

Technology

Only One Winner In The Global Robot War

By Clay Chandler

The US and Europe hope that the rise of robotics will bring manufacturing back to advanced economies. But China is well equipped to make the most of the robot revolution, leaving little space for other players.

In May, Adidas unveiled a 4,600 sq m shoe factory it billed as a prototype for manufacturing in the digital age. The plant, which the German sports-wear and equipment maker dubbed “Speed Factory,” was almost entirely automated. Yet even more remarkable than the facility’s state-of-the-art industrial robots was its location: not China or Vietnam, but Ansbach, a small town in southern Bavaria.

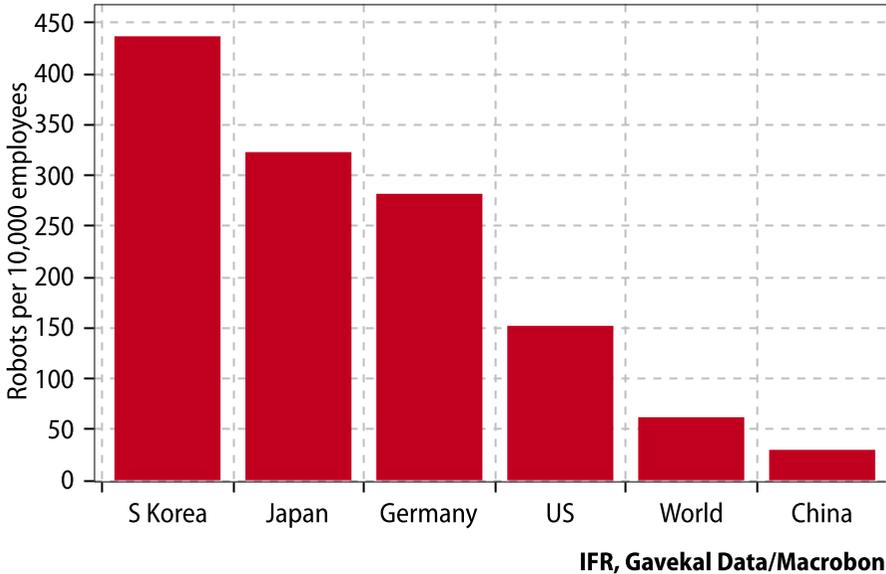
Journalists who toured the plant hailed the facility as a harbinger of a new era in which factories that had been “offshored” to China and other developing economies would be “reshored” to developed economies in North America and Europe. In the US and Europe, which have been roiled by the backlash against globalism and free trade, the idea that advances in robotics and artificial intelligence will usher in a resurgence of Western manufacturing has obvious appeal. So, too, does its implied corollary: that a technology-led industrial renaissance in the West will come at the expense of China, as robots replace tens of millions of factory workers.

Much of this optimism is misplaced. There is little evidence of widespread reshoring to the West, and China enters the robot age with formidable strengths: modern infrastructure, advanced logistics knowhow, a highly-evolved ecosystem of suppliers, a disciplined and reasonably

Clay Chandler is principal of the Barrenrock Group, an independent research firm in Hong Kong. He is a former McKinsey & Co. consultant, and reported from China and Japan for the *Wall Street Journal*, *Washington Post* and *Fortune*.

China's robot density is still low

Robot penetration in manufacturing, 2014



well-educated labor force, and a large and growing domestic market. It stands uniquely poised to exploit these new technologies, and is far more likely to benefit from them than to suffer.

The robot revolution

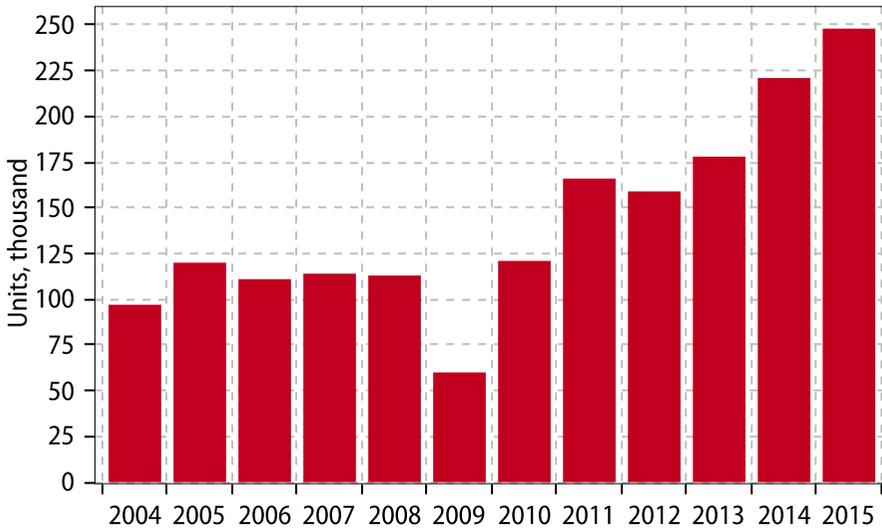
China came late to the robot revolution. In 2015, it had only 49 robots per 10,000 manufacturing workers, according to the International Federation of Robotics (IFR). This compared with 531 in South Korea, 305 in Japan, 301 in Germany and 176 in the US. Chinese auto factories were less than a third as automated as plants in the US and Japan.

But China is rapidly gaining ground. Between 2010 and 2015 its purchases of industrial robots grew at an annual average rate of 36%, enabling it to overtake the US as the world's largest market for industrial robots. In 2015, Chinese factories bought 68,600 of the 248,000 robots sold globally—more than all robots sold to European factories. Beijing has set a goal of raising the ratio of industrial robots to 100 per 10,000 manufacturing workers by 2020. IFR estimates that, by 2019, China will account for four out of every 10 industrial robots in the world.

The government has aggressively promoted automation of China's manufacturing sector, with President Xi Jinping himself calling for a "robot revolution." In March 2015, Beijing rolled out "Made in China 2025," an industrial roadmap that elevates factory automation to a nation-

The robot revolution is gathering pace

Annual global supply of industrial robots



IFR, Gavekal Data/Macrobond

al economic priority. The plan includes initiatives that will unlock billions of dollars for Chinese manufacturers to upgrade their technology, including advanced machinery and robots. Provincial governments, too, are bankrolling the effort. Guangdong and Zhejiang have allocated US\$150bn and US\$120bn respectively over the next five years to equip factories with industrial robots.

Not all this money will be well spent, of course. China's state-owned enterprises, which by some estimates account for about a quarter of China's industrial output, have a poor record when it comes to allocating capital. China's media is filled with reports of factories gussying up labor-intensive assembly lines with low-end robots to qualify for subsidies. Fortunately, China's machine drive isn't purely government led: private manufacturers, too, are moving boldly to automate operations. At Foxconn, the leading supplier of Apple's iPhone, founder Terry Gou has vowed that, by 2030, robots will assume more than 30% of tasks now handled by humans. In Kunshan, an industrial hub near Shanghai, more than 600 firms plan to use robots to slash headcount, according to a recent government survey.

Machine learning

For now, more than 70% of robots sold in China are foreign made. But already homegrown robot makers such as GSK CNC and Shenyang's Siasun Robot & Automation have developed a host of robots for factory use. Shen-

zhen's SZ DJI Technology Co. is the world's biggest consumer drone maker. Forecast International, a private market researcher, recently predicted that state-owned defense firm Aviation Industry Corporation of China will produce nearly US\$6bn worth of unmanned aerial vehicles by 2023. Meanwhile, China's largest manufacturers have demonstrated their willingness to pay top dollar for foreign companies with robotic capabilities they cannot find at home. In July, Midea Group, a leading appliance maker, overcame local political opposition to close a US\$5bn takeover of Frankfurt-listed Kuka AG, one of Germany's most advanced robot manufacturers.

Will Chinese robot makers ever compete with the likes of Japan's Fanuc Corp. or Swedish-Swiss conglomerate ABB Group? Skeptics dismiss the notion as preposterous. Many cite China's inability, despite prodigious government support, to develop world-class manufacturers in fields such as commercial aircraft, memory chips and pharmaceuticals. Yet manufacturing and industrial automation play to China's strengths. A recent McKinsey study distinguished between four categories of innovation: customer-focused, efficiency-driven, engineering-based and science-based. While China is still struggling in the latter two categories, the report found it was already a world-leader in the first two. "In manufacturing," it noted, "China's extensive ecosystem has provided an unmatched environment for efficiency-driven innovation."

By 2015, China was the world's largest market for industrial robots

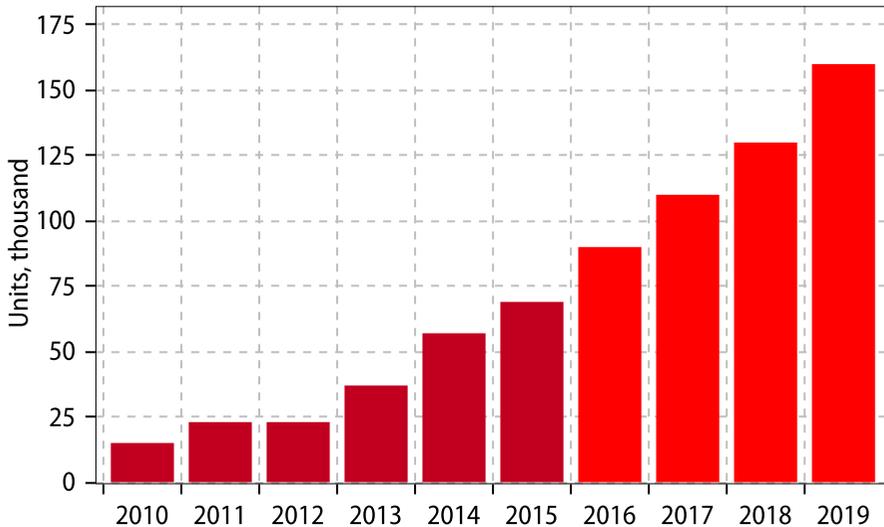
Factories, come home

The notion that industrial robots and artificial intelligence will revive manufacturing in North America and Europe is the most recent iteration of a broader Western debate about re-shoring. The idea took shape at the end of the last decade as executives at a handful of prominent Western multinationals gauged that, for at least some products, rising wages and energy costs in China combined with the challenges of meeting faster product cycles had altered the calculus of manufacturing there.

Reshoring attained mainstream credibility in 2009 when General Electric announced it would spend US\$800mn to shift production of its energy-saving GeoSpring water heaters, previously made under contract in China, to the company's fabled Appliance Park complex in Louisville, Kentucky. At its peak in 1973, Appliance Park employed more than 23,000 people; by the end of the global financial crisis, the sprawling compound was a ghost town, with fewer than 2,000 workers. But oil prices had tripled

China will soon account for 40% of global robot sales

Annual supply of industrial robots to China, 2010-19



IFR, Gavekal Data/Macrobond

since 2000 and Chinese wages had jumped fivefold in little more than a decade. Meanwhile, US labor unions had become more flexible, and labor productivity was rising. It seemed to make economic sense to move manufacturing back home.

GE rapidly ran into difficulties at Appliance Park, as its engineers had lost the knowledge of how to assemble the heaters. This forced them, at considerable time and cost, to rethink how to build them. By focusing on efficiency, however, GE’s US plant eventually beat the “China price” for the heater by 20%. Delivery time from factory to warehouse dropped from five weeks to 30 minutes. GE began to bring back manufacture of components for the heater, and later shifted assembly of one of its top-of-the-line refrigerators to from Mexico. By 2012, Appliance Park had 3,600 hourly employees and GE’s appliance business boasted sales of US\$5bn a year, 55% from products made in the US.

In the years that followed, there were other success stories. Caterpillar opened a new plant in Texas to produce excavators that it had previously made in China. Whirlpool Corp returned to Ohio for production of its KitchenAid hand-mixers. And K’Nex Brands LP, a family-owned toymaker based in Pennsylvania, brought back production of its popular Lincoln Logs. In 2012, the Boston Consulting Group published a survey of manufacturers with sales of more than US\$1bn showing that 37% “plan or are actively considering bringing production back from China to the US.”

And yet, for all the hoopla, America's industrial renaissance never materialized. In 2014, A.T. Kearney found that there were no more than about 300 cases of reshoring to the US. A comprehensive survey of 85 top global manufacturing companies conducted in 2015 by supply chain experts from seven leading business schools detected a slight positive shift in manufacturing volume to the US, but found the gain was "not driven by American corporations bringing back manufacturing." Rather, US gains reflected the actions of "European and Asian firms looking to move their production to the United States as they see the country as a very appealing market destination and source of knowledge." Notably, the survey found that China remained the most popular destination for new manufacturing investment.

Why did the reshoring prophecies not come to pass? One explanation is oil prices, which fell by more than half starting in 2014, lowering shipping costs for Chinese exporters. Even so, Chinese wages continued to climb, and potential savings from lower transport costs were offset by the appreciation of the renminbi against the dollar until mid-2014.

The loss of "industrial commons"

Harvard Business School professor Wally Shih, who conducted extensive research into reshoring efforts at Appliance Park and other ventures, believes something more fundamental is going on. In his view, the US economy's underlying problem is the loss of what he calls "industrial commons." In outsourcing to China, GE's appliance unit abandoned basic knowledge about how products were made. But that failing goes far beyond the decisions of a single firm: the entire ecosystem needed to support domestic manufacturing—product design, supplier base, and the pool of skilled labor—has been "hollowed out," not just at GE but throughout the US economy.

At GE, Shih found that worker turnover was crippling. For its initial job posting in 2012, Alliance Park started with 10,000 applicants. Of the 6,142 who passed the initial screening, 730 were hired but 228 demoted in the first year. It was almost impossible to find American workers who could operate a model printed circuit board line. Even if the data on comparative labor and energy costs suggested companies could save money by moving back to the US, reshoring made no sense if companies couldn't find reliable suppliers or workers with the right skills. GE eventually found an economic way of producing GeoSpring heaters at home, but the reshoring process was fiendishly hard to manage.

The erosion of America's "industrial commons," coupled with the sophistication and durability of its equivalent in China, is reason enough

to believe the advent of robots is more likely to bolster China's prowess as a manufacturer than to undermine it. But that is not all: China's manufacturing sector will be strengthened by its own vast consumer market. Its economy may be slowing, but China remains home to the world's fastest growing middle class. In 2015 it had 82mn "affluent" households, with an annual income of at least US\$21,000. Gavekal Dragonomics forecasts that number will rise to 137mn by 2020, and to 182mn by 2025. By that point nearly 40% of all Chinese households will fall in the affluent category.

Still China, China, China...

That does not mean that reshoring is dead. One of the themes of Donald Trump's presidential campaign was that China "stole" American manufacturing jobs, and that they should be brought back. Slapping punitive tariffs on China-made goods would certainly hurt exporters there, Chinese and American alike. In such circumstances, it may indeed make sense to manufacture at home. But this does not mean the US, or any other advanced economy, is set to win the robot war. Today, Appliance Park is going strong, employing 6,000 workers at an average of US\$15 an hour. But it no longer belongs to GE. In June, GE announced it was selling Appliance Park and its entire US appliances business for US\$5.6bn. The buyer? China's leading appliance maker, Haier.