

The
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Manufacturing industry

Politicians cannot bring back old-fashioned factory jobs

They don't make 'em like that any more

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THE vices are what strike you. The Mercedes AMG factory in Brixworth, a town in England's midlands, is a different world from that of the production line of yore. Engine making was once accompanied by loud noises and the smoke and smells of men and machinery wrestling lumps of metal. Here things are quiet and calm. Skilled mechanics wield high-tech tools amid operating-theatre cleanliness as they work on some of the best racing-car engines in the world. Banks of designers and engineers sit in front of computers nearby. The only vestige of the old world are the vices. There is one on every work bench. At some point, making things of metal requires holding parts still, and nothing better than the vice has come along.



Manufacturing exerts a powerful grip on politicians and policymakers in the rich world. It is central to what they want for their countries, they say; it needs to be brought home from abroad; it must be given renewed primacy at home. This is because it used to provide good jobs of a particular sort—jobs that offered decent and dependable wages for people, particularly men, with modest skills, and would do so throughout their working lives. Such jobs are much more scarce than once they were, and people suffer from the lack of them. In their suffering, they turn to politicians—and can also turn against them.

Hence Donald Trump's promise to create "millions of manufacturing jobs". Hence the vision articulated by George Osborne, Britain's finance minister from 2010 to 2016, of "a Britain carried aloft by the march of the makers", and the central role of making things in the "comprehensive

industrial strategy” promised by the current prime minister, Theresa May. Hence calls from the EU for a European industrial revolution and the need for things to be “Made in France” identified by Marine le Pen, leader of the country’s National Front.

The problem with such rhetoric is that manufacturing has not really gone away. But nor has it held still. The vice has gone unreplaced, but in almost everything else there has been change aplenty. Some processes that used to be tightly held together are now strung out across the world; some processes that used to be quite separate are now as close as the workers and designers who share the shop floor in Brixworth. Assembling parts into cars, washing machines or aircraft adds less value than once it did; design, supply-chain management, aftercare, servicing and the like add much more.

Ride the carousel

Once you understand what manufacturing now looks like, you come to see that the way it is represented in official statistics understates its health, and that the sector’s apparent decline in the rich world is overstated. But that does not solve the politicians’ problem. The innovations behind the sector’s resilience have changed the number, nature and location of the jobs that it offers. There are still a lot of them; but many of the good jobs for the less skilled are never to return.

Both in terms of employment and innovation manufacturing is worthy of political attention. Manufacturers are more likely to be exporters than businesses in other parts of the economy and, as you would expect given the demands of competing in a broader market, exporting firms tend to be more productive than non-exporting firms. Such firms also tend to be more capital-intensive, because selling into those broader markets allows firms to reduce capital costs per unit sold. And a sector that has higher-than-average productivity and high capital intensity will, other things being equal, be able to offer better wages.

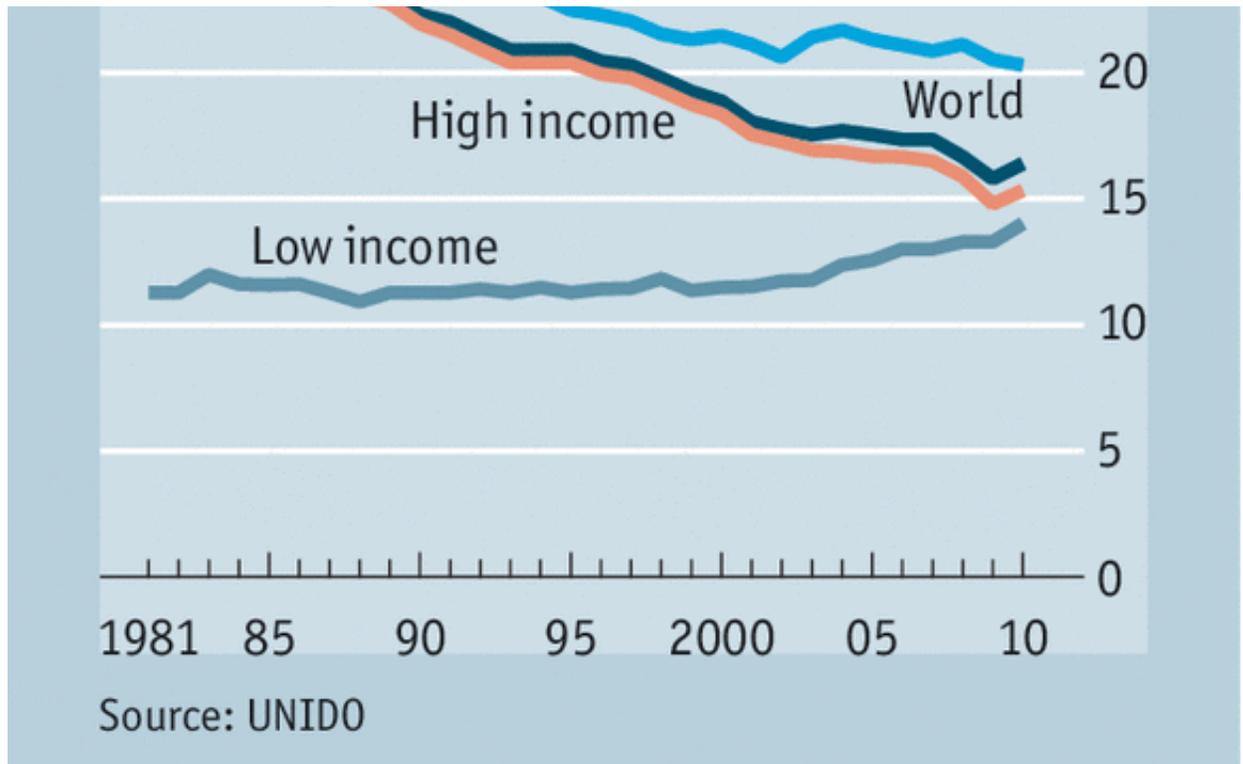
The structure of 20th-century manufacturing helped ensure that those better wages were indeed offered. Factories brought lots of modestly skilled people together with massive capital equipment that cost owners dearly when idled by strikes. Unionisation helped those workers win a large share of the value generated by industry.

In the latter part of the century, though, this system came undone. Better shipping and information technology allowed firms to unbundle the different tasks—from design to assembly to sales—that made up the business of manufacturing. It became possible to co-ordinate longer and more complicated supply chains, and thus for various activities to be moved to other countries, or to other

companies, or both. At the same time computers and computer-aided design made automation more capable. High wages gave owners the incentive they needed to take advantage of those opportunities. And while politicians now like the good jobs unionised factories provided, at the time when those unions were flexing their muscles many were happy to see them reined in.

As a result many





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manufacturing jobs vanished from the rich world (see chart 1). In Britain manufacturing's share of employment had hovered at around a third from the 1840s to the 1960s. Today official data show that around one in ten workers is involved in manufacturing. In the late 1940s manufacturing accounted for one in three non-farm jobs in America. Today's figure is just one in eleven. Even in Germany, the rich country where making things has clung on tightest, only one in five workers is in manufacturing.

The way official figures are put together means that these declines are exaggerated. But tens of millions of jobs did vanish, and as manufacturing became more productive, and prices dropped, its share of GDP fell, too. At the same time the number of people in manufacturing in developing countries exploded, with many of them working, directly or indirectly, for the same firms that were employing fewer people in rich countries. But the jobs that appeared were not, for the most part, simply the old jobs relocated.

Companies were using technology and new practices in ways that made it easier to separate straightforward, well-delineated work from the more complicated bits of the enterprise. The routine work, which was not particularly valuable, was easily moved to poor countries where labour was cheap. (If poor places had had the capacity to take the high-value bits, they would not have been poor.)

This is why promises to bring jobs back ring hollow. Valuable semi-skilled manufacturing jobs are not, for the most part, going to return to America, or anywhere else, because they were not simply shipped abroad. They were destroyed by new ways of boosting productivity and reducing costs which heightened the distinction between routine labour and the rest of manufacturing. There is no vice that can squeeze those genies back into their bottles.

The UN Industrial Development Organisation (UNIDO) reckons that, in 1991, 234m people in developing countries worked in manufacturing. By 2014 the number was 304m—and there were just 63m manufacturing jobs in the rich world. But the sixth of the workers in the rich world added two-thirds of the final value.

In terms of the perception that manufacturing moved to poor countries lock stock and barrel, it hasn't helped that the low-value work which did go overseas often involved the final stages of assembly. Putting the components that make up a product together looks like the essence of the manufacturing process. But it often adds little to the finished product's value.

Even for as complex and pricey a machine as a passenger jet, assembly is a low-value proposition compared with making the parts that go into it. By some estimates, putting together Airbus airliners in Toulouse accounts for just 5% of the added value of their manufacture—even if ensuring the aircraft were put together in France has been a non-negotiable point of national pride for the French government. Similarly, assembly in China accounted for just 1.6% of the retail cost of early Apple iPads.

Changing corporation names

Most pre-production value added comes from R&D and the design of both the product and the industrial processes required to make it. More is provided by the expert management of the complex supply chains that provide the components for final assembly. After production, taking products to market and after-sales repair and service and, in some cases, disposal all add more value—while stretching the idea of what it is to manufacture something ever further from the factory floor.

Dismantling, for example, is becoming an important part of the manufacturing process. Environmental legislation is forcing companies to take responsibility for their products after they have served their purpose by recycling components or disposing of them. Carmakers have to make sure that the batteries that power electric cars are not thrown away. In some countries white-goods firms are required to pay for recycling fridges, washing machines and other appliances.

At the same time as the value chain has been stretched, other changes have led official statistics to

exaggerate the loss of jobs in the sector. In the past, some jobs that would not today be seen as manufacturing were counted as such, inflating the total; today some jobs that seem obviously part of manufacturing are not counted as such, reducing it.

Manufacturing companies increasingly bring in other firms to take care of things like marketing or accounting. Because statisticians generally categorise firms according to what their largest block of employees does this looks like the loss of manufacturing jobs. The replacement of a tea lady with a canteen run by a contractor is statistically indistinguishable from the loss of a factory-floor metal basher (even if the tea lady is still there in the canteen).

But some outsourcing cuts the other way. Jaguar Land Rover (JLR), a British carmaker owned by India's Tata Group, handed over much of the management of its supply-chain logistics to DHL, a delivery giant, in 2009. Not only does DHL deliver parts from suppliers to JLR's factories, it gets them to the exact bit of the assembly line where they are needed; its employees whizz around the shop floor in forklift trucks. It is hard not to see the service they are offering as an integral part of the manufacturing process.

Many aspects of R&D, product design and technical testing are now sometimes looked after by service companies, along with lots of accounting, logistics, cleaning, personnel management and IT services. Production itself can be outsourced, too. Apple and ARM, a British chip company recently acquired by SoftBank of Japan, own no factories of their own. They make all their money from design, distribution and services associated with their products. An OECD committee is currently mulling whether these sorts of firms should still be classified as manufacturers.

A study published in 2015 by the Brookings Institute, an American think-tank, reckoned that the 11.5m American jobs counted as manufacturing work in 2010 were outnumbered almost two to one by jobs in manufacturing-related services, bringing the total to 32.9m. A British study conducted by the Manufacturing Metrics Experts Group in 2016 came to a similar conclusion: that 2.6m production jobs supported another 1m in pre-production activities and 1.3m in post-production jobs.

Pinning down the number of manufacturing jobs is sure to get harder. Not only will service providers penetrate ever deeper into manufacturers; some manufacturers also see themselves increasingly as sellers of services.

In the 1980s Rolls-Royce, an engineering giant that makes jet engines, started to push "power by the hour", providing an engine, servicing and maintenance at a fixed cost per hour of flying time. As

Andy Neely of the Institute for Manufacturing at Cambridge University points out, this way of turning manufacturing into a service of sorts provides more stable revenues by locking in customers rather than selling them one-off items. Moreover, margins tend to be higher for such services than for the goods themselves.

Industrial machines and the goods they turn out are increasingly packed with internet-connected sensors. Manufacturers are thus able to gather data on how their machines perform out in the world. Their intimacy with the product and the amount of data they accumulate gives them a base from which to sell services which no third party can match. A maker of cars, or wind turbines, or earth movers can use data from every product it has made to work out what is going on with any one of them, and thus increase the value to the user—who is increasingly likely to pay for the service that the manufactured object offers, rather than the object itself. The car industry, for most of the 20th century the archetype of metal bashing, increasingly sees its future in the provision of “mobility services” rather than as a seller of boxes with wheels at the corners. Running their own fleets of cars with which to offer autonomous or shared rides looks to many like the wave of the future—and possibly a very profitable one.

The enthusiasm for moving into services extends well beyond the makers of high-end machinery with whom the trend started. Henrik Adam at Tata Steel in Europe says he has a team of experts able to intervene in a customer’s production line and “improve their manufacturing performance and yield by specifying the best type of steel to match processing capability and market ambitions.” LafargeHolcim, a cement-maker, says its product can be delivered as a service. Increasingly complicated cement structures require experts to advise on design, use of specialist products and the logistics of pouring a continual stream of the stuff.

This should be comforting to politicians on the lookout for manufacturing jobs. Well-paid tasks could increase in number as services related to manufacturing grow. There are other encouraging trends, too. In some fields innovation and production are increasingly interwoven. Capital-intensive high-tech manufacturing is often better done amid the designers and engineers who thought up the product. Linking the design of both the product and its manufacturing process more closely to production can help improve all three. At the Mercedes AMG engine plant in Brixworth designers are deliberately placed in the middle of production engineers so that they cannot avoid meeting and talking.

The golden future

If being in the same place really helps, technology and redesigned production methods might be

used to bring assembly and some other forms of production back to rich countries. 3D printing, though more expensive than traditional mass manufacturing, is being used to make more luxurious and pricier wares, such as motorbikes, in the heart of cities like London and New York, close both to designers and consumers. Using new technologies to keep design and manufacturing tightly coupled can shorten lead times in industries driven by fad and fashion (see [article](http://www.economist.com/news/business/21714394-making-trainers-robots-and-3d-printers-adidass-high-tech-factory-brings-production-back) (<http://www.economist.com/news/business/21714394-making-trainers-robots-and-3d-printers-adidass-high-tech-factory-brings-production-back>)).

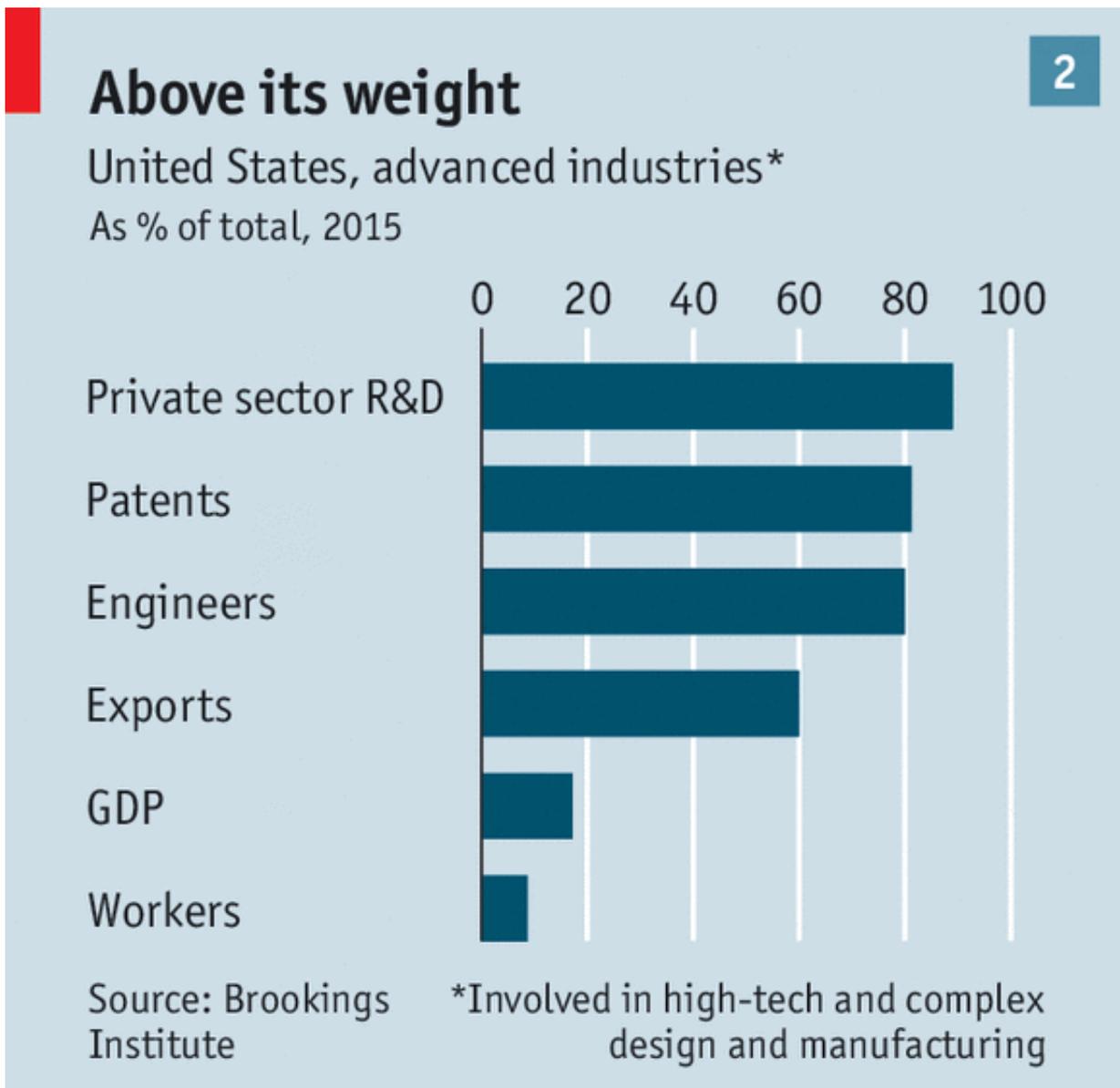
Some firms recognise that outsourcing production to cheaper locations has eroded innovation, says Ludovico Alcorta at UNIDO. When production is moved elsewhere, opportunities to learn how to do it better are often lost. The development of new products and processes can suffer, as can interactions with research organisations and universities.

As that suggests, though, the potential for new jobs in manufacturing is not quite the boon politicians would like. Advanced manufacturing provides very good jobs (see chart 2) but they are the jobs of the future, not the past; they need skill and adaptability. They will change a lot over the lifetimes of those who hold them, and they will never provide anything quite like the mass employment of the past.

Governments should “start with modest expectations” for manufacturing, says James Manyika of the McKinsey Global Institute, a think-tank. The policies that might help are mostly fairly obvious. Improve education to ensure that engineers and techies are in good supply. Provide more vocational training, along the lines that Germany uses to support its *Mittelstand*. And develop retraining programmes to refurbish the skills of current or former workers (see this week’s [special report](http://www.economist.com/news/special-report/21714171-companies-are-embracing-learning-core-skill-what-employers-can-do-encourage-their) (<http://www.economist.com/news/special-report/21714171-companies-are-embracing-learning-core-skill-what-employers-can-do-encourage-their>)).

If manufacturing cannot be counted on to bring back good jobs for semi-skilled workers, its history nonetheless suggests a route to providing good work in other sectors. First, workers still tend to do better when they are able to work within profitable companies, rather than as employees of service firms which contract with those companies. Second, workers do better when they are able to improve their bargaining power by means of a union. But neither is easy to implement, or popular across the political board.

A real commitment to helping people find work in and around manufacturing could undoubtedly do good. Simply threatening companies that seek to move jobs overseas and the countries keen to host them, as Mr Trump has, will not. Disrupting the complex cross-border supply chains on which



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manufacturers rely with tariffs would damage the very sector he purports to champion. Clamping down on migrants with skills that manufacturers cannot find at home will do harm, not good. Policies that favour production-line workers over investment in automation will end up making American industry less competitive.



What next?

Industrial manufacturing was never as simple as those far from the shop floor imagined it to be. Today it has become more complex still. There are reasons to help manufacturing; it tends to be more productive, and by some measures more innovative, than the rest of the economy. But doing so requires careful thought, a light touch and managed expectations. The application of brute force will not turn the clock back. It is more likely to break it.

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