

Can the US reshore semiconductor manufacturing?

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Summary

The covid-19 pandemic has ignited calls to reallocate critical supply chains away from China which could result in policy changes that fundamentally transform the semiconductor industry. Amid rising US-China tensions and the need to reinvigorate the US economy, Congress and President Donald Trump are poised to make sizable investments in the microchip industry to enhance US capacity in a sector that is considered vital for commercial success and national security. Such policies could reconfigure the global microelectronics supply chain and make the US more attractive for investment from chip manufacturers, as well as, other ancillary industries. It will also be important to watch how these policy changes affect geopolitical dynamics as other heavyweights in the semiconductor industry such as Taiwan, Japan, and South Korea navigate competing US and Chinese interests in the sector.

Covid-19 has prompted a debate in the US and elsewhere about the re-shoring of manufacturing of critical pharmaceuticals and medical equipment. But the US' increasingly tense relationship with China was already generating a similar interest in the same dependence on external sources of advanced technologies linked to national security, especially semiconductors.

A number of political stars are potentially aligning here. Since 2014, when China's State Council established a goal of becoming a global leader in semiconductor production by 2030, Beijing has pumped billions into the sector, increasing its share of global capacity by four percentage points in just four years, while US market share has fallen by an equivalent amount (see Figure 1).

US employment in the semiconductor industry has been largely flat for the last decade after a fall from 1.8m in 2001, following a previous decade of offshoring and technological change. The twin drivers of (perceived) industrial self-sufficiency and boosted skilled employment make this an area where bipartisan support is generally available. Recently, we've seen several players in the semiconductor and tech industries make

announcements in recognition that the trade winds are shifting. Apple Inc. recently [announced](#) it was moving ahead with plans to build custom chips in-house, rather than rely on third parties like Intel or Taiwan Semiconductor Manufacturing Company (TSMC). The move is not surprising as Apple has long sought to insource many of its components, a sentiment likely amplified by the fact that many Apple products were hard hit by covid-19 due to manufacturing delays in China. TSMC also [said](#) it is negotiating a deal with the Trump administration to build a \$12 bn chip plant in Arizona with the help of the State Department and Commerce's SelectUSA program.

Given these dynamics, what should we expect for the sector in the run up to November and in the next policy cycle?

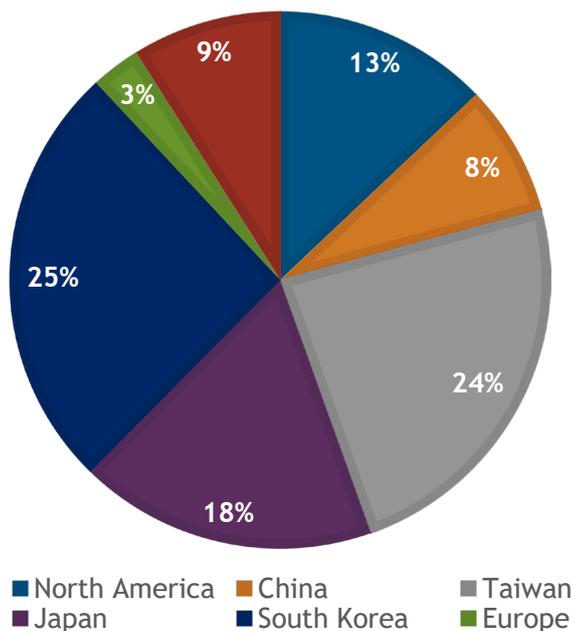
Legislative efforts

The bipartisan nature of support for the sector means it will be easier to include funding to boost the industry in a major legislative package either leading up to or shortly after the November US elections. With the Senate potentially in play in November, targeted action to support domestic

Figure 1.

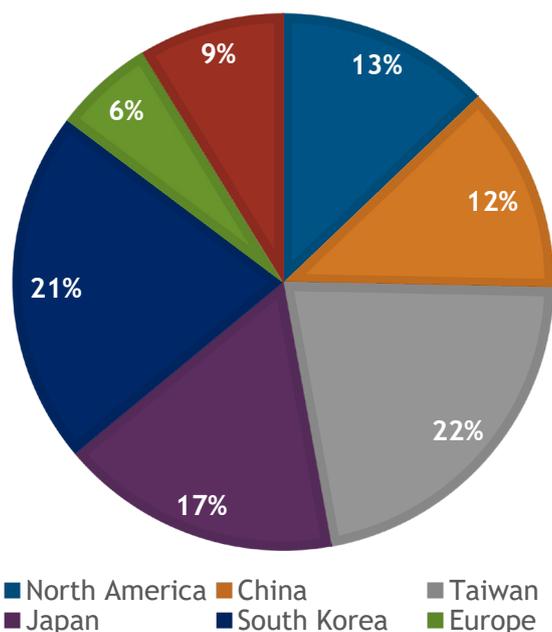
Global wafer capacity (2015)

%



Global wafer capacity (2019)

%



semiconductor manufacturing serves a clear electoral purpose. Arizona Republican Sen. Martha McSally, who is trailing to Democratic challenger Mark Kelly in a state that is one of the larger microelectronics hubs in the country (see Figure 2) is, unsurprisingly, a big supporter of quick legislative action.

Bicameral and bipartisan efforts kicked off on in June via multiple pieces of legislation to provide financial incentives for the semiconductor industry to build out domestic capacity. First, the Creating Helpful Incentives to Produce Semiconductors (CHIPS) for America Act was introduced by a

bipartisan coalition and would boost advanced manufacturing capacity, R&D funding and a deliver a large tax credit for semiconductor production.

The second major bill introduced this month is the American Foundries Act which would provide around \$25 bn for the US semiconductor industry. This measure includes provisions for the modernisation of existing facilities which could be beneficial to companies like Intel that have struggled to remain on the cutting-edge of technology. In addition to investing in new fabs and R&D, the American Foundries Act would create a subcommittee of the President’s Council on Science and Technology (PCAST) focused on making technological advances for the next generation of microchips. Notably, this measure also obligates the Department of Defense to “Buy American” when sourcing microelectronics design and production services. This legislation could easily be combined with some aspects of the CHIPS Act. The American Foundries Act is backed by Sen. Tom Cotton, a heavyweight on the Senate Armed Services Committee.

Another notable piece of legislation for the semiconductor industry introduced earlier this year is the Endless Frontier Act, which would allocate \$100 bn for research and development. \$10 bn of that funding would be set aside for establishing regional tech hubs to help launch new US companies. The new Directorate established through the legislation would fund research in critical technologies – including semiconductors – as well as artificial intelligence, quantum computing, and advanced communications technologies – areas in which the US is keen to reaffirm its technological independence and advantages over China. Although the measure has received robust support from the tech industry and US colleges and universities and is also a bipartisan, bicameral effort, it is more vulnerable than the previous two initiatives given its much higher price tag.

Despite being pulled together quickly, some combination of the CHIPS and American Foundries bills stands a strong chance of being included in the National Defense Authorization Act (NDAA). This is the annual defense funding bill that must be passed to replace the current bill by 30 September 2020. The NDAA is considered a “must-pass” legislative vehicle and has strong sponsorship from senior members in both parties and in both chambers of Congress and is supported by the Trump administration.

The sponsors of the CHIPS Act and American Foundries Act are reportedly working together at the request of the Senate Armed Services Committee to offer up an amendment to the NDAA that unites the two pieces of legislation. This amendment

Sponsors	Main highlights
CHIPS Act Sen. John Cornyn (R-TX) Sen. Mark Warner (D-VA) Sen. Jim Risch (R-ID) Sen. Kyrsten Sinema (D-AZ) Sen. Marco Rubio (R-FL) Rep. Michael McCaul (R-TX) Rep. Doris Matsui (D-CA)	<ul style="list-style-type: none"> Create a \$10 bn federal match program for any state and local incentives given to a company that builds a fab with advanced manufacturing capabilities. Authorise funding for the Department of Defense (DOD) to conduct R&D, workforce training, and testing for projects on semiconductor technologies. Direct the President to use Defense Production Act authorities to improve domestic semiconductor manufacturing capabilities. Establish a \$750m fund to work with foreign governments on policies related to microelectronics and improve alignment on policies toward China in this sector. Provide new research and development (R&D) funding streams through various federal programs including Defense Advanced Research Projects Agency, the National Science Foundation, the Department of Energy, and the Department of Commerce. Establish a 40% refundable investment tax credit (ITC) for semiconductor facility investment expenditures through 2024.
American Foundries Act Sen. Tom Cotton (R-AR) Minority Leader Chuck Schumer (D-NY)	<ul style="list-style-type: none"> Authorises \$15 bn for the construction, expansion, or modernisation of microelectronics fabrication, assembly, test, advanced packaging, or advanced R&D facilities Provides \$5 bn for defence microelectronics grants to be administered by the Department of Defense Authorises \$5 bn in spending for research and development through DARPA and the Department of Energy
Endless Frontiers Act Sen. Todd Young (R-IN) Sen. Chuck Schumer (D-NY) Rep. Ro Khanna (D-CA) Rep. Mike Gallagher (R-WI)	<ul style="list-style-type: none"> Transform the National Science Foundation (NSF) into the National Science and Technology Foundation (NSTF). Authorise \$100 bn over five years to reinvigorate US leadership in new technological innovation. Provide \$10 bn to the Commerce Department to designate at least 10 regional technology hubs

China's military, it could be a reason to deny any request by a US company to export goods or technology to that Chinese firm.

Implications

The potential beneficiaries of this largesse are obvious enough. Industry leaders like Intel Corp., Texas Instruments Inc., NVIDIA Corp., ON Semiconductor, and Micron Technology Inc. would be the immediate beneficiaries of further US federal investment in the semiconductor industry. The biggest incentives in the expected NDAA amendment will be for capital expenditures to build foundries. US chip companies including Qualcomm Inc., NVIDIA Corp., Broadcom Inc., Xilinx Inc. and Advanced

Micro Devices Inc. that have not invested in domestic factories may see that calculus change. As a result, companies involved in the construction and manufacturing of the fabs themselves could see a boost. Ancillary suppliers, such as silicon producers, will also potentially benefit. Mississippi Silicon is one of the largest US-based silicon manufacturers, but companies like the Norway-based REC Group could also see an increase in demand for their silicon wafers.

The semiconductor industry is also deeply reliant on advanced manufacturing techniques given that chip technology advances at breakneck speed. Companies that drive digital transformation of production by incorporating the latest analytics,

artificial intelligence, and machine learning into the manufacturing process are going to be critical to maintaining the competitive edge for domestic manufacturing. Importantly, progress in artificial intelligence like machine learning are directly correlated to improvements in microchips. Machine learning requires a much more chip memory and quicker semiconductor processors due to the sheer amount of data being processed and higher levels of computational power needed.

The international response is also likely to be defensive and critical of this burst of industrial policy activism. However, the policy is notably Buy Made in America rather than Buy American. It is not just US companies that are eligible for these incentives, but major foreign-owned companies like Samsung or SK Hynix would also be able to access the benefits as long as they build on US soil. This could go a long way in muting criticism of the bill outside the US. Notably, Samsung has a large plant in Austin, TX which is represented by one of the CHIPS Act's sponsors, Rep. McCaul.

Japan and South Korea also have some vested interest in expanding the semiconductor industry. These US allies are similarly concerned over China's control of chip production and manipulation of the market and it seems unlikely that such assertive industrial policy in the US does not trigger a wider reaction in the global market for semiconductors. Foreign semiconductor companies are expected to be squeezed by rising US-China competition in this space. With both China and the US investing heavily in capacity and moving more or less explicitly to cut the other out of supply chains, the shape of the global market is almost certainly entering a period of transition. China is likely going to pressure Japanese and Taiwanese chip suppliers and ramp up its own acquisition efforts in Asia and Europe. Firms in the semiconductor supply chain could ultimately be forced to "choose" between the United States and China. Consequently, it will be important for the US to work in tandem with allied international partners to minimise any disruption.

The US is already a leader in research and development for microchips. However, encouraging North American to become a hub for semiconductors serves multiple purposes for the US government. These policies move a critical industry away from the Asia-Pacific, thereby limiting China's access to the most cutting-edge chip technology. The US has a national security interest in exerting more control over the microchip sector and supplementary industries such as advanced manufacturing and AI vis-à-vis its strategic competitor China. If executed thoughtfully and strategically, these policies could also bring key allies such as Japan, South Korea, and Taiwan closer to the US orbit of influence instead

of injecting chaos and unpredictability into a vital industry. Building out US manufacturing capacity will help mitigate any concerns regarding a single point of failure in the semiconductor supply chain and provide much-needed jobs in a period of economic uncertainty. If anything, the covid-19 pandemic has demonstrated how essential it is to build in resiliencies throughout critical supply chains. This lesson is not lost on US policymakers and unlike so many other initiatives that have been stalled in Washington, the semiconductor industry has the momentum and political capital needed to overcome congressional gridlock.

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