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The Biden Administration's Export Controls at Two: Challenges and Gains

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SYNOPSIS

In 2022, the Biden administration leveraged the United States' strategic command over critical "chokepoints" in the global semiconductor value chain to impose sweeping export controls denying China access to advanced AI chips and the wherewithal to manufacture advanced semiconductors. Two years on, Washington continues to face challenges in enforcing the embargo even as Beijing has made limited progress in indigenising a semiconductor supply chain that is immune to US sanctions.

COMMENTARY

In late October 2024, Taiwan Semiconductor Manufacturing Company (TSMC) announced that it had suspended shipments to at least two clients and notified the US Commerce Department over potential violation of US sanctions following revelations that Huawei's Ascend 910B AI processor contained a 7-nm chip manufactured by TSMC. Huawei had been placed on the US Commerce Department's Entity List in 2019.

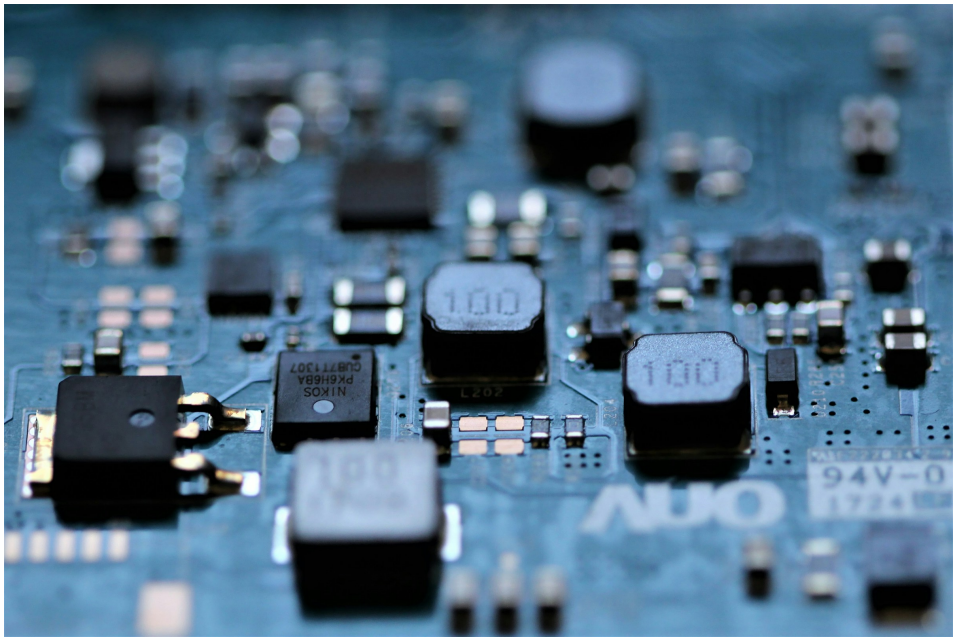
The identity of the TSMC clients and their relationship with Huawei remains unknown, but the episode highlights *both* the challenges Washington faces in enforcing its export control regime restricting China's access to advanced AI chips and the wherewithal to develop and manufacture its own advanced chips and the difficulties that Beijing confronts in successfully indigenising a semiconductor supply chain that is immune to US sanctions.

"Lax Monitoring", Smuggling, and Loopholes

The TSMC/Huawei incident has prompted accusations of "lax monitoring" of export control compliance by the Commerce Department. There is evidence that Taiwan

continues to ship advanced chips to the mainland despite US export control enforcement efforts and that smuggling fuels a lucrative black market for embargoed chips. Recent reporting by the *Wall Street Journal* and the *New York Times* indicates that chips and entire servers are available in underground markets in China, while Reuters reported that Chinese universities, research institutes and institutions linked to the People's Liberation Army (PLA) acquired high-end Nvidia chips through black market "resellers".

Chinese end-users have also been able to exploit a loophole to access restricted advanced chips and AI technology via cloud services provided by US tech giants such as Amazon, Meta, Google, and Microsoft. PLA researchers were apparently able to use Meta's publicly available Llama model to develop a military task-focused chatbot. The Commerce Department's attempt to close the loophole with a proposed "know your customer" requirement to verify the identities of foreign users faced stiff industry pushback. While legislation empowering the Commerce Department to regulate remote access to US technology cleared the US House of Representatives during "China Week" in September, it faces an uncertain path to becoming law.



The United States continues to face challenges in enforcing its export controls on advanced semiconductor technology. *Image from Unsplash.*

China's Lithographic Bind

Smuggling and exploiting regulatory loopholes, however successful, do not provide long-term structural relief from the US export control regime, and China's efforts to develop an indigenous advanced semiconductor ecosystem have met with slow progress, especially in the critical area of lithography.

Huawei's launch of its 5G-enabled Mate 60 Pro smartphone powered by an in-house designed 7-nm processor and domestically manufactured by Semiconductor Manufacturing International Corporation (SMIC) in August 2023 was greeted with glee

at home and confusion in Washington, where policymakers believed the feat to be beyond China's semiconductor industry. Denied access to advanced extreme ultraviolet (EUV) lithography technology used to manufacture advanced node chips, SMIC resorted to "multi-patterning", using its existing deep ultraviolet (DUV) lithography machines to manufacture Huawei's Kirin chip. However, multi-patterning using DUV comes with higher costs, greater strain on equipment, and lower yield rates, leading US policymakers to doubt Huawei/SMIC's ability to mass produce advanced node chips at scale.

The Huawei/TSMC chip incident lends greater credence to those doubts, along with reports that SMIC is facing acute problems in mass producing Huawei's graphics processing units (GPUs), with yield rates as low as 20 per cent. SMIC's production woes appear related to the expansion of export controls on DUV lithography equipment and the halting of maintenance of existing equipment. In 2020, SMIC stockpiled lithographic machines and parts in anticipation of tougher US export restrictions but it now appears to be running low on equipment parts and unable to access maintenance services for its equipment.

Despite the Chinese government investing huge sums to encourage indigenous innovation, Chinese lithography companies remain years away from producing a complete EUV lithographic system. Over the longer term, however, China could exploit emerging new technologies like photonic chips to develop its own advanced semiconductors without the need for foreign advanced semiconductor manufacturing equipment (SME).

Promise and Peril of Technology Competition for Southeast Asian States

The high-stakes competition over advanced technologies is now a structural feature of the strategic rivalry between Washington and Beijing. Even as it prepares to leave office next January, the Biden administration has imposed a new round of export controls, finalised rules restricting outbound US investments in China's AI, semiconductor, microelectronics and quantum information technology sectors, and issued an AI national security memorandum (NSM) outlining how Washington plans to outcompete Beijing for global AI leadership.

Regardless of whether Vice President Kamala Harris or former president Donald Trump wins the presidential election there is unlikely to be any let-up in restricting sales of advanced semiconductor technology to China, even if the two candidates are likely to adopt different approaches. A Harris administration is expected to continue with the Biden administration's "small yard, high fences" approach of imposing strict export restrictions on a small number of technologies with significant military potential while maintaining normal trade ties in other areas, along with industrial policies at home. A second Trump administration, on the other hand, could see the imposition of tariffs on both friends and foes and the repeal of the CHIPS and Science Act, which incentivises domestic high-tech research and semiconductor manufacturing.

As technology "takers" rather than "makers", US restrictions on the sale of advanced technologies present Southeast Asian states with both promise and peril. The Philippines, Indonesia, and Vietnam are poised to tap into a US$500 million CHIPS and Science Act fund to develop their semiconductor industries and move up the value

chain. More generally, Southeast Asian countries have benefitted from the "China Plus One" strategy as companies diversified their supply chains and manufacturing operations to reduce the risk of an overreliance on China and to avoid US tariffs on goods from China. This diversification strategy has seen ASEAN's exports to the United States exceed those to China and will help the region's external trade to rise by a projected US$1.2 trillion over the next decade.

However, even as the region has attracted investment from both US and Chinese technology companies to increase their semiconductor design, chip manufacturing and packaging, and data centre operations, the perils posed from ever-expanding export and investment restrictions and the threats from non-compliance and future tariffs cannot be ignored. The US announcement last month that tariffs would be imposed on solar panels manufactured in Vietnam, Thailand, Cambodia, and Malaysia offers a cautionary tale. Southeast Asian countries will need to navigate the US-China technological competition carefully and skilfully.

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