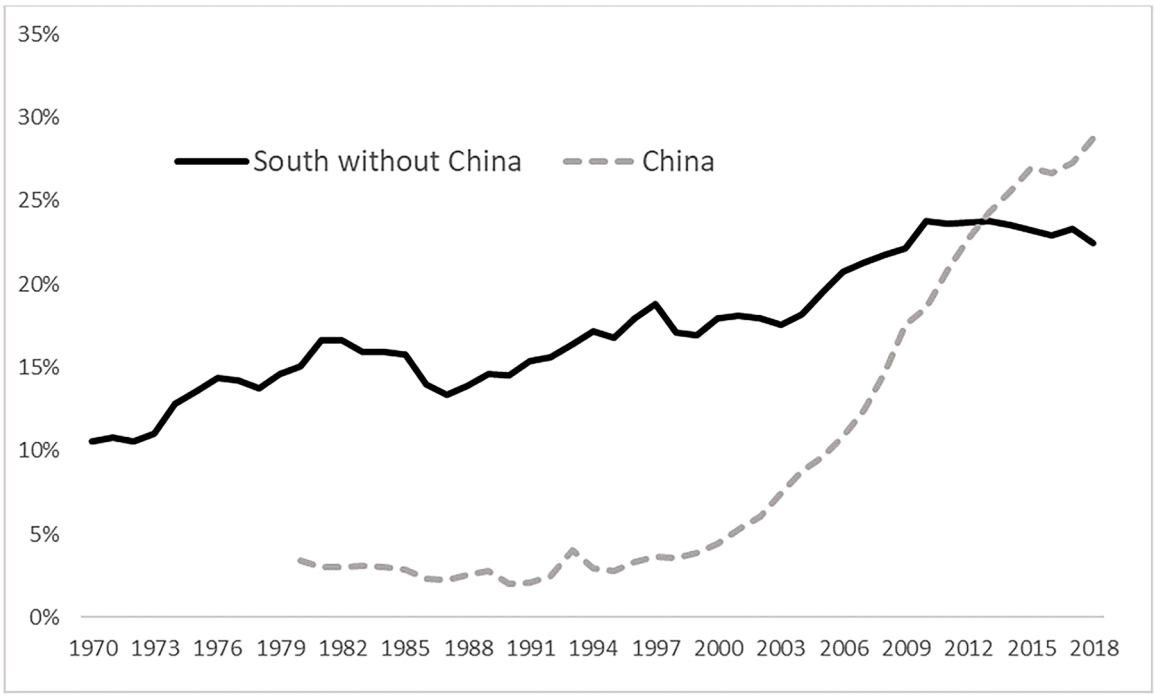

Fig. 3. Structure of the world manufacturing value added (1970–2018)
Source: Based on data from UNStats plus author's completion.

Table 2
World concentration of manufacturing production.

Leading economies	1860	1913	1970	1990	2010	2018
Top 3	48 %	60 %	46 %	48 %	48 %	49 %
Top 5	62 %	74 %	54 %	56 %	58 %	58 %

Sources: Bairoch 1982, our data.

can possibly add 13 million manufacturing jobs from ex-USSR countries (7 millions) and the rest of East-Europe. However the fast drop in the USA, where manufacturing employment has been almost cut by half during the last 25 years, contrasts with the experiences of Japan and Germany- two economies with substantial trade surplus in manufacturing – where employment decline has been slower.

Employment in DC has significantly increased in the long run. This finding is not limited by the difficulties of measure, due notably to the size of the informal sector (Africa and India) and to the lack of transparency of Chinese statistics.[14] In the South, we estimate the number of formal manufacturing jobs at 163 million in 2017, nearly three quarters of the world total. After 15 years of restructuring and industrial reorganisation, the Chinese expansion in the 2000s sped up the growth of employment in the South. Since 2010, we observe a new pattern. Formal employment has not increased any more in China, while it has continued to grow at the same pace in the rest of the developing world. Between 2010 and 2017, 10 million additional manufacturing jobs have been created in DC, outside China.

Table 3
World manufacturing employment.

	1991	1995	2000	2005	2010	2017
World total (million)	291	304	320	357	388	421
of which Formal jobs :	146	163	169	187	212	224
Manufacturing as a share of total employment						
South	11,5 %	11,4 %	11,5 %	12,2 %	13,3 %	13,4 %
North	17,1 %	16,0 %	15,3 %	12,8 %	11,6 %	10,7 %
World	13,7 %	13,3 %	13,1 %	13,5 %	13,9 %	13,7 %

Sources: UNIDO Industrial Statistics, ILO, Groningen growth and Development center data, and author completion.

Changes in the allocation of total manufacturing employment, including the informal sector, shows similar trends, even more amplified (Fig. 4). The DC and China employed 346 million workers in manufacturing, almost three times more than in 1980 (132 millions). Their cumulated share in world total employment has reached 82 %; a high level because of the important size of the informal sector in a number of these economies, like in China (estimate : 80 million informal jobs), India (49 millions) or Indonesia (13 millions). When total employment is taken into account, including the informal sector, we observe already a decrease of 4 million manufacturing jobs in China during the 2012–2017 period. Informal workers are the most vulnerable and the first to leave in case of economic slowdown or restructuring.

China has become the largest manufacturing producer in the world and it accounted for 27 % of the total value added in 2017. China's share of the world formal employment is higher, at about 42 %. However, information available on the workforce is not fully satisfying (Box 1, below). India follows with a 7 % share of the formal manufacturing jobs worldwide, then comes the USA (5 %), Japan, Vietnam, Germany, Brazil. The concentration of manufacturing employment has remain substantial. The 10 largest countries account together for 76 % of the formal employment, and the cumulated share of the 20 largest reach 91

[14] Changes in National Accounts methodology, as well as the fast transformation of the industrial structure in China, produced major statistical discontinuities in the 1980s and 1990s. During this restructuring period, State-Owned manufacturing enterprises laid off millions of workers in different sectors. The Wuhan Steel factory had for example 1 million workers, but a large part of this workforce was employed in the mining sector, in the construction industry, in the housing sector, etc. During this period the share of the manufacturing value added in the GDP has also been erratic. Indicators became more reliable after the implementation of the major reforms.

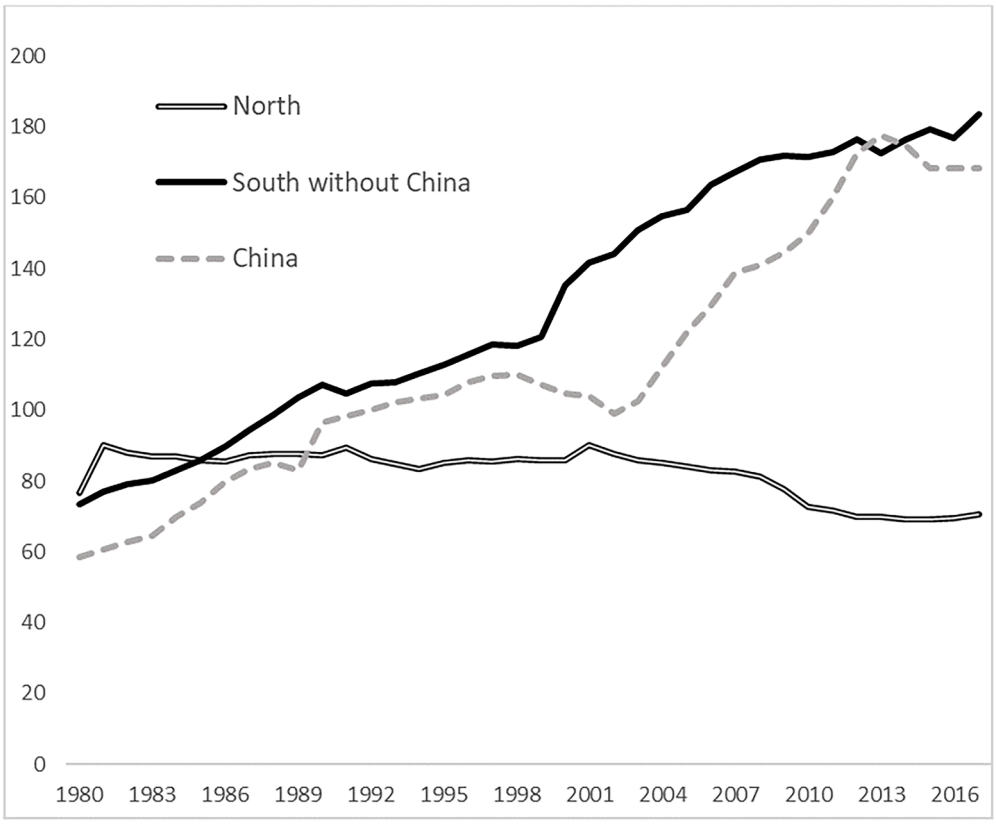

Fig. 4. World total manufacturing employment, million (1980–2017)
Sources: UNIDO Industrial Statistics, ILO, Groningen growth and Development center data, and author's completion.

% of the world total (Appendix 1). These concentration ratios are consistent with historical evidences. The inclusion of the informal sector in the assessment does not modify the international hierarchy nor the level of concentration of world employment. The main differences are the rise of India, to 15 % of the world total, and of Indonesia, to 4 %.

argues that the developing world has experienced a premature deindustrialization and that opportunities for DC to expand manufacturing VA and manufacturing employment have significantly decreased.

This paper presents world manufacturing trends based on a large set of countries during a long time period. The analysis of the performance

Box 1
The difficult measure of the workforce in China

In China, the Ministry of Labor provides information and data on manufacturing employment for the urban sector, while the Ministry of Agriculture collects data for the rest of the country, including the Town and Village enterprises, enterprises in the Special Economic Zones and rural enterprises. These different sets of data are not harmonized. Furthermore, the two ministries have proceeded to significant statistical revisions, without explanations.

The US Bureau of Labour Statistics (BLS) sent experts in 2005 to estimate Chinese wage levels. They gave up because it was too difficult to figure out the size of the workforce.[15] According to BLS estimation, manufacturing employment increased from 86 to 99 million between 2002 and 2009, and reach 114 million in 2015. Manufacturing would account for 29 % of the country total employment in 2015. These figures are about 20 % higher than the official data published by China and used in the UNIDO database.

5. Conclusion : the deindustrialization of the developing world seems premature

A major narrative has emerged on structural transformation that

of the manufacturing sector in the developing world, including or not China, does not reveal significant evidence of a recent decline of manufacturing in developing countries. Rather we document a continuous expansion of manufacturing employment in the developing world, to about 350 million workers in 2017, of which more than half outside China, where employment growth has remain robust. Empirical findings do not support the deindustrialization argument and there is no

[15] Banister J; et Cook G., "China's employment and compensation costs in manufacturing through 2008", *Monthly Labor Review,* Mars 2011.

evidence that the relative importance of manufacturing in the developing world has disappeared, or even declined, over the last 40 years.

Thus, the low or decreasing shares of manufacturing VA and employment in a number of DC has been typically, and mostly, caused by the failures of industrialization strategies, resulting in the concentration of manufacturing production in the developing world. This concentration pattern has been amplified by the fast growth of the Chinese Giant. In terms of population, China is equivalent to the sum of all African and Latin-America countries together.[16] Since the 1980s China has successfully followed an industrialization model, as growth effective than Japan and the Asian NICs experiences, but on a much bigger scale. Yet again the recent example of China has confirmed the powerful link between manufacturing expansion and income growth in DC. China's share of manufacturing VA to GDP has increased to more than 30 % in the early 2010s, but the country seems to have reached a peak. Since then this ratio has tended to decline and manufacturing employment has decreased in China.

Employment creation and economic growth arise from the process of development and from the capacities of the private sector and from the State to generate new economic activities. Development strategy is not about pushing the technology frontier but rather about catching up and changing the structure of production towards new activities with higher productivity. For the less-developed countries, so far, manufacturing has offered greater opportunities than other activities to provide a large employment potential characterized by higher productivity. While we cannot assume that the trends identified in this analysis will last over the long run, from a policy perspective our findings suggest that DC should not give up industrialization strategies. They should learn from the recent experiences of rapid industrialization and growth. In the near future, the likely upgrading of China's industrial structure should enlarge the windows of opportunities in manufacturing for low-income economies.

CRediT authorship contribution statement

Marc Lautier: Writing – original draft.

Declaration of competing interest

None.

Data availability

Data will be made available on request.

Appendix 1. World manufacturing employment by country, 20 largest (2017)

Rank	Country	Formal Employment (million)	Share world formal employment	Informal Employment est. (million)
1	China	87,6	41,5 %	81
2	India	14,0	6,7 %	49
3	USA	11,3	5,3 %	2
4	Japan	7,8	3,7 %	4
5	Vietnam	7,7	3,6 %	1,5
6	Germany	7,2	3,4 %	ns
7	Russia	7,1	3,4 %	3
8	Brazil	7,1	3,4 %	4
9	Indonesia	5,7	2,7 %	12
10	Bangladesh	5,0	2,4 %	4
11	Thailand	4,5	2,1 %	1,5
12	Turkey	3,7	1,8 %	2,5
13	Mexico	3,6	1,7 %	4
14	Italia	3,2	1,5 %	1
15	South Korea	2,9	1,4 %	1
16	France	2,8	1,3 %	1
17	Taiwan	2,8	1,3 %	1
18	UK	2,5	1,2 %	0,5
19	Poland	2,4	1,2 %	0,5
20	Malaysia	2,3	1,1 %	0,5

Sources: UNIDO Industrial Statistics, ILO, Groningen growth and Development center data, and author's completion

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