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THE FACTORY-FREE ECONOMY: OUTSOURCING, SERVITIZATION AND THE FUTURE OF INDUSTRY

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ABSTRACT

The shift towards a "factory-free" economy has drawn the attention of policy makers in North America and Europe. Some politicians have articulated alarming views, initiating mercantilist or 'beggar-thy-neighbour' cost-competitiveness policies. Yet companies that concentrate research and design innovations at home but no longer have any factories there may be the norm in the future. This paper summarizes the key themes emerging from a conference on de-industrialization. De-industrialization is a process that happens over time in all countries, even China. The distinction between manufacturing and services is likely to become increasingly blurry. More manufacturing firms are engaging in services activities, and more wholesale firms are engaging in manufacturing. One optimistic perspective suggests that industrial country firms may be able to exploit the high-value added and skill-intensive activities associated with design and innovation, as well as distribution, which are all components of the global value chain for manufacturing. Although this ongoing transformation of the industrial economies may be consistent with evolving comparative advantage, it has significant short-run costs and requires far-sighted investments. These include the costs to workers who are caught in the shift from an industrial to a service economy, and the need to invest in new infrastructure and education to prepare coming generations for their changing roles.

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De-industrialization was accelerated by the 2008-2009 crisis in most high income countries. Yet the trend began decades earlier, as comparative advantage of emerging economies shifted towards more advanced goods and their growing populations commanded an increasing share in global demand. This shift towards a *factory-free economy* in high income countries has drawn the attention of policy makers in North America and Europe. Some politicians have articulated alarming views, initiating mercantilist or beggar thy neighbor cost-competitiveness policies. Yet companies like Apple, which concentrates research and design innovations at home but no longer has any factories in the USA, may be the norm in the future.

This ongoing transformation of the industrial economies may be consistent with evolving comparative advantage, but has significant short-run costs and requires far-sighted investments. These include the costs to workers who are caught in the shift from an industrial to a service economy, and the need to invest in new infrastructure and education to prepare coming generations for their changing roles. A conference held in Paris aimed to provide an economic analysis of this phenomenon. Since then, authors have revised their papers, prolonged their research, refined their conclusions, and drafted stimulating papers summarized here.

Richard Baldwin starts off the volume by dividing global forces for trade and industrialization into two historical periods. In the first period, which he refers to as "globalization's first unbundling", falling transport costs and freer trade allowed the industrial countries to rapidly industrialize and dominate manufacturing (Baldwin, 2017). From the industrial revolution to the early 1980s, rich countries benefited from a virtuous cycle of innovation, agglomeration, and increasing competitiveness in manufacturing. Manufacturing wage increases were more than offset by productivity increases, and G7 nations saw their share of world GDP soar from a fifth in 1920 to two-thirds by 1990. Baldwin attributes most of the

impetus from globalization during this period to improvements in transport, which radically lowered transport costs and allowed countries to exploit scale economies and comparative advantage. With agglomeration, cities grew in size and the North industrialized while the South de-industrialized.

Beginning sometime between 1985 and 1995, according to Baldwin, this trend reversed. This is the so-called "second unbundling", when the nature of globalization changed and led to the upheaval which is the focus of our book. Baldwin zeroes in on the information and communication technologies (ICT) revolution as the driver of this change, as telecommunications became cheaper and more reliable. The ICT revolution was accompanied by the increasing integration into the global economy of a small number of developing countries, which rapidly increased their share of global manufacturing as well as global GDP. While the first unbundling made it easier to buy and sell goods internationally, according to Baldwin "the ICT revolution changed this. High-tech firms found it profitable to combine their firm-specific know-how with low-wage labour in developing nations". European firms could now combine their manufacturing technology with labor outside of Europe.

Baldwin describes the changing nature of globalization as shifting the drivers from lower transport costs and tariffs which made it possible to concentrate production and exports in the North, to ICT innovations which allow manufacturing to be dispersed and sent to the South. He also introduces the concept of "smile curve economics", first proposed by Acer founder Stan Shih, whereby the share of who appropriates value added follows a so-called smile: high at the design phase, lower during the manufacturing phase, and high again in the distribution phase. He points out that the smile "deepened" during the second unbundling, as manufacturing's share in value added fell with industrialization in the South.

What does all this imply for manufacturing jobs in Europe? Baldwin paradoxically concludes that while industrial country manufacturing firms are likely to retain a leading role, manufacturing *jobs* in the North will continue to decline. Industrial country firms will continue to extract a large share of value added through their role in product design and research and development, as well as sales, marketing and after sales services, and will contract out or oversee manufacturing in the "South". While some manufacturing jobs will remain at home, they will more likely be the high skill-intensive jobs. While value added may remain in industrial countries, it is unlikely that this will bring more factory jobs. These shifts will support the ever-increasing importance of cities, which Baldwin concludes "are to the twenty-first century what factories were to the twentieth century. Urban policy will be the new industrial policy."

The bottom line is that there is nothing like a traditional factory in the twenty-first century. Tasks have been split according to Adam Smith's view of the pin factory, but thanks to digitization at the global level. This has led to a dramatic reshaping of tasks maintained in the high level economies. Growth is now fueled by talents and their agglomeration. Services and industry are one and the same thing, and if there is something like a factory, this is now the big city where talents, ideas, and services can be combined. Hence the economic competition between agglomerations and the related policies to support their development. The big challenge, from a macroeconomic perspective is the induced disconnection between the creation of value added and the creation of jobs. Although the other face of this coin is productivity gains, distributional issues will become increasingly relevant in advanced economies as value is now shaped by intangible assets.

Japan is certainly one of the most affected of the advanced economies: specialization in electronic equipment, scarcity of resources, and offshoring to low-cost locations for most industrial tasks combine here in a large shock to the domestic industry. Japan's hollowing out is

the focus of Michael Ryan and Farid Toubal's analysis (Ryan and Toubal, 2017). They use a unique dataset following Japanese firms between 1982 and 2001. Their data allows them to identify whether Japanese multinational firms were responsible for the hollowing out of that economy in shifting manufacturing jobs abroad.

Ryan and Toubal focus on the so-called lost decade which followed Japan's economic collapse in 1991. They begin by documenting that an enormous expansion in Japanese multinational activity began around that time. The number of Japanese multinationals jumped by 290 per cent between 1985 and 1992, and continued to rise at a slower pace after that. While Japanese overseas production was just over 3 per cent in 1982, it increased by five fold over the next twenty years to reach 17 per cent in 2002. Ryan and Toubal also document that over these decades Japanese multinational firms reallocated their networks from North America to Asia and Europe. The share of Japanese vertical affiliates (located in a different business line than their parents) more than doubled in these two regions while it halved in North America.

The aggregate employment data for Japanese multinationals is strongly suggestive of a hollowing out. Between 1997 and 2012, for the manufacturing sector as a whole Japanese parents reduced domestic employment by almost 3 per cent. While employment in Japan shrank in most sectors, Japanese multinationals expanded employment abroad. Econometric evidence confirms that Japanese multinationals contracted domestic employment post-1991, although over the entire two decades the effect is surprisingly small and insignificant. This is partly because other Japanese companies also experienced employment stagnation, so that in comparison Japanese multinationals do not appear to engage in significant hollowing out. Compared to non-multinationals, Japanese multinational companies (MNCs) reduced domestic employment by 0.17 per cent per year from 1992 to 2001, mostly in vertically-organized firms.

Ryan and Toubal conclude that there is only limited evidence of hollowing out of the Japanese economy by Japanese MNEs moving production abroad. They hypothesize that the limited effect on domestic employment of outward Japanese MNE activity could be due to the well-known lifetime employment policies adopted by many Japanese firms. Since their formal analysis stops in 2001, it is also possible that the negative effects accelerated after that period, as suggested by their tables showing significant employment reallocation between 2001 and 2012.

An alternative way to think about de-industrialization in rich countries is through the concept of structural transformation. Recent databases on trade in value added show that goods trade cannot easily be distinguished from services trade, and the more so for advanced economies. This mirrors the shift from manufacturing to services which has been documented by Hollis Chenery and Moises Syrquin, among others. As income per capita increases, there is a shift in the sectoral structure of the value added, employment and consumption patterns. All in all, the shift in value terms is magnified, compared to evolutions of value added in volume. But the implied reduction in the labor share (as labor shifts towards less productive sectors) is at odds with a balanced growth path combining a constant growth rate of real per-capita output, a constant capital-output ratio and a constant labor income share over time.

Jean Imbs describes this structural transformation taking place in countries of the Organisation for Economic Co-operation and Development (OECD). He documents that de-industrialization of rich economies is accelerating, as labor moves away from industrial sectors (Imbs, 2017). Imbs notes that "this reallocation is taking center stage in political circles, where calls for industrial policy, rising regulation or protectionism are heard increasingly loudly."

Imbs documents the main features of structural change in fifteen OECD countries since 1970. He identifies that de-industrialization began in the OECD in the 1980's, but only in terms of

changes in the allocation of labor, not the allocation of value added. Beginning in the mid-1980s, employment shares decreased in manufacturing, and increased in services. Imbs measures the changes in sectoral shares over four decades. He finds that on average, employment shares in manufacturing have declined by 1.7 per cent per year since 1970, whereas employment shares in services have increased by 1.3 per cent per year. Measured in terms of employment per se, manufacturing employment fell by 1.2 per cent per year while services employment increased by 1.8 per cent. But the same is not true of the sectoral allocation of value added. In particular, between 1970 and 2011, the share of manufacturing in value added does not display any significant trend. As labor productivity rose more quickly than elsewhere, this translated into higher wage growth for manufacturing than for services. The reallocation of employment away from manufacturing is consistent with Baumol's (1967) view that sectors with relatively high productivity growth lose employment.

Imbs finds that for the OECD countries, the share of the manufacturing sector in value added exhibited no clear downward trend between 1970 and 2011, whereas the share of services increased. This is quite different from the conventional view going back to Chenery, Robinson and Syrquin (1986), where the reallocation goes from manufactures to services. Falling employment in manufacturing but stable value-added shares are associated with rising productivity and wages in the manufacturing sector. As Imbs points out, "de-industrialization would not be apparent just on output data", which "suggests quite some resilience in industrial production."

Imbs also unpacks the trends within both manufacturing and services. While light industries fell precipitously, the share of heavy industries (including metals, metal products, machinery, equipment, and transport equipment) increased as a share of value added. In services, the number one recipient of employment was administrative services, and the star in terms of

output gains was ICT–where employment, value added, and productivity growth all increased.

Examining changes in structural transformation between 1970 and 2011, Imbs makes three additional observations. First, de-industrialization did not begin until the mid-1980s, and the share of manufacturing value-added remained roughly constant until the year 2000, when de-industrialization accelerated. We comment in passing that the precipitious decline in manufacturing around this period has been noted by others, particularly Justin Pierce and Peter Schott, who associate it with China's entry into the World Trade Organization (WTO) in late 2001.

Second, Imbs notes that the share of construction in value-added contracted somewhat in the 1990s but accelerated following the 2007-2008 financial crisis. Finally, services has both accelerated its share in GDP and its share in employment, with the result that employment is being drawn to the lowest productivity sector. Imbs concludes by noting that one reason why "structural change is back with a vengeance in policy conversations" is that post-2000 output shares of manufacturing in value-added in the OECD finally declined. In the last six years of his sample, both labor and output shares collapsed simultaneously in heavy manufacturing. It was not until the 2000s, and the great recession, that manufacturing output shares collapsed across all sectors in the OECD.

Whatever the mechanisms at play, Matthieu Crozet and Emmanuel Milet show that the shift from industry to services is to some extent a matter of definition (Crozet and Milet, 2017). In their words, "the frontier between manufacturing and services is quite blurry." How do we define an industry? Does one refer to large-scale production, increasing returns, new consumption items that are increasingly affordable to the consumer? Taking such a broad view, many services could compare with industries. And even within manufacturing industry in the usual sense, services represent an increasing share of value added. The shift towards services within the manufacturing

sector is known as the "servitization" of the manufacturing sector.

Crozet and Milet document the importance of the servitization of French manufacturing firms over the 1997-2007 period. They define servitization as the increase in the share of services in a firm's production sales. They have a database of about 635,000 French manufacturing firms, which allows them to identify trends in the percentage of services produced and sold within manufacturing firms during that time period.

While most of the literature on de-industrialization focuses on the types of shifts from industry to services documented by Jean Imbs and Richard Baldwin, Crozet and Milet show that these same trends are very much present within French firms themselves. They document a moderate, but significant and steady trend of servitization over the period. They also decompose the trend into between and within firm changes, and find that servitization is mainly driven by changes that occur within firms. By the end of their sample period, in 2007, they document that 83 per cent of manufacturing firms sold some services, 40 per cent sold more services than goods, and 26 per cent did not even produce goods.

There are both positive and negative implications of the evidence provided by Milet and Crozet. On the one hand, taking servitization into account provides a harsher diagnosis about the de-industrialization of the French economy. Milet and Crozet estimate that the decline in the proportion of workers involved in the production of goods has been up to 8 per cent higher than the usual measures of de-industrialization based on the proportion of workers employed in manufacturing firms. On the other hand, Milet and Crozet argue that this kind of within firm shift towards services has a much more benign and likely beneficial impact on workers than the intersectoral shifts occurring at the macro level. While job losses in manufacturing and job creation in services sectors in the aggregate industrial economies are creating large social costs, the

services provided by manufacturing firms are quite different. These services – think of an Apple or a Rolls Royce – are typically strongly linked to the product they sell. Crozet and Milet optimistically conclude that "this strong complementarity is likely to support the sales of manufacturing products and to defend manufacturing employment and enhance productivity."

From a statistical point of view, a redefinition of sectors and activities is needed as soon as manufacturing firms perform services. In contrast, some firms are outside the manufacturing sector according to official government statistics but nonetheless are heavily involved in the production of manufactured goods. Although not actually *producing* such goods, how do we classify firms like Apple designing and selling products without factories? Andrew Bernard and Teresa Fort refer to these firms as "Factoryless Goods Producers" and document their importance using US census data (Bernard and Fort, 2017).

Bernard and Fort shift the focus outside of manufacturing to examine the importance of factoryless goods producers, or FGPs for short, defined as firms classified as part of the wholesale trade sector but that "design the goods they sell and coordinate the production activities." In their words, these FGPs are "manufacturing-like" in the sense that they might take a product from the concept through production and delivery but do not actually engage in the production themselves. Examples of such companies include Apple, Mindspeed Technologies (a fabless semiconductor company), and the British appliance firm Dyson, which designs and sells innovative vacuum cleaners but no longer manufactures them itself.

The analysis by Bernard and Fort is important insofar as there exists little evidence to date about these kinds of enterprises. This analysis is also particularly timely as beginning in 2017 the US Census Bureau will move FGP establishments to manufacturing. Bernard and Fort estimate that this reclassification of FGPs would have increased the number of manufacturing employees in

the USA in 2007 by a minimum of 431,000 to a maximum of 1,934,000, an increase of between 3 and 14 per cent.

While the servitization of firms implies an overly optimistic estimate for manufacturing employment according to Crozet and Milet, the significance of factoryless goods producers suggests the opposite in that many wholesalers are engaging in important aspects of the manufacturing process. Indeed, according to Baldwin, the highest value-added aspects of manufacturing are captured by these FGPs, with possible benefits for firm productivity, innovation, and wage compensation.

Using the US Census Bureau Census of Wholesale Trade, Bernard and Fort estimate that FGPs accounted for 37 per cent of these establishments in 2002. Bernard and Fort suggest that "these results challenge the stereotype of a wholesale establishment that simply intermediates between producer and consumers. The wholesale sector is a heterogeneous mix of traditional resellers and plants that are actively involved in production activities."

Crozet and Milet (2017) and Bernard and Fort (2017) present contrasting phenomena: manufacturing firms increasingly engage in services – which represents "hidden de-industrialization" – while sourcing and design activities are now performed by "factoryless goods producers" whose activities were once done within manufacturing. There is indeed no contradiction here: the boundaries of the firm – and the more so for multinational companies – are permanently adjusted to focus on core competencies (catering is not a core competence for a car maker, but designing new software might be). Thus the question is what should be internalized, what can be performed arms-length (Antras, 2003) and how productivity has shaped this choice (Defever and Toubal, 2013). Making a decision on outsourcing is even more difficult in an international context: in the presence of incomplete contracts, only the largest and most efficient

firms will benefit from offshoring (Antras and Helpman, 2004). All in all, there is nothing like a one-size-fits-all strategy: different firms, with different productivity levels, working in industries resorting differently to intangible assets, will make different choices. Some firms may even be contemplating offshoring, but eventually deciding against it.

Lionel Fontagné and Aurélien D'Isanto focus explicitly on this critical question of what to retain within the firm and what to outsource or offshore (Fontagné and D'Isanto, 2017). They present results from the 2012 survey of global value chains in fifteen European countries to uncover the main determinants of international sourcing choices. They focus on a survey of 28,000 firms located in France, with more than fifty employees at the end of 2008, belonging to industry, trade, and non-financial services sectors.

This survey, carried out by the French National Institute of Statistics and Economic Studies (INSEE) in 2012, is innovative in many aspects. The questionnaire aimed to uncover the strategic choices made by firms to either perform activities themselves inside the firm, source in France, or abroad. One may criticize the joint treatment of domestic and offshore sourcing, but presenting the questionnaire in that way avoided focusing on the always sensitive question of offshoring. Offshoring of an activity was defined as total or partial transfer of this activity to another firm located abroad, which may, or may not, be part of the parent's group.

The survey made a useful distinction between the core business activity and the support business activities of the respondents. A core business activity is usually the firm's main activity, while support business activities are carried out by the firm to allow or facilitate the production of goods or services for the market or for third parties. Six segments of the value chain were considered beyond the core business of the surveyed firm: distribution and marketing, sales and after sales services, ICT services, administrative and management functions from legal services or

accounting to corporate financial and insurance services, Research and Development, and a residual category.

Fontagné and D'Isanto identify reasons why leading firms decide not to offshore certain activities, and tentatively assess the direct consequences for employment of French firms' offshoring strategies. The survey covered the decision to offshore over a three-year period between 2009 and 2011. Only 4 per cent of French firms, representing 6.5 per cent of employees in the firms within the scope of the survey, reported at least one decision to offshore. An additional 3 per cent of the firms contemplated offshoring, but eventually decided not to. Firms that chose not to offshore cited as reasons uncertainty about the quality of goods and services produced in the offshore location, the need for close interaction with clients, or legal and administrative barriers in the host country and union problems in the home country.

Reasons for offshoring, as reported by respondents, are very much in line with the usual predictions of theories addressing the boundaries of the multinational firms. Distance (a proxy for transaction and information costs, beyond transport) is an important barrier to offshoring. Also the strategic segments of the value chain, when offshored, are kept within the firm's boundaries pointing to the potential for problems related to incomplete contracts. Offshoring firms are shown to be different: the larger the firm's employment, the larger the proportion of firms that offshored parts of their activity. Similarly, the proportion of firms that offshore is increasing with the share of exports in their turnover. For a given sector, size, and firm type, exporters offshored on average four times more often than non-exporting firms. Larger firms source to more remote places, where enforcement of contracts can be more difficult, confirming that in the presence of incomplete contracts, only the largest and most efficient firms will benefit from offshoring. Finally, firms that offshore are not only bigger, they are also members of international groups.

Lastly, Fontagné and D'Isanto estimate that 20,000 jobs (or 0.3 per cent of employment in the surveyed firms in 2011) were offshored between 2009 and 2011. This figure, however, takes no account of general equilibrium effects, and is not based on a proper counterfactual. This is where surveys, although very informative on certain decisions (like not offshoring), are intrinsically an incomplete source of information. Another, less obvious, limitation is worth mentioning: given the design of the survey performed on behalf of EUROSTAT, the definition of offshoring used excludes situations where relocations of activity abroad goes hand-in-hand with an expansion of the activity at home. Although defining international sourcing as a substitute to domestic production is restrictive enough to avoid misinterpretation of the questions by respondents, it neglects more complex strategies where outsourcing and domestic activity are complements. The measure of job losses provided must accordingly be considered as indicative, as it excludes by assumption all offshoring activity that could be complementary with domestic activity.

Fontagné and D'Isanto provide a transition from documenting de-industrialization in the North to measuring the implications for labor markets. Indeed, de-industrialization has been accompanied by real costs for industrial country workers. Those costs take the form of a lower demand for less skilled workers, rising inequality, negative effects on real wages and the declining power of unions. It is evident from the papers in this volume that the transition from industrial to factory-free or primarily service economies is painful for many segments of the population.

Rosario Crino and Paolo Epifani suggest that large and rising global imbalances – illustrated by China's trade surpluses and US trade deficits – have directly led to rising inequality in industrial countries (Crino and Epifani, 2017). They show, using a model which allows for a continuum of intermediate traded goods, that trade deficits in industrial countries and surpluses in

lower-skilled countries can explain increases in demand for skill in both regions. In their empirical work, they employ US data to suggest that the results are consistent with their theory. They also rule out other explanations for increasing skill intensity, such as skill-biased technical change (SBTC).

The model developed by Crino and Epifani builds on the insights of Gordon Hanson and Robert Feenstra who showed that capital flowing from a skill-intensive Northern country to the South could result in greater inequality in both countries. The intuition comes from the fact that more capital in the South leads to a fall in the return to capital there, allowing the South to produce a greater set of skill-intensive goods which can be traded and at the same time narrowing the set of skill-intensive goods in which the North has a comparative advantage. Crino and Epifani apply the same intuition to a trade surplus in the South (resulting in a trade deficit in the North) and show that in their model this also leads to greater demand for skill in both regions.

In their empirical section they present estimates consistent with their theory and take into account other competing explanations for the rising demand for skill, including the role of offshoring as well as skill-biased technical change. They focus on within-industry changes in the US manufacturing sector, and use as their measure of skill bias the share of non-production workers in value-added at the disaggregated industry level. They begin by documenting at the aggregate level a positive correlation between skill upgrading and the trade deficit, which holds strong even after controlling for standard proxies for offshoring, trade openness and technical change.

Next, using a panel of 380 6-digit US manufacturing industries for the 1977 through 2005 period, they test whether sector-level trade deficits are associated with a systematic within-industry increase in the relative demand for skills. Consistent with their aggregate results,

they find a strong association between sector level trade deficits and skill upgrading within US industries. They also find that this effect is statistically larger than the effects of offshoring, trade liberalization, and SBTC.

Between 1983 and 2008, US manufacturing employment declined from 22 to 16 million workers. After the 2008 financial crisis, the manufacturing sector lost an additional 2 million jobs. Avraham Ebenstein, Ann Harrison and Margaret McMillan evaluate claims by critics of globalization that "good" manufacturing jobs were shipped overseas, and that China is to blame (Ebenstein, Harrison and McMillan, 2017).

Ebenstein, Harrison, and McMillan identify shortcomings of research that is restricted to analyzing workers within the manufacturing sector. The wage effects of import competition on wages is typically identified by exploiting variation in the prices (or quantities) of imported goods across different manufacturing industries. Insofar as globalization affects the US labor market by pushing workers out of manufacturing and into services, a better measure of globalization's impact is found by focusing on occupational exposure to globalization, as workers can more easily switch industries than occupations, and so the wage declines will be felt by workers who are forced to leave manufacturing or their occupation entirely.

In their previous work, Ebenstein, Harrison, and McMillan (2014) presented evidence that an occupation-based analysis is more effective at uncovering the impact on worker wages of global competition. This new paper allows them to extend their previous analysis up to 2008, which includes a period characterized by rapid increases in offshoring, especially to China.

They also disaggregate the impact of geographically distinct sources of offshore employment changes on domestic US wages. In particular, they measure the impact of offshore employment by US parents in China, Mexico, India, and other low income locations on home

employment. They then compare the effects of import competition from China and offshore employment in China on US worker wages.

Consistent with their earlier work, they find that offshoring to low-wage countries is associated with wage declines for US workers, and the workers most affected are those performing routine tasks. Their results indicate that a 10 per cent increase in occupational exposure to import competition is associated with a 2.7 per cent decline in real wages for workers who perform routine tasks. They also find substantial wage effects of offshoring to low wage countries: a 10 percentage point increase in occupation-specific exposure to overseas employment in low wage countries is associated with a 0.27 per cent decline in real wages for workers performing routine tasks for our entire sample, and nearly a 1 per cent decline for 2000 through 2008.

The downward pressure from trade and offshoring on US wages using occupational (but not industry-level) measures of globalization explain the puzzling results found by Autor, Dorn, and Hanson (2013). David Autor and his co-authors find a positive, but insignificant impact of import competition on local wages, leading them to conclude that "manufacturing plants react to import competition by accelerating technological and organizational innovations that increase productivity and may raise wages". Ebenstein, Harrison, and McMillan (2017) suggest that occupational exposure to globalization puts significant downward pressure on wages because such a measure captures the movement of workers out of manufacturing and into lower wage services. Using a subset of the Current Population Surveys (CPS) data where they are able to follow the same worker over time, they measure what happens to worker wages when they switch industries or occupations. They find evidence that while the wage impacts of switches within manufacturing are mild, leaving manufacturing for services is associated with an appreciable loss in wages, and larger losses still for workers who are forced to switch occupation upon leaving manufacturing.

This highlights the importance of examining the impact of globalization by looking beyond workers only employed directly in manufacturing.

Ebenstein, Harrison, and McMillan (2017) then turn to a more in-depth analysis of competition from China, the US's second largest trading partner and second most popular destination for offshoring (after Mexico) in 2008. They present evidence that both imports from China and offshoring to China are associated with lower US worker wages. Increasing occupational import penetration from China by a 10 percentage point share of a market is associated with a 5.6 per cent wage decline, and increasing occupational offshore exposure to China is associated with a further 1.6 per cent decline in wages. They compare for the first time the impact of both import competition from China and offshore activities by US multinationals in China. The results suggest that focusing on imports alone understates the role of globalization in contributing to falling US wages.

Lastly, they examine the role played by trade and offshoring in explaining US labor force participation. In the wake of the global financial crisis, the US suffered persistently high rates of unemployment relative to historical averages, and generational lows in labor force participation rates. Ebenstein, Harrison, and McMillan (2017) show that neither offshoring nor international trade are associated with a significant reduction in labor force participation. Their results indicate that the most important factors associated with a reduction in US labor force participation during the sample period were computer use rates or increasing capital intensity, and that offshore activities to China or elsewhere played a very small role. These last set of results suggest that declining labor force participation in the US is better explained by technical change as computers replaced routine jobs, than by globalization.

Francis Kramarz also focuses on the costs to the labor market of increasing international

competition (Kramarz, 2017). He examines the impact of globalization on the labor market in France. The Single Market Program (SMP), an attempt to implement the European Community's internal market, was conceived in 1985, launched in 1988, with the hope of being achieved around 1992. It entailed decreased tariffs and barriers within the EC, leading to a rapid increase in import competition in France during the second half of the 1980s. Kramarz addresses two questions: with increased competitive pressures and expanded opportunities due to the SMP, was foreign outsourcing a possible response to the high wages and strong unions? Second, he asks what was the impact of increased outsourcing on wages and employment.

Kramarz begins his analysis with a formal theoretical model that shows how the threat of offshoring forces workers in firms with strong unions to accept a lower share of the profits. Offshoring creates a threat point that reduces the size of the rent to be shared after bargaining. This pushes firms facing strong unions to outsource. Through these changes in the quasi-rent, this effect depresses wages. One important contribution is to trace out the mechanism from offshoring to its (negative) impact on worker wages, which occurs as firms with stronger union activity are able to bargain more effectively with their workers.

Kramarz employs a unique French dataset that has firm level information on outsourcing decisions, imports, and union strength. He combines that data with matched employer and employee data that allows him to measure the impact of globalization on wages at the disaggregate level. He uses the exogenous shock of the SMP to trace out first its effect on the bargaining strength of unions at the firm level, and consequently the impact on firm level decisions to outsource employment. Outsourcing and import competition at the firm level in turn affected domestic wages and employment.

Kramarz shows, both theoretically and empirically, that in France there are essentially two

types of firms: firms facing strong unions in which workers capture half of the rents and firms facing weaker unions where workers are paid their opportunity wage. Kramarz first identifies the exercise of union power with firm size, in particular with firms having at least fifty employees. The fifty employee cutoff is associated with the Auroux Laws in France, which stipulate that bargaining should take place every year in an establishment or a firm with more than fifty employees. Kramarz then goes beyond the firm size cutoff and uses firm level information on union activity to confirm the extent of union strength.

Kramarz finds that large firms decrease domestic employment when their offshoring increases. At the same time, rent sharing declines. In terms of magnitudes, he finds that a 10 percentage point increase in the share of offshoring in sales is associated with a 1.3 percentage point decrease in employment. Kramarz concludes that firms facing strong unions increased offshoring and decreased employment while other firms increased relative employment and used outsourcing much less intensively. He concludes that "Union strength may well have backfired."

Matteo Fiorini, Marion Jansen, and Weisi Xie document increasing globalization, structural change in all economies, and employment losses in manufacturing (Fiorini, Jansen, and Xsie, 2017). One issue that remains unresolved is the relative importance of offshoring, labor saving technological change and finally the natural shift of economies towards services in explaining these global trends. Such shifts are not independent: offshoring is one consequence of the shifting comparative advantage of industrialized economies, and technical change is partly a response to competition from low-wage countries. If structural change observed in industrialized countries goes hand-in-hand with offshoring, it should also have a mirror image: structural change in the developing world.

Fiorini, Jansen, and Xsie take a comprehensive view of structural change by comparing

and contrasting trends in both developing and industrialized countries. Two questions are the focus of their research: (1) has structural change accelerated in recent years, and (2) has the movement of factories to the developing world been systematic and global?

On the first question, focusing in particular on the relative role of the manufacturing sector in the United States, the authors suggest that changes in recent years are not dramatic. The decline in manufacturing employment has been steady over the past three decades. A somewhat different picture arises in terms of value added, as a result of changes in relative prices and productivity differentials: the sector's role in terms of (the volume of) value added declined less than employment.

On the second question, they find that in most industrialized countries the decline of the manufacturing sector has occurred in conjunction with increased imports from the developing world. While such a trend might imply causality between the two, changes observed in the sectoral composition of economic activity are far more complex than what would be expected from this pure offshoring story. Interestingly, even China experienced a decline in the relative importance of manufacturing employment in the 1990s. They also find that Japan, Germany and Korea, went through significant labor shedding in manufacturing in the 1990s but now have trade surpluses with China. Such structural transformation in China suggests that the gradual decline in employment shares of manufacturing cannot be attributed primarily to emerging market competition but is part of a global and perhaps universal process of structural transformation.

In the light of this inconclusive prima facie evidence, Fiorini, Jansen, and Xsie seek to properly measure structural change. They develop a structural change index which reflects the share of a given economy that has shifted sectoral allocations over a certain period of time. This index does not indicate the direction of change (it does not say whether economic activity has

moved away from manufacturing towards services or vice versa) but the intensity of change. This measure can easily be compared across countries and can be calculated using sectoral value-added or employment data.

Like Imbs (2017), they find that structural change in terms of value added has not accelerated over the past three decades for the United States, whereas it has in terms of employment. This acceleration does not necessarily hold for other developed countries and one should refrain from drawing general conclusions based on the US example only.

Finally, Fiorini, Jansen and Xsie explore the relationship between growth and structural change, but find that no general pattern arises. In most advanced economies, the values of their structural change indices are comparable across decades while decade level growth rates have declined. In Asia, growth rates have remained relatively stable across the decades, while most of the reshuffling took place in the 1980s. Finally, for Latin America their research suggests a negative relationship between growth and structural change. All in all, they conclude that there is no clear link between growth and structural change. Structural change can take place in a context of positive, no or negative growth.

These inconclusive findings, which refute the popular view of a direct relationship between growth in developing countries and de-industrialization in the developed world, lead Fiorini, Jansen and Xsie to conclude that structural change is not automatically associated with productivity increases or growth. Episodes of large structural changes in economies at different level of development do not necessarily coincide. Microeconomic evidence, ideally using matched employer employee data, is needed to precisely assess what are the ultimate consequences of offshoring and de-industrialization on the labor market.

The final chapter explores whether so-called "cluster policies" could address the policy

challenges of de-industrialization and worker dislocation. Philippe Martin, Thierry Mayer, and Florian Mayneris explore why some firms were able to weather the 2008-2009 crisis better. In particular, they focus on the role of cluster policies in allowing some exporters to survive the collapse of international trade in 2009 better than others (Martin, Mayer, and Mayneris, 2017).

They are specifically interested in French cluster policies, the "pôles de compétitivité" (which translates as "clusters for competitiveness") which were launched in 2005. Their results show that the agglomeration of exporters positively affects the survival probability of firms on export markets, and conditioning on survival, the growth rate of their exports. However, these spillover effects were not stronger during the crisis; if anything, the opposite is true. They then show that this weaker resilience of firms in clusters is probably due to the fact that firms in clusters are more dependent on the fate of the largest exporter in the cluster.

As Martin and his co-authors point out, "clusters are popular among policy makers. There are good reasons for this: geographical concentration of firms operating in the same industry has been extensively shown to favor firm-level economic performance." In contrast, the literature shows modest gains from public policies that provide incentives for more clustering. This is because agglomeration gains are already partly internalized by firms in their location choices.

Philippe Martin and his co-authors fill the gap in the business cycle literature by investigating whether firms in clusters are better able to resist economic shocks than others. They highlight an interesting feature of clusters that has been ignored so far: by reinforcing the relationships and the interdependencies between firms, clusters might amplify the transmission of shocks, and thus increase the volatility of activity at the local level. They suggest that policy makers interested in promoting clusters may want to take into account this possible amplification of shocks when evaluating the costs and benefits of cluster policies.

All these contributions address the new role for technology, which makes it possible to handle complexity and to exchange an unprecedented amount of information on a global scale instantaneously. Recent developments in the literature on global value chains give a better understanding of the extent to which trade in intermediate goods changes the overall picture of traded value added. Such changes may lead researchers to compute adjusted revealed comparative advantage indicators (Koopman, Wang, and Wei, 2014).

Choices made by firms clearly affect their total employment, conditional on the complementarity or substitutability of the offshored tasks. But beyond the volume of hours worked, choices regarding the boundaries of the firm affect the nature of tasks performed within the firm. In a factory-free economy, the content of tasks performed in the industrial sector has little to do with the physical transformation of materials into products. The two main activities are designing new products, or new bundles of products and services (iPhone and iTunes), and supervising the global value and logistic chains leading to the physical product delivered to the final consumer. Most of the tasks are focused on research and development, and treatment of complex batches of information. Associated tasks being skill-intensive, the skill content of tasks performed within the factory-free company are likely to rise.

We know since Feenstra and Hanson (1996) that the vertical fragmentation of production at the international level contributed to rising wage inequalities in the United States. What is different in the case of "factory-China" is the size of the country where physical production activities are offshored. In such a case, trade imbalances (only partially compensated by services income, e.g. royalties) may well reinforce the mechanisms at stake on industrial country labor markets. International trade is no longer about products, but tasks (Grossman and Rossi-Hansberg, 2008). Low-wage countries tend to specialize in offshorable tasks, while advanced countries

specialize in the less offshorable segments of sequential value chains handling complexity, while unskilled non-offshorable tasks may be maintained as well.

Ebenstein, Harrison, and McMillan (2017) show that reorganization of production on a global scale is leading to the reallocation of workers away from high-wage manufacturing jobs into other sectors or other occupations within industry. Trade in tasks can affect a wider class of workers than those directly affected in handling physical products. Displaced workers will face a reduction in their earnings, as they shift industries (even from manufacturing to services), but continue performing tasks that are routine and offshorable. Indeed, Kramarz shows that unions can paradoxically reinforce the desirability of offshoring for firms confronted by competition, but could also limit the ultimate recourse to offshoring as well.

If the distinction between industry and services is no longer relevant, if tasks performed are the relevant prism to analyze transformations in the labor market, and if cities are the twenty-first century "factories", how will public policies adjust? One likely outcome is that public policies will be redesigned to target individuals, rather than industries (manufacturing or services), when addressing employment issues. The other dimension is about the promotion of cities. How do we interpret the evidence presented by Martin, Mayer, and Mayneris that productivity gains are associated with clusters? Denser areas are more productive. This can be due to selection, as only the most productive firms can survive in more competitive environments. This can also be due to agglomeration economies, associated with a better access to a variety of inputs, or the circulation of ideas (Duranton and Puga, 2004). If such difference in the efficiency of big cities is mainly the outcome of a selection issue, and if firms internalize agglomeration economies in their location decisions, the gains to be expected from policies reinforcing clustering might be limited. Fortunately, selection is only part of the answer. The comparison of the empirical firm

productivity distribution across high- and low-density locations confirms that there is a substantial efficiency premium associated with city size, and that it is even higher for highly productive firms (Combes et al., 2012). Fontagné and Santoni (2016) explain this outcome in terms of firm optimization implying the reallocation of inputs. Resource misallocation and the associated effect on productivity is not only related to firms characteristics but also to the environment in which firms operate. Denser locations offer a better match between employers and employees, hence higher overall productivity, beyond individual firm characteristics.

The contributions summarized here point to a renewal of interest in the process of de-industrialization and present a daunting picture of a new, factory-free world. As shown by Richard Baldwin (2017), de-industrialization is happening in all the industrial countries. Jean Imbs reinforces the picture. Such macro level trends away from manufacturing are reinforced by the volume's authors using individual firm-level data for Japan, the United States, and countries in Europe.

Richard Baldwin, Jean Imbs, and Fiorini, Jansen, and Xsie all concur that structural transformation towards a factory-free economy has been happening in industrial countries for many decades. The evidence discussed here suggests that de-industrialization is a process that happens over time in all countries, even in China today. One implication is that the current vogue of China-bashing is not likely to provide a solution to these long-term trends. Another implication is that the distinction between manufacturing and services is likely to become increasingly blurry. More manufacturing firms are engaging in services activities, and more wholesale firms are engaging in manufacturing. One optimistic perspective suggests that industrial country firms may be able to exploit the high value-added and skill intensive activities associated with design and innovation, as well as distribution, all components of the global value chain for manufacturing.

A less optimistic picture emerges when we turn to an evaluation of the impact of these trends on industrial country labor markets. While over the longer term economies may adjust to the shift towards a factory-free economy, in the medium term the personal and political costs are significant. The most painful adjustment is for workers who do routine jobs, who are older and less educated, and cannot easily adjust to the demands of this factory-free world.

These findings raise challenges for economic policy. If workers do not benefit from globalization, they will cease to support it. The goal of this book is primarily to document the trends in industrial economies and the impact on labor markets, but as the editors we would like to offer some concluding observations. A first issue relates to the statistical definition of manufacturing and services. This collection of papers shows that there in no longer a boundary between the two: services increasingly rely on immobilized capital and technology as exemplified by data centers, cloud computing, exploitation of big data; manufactured goods are increasingly bound to services to the client; factory-less producers develop and market new products without any single tangible intervention on goods or materials.

Second, a clear challenge is how to design public policies that address the structural changes documented in this book. In a situation where the value chain is long and highly fragmented, policy makers are likely to promote the creation, design and marketing of attractive bundles of products and services. These are areas of innovation, economies of scale, and high productivity. Industrial policy, be it horizontal or more targeted, is likely to become dedicated to innovation across all sectors, not only manufacturing.

Funding declining activities with public money and raising obstacles to the development of new activities will not stop the movement described in these pages. These changes are global, rapid and result from a combination of technical progress and raising capabilities of the new

players in the world economy. However, Aghion et al. (2015) suggest that promoting new activities across all economic sectors and combining that promotion with greater competition could be highly effective. A side effect of the new organization of the world economy is the rising importance of big cities as clustering talents; nations are less relevant with globalization, while cities gain in importance.

The third issue highlighted in this volume is the cost to displaced workers, and the consequences for educational policies and redistribution. The evidence suggests that certain occupations are particularly hit by the ongoing process. Policies like safety nets or vocational training are likely to be effective if targeted at individuals, rather than positions. In the United States, legislation passed in 2015 extends assistance to workers hurt by trade to the service sectors. However, research shows that only half of the US workers who could benefit from trade adjustment assistance actually apply for it. Particularly in the United States, educational opportunities are skewed towards the better off. A more globalized world requires significantly greater investments in education, infrastructure, and social safety nets.

Current policies were designed for an a era very different from the factory-free economies described here. Ultimately, the disconnection between value added and physical production is a big challenge for public budgets: the tax base is highly mobile and the value added is increasingly associated with intangibles.

A last issue goes beyond the economic analysis.There is now good evidence (Autor, Dorn, Hanson, and Majlesi 2016) that locations particularly exposed to the changes that we described elect more extremist members of the traditional political parties (in the US) or even vote for extremist parties (in Europe). This is the big challenge for our democracies: creating the policies and the political dialogue to make the structural transformations acceptable for citizens.

While international economists for many years downplayed the transitional costs associated with structural changes, it is increasingly evident that globalization imposes significant adjustment costs. Those costs are borne disproportionately by less skilled workers. One of the great challenges of the twenty first century will be how to improve the lives and opportunities for those left behind.

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