U.S. Semi-Conductor Policy: The Limits of Alliance and Sanction

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Abstract: This study analyzes the Biden administration's semiconductor export control policy toward China in order to fully understand the background, purpose and potential impact of the policy. In the context of increasingly fierce competition in the global semiconductor market, this move by the US government has attracted widespread attention from the international community. This paper first sorts out the specific content and implementation details of Biden administration's semiconductor export control to China, and then focuses on two obstacles that the policy may face in the implementation process. The paper further discusses the impact of these restrictions on the effectiveness of semiconductor regulatory policies for China. The analysis shows that although the US export control policy can restrict China's access to advanced semiconductor technology to some extent, its actual effect may be restricted by many factors, including the risk of technology leakage, the complexity of international cooperation and the uncertainty of market competition. Therefore, this paper argues that the Biden administration's semiconductor export control policy needs to be adjusted and perfected in the process of implementation to meet various challenges and changes.

***Keywords*:** semiconductor, Sino-US Relations, trade sanction

1. Introduction

In July 2022, the U.S. Congress passed the “Chip and Science Act” with a vote of 64-33 in the Senate and 243-187 in the House of Representatives. The bill officially came into effect after being signed by U.S. President Joe Biden in August of the same year. This bill reflects the U.S. government’s financial support for the U.S. chip industry in scientific research and production in terms of content. It is functionally consistent with the “U.S. Chip Act”, “U.S. Communications Act”, and “National Defense Authorization for Fiscal Year 2021” introduced by the U.S. Congress in 2021. "The CHIPS Act" and other bills will form a multi-sector coordination mechanism to promote the "American centralization" and “de-Chinaization” of global semiconductor innovation and production. Unlike the broad trade sanctions imposed by the previous Trump administration, the Biden administration is increasingly focusing on "precision strikes" in restricting semiconductor exports to China to comprehensively curb China's semiconductor industry.

Protecting national security and preserving technological competence are the common narratives of the United States, but with the radicalization of U.S. sanctions on semiconductors targeted at Beijing, the execution of such stringent policies and their consistency are questions to ponder over. Past sanction success and cooperation with allies have persuaded decision-makers in Washington that sanctions are viable, necessary, and effective. Yet, as the semiconductor industry is witnessing austere stipulations, growing signs and the cost of “de-coupling” and “long-arm jurisdiction” would draw the attention of all parties whose concerns cannot be alleviated by the U.S. determination to protect national security and attempt to dwarf Chinese competence in the semiconductor business. In other words, Washington cannot perfunctorily resort to national security in persuading other parties of interest to stay in its grandiose sanction game.

2. Literature Review

Scholars have paid attention to the disorder of the global semiconductor industry chain and a series of chain reactions. Tan (2021) believes that the huge allocations in the United States focus too much on the long-term research link and ignore the improvement of production capacity in the short term, which directly leads to the persistence of the chip shortage problem. Yu & Ji (2021) pointed out that the national technocracy in the United States has caused widespread collateral damage, including American multinational companies (Farrell & Newman, 2022), such as the chip shortage in the US automobile industry (Cao & Chen, 2022). Although China currently does not have an advantage in the division of labor in the semiconductor industry production chain, China's advantages in production efficiency will not be changed by the United States “decoupling” policy in the short term. Therefore, the United States will break away from China The possibility of establishing another supply chain is questionable. The expected effect of the reshoring of the semiconductor industry is not

good (Shattuck, 2021), losing the Chinese market (Zhang, 2021), hurting the interests of US companies in China (Tan, 2021), and the global market share of US chip companies may also decline (Jiang et al., 2022).

3. Dilemma of Alliance

The Biden administration has listed semiconductors as one of the four major products critical to U.S. security and called for industry reshoring to bring the production of these products back to the United States and its "like-minded" allies. Faced with the ever-increasing export controls on China, the endless "long-arm jurisdiction" provisions, and the contradiction between commercial interests and national security narratives, whether the United States can obtain unconditional support from its allies for its national security needs is a question worthy of attention. Political priorities centered on national security cannot exist independently of industrial realities. Therefore, political demand has limited impetus for alliances. The specific operating conditions of each country's semiconductor industry and the competition between industries in various countries play a non-negligible role in the formation of alliances.

Although the United States can convince these allies on its national security narrative, the semiconductor industries in these countries are somewhat competitive. The semiconductor industry is highly competitive, and each company is focused on acquiring some cutting-edge R&D capabilities before other companies, thereby increasing its market share. Once a company's products take the lead in the market, manufacturers rarely choose to change suppliers midway due to the additional costs of adjusting the supply chain. Therefore, once a company dominates the R&D and production of a certain high-end category, it will dominate the profit distribution in this field for a long time, eventually forming a winner-takes-all situation. Under the stimulation of this market mechanism, the internal contradictions of the alliance are mainly reflected in direct market competition. For example, Intel and Samsung are both building new semiconductor manufacturing plants in the United States and will compete in contract manufacturing of chips.

In addition, the CHIPS Act has a large number of additional conditions for the financial subsidies provided to manufacturers, such as information sharing, employee benefits, compliance inspections, etc. The breadth and depth of these additional conditions are unprecedented for governments within the alliance that apply for funding. The United States, as the party providing funds, also has doubts about companies receiving subsidies. The United States is concerned about unfair competition and lack of transparency after South Korean companies receive subsidies. South Korea was initially concerned that only U.S. companies would receive subsidies under the CHIPS for America Act. The U.S. Department of Commerce's request for chip manufacturers, including South Korean companies, to provide supply chain information to help the Biden administration solve the global chip shortage has also been met with great misgivings by the South Korean government and companies.

Moreover, South Korean chipmakers have significant business interests in China, and U.S. supply chain policies will harm their bottom lines. Samsung and SK Hynix have factories in Xi'an and Wuxi respectively, and the Chinese market accounts for more than 40% of the Korean chipmaker's sales. In 2021, the United States blocked SK Hynix from upgrading its Wuxi factory with ASML's latest extreme ultraviolet (EUV) lithography machines, fearing that bringing the most advanced equipment to China could lead to the technology being stolen and used in China's military modernization drive. Unable to upgrade its factory, SK Hynix now worries about profitability and factory viability. South Korean chipmakers are also reportedly worried that joining the Chip 4 alliance will hurt their business in China due to U.S.-imposed restrictions and Chinese retaliation.

4. Techno-nationalism and Business Interests

Enterprises and private investors in China will respond to ever-increasing regulations and increasing investment risks. Suppressing China's semiconductor technology progress is a clear goal of the Biden administration. The implicit premise is that the United States is willing to bear the accumulating economic costs of such a strategy. But when these economic costs are borne by private actors, there may be "protests" from the private sector and interest groups. In August 2023, President Biden's administration signed an executive order that authorizes the U.S. Treasury to prohibit or restrict U.S. investments in Chinese entities in three sectors including semiconductors and microelectronics. In the year of 2022, total U.S.-based venture-capital investment in China plummeted to $9.7 billion from $32.9 billion in 2021 (Liao, 2023). By August 2023, U.S. V.C. investors only put $1.2 billion into Chinese tech startups. The activity of venture capital with U.S. participation in China during 2023 is predicted to "hit a nine-year low, followed by a decade low in 2024" (Liao, 2023). Investors seeking extraordinary returns from China's tech industry are now denied the invisible hand of the market since the executive order will prohibit some deals and require investors to report financial plans and others (Liao, 2023).

The targeting of this new turn of policy would surely discourage U.S. investors from dealing with Chinese technology

companies, but does it mean that U.S. investors should and can simply remove China's name from their business catalog? The answer is no. In the past decade, China has been a major source of revenue for many U.S. investors. Over the past five years, China's foreign direct investment has yielded a return rate of 9.1 percent. Notably, over 70,000 U.S. companies have ventured into China, with nearly 90 percent of these investments proving highly profitable. Even if U.S. investors shy away from investing in China, businesses will still have a bigger chance of yielding more profits in China than in the U.S. or its allies to whom Washington seeks to re-ashore its semiconductor business in the following years. Thus, it's too early and too costly for Washington and U.S. businesspeople to turn their back on the biggest and fastest-growing market in the world.

5. The Road Ahead

This research provides an evaluation of the effectiveness of the existing semiconductor industry's restrictive strategies against China from the perspective of the United States in a game framework. It looks at the limits and side effects of its policy behavior from the U.S. perspective: the limited cooperation between Washington's "like-minded" allies and the undecided tolerance for profits lost to U.S.-based investors. Considering the limits of America's own behavior from an American perspective and understanding the background of these decisions provide us with important political information. On the one hand, this move can increase China's confidence in dealing with challenges; on the other hand, it can also enrich decision-making information and increase response flexibility.

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