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Onshoring Semiconductor Production: National Security Versus Economic Efficiency

Policymakers are increasingly concerned by the U.S.'s dependence on Taiwanese semiconductors. Is onshoring their production to the U.S.—a goal of the CHIPS and Science Act—a practical path forward?

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A wafer can be seen as taiwanese chip giant TSMC holds a ceremony to start mass production of its most advanced 3-nanometer chips in the southern city of Tainan, Taiwan. REUTERS/Ann Wang

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Semiconductors—commonly known as microchips, chips, or integrated circuits—enable modern life. Those small devices make everything from computers, smartphones, microwaves, and cars to advanced weaponry work. A car, for instance, needs as many as 3,000 semiconductors while one Javelin anti-tank missile requires more than 250 chips. As artificial intelligence (AI) and quantum computing continue to advance, the global demand for semiconductors will only increase, while power will accrue to those countries that can develop, produce, and harness the most advanced chips.

Currently, however, none of the world's most advanced chips are produced in the United States; Taiwanese companies dominate the market. U.S. policymakers, worried that the United States would lose access to semiconductors during a conflict with China over Taiwan, have turned to industrial policy to address this issue. Such an approach, however, comes with the inherent trade-off of maximizing economic efficiency versus bolstering national security and resilience.

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Despite the critical importance of semiconductors, the United States remains highly dependent on imports to meet domestic demand—especially from Taiwan. Although U.S. companies design the most advanced chips, they are entirely or largely "fabless," meaning that they contract out production. According to U.S. International Trade Commission estimates, 44.2 percent of U.S. imports of the most sophisticated logic chips (the "brains" of devices that process information) are manufactured in Taiwan. But even that understates Taiwan's dominance of the global semiconductor market: 60 percent of all semiconductors and more than 90 percent of the most advanced chips are manufactured in Taiwan.

The supply chain for semiconductors is a model of efficiency, with companies hyper-specializing in one area and leaving other parts to their peers. Although semiconductors were invented in the United States—at one point it produced nearly 40 percent of the world's chips—U.S. companies decided to focus on chip design, which has the highest margins, and outsource actual production. Foundries such as Taiwan Semiconductor

Manufacturing Company (TSMC), which dominates semiconductor manufacturing, produce chips designed by firms such as Apple, Intel, Nvidia, and Qualcomm. Once a chip is made, it is typically sent to Southeast Asia for assembly, testing, and packaging. Chips are then shipped to factories around the world.

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This process, an archetype of globalization, has allowed each participant to focus on their respective comparative advantage, driving down costs and enabling the industry's blistering rate of innovation. At the same time, however, this industry, which is vital to the global economy and to national security, has become heavily reliant on one manufacturing hub, Taiwan, which has raised anxieties in the United States regarding the fragility of the supply chain.

Rising Concerns

With China exerting more pressure on Taiwan and questions growing about whether Chinese leader Xi Jinping will use military force against the island, the United States is increasingly focused on the implications of a conflict for the global economy. Bloomberg, for instance, estimates that a war between the United States and China over Taiwan could shave as much as $10 trillion off of global gross domestic product. The economic

devastation that a conflict would bring is driven above all by the reality that such a war would likely entail a prolonged halt in the production and shipment of chips, which would make it difficult for companies to produce much of anything.

The argument for establishing semiconductor manufacturing capacity outside Taiwan and in the United States, however, extends beyond the growing possibility of war. Taiwan's susceptibility to earthquakes and typhoons carries heightened risks for supply chain disruptions. Manufacturing semiconductors also requires vast amounts of water, which Taiwan has been forced to ration during droughts, raising the possibility that semiconductor manufacturing could be impacted during an extended drought.

To guard against the possibility of such a disruption and enhance supply chain resiliency, the United States has poured resources into rebuilding its long-dormant domestic semiconductor manufacturing industry. There is no guarantee, however, that industrial policy along these lines will work, as it could drive up prices and reduce innovation.

Made in America

Recognizing the United States' vulnerability to semiconductor supply chain disruptions, in 2022 Congress passed and President Joe Biden signed into law the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act, which will deliver $280 billion in federal subsidies over ten years to increase domestic semiconductor capacity, of which some $39 billion will go to building and expanding fabrication plants (or fabs) in the United States. To that end, the Biden administration has awarded $8.5 billion to Intel, $6.6 billion to TSMC, and $6.4 billion to Samsung. The recipients of these grants have vowed to invest billions more in the United States, with the goal of producing two nanometer or more advanced chips, which support AI and high-performance computing. The United States has set a goal of producing 20 percent of the world's leading-edge chips by the end of the decade.

At What Cost?

The push to build resiliency in the semiconductor industry could result in higher costs and less innovation. TSMC founder Morris Chang has cautioned that U.S. efforts "will be a very expensive exercise in futility." He has estimated that shifting production to the United States could double the cost of chips and warned that "when the cost goes up, the pervasiveness of chips will either stop or slow down considerably." Chang pointed to TSMC's fab in Oregon, where he claimed chips cost 50 percent more than those made in Taiwan. If companies like TSMC have to spend more on production, they will likely pass those costs on to their customers, which will then pass the costs to the consumer. This means pricier phones, computers, and AI-related applications.

In addition, the CHIPS Act alone is likely not enough to guarantee success. TSMC's annual capital expenditures are nearly as much as the entire sum in the CHIPS Act dedicated to boosting U.S. manufacturing. TSMC benefits from an ecosystem of critical suppliers that has grown around it in Taiwan, which lowers its costs and allows it to quickly repair and upgrade equipment. Such a network, however, does not currently exist in the United States. Taiwan's undervalued currency, the New Taiwan Dollar (NTD), also enables Taiwan to offer more competitive exports. Some have pointed to the perceived mismatch between the United States' workforce and that of Taiwan in terms of compensation expectations, training level, and work ethic. To address those shortcomings, the United States could find itself having to spend billions more to keep a nascent semiconductor manufacturing industry afloat. Indeed, Intel CEO Pat Gelsinger has alluded to just this, commenting, "I don't think CHIPS 1 is the end of what we need to do to rebuild the industry." Secretary of Commerce Gina Raimondo seems to agree, stating, "I suspect there will have to be… continued investment."

U.S. efforts to reshore semiconductor manufacturing could also threaten Taiwan's crown jewel, the "silicon shield" that some believe deters China by raising the costs to Beijing of military action. In addition, China has used U.S. onshoring efforts as an opportunity to

sow distrust of the United States in Taiwan by pushing the narrative that the United States is looking to hollow out and then abandon the island. The U.S. focus on onshoring because of perceived risk over Taiwan has also prompted other businesses to reevaluate their investment plans and presence in Taiwan, which could make Taiwan more vulnerable to Chinese pressure. If Taiwan becomes less economically competitive and more susceptible to Chinese coercion while Taiwanese people grow skeptical of U.S. intentions, the U.S.-Taiwan partnership could grow strained.

Do Alternatives Exist?

If onshoring proves to be too expensive or difficult, one alternative that would still increase resilience is to friendshore production in places like Japan, South Korea, and Malaysia. Each of those countries has experience with semiconductor manufacturing or testing and packaging and offers lower costs than production in the United States. In the event of a conflict over Taiwan, those countries would still likely be able to produce and ship chips.

If policymakers conclude that Taiwan is truly irreplaceable to the global semiconductor supply chain and that it is nearly impossible to meaningfully reduce reliance on chips manufactured in Taiwan, that will provide an added incentive to safeguard Taiwan's security. An alternative, or supplemental, approach could therefore be to make explicit that the United States will come to Taiwan's defense or to invest greater resources in bolstering Taiwan's own military capabilities. After all, if the effort to onshore semiconductor manufacturing is largely a product of fears of a conflict over Taiwan, then reducing the likelihood of such a conflict by bolstering deterrence would directly address such concerns.

Alternatively, policymakers could turn to coercive diplomacy if they deem that relocating the bulk of semiconductor manufacturing is a strategic imperative but the CHIPS Act is insufficient. Such an approach could entail threatening to withhold critical manufacturing

equipment or refusing to service existing equipment at Taiwan's foundries unless they shifted more production to the United States. Doing so, however, would fundamentally damage U.S.-Taiwan relations and make Taiwan far more vulnerable to Chinese pressure.

Finally, the United States could seek to supplement the CHIPS Act by pursuing legislation or regulatory changes that incentivize companies to procure domestically manufactured chips. While the CHIPS Act seeks to ensure a supply of chips made in the United States, as of now there is no guarantee customers will demand that a certain percentage of their chips be made in the United States. The United States could offer tax breaks to those companies that source chips made in the United States or require that chips used in national security applications be made in the United States.

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