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Computer Chips: Stronger Ties Can Mitigate Costs

The United States is grappling with how to maintain leadership in semiconductor technology while limiting China's ability to use US technology against the United States and its allies militarily. The Biden Administration has a four-pronged approach: (i) invest in the science and technology ecosystem; (ii) nurture top science, technology, engineering and math (STEM) talent; (iii) protect our technology advantages; and (iv) deepen alliances and partnerships. The calculus is complicated because China is simultaneously the biggest customer for most US chipmakers and a geopolitical threat to US national security. The US has focused primarily on subsidizing domestic industry and restricting access to US technologies in China. But export controls are short-term and costly, and industrial subsidies and tax credits usually do not work. Elevating international partnerships in trade and migration could mitigate the costs for US industry and partners abroad.

The CHIPS and Science Act of 2022 supports the first two prongs. It includes \$53 billion to support US semiconductor manufacturing, mainly through subsidies and tax credits. Another \$225 billion was authorized for STEM R&D and workforce development, but these funds have not been appropriated by Congress. Licensing requirements, export controls and investment restrictions targeting China show the heft of the third prong. Last year, the Biden Administration imposed licensing requirements on shipments of highly advanced chips to China, and export controls on semiconductors and the machines that make them.

Deepening alliances and partnerships, the last prong of the approach, is also critical for success, but tangible measures are largely absent. Expanding trade and investment with allies would enhance efficiency while promoting US technology adoption around the world. Removing restrictions on migration of highly skilled workers would allow US firms to access a broader array of talent. Such partnerships could reduce risks associated with the two prongs that have been most fully implemented – industrial policy aiding the US chip industry and export and investment restrictions related to China. Industrial policies are costly and, as history has shown, usually unsuccessful in achieving their goals. Working with partners and expanding the pool of competitive labor and capital markets would make it more likely that resources are efficiently allocated. Export controls may buy time in the short run, but could have perverse consequences of reducing US technological leadership in the longer run if trade partners follow a different approach.

The Biden Administration's strategy on computer chips is designed to drive scarce resources to semiconductor fabs, chosen not by market signals but by the government. The risk is that the companies in the sector may prove to be globally uncompetitive because the US lacks the technology, skills, or capital required for success. Those same resources spent on manufacturing that did not materialize could have instead been invested in education or infrastructure. Arguably the most notable threat to successful semiconductor fabrication in the US is the absence of skilled workers. Companies need access to talent to stay ahead of the curve. US firms need people now.

The United States has the potential to source talent from the world, while China sources talent from within China. US openness has long been a strength of its innovation ecosystem. But H1B visas that allow foreigners with special skills to work are unnecessarily capped at 65,000, unchanged since H1B was created in 1990, despite huge increases in both the size

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of the US economy and demand for high-skilled workers. In contrast, other countries are opening borders to the educated. The United Kingdom, for example, has a “high potential individual” visa that allows graduates of top universities to come for two to three years and look for work. In addition to expanding high-skilled immigration, the United States could work with allies on an agreement on the free movement of engineers and other scarce talent. With appropriate background checks, greater movement of talent could ease US labor shortages and maximize Chips Act funding returns.

Unlike the Chips Act, which aims to build up US production capabilities, export controls are designed to prevent China from using US technology for military purposes against the US or its allies. If other countries do not participate actively in the strategy, China will continue to access new technologies at the expense of US firms’ growth and innovation. International cooperation has at times been too little or too late. Without coordination among key suppliers, China will circumvent US export controls and access the US technologies from another source.

Given China’s large and growing market, the effect of technological decoupling on US industry is substantial. China represents large revenue streams for US chip producers: over 60% for Qualcomm, 35% for Broadcom, 25% for Intel, 20% for Nvidia. If these US companies cannot license or export to China, their revenue streams will decrease, translating into smaller margins, fewer jobs and less R&D spending. A 2020 BCG report showed potential losses of roughly \$80 billion in revenues and \$20 billion in R&D spending from full US-China decoupling in the semiconductor market. With a big chunk of their sales and investment gone, export controls could threaten US leadership in chip design. In the short run, the global market leader becomes Korea, while the longer-term leader could be China under the decoupling scenario.

The intuition is that US firms have competitors that are less affected by export controls or retaliatory restrictions from China. Micron will be a critical test case because the firm was banned by China from major infrastructure projects in May 2023. SK Hynix and Samsung produce alternative products, so Micron’s revenue loss is anticipated to be their gain. New restrictions on Apple iPhones in China could have similar implications for its competitors, primarily local Chinese competitors, with Apple’s loss reverberating to its US chip suppliers.

US firms could lose market share in foreign markets apart from China if the trade dispute continues to widen, as those firms may not want to get in the middle of US-China conflict. For example, if China restricts imported cars or phones with certain US chips inside, foreign firms dependent on the Chinese market would look for substitutes to those chips. In contrast, if international partners craft policies together, there is less harm to US innovation and leadership. The risk of go-it-alone policy was made evident in the recent energy sanctions against Russia.

Fortunately, there is a big difference between oil and technology. Each product has at most a handful of substitutes – giving the United States and its allies greater market power. Working closely with allies to craft trade and investment policies could produce better outcomes – limiting access in China, creating a larger market for US firms and reliable trade partners, and making it more costly for China to retaliate. But this close coordination could still backfire by expediting China’s efforts to advance on its own. Huawei recently released a smartphone with 5G capabilities. Time will tell if these chips can be produced affordably at high volume. While the technology is still generations behind market leaders like Taiwan Semiconductor Manufacturing, it would represent a big step forward for China’s chipmakers. For this reason, restrictions should continue to be highly calibrated and strategically applied, with a focus on the tools to make chips.

The chipmaking business is global, and an effective strategy in limiting a military aggressor’s access to dual use technology likewise needs to be global. More focus on international partnerships in trade and migration could help mitigate the costs of risky parts of Biden’s strategy for US industry and partners abroad.