Competing With China

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The CHIPS and Science Act authorized $52 billion for domestic semiconductor chip manufacturers with the aim of enhancing the global competitiveness of the US chip industry, improving the security of the supply chain, and countering China's ambitions in the sector.

While increasing investment in semiconductor research and development is welcome, whether it can improve US global competitiveness and prevent the rise of China is uncertain. In 1990, US companies manufactured 37% of semiconductors produced globally, but by 2020 that share had shrunk to 12%. Scholars such as William Lazonick and Matt Hopkins blamed this loss of American leadership on the financialization of American corporations. With the rise of "pure play" foundries (companies that exclusively fabricate chips designed by others), most US companies have outsourced manufacturing to Asian firms while retaining only the higher-profit design operations. The emphasis on profit margin and shareholder value also drove integrated companies such as Intel to invest less in R&D relative to Asian counterparts, such as Samsung and Taiwan Semiconductor Manufacturing Company (TSMC).

In this notoriously capital-intensive industry, the CHIPS Act's $52 billion investment is relatively small. For example, in 2022, just one company, TSMC, announced new capital investments of over $40 billion, building on $30 billion invested last year. Samsung plans to invest $355 billion in its semiconductor and biopharmaceutical technologies over the next five years. Since the semiconductor industry is the single most important global niche held by South Korea and Taiwan, government and commercial conglomerates in those countries are likely to do whatever is necessary to maintain their supremacy. The CHIPS Act thus signals the start of a high-stakes global race, leading to more public and private money in the semiconductor industry.

A race to invest in manufacturing will ultimately flood the market with chips, which is likely to drive down the price and profit margin for all players—as is already being seen with memory chips. Given that such slumps are almost inevitable, it is unclear how American chip makers, with their long-standing focus on quarterly earnings, will deliver on promises of expanding capacity. Asian corporate structures, by contrast, are far more tolerant of temporarily low profit margins.

Although the "threat" of China has been used to justify American governmental spending, when it comes to semiconductors, China has largely been a customer of American and Asian giants rather than a competitor. Despite decades of promotion, China did not have much success in developing a cutting-edge domestic semiconductor industry. Until very recently, most Chinese electronic companies relied on American chip design, with Samsung or TSMC fabricating the more advanced components.

China's dependence on foreign chips was the result of a deliberate strategy for global integration in the information and telecommunication (ICT) industry. Despite the Chinese government's long-standing concerns about the security implications of external chip dependency, telecom and consumer-facing Chinese companies such as Huawei developed products based on foreign chips because these chips were advanced, stable, and competitive in pricing. This allowed Chinese companies to concentrate their R&D on 5G and other competitive applications, rather than reinventing the wheel in the semiconductor space. Given the global division of labor in the ICT supply chain, this was a rational strategy, but it came at a cost: with most of its leading firms choosing foreign chips, China's semiconductor ecosystem has been slow to mature.

This changed in January 2018 when the Trump administration initiated a "trade war" by imposing tariffs on certain goods made in China. Since then, the United States has implemented increasingly stringent and broad bans on advanced chip or parts exports from American and third-party vendors to Chinese firms. Under the Biden administration, the restrictions have been further expanded to semiconductor manufacturing equipment, material, and design software.

This abrupt disruption in the supply chain was a wake-up call for Chinese companies, not limited to targeted firms like Huawei. In response to the trade war, the Chinese state has provided dedicated funding and issued tax relief to foster the growth of its domestic semiconductor manufacturing. Realizing their vulnerabilities, Chinese companies have also started to invest in alternative chip design and manufacturing capacity. In 2020, cash flow into semiconductor firms in China amounted to $35.2 billion, a 407% increase from the previous year. Bloomberg reported that orders for equipment from the Chinese chip-making industry far outpaced those of other regions in 2021.

Ramping up a complex industrial ecosystem of this kind is not without peril. China has had to reckon with institutional deficiencies around experience and accountability that have led to fraud and corruption in the semiconductor space. Additionally, chip designers and makers in China will be forced to navigate expanding technological rules imposed by the United States.

Even so, China has a fundamental advantage in its massive and growing market, which exerts a powerful gravitational pull on chip makers. As the world's largest maker of electronics, 60% of global semiconductors end up in products made in China, which is also the world's largest market for smartphones, personal computers, and data servers. And China is investing heavily in next-generation communication and power infrastructure, automation, electronic cars, and artificial intelligence, all of which

require sophisticated semiconductor chips.

With American bans, this massive market provides new opportunities for domestic Chinese companies. These firms, which previously suffered from lack of demand, have already started to grow by filling gaps up and down the semiconductor ecosystem. China will also likely strengthen its collaboration with other players, like South Korea, that have been treading cautiously amid the rivalry between China and the United States.

While the United States increases its investment in the semiconductor sector, it would also be essential to make an effort to reform the financialization of US corporations, whose emphasis on maximizing shareholder value and short-term profit led to the loss of American leadership in manufacturing in general. It should also be expected that in response to the CHIPS Act, Asian governments, including China, will invest more in semiconductors. The biggest impact of the act may be to reinforce China's determination for self-reliance.

For all chip makers, including those in the United States, a prolonged absence from the Chinese market carries its own risk. If China successfully develops solutions independent from American suppliers, it will effectively shut US vendors out of the world's largest market. Although the CHIPS Act may provide a boost to domestic companies, America's long-term global leadership in semiconductor technology will be more secure if China remains within the orbit of American products, rather than allowing it to flourish without US participation.

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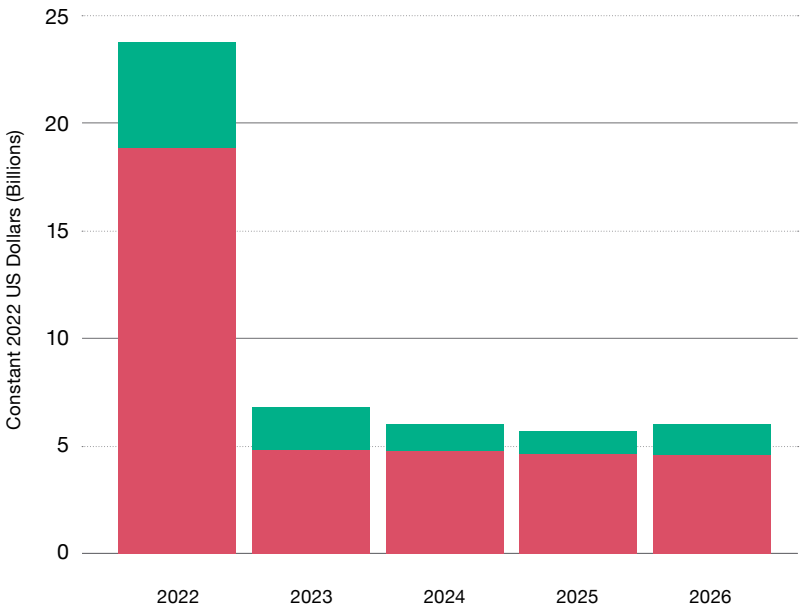
CORE CHIPS ACT APPROPRIATIONS: MANUFACTURING AND R&D



Semiconductor appropriations

The CHIPS and Science Act appropriates $39 billion for semiconductor manufacturing incentives and an additional $11 billion for semiconductor research and development. In addition to these core appropriations, the act also establishes four other funds (not shown in this figure): a Defense Fund ($2 billion), a Public Wireless Supply Chain Innovation Fund ($1.5 billion), an International Technology Security and Innovation Fund ($0.5 billion), and a Workforce and Education Fund ($0.2 billion); this part of the act also includes the Advanced Manufacturing Investment Tax Credit.