

Essays

Addressing America's Semiconductor Dependency on East Asia

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This memo explores the risks of America's dependency on East Asia for advanced semiconductor chip technology. It discusses how the concentration of semiconductor production in this region exposes the global economy to disruptions, with potentially catastrophic consequences for national security, innovation, and economic stability. A key concern is the imbalance of power that could arise if one nation, namely China, gains control over semiconductor technology, leading to strategic military advantages and economic leverage. Several potential solutions are proposed to mitigate these risks, including the diversification of semiconductor manufacturing through government incentives for domestic production in the U.S., Europe, and Japan. It advocates for the creation of an Indo-Pacific Semiconductor Alliance among key allies to promote supply chain resilience and technological innovation. Additionally, there are suggestions to strengthen military and diplomatic relations in the Indo-Pacific region to ensure security and protect against geopolitical threats. By addressing these vulnerabilities, the U.S. can secure its position in the global semiconductor industry and safeguard national and global stability.

Dear Mr. President:

As your administration prepares to take office, I want to bring to your attention the most pressing global challenge your administration will face: the geopolitical issues surrounding semiconductor technology and supply chains. I will also present solutions to this challenge in the following paragraphs.

The new technological Cold War between China and the United States is the horsepower behind geopolitical tensions. Unlike the Cold War in the 20th century, the current rivalry between the U.S. and China isn't characterized by direct production control. Instead, it is controlled by the ability to shape the global semiconductor ecosystem through influence and leverage. Neither the U.S. nor China dominates manufacturing, Taiwan does. The U.S. dominates choke points and technological superiority in the semiconductor supply chain. China sits at the perfect geographical location (about 100 miles from Taiwan) to grant the nation substantial influence over global supply networks. This dichotomy creates a complex geopolitical landscape where both nations exert considerable leverage on the international semiconductor industry. Taiwan Semiconductor Manufacturing Company produces 90% of the world's most advanced chips and 41% of processor chips. While TSMC dominates advanced semiconductor manufacturing, other Asian countries produce a large percentage of the global chip market. Japan produces 17% of all chips, Korea produces 44% of all memory chips and 8% of all processor chips, Singapore produces about 5%, and China produces 15% of all chips, although China's chips are low-tech. East Asia produces 90% of all memory chips, 75% of

all logic chips, and 80% of all silicon wafers. The Western world relies heavily on the production and transportation of these semiconductors.

The issue isn't solely geopolitical tension, which has been a constant in international relations. The unprecedented concentration of semiconductor manufacturing power presents a potentially destabilizing dynamic. The issue doesn't lie in the rivalry itself, but in the balance of power surrounding the supply chains and technology in the semiconductor industry. As much as the U.S. wants control of the semiconductor industry, it's impossible. It is too difficult for even the most powerful nations to have technological independence in the world supply chains. The risk of one nation gaining disproportionate control over the semiconductor industry goes beyond traditional power dynamics and reaches the foundations of our interconnected tech-dependent societies. There are more implications to consider if one nation were to have control of the semiconductor industry. The largest is the military advantage. Advanced semiconductors are crucial for modern military systems. A single nation in control would create an imbalance in military capabilities. The monopolization of semiconductor technology would destabilize the deterrence of nuclear war. If a single nation controlled the semiconductor industry, national security would be compromised, research and development would be constrained affecting large innovation hubs like Silicon Valley, and the controlling nation would have economic leverage over the rest of the world, holding technological progress and economic stability hostage.

The global chip industry spends over 100 billion annually on capital expenditure, which all travel through the supply chain. In 2022 the U.S. spent \$16.6 billion importing semiconductor devices. Currently, China is spending more on importing semiconductors than oil. In 2022 Japan exported over \$9 billion of semiconductor items. Of South Korea's total exports, 18.9% were semiconductor items. The semiconductor supply chain is complex and spans multiple countries, increasing its vulnerability to disruptions. If one small incident were to shock the supply chain, the consequences would be felt worldwide, affecting industries far beyond technology.

Taiwan faces a dilemma. Taiwan benefits from the protective military umbrella of allied nations, but it remains under constant threat from China, which is seven minutes away from a missile strike. Any increase in the U.S. military to Taiwan or the Taiwan Strait could trigger an attack. Even if the U.S. increased military power with no retaliation, China still has the geographical advantage. The forceful takeover of Taiwan would be unwise and would lead to global conflict. If TSMC fabs were to be destroyed in conflict, the impact on the world economy would be abysmal. If we are to continue with life as we know it, Taiwan must remain independent and protected. China's longstanding claim over Taiwan complicates this suggestion. Beijing's perspective of Taiwan as an integral part of China, rather than an independent nation, adds to the layers of geopolitical complexity. The Chinese government considers Taiwan a breakaway province destined for reunification; it drives a persistent pursuit. It would be naïve to assume Taiwan's semiconductor industry alone provides enough protection against potential conflict. As seen with the Russian invasion of Ukraine, geopolitical ambitions can override economic considerations. Thus, while Taiwan's semiconductor industry is a strategic asset, it cannot be relied upon as the sole deterrent against geopolitical aggression.

There are other soft protections over TSMC. The U.S. controls several chokepoints in the supply chain, through its dominance over specific machinery required for advanced chip manufacturing. Three U.S.-based companies – Applied Materials, Lam Research, and KLA – hold the largest market share for the machinery. Japan stands as the only other nation with comparable machinery. The duopoly over this machinery creates a strategic advantage in the supply chain. If Tokyo and Washington were to coordinate efforts, they could effectively halt the production of advanced semiconductors. This serves as a deterrent against China's potential takeover of TSMC, however, acting as a double-edged sword: since any disruption of this technology to TSMC would send shockwaves through the global economy.

Now that the issues have been presented, I want to propose potential solutions. The first is the diversification of manufacturing locations. There must be reliable fabs closer to or in the United States. TSMC is building a fab in Arizona but has limited advanced manufacturing ability, which is insufficient if the East couldn't provide semiconductors. Offer subsidies to TSMC and other advanced semiconductor manufacturers to bring this technology to the United States. At the least in strategically located areas with ge-

ographical protection. Moreover, extending these government incentives to support domestic chip production not only in the U.S. but also in European nations and Japan would create a more resilient semiconductor ecosystem. By promoting regional manufacturing, the risk associated with geopolitical tensions and supply chain vulnerabilities can be mitigated. Since the clock is ticking, it is crucial to swiftly ensure U.S. military bases in Asia are well stocked and equipped with the latest technology, especially given the urgency of the situation. Maintaining a military presence in the region is crucial and should be monitored very closely. The U.S. can expand joint operations with Japan, South Korea, and Thailand to improve readiness and gain strategic locations. There is a delicate balance between protection and what China may constitute as the first step towards conflict.

It has never been more important to maintain and strengthen relationships with allies. I suggest that the United States renews and expands trade agreements in the Indo-Pacific Economic Framework. This would include more favorable terms for Japan, South Korea, and Australia. Along with strengthening trade, the United States should extend infrastructure development in Southeast Asia. Following these frameworks, the United States can solidify economic and trade cooperation. Diplomatic and political engagement in the region will strengthen relations by participating in organizations like ASEAN and continuing work with the Quadrilateral Security Dialogue.

The last suggestion is to strengthen supply chains. I previously mentioned bringing advanced manufacturers to the United States. Another incentive for these companies would be to co-invest to establish facilities in the U.S. TSMC and Samsung are exploring opportunities to build fabs in the United Arab Emirates. This presents a unique chance for collaborative investment that could focus on developing advanced water purification systems, which is a critical need in the region. Additionally, I suggest the establishment of an Indo-Pacific Semiconductor Alliance with Japan, South Korea, Taiwan, Australia, India, and Singapore, this would ensure transparency and a steady supply of materials and chips. In this alliance work with Japan, Australia, and India to develop supply chains for rare earth minerals like gallium and silicon. Also, within this coalition develop shared reserves of semiconductor inputs to protect against supply chain disruptions. Streamline export process for U.S. allies to eliminate tariffs and trade barriers on semiconductor technology and materials.

Partner with Japan and South Korea which have a history in lithography and advanced materials to develop the next generation of chip technologies. This promotes technological advancements. Collaborate with ASML to bring advanced lithography machines to the United States and its allies. Partnering with allies to help protect the semiconductor supply chain from cyber-attacks and espionage will provide extra levels of security.

In summary, the complexities of the global semiconductor supply chain present significant vulnerabilities that require immediate attention to safeguard national security and economic stability. Proactive measures are necessary.

By providing incentives to semiconductor manufacturers and investing in military readiness, the U.S. can strengthen its strategic position. However, it is crucial to navigate these processes with the understanding that certain actions may provoke conflict with China. Mr. President-elect please understand whoever controls the chip controls the modern

world, and in the wrong hands, the consequences will be catastrophic.

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