CDE INSIGHT

The future of manufacturing employment

Professor Robert Lawrence | Harvard University

Introduction

In March 2018, CDE invited Robert Lawrence to speak to a number of audiences of policy-makers and business leaders about the evolution of manufacturing activities globally, the extent to which digitisation and robotisation are undermining the prospects of employment growth in this sector, and what South Africa could and should do to expand manufacturing employment. Professor Lawrence, a former South African, is the Albert L. Williams Professor of International Trade and Investment at John F. Kennedy School of Government at Harvard University. He is also a senior fellow at the Peterson Institute for International Economics, a Research Associate at the National Bureau of Economic Research, and was a member of Bill Clinton's Council of Economic Advisors.

This report summarises the presentations he made at the various events CDE organised. It is not a verbatim transcript of any one of the talks, but seeks to weave together his presentations, and the answers he provided to questions posed by participants in the lectures and discussions.

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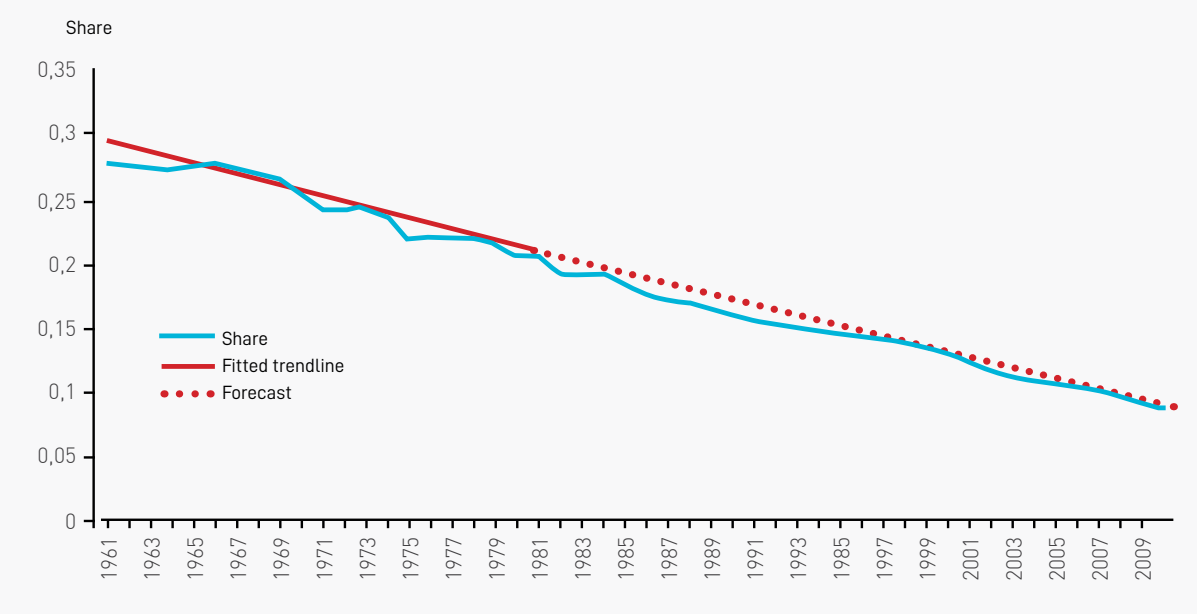
The declining share of employment in manufacturing

The central fact about employment in manufacturing worldwide is that the proportion of a country's workforce that is engaged in manufacturing activities is falling. This is true of both the developed and the developing worlds as a whole, with the only exceptions being a relatively small number of poor countries such as Bangladesh, Cambodia, Ethiopia and Vietnam.

This is a fact of considerable economic and political importance: it is not unreasonable to say that the decline in the number of manufacturing jobs in the United States (US) is one of the central reasons for the anger and resentment at the status quo that drove some voters towards Donald Trump in the 2016 election. For these voters – and for many politicians, commentators and even business leaders – the decline in manufacturing in the US is the result of globalisation, digitisation and robotics, combined with unfair trade policies of countries like China who have, or so the argument goes, "stolen" American jobs.

But there is a fundamental problem with this argument. The decline in US manufacturing employment as a share of total employment began long before the forces that are supposed to have driven it. In fact, if you had been asked in 1980 what share of the US workforce would be involved in manufacturing in 2010, and if you had sought to answer that by looking at what had happened over the previous 20 years, your answer would have been spot on. And this, despite the fact that when you made your prediction in 1980, you would have known nothing about the nature of the trade deals that would be signed in the last two decades of the 20th century or the rise of China or the advent of artificial intelligence and robots, all of which are said to be responsible for the decline in manufacturing employment.

Figure 1: Manufacturing share in establishment employment, United States, 1961-2010



Source: US Bureau of Labor Statistics

So if these forces are not the drivers of declining US manufacturing employment, what does explain it?

Rising productivity and declining manufacturing employment

In many ways, the process of economic development coincides with and can be defined by an increase in the productivity of labour. Rising productivity means that people are able to generate more and more output for every hour of labour. The result is a rise in the value of output per capita and, hence, increasing incomes and improvements in the quality of life.

There are many factors that explain the rise in productivity (or, conversely, its failure to rise), among them the rate of accumulation of capital equipment; the skills, training and knowhow of the workforce; the nature and quality of social institutions; and, critically, the development of new technologies. There are numerous accounts of how these factors combine to raise productivity. For present purposes, how and why this happens is much less important than the reality that productivity has risen dramatically over the past two centuries, with the implication that human welfare is enormously greater today than it was at any stage in the history of our species.

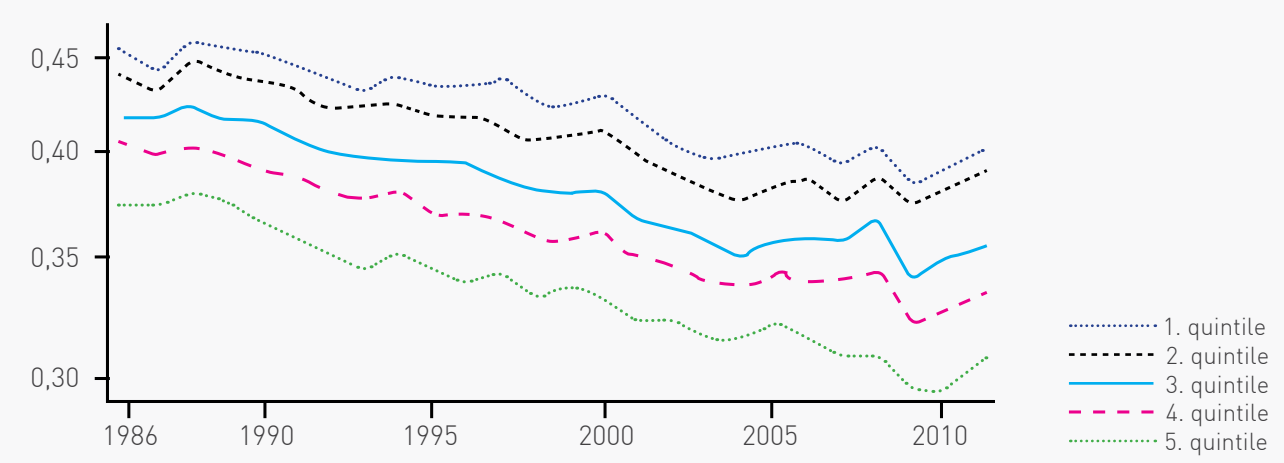
A critical issue to understand is that productivity rises more quickly in some industries and some sectors than in others. Productivity growth in service industries, for example, has tended to be a lot slower than in manufacturing, with some activities being much less susceptible to productivity increases than others. Thus, as economist, William Baumol, famously observed, it takes as many musicians to play Beethoven's Fifth today as it did when he wrote the piece. The same is true, more or less, for teachers, barbers, plumbers, restauranteurs, and the providers of many other services. On the other hand, productivity growth in some other sectors has been, if anything, even more dramatic than has been the case in manufacturing: productivity increases in agriculture have meant that, in the developed world, a tiny fraction of the population can now feed everyone else.

When manufacturing productivity rises more quickly than productivity in other sectors, the price of manufactured goods falls relative to the prices of other goods and services. The reason for this is obvious: more goods are being produced using the same amount of inputs, and, as supply increases, so price must fall in order to clear the market.

So how do people respond when the price of goods fall? Well, one response might be to buy a lot more of the good: its price has fallen after all, so consumers can afford more of it. If that happened, rapid productivity growth in manufacturing would be associated with a lot more jobs in manufacturing. But it turns out that, in the aggregate, demand for manufactured goods is what economists call 'price inelastic' – while people do buy more manufactured goods as the price falls, the percentage increase in the quantities bought is smaller than the percentage fall in their price. Most of the food that consumers buy, for example, counts as manufactured goods because it is processed in factories. As these factories become more productive, the price of food falls, but consumers do not necessarily react by buying a larger quantity of it.

Another factor is that as incomes rise, demand for services rises more quickly than demand for goods. Poor people need clothing. They need footwear and bicycles. That's what poor people buy. Rich people need psychiatrists, personal trainers and tax consultants. All of those are services. This is why, as an economy gets wealthier and the number of rich people increases, the proportion of consumer spending that goes on manufactured goods will tend to fall. This is readily apparent in US data, for all income groups.

Figure 2: consumption spending share on goods by quintile



Source: Boppart (2014) Econometrica

By my calculations, for every 1 per cent fall in the price of goods, people will increase the quantity they buy by 0.7 per cent. The result is that even though the quantity of goods produced (and sold) increases, the value of the goods sold actually falls. That means that if prices fall at the same rate as productivity increases, you end up needing fewer workers to produce the goods you are able to sell.

It is hard to overstate the importance of this for how we think about the role of manufacturing in the economy, because it means, in effect, that the process of productivity growth – i.e. the process that increases a society's prosperity – leads to declining numbers of workers being engaged in manufacturing.

Table 1: Share of employment in manufacturing, 1973-2010 (per cent)

Country	1973	1990	2000	2010	Percentage point change
USA	24,8	18,0	14,4	10,1	(14,7)
Canada	22,0	15,8	15,3	10,3	(11,7)
Australia	23,3	14,4	12,0	8,9	(14,4)
Japan	27,8	24,3	20,7	16,9	(10,9)
France	28,8	21,0	17,6	13,1	(15,7)
Germany	36,7	31,6	23,9	21,2	(15,5)
Italy	27,9	22,6	23,6	18,8	(9,1)
Netherlands	25,3	19,1	14,8	10,6	(14,7)
Sweden	27,6	21,0	18,0	12,7	(14,9)

Source: US Bureau of Labor Statistics

As the data in Table 1 show: across the developed world, the share of the workforce engaged in manufacturing fell from somewhere between 22 per cent and 37 per cent in 1973, to between 9 and 21 per cent in 2010. By my estimation, fully 80 per cent of this decline can be traced to the dynamic

of increased productivity leading to lower prices in the context of inelastic demand for manufactured goods. There is another factor explaining the declining proportion of spending accounted for by goods. This is that many services are complements to goods, and so, as the quantity of goods sold increases, so too does the quantity of services. Think, for example, about the volume of services sold to everyone who buys a cell-phone, or the widening gap of spending on software relative to computers.

The bottom line, then, is that, while an enormous amount of attention is being paid to supply-side factors to try to explain the decline in manufacturing employment in the developed world – globalisation, technological advances, etc. – the structure of demand is at least as important. Because the demand for manufactured goods is inelastic the impact of both rising incomes and productivity increases in manufacturing tend to result in less than proportionate increases in demand. The result is declining shares of spending on goods and declining shares of labour forces engaged in manufacturing.

Premature deindustrialisation in the developing world

If the decline in manufacturing employment in the developed world has been driven primarily by rising productivity combined with inelastic demand for manufactured goods, then the same force can be expected to play itself out in the developing world as productivity and incomes rise. There is, however, another factor that also has adverse effects on manufacturing employment in the developing world.

When countries in the developing world hit 'peak manufacturing employment', they do so at a lower level of per capita income and achieve much lower levels of total employment. If we look at the historical data, we see that when the United Kingdom reached peak manufacturing, per capita income was around the equivalent of about $15,000 and nearly 35 per cent of its workers were involved in these activities; when the US reached its peak, per capita income was about $18,000 and we had about 25 per cent. But if we looked at the peaks reached by the emerging economies today, they are significantly lower. Emerging economies are finding it increasingly difficult to reach the same shares of manufacturing employment as the earlier industrialising economies: peak manufacturing in China was achieved in 2010, at a per capita income of about $10,000 and saw fewer than one worker in five employed in the sector. This is the phenomenon that has come to be known as "premature deindustrialisation".

Table 2: Examples of peak manufacturing shares

	Peak	Share	Per capita Income 2015 Dollars
USA	1953	25 per cent	$17,977
UK	1961	32 per cent	$15,214
South Africa	1981	17 per cent	$11,776
Brazil	1986	15.4 per cent	$11,492
China	2010	19.2 per cent	$9,876

Source: US Bureau of Labor Statistics

The origins of this lie in the same technological development that has driven productivity increases and lowered the prices of manufactured goods. Because many of those advances are embodied in the

machinery used to make goods, and because developing countries import this machinery, it takes fewer workers to make goods than it did when countries that are now developed first industrialised. If, for example, you want to build a motorbike for someone earning $10,000 a year, you need far fewer workers to do so in Thailand today than you did in the UK in the 1950s or 1960s.

Premature deindustrialisation is the result of the fact that developing countries can supply more of the manufactured goods their people want at lower levels of per capita income than was possible in the past, and need fewer workers to do so. The implication of this, of course, is that manufacturing growth cannot be expected to generate the same level of employment growth in the developing world now as it did in the now-industrialised world in previous decades.

Are the robots going to take our jobs?

Over the past decade, an increasing number of people have expressed concern about the extent to which that the "fourth industrial revolution" – digitization, artificial intelligence, robotization and 3D printing – may eviscerate manufacturing employment.

These concerns are not new: a few years ago, I collected stories from newspaper archives on the subject of the malign effect of machines on employment. Apart from the current concerns about this, I found examples from the 1980s – "A robot is after your job" (New York Times, September 1980); the 1960s – "Robots rise: They bid for big jobs both in outer space and in US factories (Wall Street Journal, July 1960); the 1930s – "Thinking machines replace the thinker" (Washington Post, January 1935). In fact, these concerns go all the way back to the start of the first industrial revolution, when the Luddites sought to destroy the machines they believed would lower workers' wages.

The point about the persistence of these concerns and their periodic eruption into public consciousness is that, at least to this point, they have all proved to be unfounded. Every new technology, while destroying some jobs, has created many others that could not have been conceived of previously. There may, for example, be tens of thousands fewer jobs in typing pools today than there were in the 1960s, but there are also many more jobs in cybersecurity, and despite all the advances made over the past two centuries, there are hundreds of millions more people in employment today than there were in the 1810s. It is possible that the fourth industrial revolution might break this pattern as it accelerates. But, to date, the productivity and employment data do not appear to support the conclusions of the pessimists.

Implications for South Africa

There is considerable debate in South Africa about why employment in manufacturing has declined and what could be done to address that.

In some respects the forces that have driven the decline in manufacturing employment here are identical to those that have affected other countries. Thus, if I look at the data, I see that the prices of manufactured goods has fallen by about 1.6 per cent a year in real terms since the early 1990s, and, in response, South Africans, like people in other countries have used an increasing share of their incomes to purchase services.

Given this, I think the emphasis that I see in various discussions on "localisation" is wrong. This idea implies a conviction that there is enough demand for manufactured goods, but too much of it is being met by imports. I think the evidence about the declining importance of manufacturing employment shows that this is not likely to be a very effective strategy, and certainly not in the long-term.

Of course, South Africa doesn't have to rely exclusively on domestic consumers, and their (typically) inelastic demand for manufactured goods; you could try to export more. If you could do that, you might increase employment. But then you would still have to contend with the reality of the forces driving premature deindustrialisation, forces that have meant that even China has never been able to employ more than 20 per cent of its workforce in manufacturing activities.

Achieving more rapid growth in manufactured exports means, of course, that the goods you make must get to international markets at prices that are globally competitive. This means the ports must function at world prices and every step in moving goods out the country has to be at global prices. The economy has to function efficiently, and your logistics services must be efficient, competitively priced and reliable. To the extent that these prices are high or the services are inefficient, they act as a tax on exporters, and will reduce overall exports. It also seems clear that your manufacturers are reasonably responsive to a more competitively priced exchange rate.

In relation to exports, one often reads about the desirability of 'beneficiation' – a uniquely South African word that seems to mean the process of adding value to primary products before exporting them. This seems to me to reflect a misunderstanding of the way economic capabilities relate to each other: there is no reason why a country that is good at growing coffee or cocoa should expect to have the institutions, skills and know-how to run Starbucks or high-end chocolate. Indeed, there is little empirical evidence to suggest that what raw materials exist in a country will be a very strong predictor of what other activities it will be competitive in.

It may be that one reason why the idea of beneficiation resonates so much in South Africa is that it fits into a narrative about colonialism, the core of which is that Europeans came to Africa, extracted its raw materials, and used that to get rich at the expense of the colonies. A policy of beneficiation would seek to reverse that. But if you look at these issues as an economist, and you break down the supply chains for specific products, you realise that there are a lot of different capabilities needed at each phase of producing something. You might be good at some of these, and not so good at others. Chinese manufacturers, for example, make very few of the components that go into an iPhone, and are responsible for even less of the intellectual property embodied in the device, but they are indispensable in its assembly. If that is the case, you are better off specialising in the ones you are good at, and that you can do at world prices.

You sometimes hear, for example, that South Africa should beneficiate its diamonds before exporting them. But really, the costs of transporting diamonds are a tiny fraction of their value, so you'd have to be able to compete with the exceptionally cheap (and highly skilled) cutters of India if you were going to beneficiate competitively. So I would not rule out a policy that supports some kinds of beneficiation, but I would treat it with some scepticism.

Localisation is another oft-stated policy goal, with people in government and industry proposing to support local businesses by requiring government agencies to spend their procurement budgets on

local products. From the point of view of an economist, however, the key consideration in thinking about proposals of this kind is what localisation costs and what the trade-offs are.

For my part, I think you can make the case for some kinds of localisation, but only if the costs of the policy are well understood and transparent. Often localisation policies are framed in quantitative terms, setting a fixed proportion of any particular good to be purchased by a public institution to be sourced from local producers. This approach, however, makes it almost impossible to assess what a localisation strategy costs, and it would be much better to set your policies in price terms, and say that public agencies must buy local, but only if the relevant goods are within 10 or 15 per cent of the imported equivalents. This way, you know exactly how much localisation costs, and exactly what you are getting for your money.

Concluding remarks

South Africa faces extraordinary challenges in dealing with the crisis of unemployment that is, as much as anything else, a crisis of inadequate growth. Addressing it will require imagination, hard work and luck. It will also require a degree of realism about the extent to which development can rely as heavily on manufacturing-led growth as societies in the developed world did. There is a lot of evidence that, at least from the point of view of job creation, manufacturing-led development will have to be supplemented by the growth of good jobs in other sectors, especially services. There are vast numbers of jobs to be created in tourism, for example, and in healthcare and care-giving in aging populations.

To the extent that South Africa stands any chance of creating more manufacturing jobs, however, it needs to take seriously the fact that many of those for whom jobs needed to be created are not sufficiently skilled to secure high-productivity manufacturing jobs. There needs, therefore, to be realism about the extent to which a high-wage strategy is compatible with the stated goal of growing labour-intensive industries. If there were more realism about this, it seem possible that South Africa might be able to secure some of the jobs relocating from Asia as wages in China rise.

Having said that, there is one reason for optimism, albeit qualified. This is that, while the share of a country's workforce that is employed in manufacturing is fated to decline over time, in a country in which there are very high levels of unemployment, you could see an increase in the absolute number of people employed in manufacturing even if the share of the workforce employed falls. This, I think, is what might happen if and when the economy grows more quickly: you will see increased numbers of people employed across all sectors, but the rate of increase in services is likely to be faster than the increase in manufacturing.

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