

# The Recent Developments of US Chip Bans Against China and Its Impacts on Taiwan

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## 1. News Highlights

The US government believes that the three most important technologies for the next decade are computing, biotechnology, and green energy generation. The computing technology includes microelectronics, AI, quantum computing, and more. To prevent China from threatening the US position in the future development of these three technologies and their military applications, the US government's new chip ban on October 7, 2022, was more

stringent than the previous measures. The new measures directly specified the restrictive standards of the relevant bans, such as expanding the scope of control on semiconductor processes and defining supercomputers in favor of US control of exports to China,<sup>1</sup> to indirectly constrain China's development of information technology.<sup>2</sup> The US is currently exploring the feasibility of other export control measures. Although the Biden administration intends to continue the expansion of equipment export

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1. The new US rule defines a supercomputer as "a machine capable of performing 100 petaFLOPS in 41,600 cubic feet of volume." This standard threatens to impact China's development of new infrastructure for high-speed computing. The information centers of Chinese Internet companies such as Alibaba could fall into this range and be affected. "Chip War Turns White-hot: the US Unites Industry Leaders Worldwide Against China," *Commercial Times*, October 14, 2022, <https://ctee.com.tw/news/tech/734588.html>.

2. "The US Intends to Expand Its Ban on China," *Commercial Times*, October 22, 2022, <https://ctee.com.tw/news/global/740344.html>.

restrictions, this has caused a backlash from industry stakeholders.<sup>3</sup> This article will examine the latest developments and possible implications of the recent US chip bans on China.

## 2. Security Implications

### 2-1. The US chip bans on China are approaching a new peak

The Bureau of Industry and Security (BIS) of the US Department of Commerce issued a notice on October 7, 2022, imposing new export controls on advanced computing and semiconductor industries toward China. The notice includes restrictive export controls on semiconductor manufacturing equipment destined for China for “end-use transactions involving certain entities on the Entity List” based on the principle

of “presumption of denial” of exports. The control items are “devices for logic processes below 14/16nm” and “devices for processes below 18nm for DRAM and above 128 layers for NAND flash memory.” At the same time, “some high-end and high-computing processors” were newly added to the list.<sup>4</sup> Since October 12 of the same year, “US Persons” (US citizens, Green Card holders, persons protected by US law, natural persons in the US, and US corporations) are not allowed to support the development or production of chips by certain semiconductor manufacturers in China without prior approval.<sup>5</sup> The two-pronged approach controls China’s acquisition of equipment and talents in the semiconductor field. This move has caused companies such as Lam Research and Applied Materials to withdraw their employees and suspend

3. “China Doomed? Netherlands and Japan Joined US Chip Ban,” *The Liberty Times*, December 13, 2022, <https://ec.ltn.com.tw/article/breakingnews/4152936>.

4. “Commerce Implements New Export Controls on Advanced Computing and Semiconductor Manufacturing Items to the People’s Republic of China (PRC),” Department of Commerce, Bureau of Industry and Security, October 7, 2022, <https://www.bis.doc.gov/index.php/documents/about-bis/newsroom/press-releases/3158-2022-10-07-bis-press-release-advanced-computing-and-semiconductor-manufacturing-controls-final/file>.

5. “FAQs for Interim Final Rule - Implementation of Additional Export Controls: Certain Advanced Computing and Semiconductor Manufacturing Items; Supercomputer and Semiconductor End Use; Entity List Modification,” *Department of Commerce, Bureau of Industry and Security*, October 28, 2022, <https://www.bis.doc.gov/index.php/documents/product-guidance/3181-2022-10-28-bis-faqs-advanced-computing-and-semiconductor-manufacturing-items-rule-2/file>.

their advanced production lines in China. To avoid accidentally violating the new regulations, Netherlands' ASML company has announced that its "US Persons" employees have temporarily suspended their business services to Chinese customers.<sup>6</sup>

Since the Biden administration took office, in addition to continuing the policy direction of the Trump era since 2018, it has continued to retard the development of China's high-tech industries even further. The ban after October 2022 has focused on three areas: 1. the first time to start with cutting off the network of talent chain; 2. the expansion of the commercial control list items in a more pervasive manner; 3. execution of "Foreign Direct Product Rule" (FDPR) again to control technology products globally,<sup>7</sup> including supercomputer-related components and

equipment, such as graphics processors (GPU).<sup>8</sup> This wave of actions covers the entire spectrum in an unprecedented way and clearly demonstrates the Biden administration's determination to crack down on China's high-tech industry.

## **2-2. Some major semiconductor equipment manufacturers rebound the ban**

China is still the world's largest semiconductor market today. Since 2019, the Trump administration has restricted the development of advanced process technology in China through the Wassenaar Arrangement, which prevents ASML from selling extreme ultraviolet lithography equipment to China.<sup>9</sup>

The Biden administration will likely ask major semiconductor equipment countries such as the Netherlands and

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6. "World's Top Chip Equipment Suppliers Halt Business with China," *Financial Times*, October 13, 2022, <https://www.ft.com/content/51f9ec46-ec9e-43a1-ba64-45e0e6e6da71>.

7. This means that foreign companies are restricted from using US technology for military or national security products. i.e., foreign products made with US technology or software must be regulated by the US government. For example, in early 2020, the US Department of Commerce intends to amend the relevant rules to make it mandatory for foreign chip makers "using US chips for manufacturing equipment" to obtain a US license before supplying chips to Huawei, which expands the US control over export licenses. Foreign Direct Product Rule," *The Liberty Times*, February 19, 2022, <https://ec.ltn.com.tw/article/paper/1353084>.

8. "Chip War Turns White-hot: the US Unites Industry Leaders Worldwide Against China," *Commercial Times*, October 14, 2022, <https://ctee.com.tw/news/tech/734588.html>.

9. "SMIC 7nm Chips Lack Competitiveness; the US Expands Control Over DUV Equipment to Affect the Expansion of Matured Manufacturing Processes in China," *The Investor*, August 1, 2022, <https://reurl.cc/GE853>.

Japan to adopt the same export control measures. For instance, the restrictions could be expanded from the originally restricted extreme ultraviolet (EUV) level to the deep ultraviolet (DUV) equipment, especially the immersion DUV types. It is reported that the Dutch and Japanese governments will agree in principle to join the US ban on selling sub-14nm wafer manufacturing equipment to China. If so, the joint US-Dutch-Japanese ban could almost completely block the possibility of China acquiring advanced process equipment and suppress the further development of matured processes.

However, the expected effect of the US ban will depend on the willingness of the two key semiconductor equipment suppliers, Tokyo Electron and ASML, to cooperate. Even if the Japanese government cooperates, it may face a potential backlash from private companies, such as Tokyo Electron, Nikon, Canon, and other small and medium-sized companies.<sup>10</sup> Since the revenue from

China is one of their major profit sources, they will not benefit or be compensated if forced into the semiconductor wars between major powers.

The semiconductor bans in recent years have now caused ASML's senior management to rebound. According to ASML, 15% of its revenue comes from China, but 25% to 30% of US wafer equipment suppliers' revenues come from China. If the US ban restricts the Netherlands, ASML can only sacrifice its interests by giving up related equipment sales to China. However, the US chip makers can sell alternative technologies to China and question the contradictory policy of the US government; this makes the US policy less convincing if it requires the Netherlands to join the new ban.<sup>11</sup>

In the past, major semiconductor equipment countries were forced to cooperate with export controls on China due to political pressure from the US. However, pressured by profit targets and an imbalanced market,

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10. "Japan to Join US Effort to Tighten Chip Exports to China," *Bloomberg*, December 12, 2022, <https://www.bloomberg.com/news/articles/2022-12-12/japan-is-said-to-join-us-effort-to-tighten-chip-exports-to-china?leadSource=uverify%20wall>.

11. "Dutch Chip Equipment Maker ASML's CEO Questions U.S. Export Rules on China," *Reuters*, December 14, 2022, <https://www.reuters.com/technology/ceo-dutch-chip-equipment-maker-asml-questions-us-imposed-export-rules-china-2022-12-13/>.

the companies gradually show their reluctance to cooperate in the long run and unwillingness to become sacrifices in international political wrestling.

### 3. Trend Observation

#### 3-1. China's countermeasures may have little effect

On December 12, 2022, the Chinese Ministry of Commerce filed a complaint with the World Trade Organization (WTO) dispute settlement mechanism against the US for its targeted export control measures. The complaint accused the US of “continuously generalizing the concept of national security and abusing export control measures in recent years to impede normal international trade in products such as chips, which threaten the stability of the global industrial supply chain and disrupt the international economic and trade order... a typical trade protectionist practice.”<sup>12</sup> With the action, China attempted to persuade the WTO to endorse

its accusation of the US's disruption of the international trade order. The Office of the United States Trade Representative (USTR) said it had received a Request of Consultations from China, but “these US policies are related to national security, and the WTO is not an appropriate forum for discussing such issues.”<sup>13</sup>

The WTO dispute resolution mechanism is an exhausting, time-consuming process; in practice, some past disputes were never effectively resolved through it. China's purpose in bringing this case to the WTO is not to obtain timely, effective legal relief but to demonstrate that it is still a legitimate but injured entity under international trade rules as the US being the violator.

It has also been reported that the Chinese government will propose a more than RMB 1 trillion semiconductor industry support plan in the first quarter of 2023 at the earliest. The plan may encourage domestic semiconductor manufacturing and development and

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12. Ministry of Commerce of the People's Republic of China, “Leader of the Department of Articles and Laws of the Ministry of Commerce Answers Reporters' Questions on China's Accusation at WTO Against the US for Abusing Export Control Measures to Restrict Trade in Chips and Other Products,” December 12, 2022, <http://www.mofcom.gov.cn/article/xwfb/xwsjzr/202212/20221203373159.shtml>.

13. “China Starts WTO Dispute Against U.S. Chip Export Curbs,” *Reuters*, December 13, 2022, <https://www.reuters.com/world/china/china-launches-suit-wto-against-us-chip-export-curbs-global-times-2022-12-12/>.

offer financial assistance to purchase related equipment using subsidies and tax concessions to counter the suppression tactics of the US in recent years.<sup>14</sup> However, experience has shown that the fraud case of China's national IC Industry Investment Fund was a major setback in fostering its domestic semiconductor industry.<sup>15</sup> With a culture of corruption within the CCP and the semiconductor industry chain domestication that may take more than a generation, it will take more than a short period to achieve the policy goal of semiconductor self-sufficiency through large amounts of policy subsidies to offset the impact of the US ban.

### **3-2. The raising chip ban level might benefit Taiwan only in the short term**

Officials from Taiwan's Ministry of Economic Affairs have stated that the impact of the chip ban on Taiwan is limited. Since the high-efficiency

computing chips targeted by the ban are still designed by US companies and manufactured in Taiwan, the percentage of such chips in the ban is very low. If the US companies attempt to circumvent the ban, they only need to change their designs, and Taiwanese manufacturers will adjust to the design changes accordingly. Although the ban has covered IC design, chip manufacturing, packaging, and testing directly or indirectly, since it doesn't mean that Taiwan is forbidden to produce the IC in question, the immediate impact on Taiwan's semiconductor industry is still limited for now.<sup>16</sup>

However, as the global semiconductor industry has established a complete supply chain over the past decades, the tightening of the US chip policy towards China has caused the chain to deviate from the existing business norm. The new ban covering talents and sub-14nm wafer manufacturing equipment not only restricts chips from matured

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14. "Exclusive: China Readying \$143 Billion Package for Its Chip Firms in Face of U.S. Curbs," *Reuters*, December 14, 2022, <https://www.reuters.com/technology/china-plans-over-143-bln-push-boost-domestic-chips-compete-with-us-sources-2022-12-13/>.

15. "China's Semiconductor Industry in A 'Chip Storm' with Complex Investment Relationships of Large Funds Emerge," *Central News Agency*, August 11, 2022, <https://www.cna.com.tw/news/acn/202208110167.aspx>.

16. "Minister of Economic Affairs: US Chip Ban Has Minimum Effect on TSMC," *Economic Daily*, October 19, 2022, [https://money.udn.com/money/story/12689/6696861?from=edn\\_next\\_story](https://money.udn.com/money/story/12689/6696861?from=edn_next_story) °

processes but also includes memory, affecting Chinese memory makers' technological development. However, as the demand for computing and memory chips from matured processes in China's domestic market still exists, Taiwanese manufacturers may benefit from the switching effect in the short term. In the long run, since the global semiconductor supply chain had its normal order, and half of Taiwan's exports to China are semiconductors, the escalating one-size-fits-all ban may disrupt the planning of major manufacturers. Under the pressure of reality, Taiwan's semiconductor manufacturers are forced to conform to the ban rules and even to compromise (on resources such as technology and talent). This situation may become more frequent in the future. It is advisable for the Taiwanese semiconductor industry to evaluate the pros and cons early of various possible regulatory consequences in the future and adopt a flexible strategy to maintain operating efficiency and corporate niches.

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