THE SELECT COMMITTEE ON THE STRATEGIC COMPETITION BETWEEN THE UNITED STATES AND THE CHINESE COMMUNIST PARTY

SELLING THE FORGES OF THE FUTURE

How the CCP Gets Its Key Equipment for Making Semiconductors from U.S., Dutch, and Japanese Companies

EXECUTIVE SUMMARY

The Chinese Communist Party (CCP) is straining with all its might to build a domestic, self-sufficient, semiconductor manufacturing industry in the People's Republic of China (PRC). To do this, the PRC has been acquiring semiconductor manufacturing equipment (SME) produced by U.S. and allied companies to build in semiconductor fabrication facilities ("fabs") in the PRC that produce a wide range of semiconductor chips, including advanced, foundational, and legacy chips. The ability to design and produce semiconductors lies at the heart of the technology competition with China, and SME represents a crucial chokepoint that the U.S. and our allies currently have over China. As the U.S. government works with our allies and partners and plots the course ahead on export-control policy and related actions, this crucial chokepoint must be preserved, not squandered.

The United States and our allies have taken some steps to restrict advanced SME from being sold to anyone in the PRC and a broader set of SME from being sold to some particularly threatening PRC entities, but China is still buying vast quantities of highly sophisticated SME from the United States, Japan, and the Netherlands. This investigation did not seek to address illegal activity. The findings discussed below do not claim or posit that any Toolmaker has violated applicable U.S., Dutch, or Japanese laws. To be effective, SME export controls must apply to all of the PRC, not just individual entities, and must encompass any components or other inputs that support the production of advanced or foundational semiconductors.

The PRC's procurement of SME presents military, trade, economic security, and human rights threats:

1. **Military.** The PRC will manufacture chips for the People's Liberation Army (PLA) weapon systems that could be used to kill American and allied soldiers, sailors, airmen, and marines, especially via the PLA's "intelligentized" warfare concept leveraging artificial intelligence (AI) and high-performance computing.
2. **Trade.** China will build a domestic, vertically integrated chip manufacturing industry, rendering its military and economy resistant to the effects of future computing-related export restrictions by the United States and our allies.
3. **Economic Security.** China will gain an economically dominant chip manufacturing position in both legacy and leading-edge chips for current and future strategic industries with national security implications, including AI.
4. **Human Rights.** As the Select Committee has documented in previous investigations, the CCP uses both AI and high-performance computing to violate human rights domestically and promote digital authoritarianism globally.

The Select Committee sought and received information from the five leading manufacturers of SME, i.e., the "Toolmakers." The Select Committee's investigation found:

1. The U.S. Department of Commerce's Bureau of Industry and Security **(BIS) has imposed export controls to impede the PRC's advanced production with some success, but those controls have significant gaps.**
2. **The PRC is heavily reliant on the five Toolmakers[1] based in the United States, Japan, and the Netherlands, spending $38 billion in 2024[2]** for their products and services, representing 39% of the Toolmakers' aggregate worldwide revenue and an increase of 66% in the PRC's purchases from the Toolmakers compared to 2022.
    a. The Toolmakers have expanded these sales even while some of them acknowledge that the Toolmakers' access to the PRC market is unnecessary to maintain their long-term growth.
3. **The PRC's most dangerous restricted semiconductor companies were Toolmakers' top customers in the examined time period.**
    a. Five restricted (i.e., on the U.S. Government's Chinese military company list, investment restriction list, or Entity List) semiconductor companies in China were also top customers of each Toolmaker 2022 to 2024. U.S. company sales of export-restricted items to companies on the Entity List require a BIS license.
    b. Individual Toolmakers each count other restricted Chinese semiconductor companies among their top 30 customers in China.
4. **Non-U.S. Toolmakers have substantially increased their revenues from Chinese restricted entities as the U.S. has imposed more controls on U.S. Toolmakers**.
    a. For 4 of the 5 Toolmakers, 45% of their combined 2022 to 2024 total revenue from China came from currently restricted Chinese companies.
    b. Lam Research received a higher share of its revenue from sales to restricted Chinese companies than the other U.S. Toolmakers did from 2022 to 2025.
    c. Between 2023 and 2024, Lam may have shifted some sales away from entities that were then already restricted only to redirect those sales to the PRC's newer substitute entities. Those substitute entities would not be restricted until later, potentially December 2024, but were already undermining U.S. national security and able to receive SME from the U.S. that restricted PRC entities could not.

d. For non-U.S. Toolmakers, partial-year data through March and April 2025 shows a slight decrease in sales to restricted entities compared to full-year data for 2024.

5. **Most of the Toolmakers' PRC revenue in 2024 came from state-owned enterprises (SOEs), and from 2022 to 2024, each Toolmaker more than doubled the share of its worldwide revenue coming from PRC SOEs.**
6. **PRC semiconductor companies are aggressively acquiring advanced DUV lithography equipment that is only banned from specific PRC semiconductor companies** but is otherwise allowed to be exported country-wide to China**.**
    a. ASML sold a majority of its DUV immersion lithography systems to China in 2024 and a majority of its dry lithography systems to China in 2023 and 2024.
7. Semiconductor Manufacturing International Corporation (SMIC), China's national champion chipmaker, **was placed on the BIS Entity List with a permissive export licensing policy in 2020 and BIS granted licenses to export SME to SMIC thereafter.**

Based on these investigatory findings, the Select Committee determined that:

1. **The CCP relies on foreign SME.** The large amounts of sales to the PRC (Finding 2) and the number of restricted entities that are top customers of the Toolmakers (Finding 3) together show that Toolmakers sold billions of dollars of SME and maintenance services to the very companies the CCP is relying on to fuel its plans for military and economic dominance and digital authoritarianism, including those specifically identified and restricted by the U.S. government.
2. **U.S. Toolmakers are more constrained than non-U.S. Toolmakers.** The large disparity between U.S. and non-U.S. Toolmakers' sales to restricted entities restricted at the time of sale (Finding 4) suggests that U.S. export controls have created an unlevel playing field where the non-U.S. Toolmakers are empowered to sell billions of dollars of SME per year to restricted entities to which U.S. Toolmakers are restrained from selling.
3. **The entity-based approach to export controls has an impact on the entities to which they apply but has not sufficiently prevented China from advancing its indigenous semiconductor manufacturing capability.** The disparity between U.S. Toolmakers' sales to currently restricted entities and their sales to entities that were restricted at the time of sale (Finding 4)—combined with BIS's licensing of exports to restricted entities in China (Finding 7)—shows that, when strictly applied, restricting entities has some impact on at least those particular entities' ability to obtain export-controlled

items. However, Chinese companies use entity obfuscation as a workaround to continue to access U.S. technology (Finding 4.c).

4. **Current country-wide export controls have only restricted China from accessing the most advanced SME.** While the Netherlands has denied EUV lithography to the PRC market, the Toolmakers have continued to provide vast quantities of highly capable SME that is not labeled as "advanced" (Finding 2), as particularly illustrated by ASML's sales of DUV and other lithography systems (Finding 6).
5. **The majority of the PRC's semiconductor industry is overtly state-owned**, as suggested by the fact that 69% of all Toolmakers' 2024 revenue from the PRC came from SOEs. Therefore, companies doing business with the PRC's semiconductor manufacturing industry will necessarily do business with entities under the direct command of the CCP (Findings 2, 3, 4, and 5).

These realities allow China to continue enhancing its capabilities to indigenously manufacture advanced chips and, even more concerningly, advanced SME. China achieving these at scale would both effectuate the plans of the People's Liberation Army (PLA) and remove two tools of deterrence from the United States and its allies if they cannot cut off China from both advanced chips and the means to manufacture them. To prevent the PRC from using U.S. and allied technology to achieve its ambitions of "intelligentized" warfare, domination of semiconductor production, and global digital authoritarianism, the PRC's semiconductor industry must face meaningful restrictions across the entire chain of semiconductor production.

To that end, **the Select Committee makes nine recommendations to expand export restrictions, improve enforcement, and advance American and allied technological leadership**:

I. **Align U.S. and allied export controls.** The Executive Branch should employ incentives and leverage to so that our allied and partner nations, particularly the Netherlands and Japan, are fully aligned with U.S. export control policy and enforcement. The SME supply chain spans multiple nations with substantially varying abilities to successfully apply export controls. Preventing the PRC from further advancing its SME capability should include both coordination on the execution of controls as well as efforts to accelerate SME technology through collaboration between the United States and its allies.

II. **Dramatically expand country-wide bans and licensing requirements** on SME exports to China to cover any SME and related components and consumables useful for making advanced *and* foundational chips. Country-wide controls should include all SME capable of processing large wafers (300 mm) and all other chokepoint SME, which is currently allowed to be

sold to all of China except a few specific entities. If allies do not align their controls, utilize foreign direct product rule (FDPR) to extend this China-wide ban to ally-produced advanced and foundational SME. For lithography, these new country-wide controls should apply to older-generation deep ultraviolet (DUV) immersion tools, building on already existing country-wide restrictions on newer generation DUV immersion tools. Banning tools from going only to certain entities in China rather than all of China will not change the current, unacceptable state of affairs wherein the PRC buys more SME from the Toolmakers than any other country.

III. **Expand the list of restricted entities and utilize FDPR authority, if necessary, to prohibit all sales of allied SME to restricted entities**, matching current U.S. controls with a licensing policy of presumption of denial**.** Existing FDPR authority can legally and straightforwardly be applied to any foreign-made SME, because this SME contains integrated circuits produced with U.S. technology.

IV. **Prevent diversion of any SME for which sale to China remains permitted.** Ensure that any affiliate of a semiconductor manufacturing entity on the Entity List is automatically subject to the same Entity List restrictions and prevent all SME exporters from selling SME to anyone other than the final end-users, while also providing export notifications to BIS and instituting location tracking technology.

V. **Restrict any fabs worldwide that use U.S. and allied SME from also using Chinese SME**, leveraging <u>both</u> BIS's export control and Information and Communications Technology and Services (ICTS) authorities. BIS should also focus its Section 232 investigation and potential new tariffs on Chinese SME while exempting allied SME to create new opportunities in the U.S. market as the Chinese market closes off.

VI. **Restrict the export to China of components that are important to the production of SME** and seek comment at regular intervals from the SME industry regarding which components are critical.

VII. **Bolster BIS's resources and authorities to successfully constrain China's semiconductor manufacturing capabilities and capacity** by increasing appropriations for BIS enforcement and analytic capacity and modernization of its IT systems, as well as providing enhanced authorities for flexible hiring.

VIII. **Enact bipartisan legislation to create a new whistleblower incentive program** to increase reporting of export control violations**.**

IX. **Support SME firms in the United States and our allied nations**, including through training and attracting the top domestic and global talent**.**

SCOPE OF THE INVESTIGATION

Congress established the House Select Committee on the Strategic Competition between the United States and the Chinese Communist Party (the Select Committee) to investigate the Chinese Communist Party's economic, technological, security, and ideological threats to the United States and submit policy recommendations for countering those threats. In the 119th Congress, the Select Committee's jurisdiction was expanded to expressly include such matters as they pertain to our allies and partners. Since its inception, the Select Committee has scrutinized the multifaceted threats posed by the Chinese Communist Party (CCP) to our national security and economic interests. This report addresses a critical aspect of this competition: the ability to produce semiconductors, both now and in the future.

Over the past 11 months, the Select Committee has investigated the SME industry and related sectors. During that investigation, the Select Committee requested and obtained information from the five leading manufacturers of SME, collectively known herein as the "Toolmakers." These companies are Applied Materials, Inc. (Applied), Advanced Semiconductor Materials Lithography (ASML), KLA Corporation (KLA), Lam Research Corporation (Lam), and Tokyo Electron Ltd. (TEL), all of which cooperated with the investigation. The Select Committee also reviewed corporate data of entities within the PRC's semiconductor industry and open-source information. Chairman Moolenaar, Ranking Member Krishnamoorthi, and bipartisan Select Committee staff engaged in private correspondence with the Ambassadors of both Japan and the Netherlands. With respect to the Toolmakers, the data reviewed was based on each company's fiscal years 2022 to 2024 and partial-year data for fiscal year 2025.[3] Statements in this report regarding companies' financials or other organizations' related spending generally refer to the respective companies' fiscal years, and all information in this report assumes the accuracy of the material provided to the Select Committee.[4]

Select Committee staff had extensive bipartisan discussions and correspondence with the Toolmakers throughout this investigation. In particular, the Select Committee provided each Toolmaker—at multiple stages throughout the investigation—with summaries of findings and recommendations relevant to that respective Toolmaker and offered each Toolmaker an opportunity to discuss initial findings and potential policies in-person. The Select Committee incorporated Toolmakers' feedback in its findings and recommendations where appropriate.

This investigation did not seek, address, or focus on any potential illegal activity, including any assessment of Toolmakers' compliance or non-compliance with export control laws. The findings discussed below do not claim or posit that any Toolmaker has violated any applicable U.S., Dutch, or Japanese law.[5]

INTRODUCTION

PRC semiconductor manufacturers are annually buying tens of billions of dollars' worth of advanced equipment from the Toolmakers. Toolmakers have been selling much of this equipment directly to entities known to both produce chips for the PRC's military and surveillance state, and to drive the PRC's coordinated effort to build an indigenous, self-sufficient chip manufacturing industry.

Chairman Moolenaar and Ranking Member Krishnamoorthi in their initial letters to the Toolmakers:

"[t]he PRC is now the largest market for semiconductor manufacturing equipment, and it is stockpiling semiconductor manufacturing equipment to bolster its national self-sufficiency in a long-term competition with the United States. Alarming reports show the PRC now purchases more semiconductor manufacturing equipment than the United States, South Korea, and Taiwan combined. This will not only help the PRC supply chips to Russia's war machine but also threaten its neighbors, including Taiwan, as the PRC will feel less constrained by the threat of American sanctions. It will also allow the PRC to continue to progress in critical fields such as artificial intelligence, which are at the very heart of the strategic competition between the United States and the PRC."

This investigation has substantiated these concerns and clearly demonstrated the need for continued action to protect our national security by constraining the flow of SME to the PRC.

SEMICONDUCTOR MANUFACTURING EQUIPMENT

Much of the world runs on the interaction of millions of semiconductor chips. These include logic chips (e.g., general-purpose processor chips such as central processing units (CPUs), chips used in AI graphics processing units (GPUs), and various other application-specific integrated circuits (ASICs), memory chips (e.g., dynamic random-access memory (DRAM) and NAND flash memory chips). Technological advancement in semiconductors is principally measured in terms of the reduction in size, referred to as "node," of the chips. Over time, the most advanced chips have had increasingly smaller physical features and

components ("nodes"), particularly their transistors, which are the basic computational units in a chip. As the node becomes smaller through more advanced production methods, more transistors can be packed into a single chip. Today's most sophisticated logic chips, at the 3 nm node size, have hundreds of billions of transistors in a single chip.

This report refers to 3 different categories of chip node size, an industry metric that roughly approximates a chip's sophistication.[6]

- **Advanced**. Logic chips with nodes at or below 16/14 nm; NAND with 128 or more layers; DRAM chips with high density (roughly at or below 18 nm).
- **Foundational**. Logic chips with nodes above 16/14 nm and up to 40 nm.
- **Legacy**. Logic chips with nodes above 40 nm; NAND chips below 128 layers; DRAM chips above 18 nm.

Smaller-node semiconductors can produce the same amount of computing output while requiring less power and taking up less space. This is not just about more powerful mobile computing; it also allows for greater size, weight, and power flexibility in military weapon systems, space systems, data centers, and other applications. However, less advanced chips, including those made with foundational nodes and legacy nodes can be more durable and cost-effective for a range of applications. So these less advanced chips are and will remain ubiquitous for most applications, including industrial automation, automotives, consumer devices, weapon systems, and surveillance systems.

Those semiconductors, from the legacy to the absolute cutting-edge, are built in fabrication facilities ("fabs") using highly specialized machines and tools made mostly by the five Toolmakers. Chip designers such as AMD, Nvidia, and Huawei design semiconductors, but do not manufacture them, and are known as "fabless" design companies. They then contract the manufacture of those chips to chip fabricators or, "foundries," such as Taiwan Semiconductor Manufacturing Company (TSMC), Global Foundries, or SMIC that produce chips for third-party "fabless" designers. Some chip designers, such as Intel, also fabricate some or all of their designed chips in-house, and are known as "integrated device manufacturers" (IDMs). Both types of fabricators—foundries and IDMs—buy their manufacturing equipment (SME) from the Toolmakers. For fabricators to make more advanced chips over time, the Toolmakers must continue innovating and selling new SME to fabricators, who also rely on the Toolmakers to maintain and service that SME. Therefore, without a continuing commercial relationship with the Toolmakers, fabricators are unable to keep their current production lines commercially competitive. SME is highly complex and expensive; as an example, extreme ultraviolet (EUV) lithography tools sell for hundreds of millions of dollars apiece, and a single fab can now cost tens of billions of dollars to build and outfit.

[7] See Appendix 1 for a brief description of specific types of SME. In this report, advanced, foundational, and legacy SME refers to SME that is capable of producing, respectively, advanced, foundational, and legacy semiconductors.

TOOLMAKER BACKGROUNDS

The Select Committee investigated five manufacturers of SME (the "Toolmakers"). These five companies are estimated to comprise 80–85% of the entire SME market.[8] The Toolmakers are essential to modern economies; their products are needed to make the chips powering the devices and systems that we rely on.

- **Applied Materials, Inc. (Applied).** Applied is one of the most diversified makers of SME, with products across most segments, but not lithography and tracks. It competes in different segments with KLA, Lam, and TEL. Applied is headquartered in the United States.
- **Advanced Semiconductor Materials Lithography (ASML)**. ASML primarily manufactures lithography tools, with a market share of approximately 83%. Its competitors in lithography – Canon and Nikon – have significant legacy node market share, but ASML has a large lead in commercializing production of leading-edge semiconductors through its EUV lithography tools.[9] ASML is headquartered in the Netherlands.
- **KLA Corporation (KLA)**. KLA produces a range of process control and analysis tools. KLA is based in the United States and competes with Applied and TEL.
- **Lam Research Corporation (Lam)**. Lam produces tools used throughout the wafer fabrication process, particularly for etching, deposition, and cleaning. Lam competes with TEL and Applied and is based in the United States.
- **Tokyo Electron Ltd. (TEL)**. Much like Lam, TEL produces a range of products, particularly tools for coating, developing, etching, deposition, and cleaning. TEL competes with Applied, Lam, and KLA in some product lines and is headquartered in Japan.

CHINA'S INDIGENIZATION OF ITS SME INDUSTRY

The CCP has been striving for years to build a competitive domestic semiconductor manufacturing industry. Seeking to replace imported SME, Chinese firms have begun to make their own sophisticated SME within the PRC to vertically integrate and indigenize the supply chain. Indigenizing the semiconductor supply chain has been a major ambition of the PRC since at least 2015, long before the U.S. or its allies implemented broad restrictions on the export of SME to China.[10] As PRC state committees began implementing the "Made in China 2025" initiative, their 2015 roadmap for the semiconductor industry included targets to have domestic production of DUV immersion lithography machines by 2025 and EUV lithography machines by 2030.[11] While these targets now seem optimistic, as the PRC has not yet produced a commercially viable DUV (or EUV) lithography machine, the PRC has grown its global market share in SME production, mainly in segments other than lithography. As of 2023, Chinese SME makers had gained 3.2% global market share and 14% domestic market share, up from 1.3% and 6% in 2020.[12] The Select Committee has even reviewed with concern reports that ACM Research, a PRC SME producer, has sold SME to a semiconductor manufacturer with U.S. operations that also formally certified ACM Research's tools for use in its production line.[13]

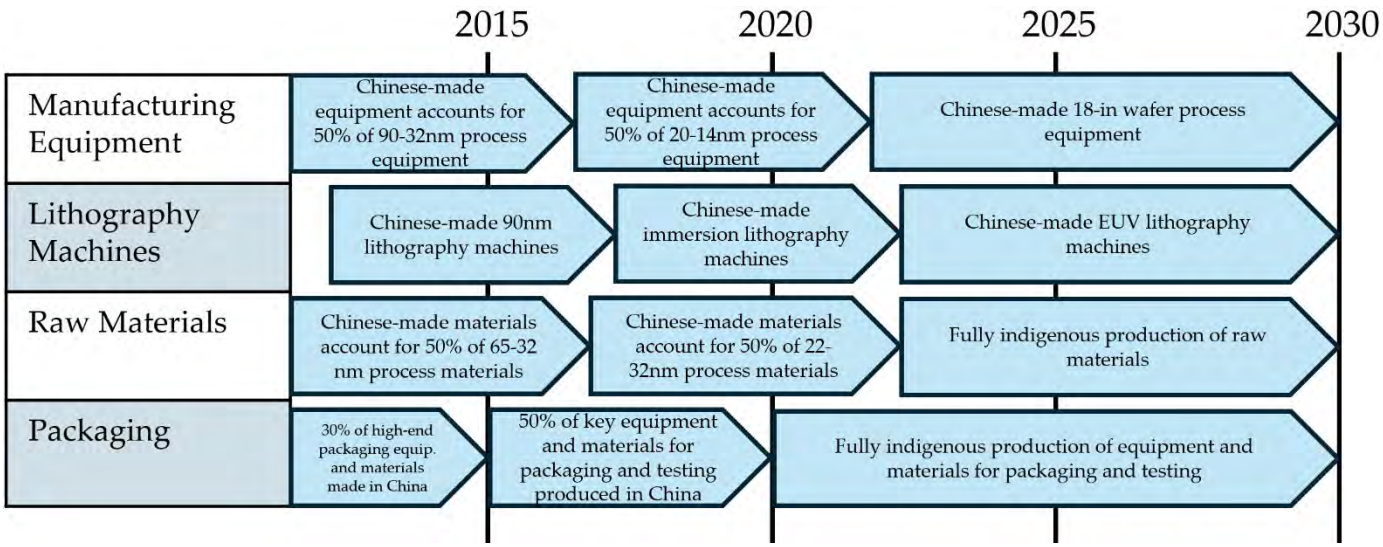


Table 1. A translated excerpt of the roadmap for Made in China 2025 authored in 2015 by China's State Strategic Advisory Committee for Building China into a Manufacturing Superpower.[14]

Shenzhen SiCarrier Technologies Co., Ltd. (SiCarrier), discussed at greater length in Finding 3, is just one example of a toolmaker owned by the PRC state and heavily supported by other PRC-based firms such as Huawei. Through its "Big Fund" (the China Integrated Circuit Industry Investment Fund) alone, the PRC has recently invested at least another $48 billion in its domestic semiconductor manufacturing industry, especially focused on SME, in addition to

previous investments in 2014 and 2019 totaling $52 billion, for an estimated total of $100 billion across the three "Big Fund" rounds.[15] This is in addition to an estimated $73 billion in direct state funding for the semiconductor industry between 2014 and 2021.[16]

As the PRC seeks to create dominant SME companies, China will move up the supply chain to ensure its domestic SME companies control components needed to assemble SME. As one example of the importance of specialized components, Carl Zeiss SMT, a German company, is ASML's "sole supplier of lenses, mirrors, illuminators, collectors and other critical optical components[.]"[17] As ASML noted in its 2024 Annual Report, "if Carl Zeiss SMT were to terminate its supply relationship with us or be unable to maintain production of optics over a prolonged period, we would effectively cease to be able to conduct our business."[18] China's toolmakers' lack of high-quality optics such as those made by Zeiss has sent them in search of novel, but less efficient solutions.[19]

For years the PRC and its companies have been pouring vast resources into trying to master the production of advanced SME. Steeply limiting sales of SME to the PRC will not affect the CCP's goals as it already highly prioritizes jumpstarting indigenous SME manufacturers. Even if the PRC wanted to push even more capital into its SME industry, China's SME companies may already be at their limit for deploying that capital and unable to absorb that additional state investment.[20]

CHINA'S DOMESTIC SEMICONDUCTOR PRODUCTION CAPABILITY

As the PRC strives to master domestic production of advanced SME, it is already able to produce a wide range of chips with the SME that U.S. and allied nation companies have sold to it over the past 10 years. This has been part of the CCP's roadmap since at least 2015, with Made in China 2025 targeting indigenous capability "matching the international market" beginning in 2024.[21]

While the PRC has been unable to fully develop the most advanced production, it relies on national champions to make progress across all major semiconductor manufacturing sectors: (1) advanced logic chips, (2) foundational/legacy (including logic, analog, power, and others), (3) DRAM, and (4) NAND flash memory. Semiconductor Manufacturing International Corporation (SMIC) has long been China's most advanced logic manufacturer, as well as its largest foundry across a range of foundational and legacy nodes. CXMT is China's DRAM national champion, and YMTC is its NAND flash national champion. PRC-headquartered companies hold a low single-digit percentage of global market share in advanced logic chips and mid-to-high single-digit percentage market shares in memory chips (including both DRAM and NAND). Currently, advanced logic and memory companies are subject to some export controls, as discussed below.

More recently, the PRC's largest chip designer, Huawei, has begun leading the PRC's overall effort in coordination with the national champions discussed above and with extensive support from the PRC state, both by designing increasingly advanced chips and directing a clandestine network of fabs and SME companies.[22] As a builder of global telecommunications infrastructure beholden to the whims of the CCP, Huawei has posed – and in many places continues to pose – the danger that it could, on behalf of the PRC, surveil communications passing through that infrastructure.[23] The United States applied broad export controls to Huawei to curb its global expansion and infiltration of telecommunications networks. This limited Huawei's direct procurement of chips needed for a range of its devices. While the CCP's chip manufacturing indigenization effort was already ongoing, Huawei's established business line and scramble for chips made it a logical choice as the CCP's quarterback for this effort. Huawei has invested in over 60 companies in the PRC's semiconductor industry since 2019.[24] Some of these investments, including its design arm HiSilicon, are majority or even 100% ownership stakes for Huawei. Huawei also directs ostensibly independent entities, including fabs that buy SME and produce semiconductors designed by HiSilicon for Huawei products. Some of these are discussed below, particularly in Findings 3 and 4.

FINDINGS

The findings of this investigation point to an overarching conclusion: to be effective, export controls to prevent SME technology transfer to China must apply to all of the PRC, not just specific entities. They must also encompass the entire production chain, supply chain, and associated components of the SME at the technical threshold being protected. Companies in the PRC act at the behest of the CCP, either directly as SOEs or indirectly because they must comply with the CCP or face state retaliation. In this environment, PRC companies cooperate with each other to evade export controls and diffuse technology throughout China. The piecemeal nature of the United States' entity-based export controls has for the past decade allowed China to acquire vast stockpiles of sophisticated SME to accelerate its semiconductor manufacturing capability and develop its own SME industry seeking to overtake the United States and our allies.

Key Finding 1. BIS has imposed export controls to impede advanced PRC production with some success, but the current controls have significant gaps.

The U.S. government has focused on restricting SME for advanced production, with an "advanced-node" threshold for producing the three most common type of chips: 16/14 nm and below for logic chips (i.e. the types of chips used for AI chips and other processors), 128 layers and above for advanced NAND flash memory, and various thresholds for dynamic random-access memory

(DRAM) (the type of memory used to produce high-bandwidth memory (HBM) that is used for AI chips).[25]

Based on these thresholds, the U.S. government instituted two sets of controls. The first set includes PRC-wide controls for over three dozen chokepoint tools that are used only for advanced production (thus avoiding constraining less-advanced production).[26] The U.S. government recently applied the FDPR to control tools made in various foreign countries, including tool production hubs like Korea, Malaysia, Israel, including by subsidiaries of American, Japanese, and Dutch companies.[27] Thirty-three countries are exempted from this FDPR, including Japan and the Netherlands, but these two countries have instead issued similar country-wide controls of their own following U.S. diplomatic efforts.[28] These controls are distinct from their end-user and entity-based controls, which are misaligned with U.S. controls.[29] However, in addition to leaving foundational and legacy SME unrestricted, these controls have significant gaps even in the restriction of advanced SME exports. The PRC is still able to buy "node-agnostic" SME that is useful for advanced production, as these are only limited from export to restricted entities in the PRC.[30] Other PRC entities can legally purchase this node-agnostic, foundational, and legacy SME, with no license required for the Toolmaker to export. PRC-based entities can also divert node-agnostic advanced SME to another fab or use it to build more advanced chips than U.S. regulators have assessed.

The second set of controls includes subjecting restricted entities to additional controls. The United States uses several designations to limit companies from conducting certain transactions with dangerous foreign entities that are enemies of the United States. Companies that are so designated on at least one of the following lists (and their known affiliates[31]) are referred to in this report as "restricted entities":

- **U.S. Department of Commerce, Bureau of Industry and Security's (BIS) Entity List**. This list identifies organizations and people involved in "activities contrary to the national security or foreign policy interests of the United States."[32] While it is still possible to legally export to entities on this list, it is usually more difficult to receive an approved export license to do so. The United States extensively uses this list when enforcing SME export restrictions. Relatedly, BIS restricts all exports and U.S. persons' support to any entities in China producing advanced chips meeting the above thresholds. Companies meeting these thresholds are typically also on the Entity List, with one major exception being CXMT.
- **U.S. Department of Treasury, Office of Foreign Assets Control's Non-SDN (Specially Designated Nationals and Blocked Persons) Chinese Military-Industrial Complex Companies (NS-CMIC) List**. This

designation bars U.S. persons from conducting certain investment activity with the listed entities.

- **U.S. Department of Defense's Section 1260H "Chinese Military Company" List**. This designates entities that are either connected to China's military or contribute to China's civil-military fusion strategy.[33]

U.S. export controls on restricted entities on the BIS Entity List apply to *all* items subject to U.S. jurisdiction (primarily U.S.-origin SME), via the Entity List and end-use controls, because they produce advanced chips or work with the Chinese military. These entities include, among others, SMIC, Peng Chip (PXW), ICRD, CXMT, YMTC, Shanghai Integrated Circuit Equipment & Materials Industry and Innovation Center, Zhangjiang Laboratory, Northern Integrated Circuit Technology Innovation Center, Shenzhen Pengxinxu Technology, SiEn Qingdao, SwaySure Technology, and Chinese Academy of Sciences Institute of Microelectronics. These controls prohibit U.S. persons from supporting – except under a license approved by BIS – restricted entities that produce advanced chips, including support such as servicing SME already installed in a fab. The Netherlands and Japan have also implemented some restrictions on the export of specified tools produced by ASML and TEL on an end-user basis, beyond their China-wide controls on certain advanced SME.

At the time of this writing, BIS has very recently expanded the application of its Entity List restrictions under its "Affiliate Rule".[34] If an entity on the Entity List (Entity A) owns 50 percent or more of any other entity (Entity B), that affiliate Entity B will also be subject to the same restrictions as if it were on the Entity List, as would any entities of which Entity B owns 50 percent or more.[35] This may allow for quicker reaction to the CCP's entity obfuscation, so long as it does not raise the bar for BIS to add risky entities to its Entity List. However, entities in the PRC do not need official corporate links to cooperate effectively with each other to evade U.S. export controls.

However, there are multiple gaps in the controls on restricted entities. First, no allies have taken comparable measures restricting the provision of *all* tools or services to restricted entities. The U.S. government recently applied the FDPR to control a broad range of tools made in foreign countries, except for tools made in thirty-three exempted countries, including Japan and the Netherlands. These extraterritorial U.S. controls, however, apply to fewer types of foreign-made tools than those that apply to U.S.-origin SME.[36] Second, the U.S. government has not systematically restricted entities making foundational chips. Third, BIS has granted licenses for export of items to certain entities even though those entities have been identified as threats to U.S. interests and accordingly restricted.

Existing U.S., Dutch, and Japanese SME export controls have played a role in mitigating the profound national security risks posed by the PRC's advanced

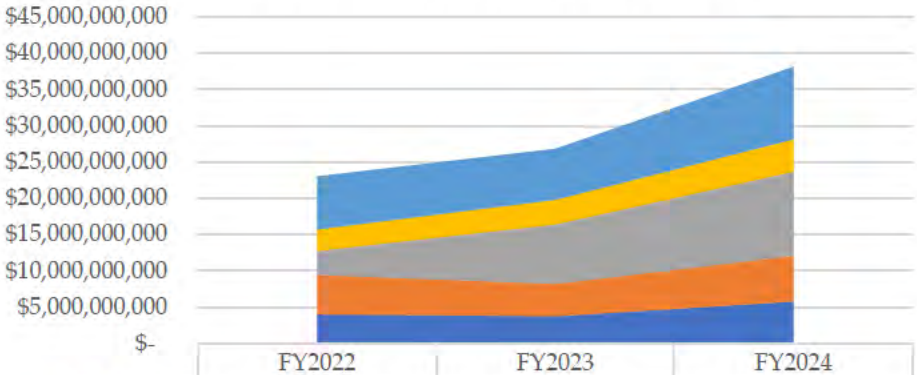
production. The PRC's revenue and wafer capacity at advanced logic nodes—primarily at SMIC—has experienced limited expansion since the SMIC Entity Listing in 2020 and PRC-wide SME controls beginning in 2022. The PRC's share of global capacity for advanced logic nodes remains small, unlike its rising market share in foundational and legacy chip production. The U.S. government has assessed that Huawei is indigenously manufacturing, no more than 200,000 Huawei Ascend AI chips in 2025.[37] Similarly, press reporting claims that, in 2025, Huawei will produce the equivalent of 250,000 Ascend 910Cs, which is Huawei's most powerful chip.[38] However, assessments differ, and at least one analysis points to much higher production of this chip in 2025: 800,000 Ascend 910Cs (due to a stockpile of HBM wafers from a foundry's potential export control violation), but then dropping back to around 300,000 in 2026 if HBM wafer production remains a bottleneck for the PRC.[39] By comparison, U.S. companies are expected to produce and deploy over 14 million AI chips in the United States in 2025.[40] Many of these chips are Nvidia's flagship Blackwell GPUs, which have roughly double (B100), triple (GB200) or quadruple (GB300) the performance of the Huawei Ascend 910C.[41] More systematic restrictions, as described in the policy recommendations section of this report, could further limit the PRC's production of advanced chips such as the Huawei Ascend. Additionally, the lack of restrictions on SME for non-advanced production has allowed the PRC to continue gaining market share in foundational and legacy chips.

<u>Key Finding 2</u>. The PRC is heavily reliant on the five Toolmakers, spending $38 billion in FY2024 for their products and services, representing 39% of the Toolmakers' aggregate worldwide revenue.

Chinese semiconductor manufacturers have spent the equivalent of tens of billions of dollars every year to obtain SME from the five Toolmakers, even though some advanced SME is restricted from export to the PRC. This reliance increased in the last three years.[42] Revenue from the PRC was 39% ($38 billion) of total revenue for the five Toolmakers in 2024, a 56% increase from 2022 in the share of Toolmakers' revenue coming from the PRC.[43] If the PRC could get this equipment elsewhere or build it within the PRC, it would. But it can't – for now.

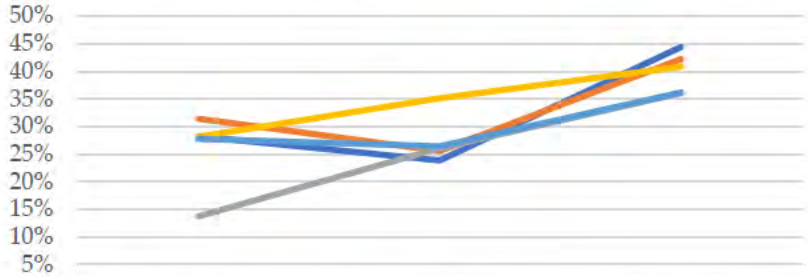
The charts below show both the five Toolmakers' annual revenue derived from their sales to PRC-based semiconductor facilities and the percentage of their overall revenue derived from sales to PRC-based semiconductor facilities.

Table 2. Revenue from China (USD)



	FY2022	FY2023	FY2024
Applied	$7,300,000,000	$7,000,000,000	$10,000,000,000
KLA	$2,952,000,000	$3,400,000,000	$4,433,000,000
ASML	$3,324,240,000	$8,196,600,000	$11,622,414,000
Lam	$5,411,502,000	$4,462,663,000	$6,293,990,000
TEL	$4,020,154,900	$3,744,809,800	$5,774,479,700

Table 3. Percentage of Revenue from China



	FY2022	FY2023	FY2024
TEL	28%	24%	44%
Lam	31%	26%	42%
ASML	14%	26%	36%
KLA	28%	35%	41%
Applied	28%	26%	36%

TEL Lam ASML KLA Applied

These are the sales that gave China's semiconductor fabs, including Huawei's network and SMIC, the production capacity and technological sophistication they now possess. These are the sales that made China increasingly competitive in the manufacture of a wide range of semiconductors, with profound implications for human rights and democratic values around the world. These are the sales that helped create grave long-term risks to U.S. national security, including by making China's "intelligentized" warfare model more resilient against trade restrictions from other countries.

a. The Toolmakers have expanded these sales even while some of them acknowledge that the Toolmakers' access to the PRC market is unnecessary to maintain their long-term growth.

Restricting SME exports to the PRC diverts those same sales to other countries, which will then build semiconductor fabs that otherwise would have been built in the PRC. For example, ASML's then-CEO Peter Wennink said that if "China would absolutely be excluded from any growth, the demand is there. The fabs would be built somewhere else. There could be a temporary hiccup. But ultimately those chips need to be made. So it doesn't change the 2030 picture that much."[44] Separately, in response to a question of whether U.S. export controls imposed in 2022 made him concerned about investing in fabs in China, and KLA CEO Rick Wallace said KLA customers were assessing the "long-term viability" of doing business with China, and that "it's a much better question to ask [our customers] than us. And ultimately, from our standpoint, frankly, it doesn't matter that much, because if they choose not to invest there, what they're doing is investing to support demand, and they'll move that investment to where they can do it."[45] The full quote from Mr. Wallace is available in footnote 45.

<u>Key Finding 3</u>. China's dangerous, restricted semiconductor companies were also the Toolmakers' top customers in the examined time period.

TEL, ASML, and Lam's revenues came, in significant part, from sales to China's restricted entities. Here, "restricted entities" means those companies on one of the three U.S. government lists previously discussed (which denote that a company poses a serious national security concern) and known affiliates of those companies. The term "restricted entities" does not mean that such sales were illegal or necessarily subject to a licensing requirement in all cases. The five Toolmakers count many PRC "national champions" (private sector entities that the CCP has determined are strategically essential to their national interests), their affiliates, and many other SOEs among their top 30 customers in the PRC 2022 to 2024. The Toolmakers have been selling to the very organizations that will almost certainly cut them out of the loop in favor of the PRC's SME national champions in the future. Some of these organizations, such as SwaySure, SiEn, and PST (also known as PXX), were added to U.S. restricted lists only in December 2024, but the

U.S. government has long noted concerns about known associates of those organizations. The U.S. government, on the other hand, has directly listed SMIC since December 2020 and Pengxinwei IC Manufacturing Co. (PXW) and Yangtze Memory Technologies Co., Ltd. (YMTC) since December 2022.

a. Five dangerous, restricted semiconductor companies in China are also top customers of every single Toolmaker.

There are eight companies that every Toolmaker shares as one of their top 30 customers in China from 2022 to 2024.[46] Five of these eight companies are restricted entities. All five Toolmakers counted these following five restricted Chinese companies among their ***top 30*** customers in China.

1. Semiconductor Manufacturing International Corp. (Beijing) (SMIC)
2. SwaySure Technology Co. (SwaySure)
3. Shenzhen Pengxinxu Technology Co. (PST)
4. SiEn (Qingdao) Integrated Circuits Co. (SiEn)
5. Yangtze Memory Technologies Co., Ltd. (YMTC)

SMIC is the PRC's largest foundry and most advanced producer of logic chips, while YMTC is the PRC's largest NAND memory chip producer; both are tied to the People's Liberation Army (PLA).[47] All five companies work with other restricted PRC entities, particularly Huawei. SMIC builds chips for Huawei's devices, including chips at least as advanced as 7 nm as of 2023.[48] Swaysure, PST, and SiEn received extensive scrutiny in October 2024 when Select Committee Chairman Moolenaar and Ranking Member Krishnamoorthi sent a letter to the Commerce Department highlighting that "Huawei's clandestine chip network appears to include firms such as Pengxinxu (鹏新旭), SwaySure Technology (昇维旭) Qingdao SiEn (芯恩-青岛), and potentially many others."[49] Huawei earlier had at least serious discussions about investing directly in SiEn.[50] Additional reporting has since shown this network expanding its physical footprint and deepening its ties.[51] Huawei is inextricably linked with these companies' operations despite Huawei's efforts to obfuscate its ties to these and others of its clandestine fabs.[52]

These are the leading companies working for and with China's military to build the "intelligentized" PLA for which Chairman Xi Jinping has called since at least October 2022.[53] "Intelligentized warfare," the PLA's near-future operating doctrine, places compute-intensive technologies at the heart of sensing, situational awareness, and decision making in conflict.[54] The PLA's primary publication, the PLA Daily, discussed it in 132 articles in 2023 alone (of the 370 total articles it ran that year).[55] The PLA is investing in this concept, having published "close to 3,000 AI-related contract award notices in 2023 and 2024."[56] Most of those contracts were won by entities outside the standard Chinese defense industry.[57] The PLA believes pervasive advanced computing capabilities, particularly artificial intelligence, will bring about its military superiority over the U.S. and our allies.[58] The PLA will turn to these restricted entities to build the chips that will power those capabilities.

In addition, these restricted companies provide technology for the CCP to violate human rights and promote digital authoritarianism across the globe, all while enabling PRC-based AI firms and national champions to gain access to chips they need to dominate the foundational technology of our lifetimes. For example, BIS added YMTC to its Entity List in 2022 because of the risk of YMTC diverting exported U.S. technology to Hikvision.[59] The PRC uses Hikvision's surveillance equipment for its mass surveillance apparatus, including the targeting of Uyghurs and other ethnic minorities.[60] To ensure these capabilities, the CCP seeks to turn China into the leading producer of advanced semiconductors and make that production self-sufficient within the PRC.

These five companies are buying large amounts of equipment across every stage of the semiconductor manufacturing process all while striving to replace the Toolmakers with indigenous Chinese companies.[61] SwaySure and PST's owner Shenzhen State-owned Assets Supervision and Administration Commission (SASAC) also owns Shenzhen SiCarrier Technologies Co., Ltd. (SiCarrier), a leading PRC toolmaker seeking to replace ASML and other non-Chinese Toolmakers.[62] Additionally, Shenzhen SASAC holds a substantial stake (potentially just short of 50%) in Honor, which it bought from Huawei in 2020 to exempt it from the restrictive measures applied to Huawei.[63] And the Shenzhen SASAC subsidiary (Shenzhen Major Industry Investment Group Co., Ltd.) that owns SwaySure, PST, and SiCarrier also owns Pengxinwei IC Manufacturing Co. (PXW), a major Huawei fab also highlighted in the Select Committee's October 2024 letter.[64] These fabs have used American, Dutch, and Japanese SME to build Huawei's chips.

With the ongoing direction and support of the CCP via Shenzhen SASAC, these restricted entities will increasingly look to use SME made in the PRC by their closely linked affiliate SiCarrier, which is also a restricted entity.[65] They will use their possession of the Toolmakers' SME to speed SiCarrier's technological growth and sophistication. The PRC provides vast resources for SiCarrier to drive this goal forward, including state funding and directing investors to support SiCarrier. And SiCarrier is drawing on those resources: SiCarrier recently raised $2.8 billion in exchange for 25% equity in one of its subsidiary entities. [66] SiCarrier will deploy this capital for its intended domination of the entire SME market, and it still has the large majority of its equity remaining from which to raise further funds. Compare that $2.8 billion raise with Applied Materials, which has raised $700 million in additional capital since 2022.[67] While the Toolmakers have operating profit that they can and do reinvest in capital expenditures, SiCarrier and other PRC SMEs have the full weight of the PRC state for direct funding and fundraising. SiCarrier's subsidiaries focus on tools across the range of semiconductor manufacturing tools, further demonstrating that its ambitions extend throughout the entire semiconductor manufacturing process. These

subsidiaries, which all list SiCarrier's legal representative, Yu Hai, as a legal representative, manager, or director in their corporations, include:

- Zhuhai Cornerstone Technologies Co. (Cornerstone).[68] In 2022, Cornerstone started to produce in China chemicals used in semiconductor manufacturing, such as photoresists.[69]
- Shenzhen Xinkailai Industrial Machine Co., Ltd. (Xinkaillai). Xinkailai appears to produce tools across the range of the semiconductor production process, particularly etching.[70]
- Shanghai Yuliangsheng Technology Co., Ltd. (Yuliangsheng). Yuliangsheng works in lithography and has reportedly produced a prototype DUV machine currently undergoing testing with SMIC.[71]
- ZETOP Technologies Co., Ltd. ZETOP manufactures advanced optical machinery, a key component in lithography machines.[72]

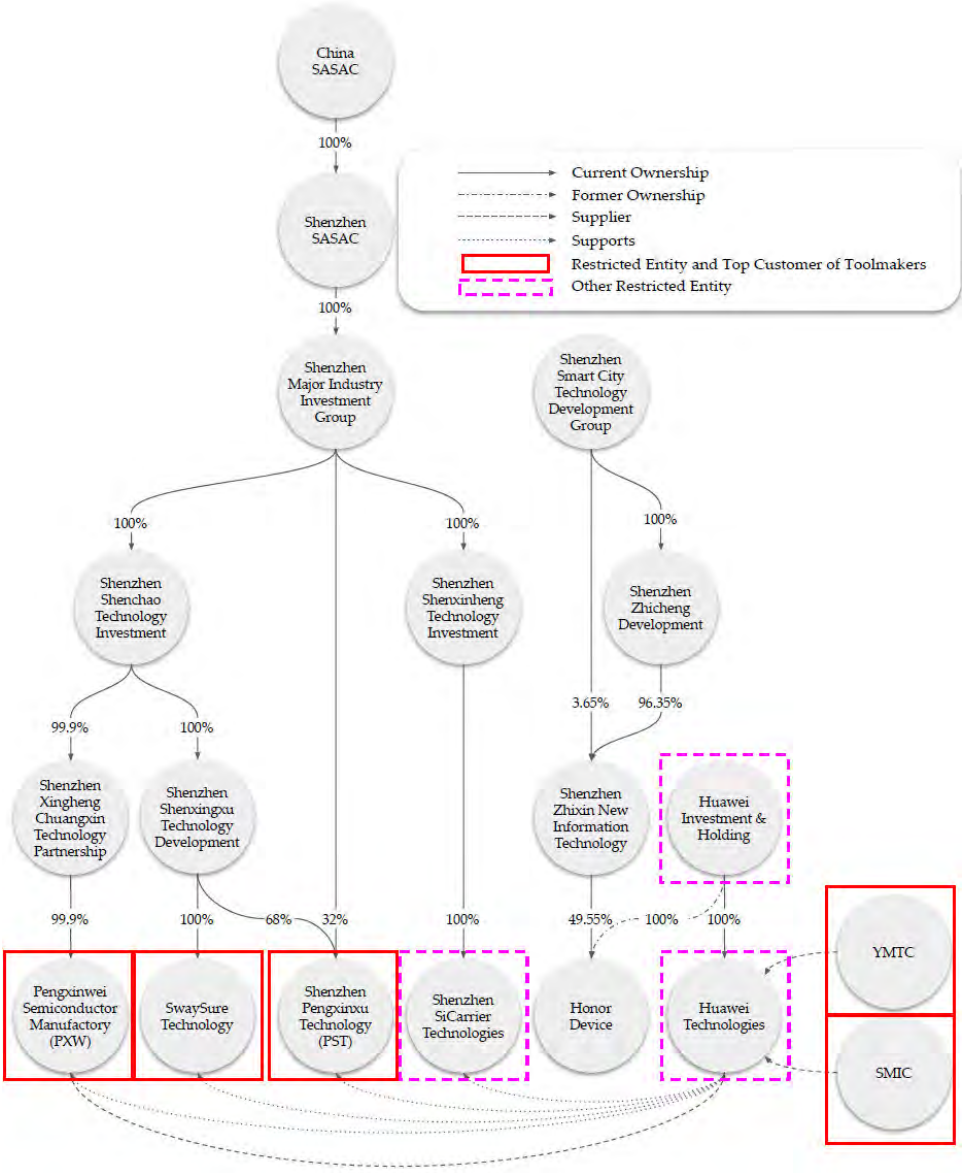


Table 4. Relationship of Five Entities – Which Are Restricted and Top Customers of Toolmakers – with Huawei and SiCarrier[73]

The Toolmakers are not selling neutral goods to other normal commercial companies that are seeking to profit by mutual exchange. Rather, the Toolmakers are selling the forges of future weapons and surveillance tools to the very companies that seek to build the PRC's semiconductor industry into a dominant force that will help the CCP achieve its international and domestic objectives, contrary to our national security and values.

b. Individual Toolmakers each count other restricted Chinese semiconductor companies among their top 30 customers in China.

There are other top customers of the Toolmakers in the PRC that are also building the Chinese military and CCP dominance of key future industries. For example, Changxin Memory Technologies Co., Ltd. (CXMT) is a restricted entity that is a customer of four of the five Toolmakers.[74] As CXMT is a military-civil fusion contributor in the PRC, it provides its products and capabilities to the PRC's defense industrial base.[75] CXMT is intertwined with Changxin Jidian (Beijing) Memory Technology Co., Ltd. (CXJD), a non-restricted entity that is a customer of all five Toolmakers.[76] Through their ultimate owner, Changxin Technology Group Co., Ltd., these two companies support each other's work and frustrate the purposes of imposed U.S. export controls.[77] CXMT is a leading PRC producer of DRAM and plans to scale production of high-bandwidth memory (HBM).[78] HBM is a crucial component needed to indigenously produce AI chips, and some assessments place China's HBM wafer output as a key factor limiting the PRC's production volume for advanced AI chips.[79]

Other examples include:

- **Pengxinwei Semiconductor Manufactory Co., Ltd. (PXW)**. PXW, restricted in December 2022, was a top customer of two of the Toolmakers. PXW is part of Huawei's fab network, with facilities in close proximity to the network's new fabs.[80] PXW is owned by the same Shenzhen SASAC subsidiary that owns SwaySure, PST, and SiCarrier.[81] PXW focuses on manufacturing advanced logic chips, such as those key to artificial intelligence and high-performance computing applications.
- **SMIC branches**. While each Toolmaker counted at least SMIC Beijing among its top 30 customers in China, four of the five Toolmakers also counted other SMIC entities among their top customers in China. These SMIC entities include SMIC Shenzhen, SMIC Shanghai, and SMIC South China.

<u>Key Finding 4</u>. Non-U.S. Toolmakers have substantially increased their revenues from restricted Chinese entities as the U.S. has imposed more controls on U.S. Toolmakers.

Non-U.S. Toolmakers' revenue from entities that were *restricted at the time of sale* more than tripled from 2022 to 2024, as a share of their worldwide revenue and in absolute terms. [82] And even as a share only of ASML and TEL's total PRC revenue, these sales grew by 50% over the same time period.[83] As the U.S. government designated Chinese entities and restricted U.S. Toolmakers from selling certain items to them, the non-U.S. Toolmakers (not bound in most cases by U.S. export controls[84]) increased their sales to restricted entities. From 2022 through 2024, TEL and ASML sold increasing percentages of their products to PRC companies that were then, or have since been, restricted by the U.S. government

for their work supporting the PRC military.[85] At the same time, the sales of U.S. Toolmakers to PRC entities that were restricted at the time of sale decreased or held steady.[86] For the three U.S. Toolmakers (Applied, Lam, and KLA) combined, these sales *decreased* by 56% in absolute terms and from 3.4% of worldwide revenue to 1.5% of worldwide revenue between 2022 and 2024.[87] In 2024, the three U.S. Toolmakers together sold $786 million worth of SME to entities restricted at time of sale, while TEL sold $1.23 billion and ASML sold $2.98 billion.[88]

And U.S. Toolmakers received a smaller share of their revenue from companies once they became restricted entities than non-U.S. Toolmakers did. As evidence of this, looking at revenue from all entities which were restricted entities as of February 2025, even if they were not restricted at the time of sale (here referred to as "currently restricted entities"), 2 of the U.S. Toolmakers' combined sales in 2024 to these currently restricted entities were 20% of their worldwide revenue and their revenue from entities restricted at the time of sale were 2%.[89] The same figures for ASML and TEL combined in 2024 were 19% and 9%.[90]

As U.S. Toolmakers mostly restrained the growth of sales to restricted entities in China, their non-U.S. counterparts did not. This frustrated the purpose behind restricting entities in China: preventing advanced technology from being available to dangerous companies that are fueling the ambitions of the CCP. The data reviewed by the Select Committee suggests that TEL and ASML kept selling to several companies after the U.S. government restricted those entities.

As foreign companies, TEL and ASML are not required in most cases to seek an export license from the U.S. government before exporting controlled technology to a company restricted by the U.S. government.[91] U.S. companies must seek licenses before exporting controlled SME to most restricted entities, since most of these entities are on BIS's Entity List or subject to stringent U.S. end-use export controls that TEL and ASML do not have to follow. U.S. Toolmakers therefore face a disadvantage in parts of the PRC market, but China's most threatening semiconductor companies are still receiving vast quantities of SME directly from non-U.S. Toolmakers. TEL presents a particular concern here as it competes directly with the U.S. Toolmakers. While ASML competes with U.S. Toolmakers in its smaller product lines, it is effectively unchallenged by them in its primary product line, lithography.

a. For 4 of the 5 Toolmakers, 45% of their combined 2022 to 2024 total revenue from China came from currently restricted Chinese companies.

Toolmakers have not only sold to then-restricted PRC entities, but have also sold even larger amounts to PRC entities that would soon after become restricted. For 4 of the 5 Toolmakers[92], combined revenue from currently restricted entities in China (those that were restricted entities as of February 2025) represented nearly half of their combined revenue from China.[93] From 2022 to 2024 for these Toolmakers combined, this revenue from currently restricted entities

more than doubled both in absolute terms and as a share of worldwide revenue.[94] While many of these companies were not yet restricted entities, they were likely already undertaking the activities which presented a risk to U.S. national security and would lead to their becoming restricted entities.

As noted in discussing Finding 3, many entities were restricted only recently. For example, SwaySure and PST were restricted in December 2024, after the 2024 fiscal year ended for four of the Toolmakers. This likely accounts for a large difference between a) the Toolmakers' sales to currently restricted companies; and b) the Toolmakers' sales to companies that were on restricted lists at the time of sale.

b. Lam Research received a higher share of its revenue from sales to restricted PRC companies than the other U.S. Toolmakers did from 2022 to 2025.

Close to 4% of Lam's global revenue from 2022 through Q3 FY2025 came from restricted PRC companies that were on a restricted list at the time of the transaction with Lam.[95] While this is less than the same figure for non-U.S. Toolmakers, it is much more than either Applied Materials or KLA, the other two U.S. Toolmakers. Applied Materials and KLA averaged 2% and 1% for similar figures, respectively, over similar time periods.[96] Lam also diverged sharply in 2023, with sales to PRC entities restricted at the time of sale representing 7.5% of Lam's worldwide revenue before returning to around 3% in 2024.[97]

c. Between 2023 and 2024, Lam may have shifted some sales away from entities that were then already restricted only to redirect those sales to other entities in the PRC. These potential substitute entities would not be restricted until later, potentially December 2024, but were already undermining U.S. national security and able to receive SME from the U.S. that restricted PRC entities could not.

As Lam's revenue from entities restricted at the time of sale decreased from 2023 to 2024, its revenue from currently (as of February 2025) restricted entities skyrocketed from $1.7 billion, 10% of worldwide revenue, and 39% of PRC revenue in 2023 to $3.7 billion, 25% of worldwide revenue and 59% of PRC revenue in 2024.[98] This suggests that as Lam shifted some sales ($900 million) away from its customers who had been restricted by the U.S. government in 2022 and 2023, it moved a larger amount of sales ($2 billion) to other companies in the PRC which were stepping in to fill the same role as those PRC companies just recently restricted. These new customers in the PRC could buy large quantities of SME from the U.S. without an entity-based BIS licensing requirement. As the U.S. government identified the operations of these new PRC customers, it added them to restricted lists, particularly in December 2024. And this is not a factor of Lam's overall PRC revenue growing; the shifts in sales are nearly identical as a share of Lam's PRC revenue. From 2023 to 2024, Lam received 22% less of its total PRC

revenue (29% to 7%) from entities restricted at the time of sale and received 20% more of its PRC revenue from entities restricted as of February 2025 (39% to 59%).[99]

In a similar but smaller trend, TEL's sales to entities restricted at the time of sale decreased from 2023 to 2024 only as a share of its PRC revenue (it increased in absolute terms and as a share of worldwide revenue).[100] This decrease (24.6% to 21.3%) was closely matched by a concurrent increase (47.2% to 51.3%) in TEL's PRC revenue from currently restricted entities.[101]

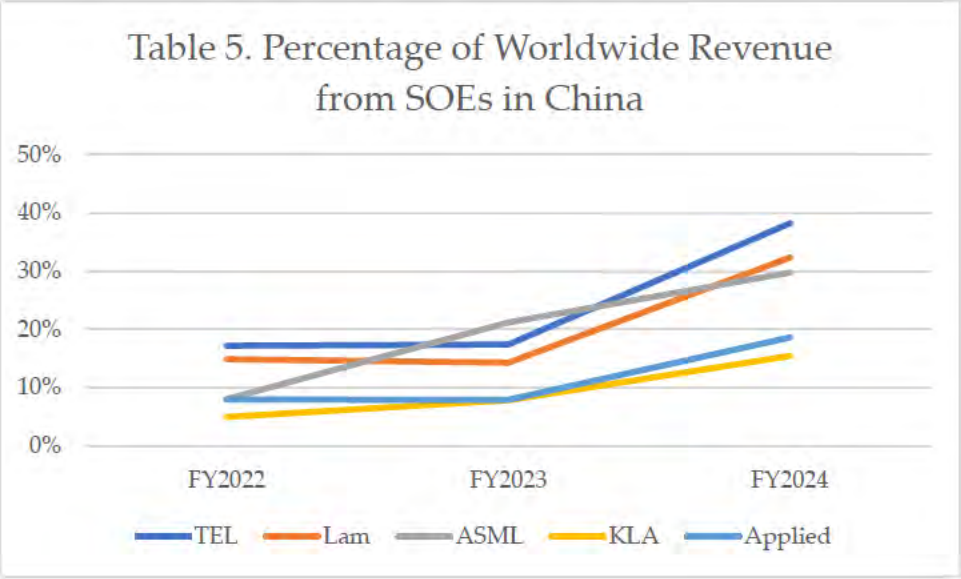
As noted above, the term "restricted entities" does not mean that such sales were illegal or necessarily subject to a licensing requirement in all cases and this finding does not posit that any activity discussed in this finding or sub-finding violated any applicable law.

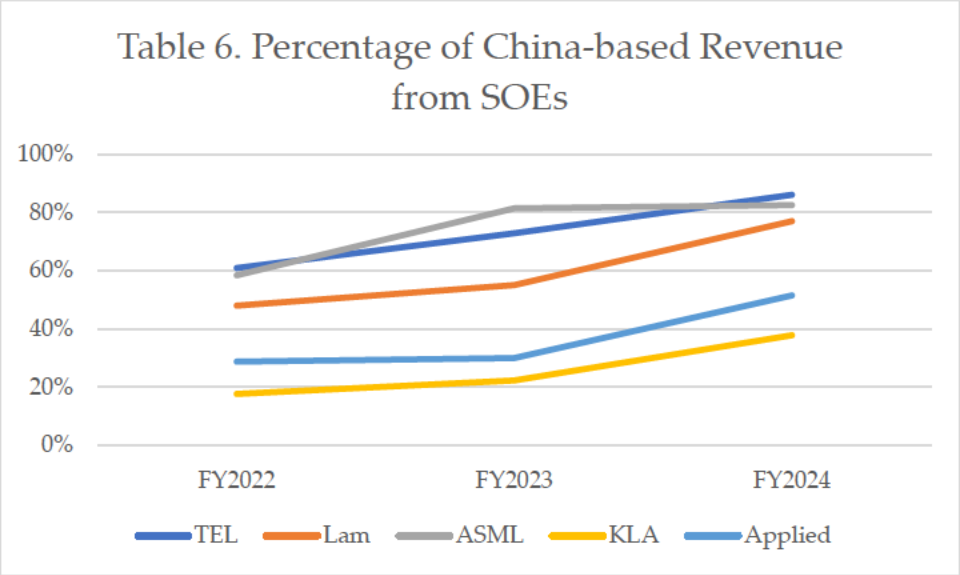
d. Partial-year data through March and April 2025 suggests a possible decrease in Toolmakers' sales to restricted entities in the PRC following the addition of multiple semiconductor companies to U.S. restricted lists in December 2024 through February 2025.

TEL and ASML's reactions to the recent prohibition of several of the Toolmakers' top customers in the PRC are not yet clear. Their sales to customers like SwaySure, PST, and SiEn (except for those in December 2024) are not included in their revenue from entities restricted at the time of sale because those customers were added to the U.S. Entity List in December 2024. TEL and ASML are not legally obligated to stop selling to these customers, despite those entities now being restricted, and their data from 2022 to 2024 suggests that it is unlikely they will stop doing so. TEL and ASML made 9% of their entire 2024 revenue from sales to then-restricted companies in the PRC—and that was ***before*** their customers such as SwaySure, PST, and SiEn were restricted.[102] However, initial partial year data for 2025 suggests TEL and ASML may have returned to lower levels of sales to restricted entities at least in the first months of calendar year 2025.[103] These levels so far are higher than 2022 in both absolute terms and as a share of revenue, but lower than 2024.[104] These companies' operations in the coming months will demonstrate whether this is: 1) a transitory change while TEL and ASML adjust to the prohibition of a number of their customers; 2) reflective of TEL and ASML delaying their China sales (overall or specifically to restricted entities) to later in the calendar year; or 3) a permanent shift to at least slow the growth of sales to restricted entities.

<u>Key Finding 5</u>. Most of the Toolmakers' PRC revenue in 2024 came from SOEs, and from 2022 to 2024 each Toolmaker more than doubled the share of its worldwide revenue coming from PRC SOEs.

Toolmakers received large and increasing shares of their overall revenue from sales to PRC SOEs.[105] In 2022, the Toolmakers sold $9.5 billion worth of SME to PRC SOEs, representing 11% of their overall revenue and 42% of their PRC-based revenue. By 2024, this had grown to $26.2 billion, 27% of overall revenue, and 69% of PRC-based revenue. When looking at only ASML and TEL, in 2024, this was 32% of overall revenue and an astonishing 84% of PRC-based revenue. Among the three U.S. Toolmakers, Lam's business in the PRC has been markedly more focused on SOEs, though all three were more heavily concentrated in PRC SOEs in 2024 than they were in 2022.





<u>Key Finding 6</u>. PRC semiconductor companies are aggressively acquiring advanced DUV lithography equipment that is only banned from specific PRC semiconductor companies but is otherwise allowed to be exported country-wide into the PRC.

PRC semiconductor manufacturers are desperate for the most advanced SME they can buy from the Toolmakers. But China's demand is not just for the systems at the absolute cutting edge of semiconductor manufacturing. PRC semiconductor manufacturers want—and are paying many billions of dollars to get—the most advanced machines ASML has been allowed to sell, adapting as export controls prevented sales of more advanced machines.

As discussed earlier, ASML is essentially the sole supplier of the most critical tools to build advanced semiconductors, which are essential to the PRC's artificial intelligence objectives. ASML sells lithography machines in three categories, from most to least advanced:

1. EUV immersion tools, which can produce chips at the 5 nm node and below (but are also used for 7 nm);

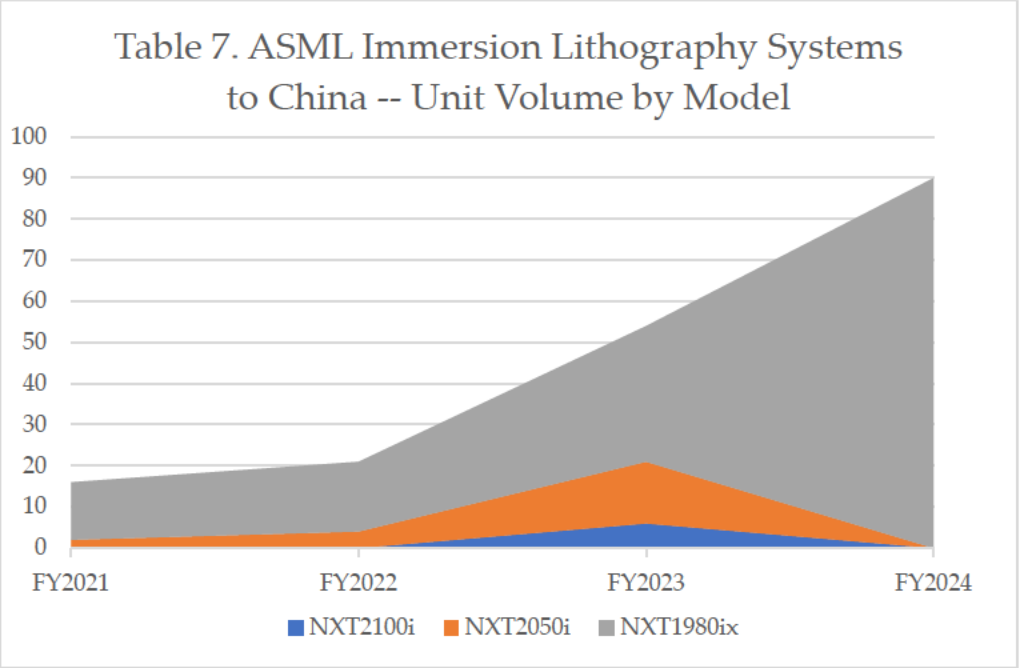
2. DUV immersion tools, used to produce logic chips with nodes between 40 nm and 7 nm (and which China is trying to use for even smaller nodes, including 5 nm); and

3. Dry lithography tools, used for above-40 nm logic chips.

The United States and its allies have restricted the transfer to China of EUV machines, which, to date, has prevented China from having the capability to

manufacture advanced semiconductors at and below the 5 nm node. By not transferring EUV technology to the PRC, the Netherlands and ASML have done a great service to their allies' security, including our own in the United States. However, PRC companies have continued to procure DUV immersion machines, some of which the U.S. and Dutch governments eventually restricted in halting steps and some of which remain restricted only from certain entities in China.

Even with EUV lithography machines banned for sale to China, China continued to buy ASML's most advanced DUV immersion machines: the NXT:2100i, NXT:2050i, and NXT:2000i. These machines can work on nodes as small as 5 nm and in some cases 3 nm, though likely at reduced yields under current conditions.[106] In late 2023, the Dutch government restricted export of these three machines to the PRC.[107] Meanwhile, the U.S. government required a license for ASML's less advanced DUV immersion machines: the NXT:1980i and the now-retired NXT:1970i. But this license requirement only applied for exports to a select set of advanced fabs—such as SMIC South and its 7 nm lines—as these less-advanced machines are also capable of manufacturing 7 nm node chips, and Chinese fabs may be attempting to use these machines to manufacture even smaller node chips (with significant loss in production efficiency).[108] However, because these less-advanced machines were not restricted country-wide, PRC manufacturers adapted by buying large quantities of the NXT:1980i, purportedly for entities running foundational and legacy chip fabs (as opposed to the advanced fabs). And they bought this machine at scale, nearly tripling their orders for the NXT:1980i between 2023 and 2024, while their orders for the NXT:2100i and 2050i dropped to zero due to export restrictions. PRC manufacturers, such as SMIC, can use these NXT:1980i machines to produce large volumes of advanced semiconductors, including at the 7 nm node. [109] So far it appears that their production of such semiconductors with these machines may be at significantly reduced efficiency and yield.[110] Thus, by acquiring large amounts of these machines—as it already has done and will continue to do if we and allies allow it—the PRC will attempt to manufacture advanced semiconductors even while the CCP pushes and funds Chinese toolmakers to replace ASML within Chinese supply chains.



In September 2024, the Dutch government issued export license requirements for the NXT:1980i and NXT:1970i to all of China, with the U.S. license requirements no longer applicable.[111] Although the Dutch government now has a license requirement for all DUV immersion lithography machines currently in production (the NXT:2100i, NXT:2050i, NXT:2000i, and NXT:1980i) and does not appear to have approved any licenses for the NXT:2000i, NXT:2050i, and NXT:2100i since 2023, the important measure will be whether and how many licenses are granted for exporting the NXT:1980i to the PRC.

The PRC's semiconductor fabricators are also hungry for dry lithography systems, which as noted above are essential to the production of above-40 nm logic chips used in countless electronic devices. This is a sector where the CCP has clear intent to flood overseas markets with overcapacity and gain a strategic chokehold over production by foreign competitors, similar to the leverage they currently enjoy in critical minerals and other industries.

a. **ASML sold a majority of its DUV immersion lithography systems to China in 2024 and a majority of its dry lithography systems to China in 2023 and 2024.**

In 2024, 70% of ASML's sales of DUV immersion lithography systems went to the PRC, along with 64% of ASML's sales of dry lithography machines.[112] The below numbers illustrate this growth trend across these categories of ASML's lithography tool sales to China.

Table 8. Percentage of ASML's Lithography Systems Sales to the PRC (by unit volume)[113]			
Category	*FY2022*	*FY2023*	*FY2024*
DUV immersion lithography	26%	45%	70%
Dry lithography	36%	52%	64%
All lithography[114]	29%	44%	59%

As these numbers show, the PRC bought more and more of ASML's lithography machines between 2022 and 2024, whether it was the most advanced machines they could buy to produce advanced chips, or older models to produce foundational and legacy chips.

ASML is one of the 50 most valuable companies in the world, has a dominant position in its market segment, and in 2024 sold 59% (by unit volume) of its primary product to the PRC—including products that can produce some of the most advanced semiconductors in the world. Note that while ASML's lithography sales to China represent a majority in unit volume, the systems sold are less expensive than ASML's more advanced EUV systems, and accordingly ASML's 2024 sales to the PRC were 36% by revenue compared to 59% by unit volume. ASML has previously publicly confirmed that it plans to continue its sales to China, with ASML's CEO acknowledging in 2024 that he expected demand to remain high in 2025 and China system sales in 2025 to represent "a bit over 25%" of their overall system sales in revenue terms.[115] ASML nearly met this number exactly in Q1 FY2025, with its revenue from China representing 24% of its overall revenue that quarter.[116]

ASML is also selling services to maintain and repair those systems it has already sold.[117] One of seven of its repair centers that ASML highlighted in its 2024 Annual Report is located in the PRC.[118] News reports indicate that this repair center, located in Beijing, is currently undergoing significant upgrades.[119] In 2023 and 2024, ASML submitted multiple U.S. export license applications to send items—under the same license—to SwaySure, SiEn (Qingdao), and ASML's China-based repair subsidiaries as the end users.[120] Of the license application data that the Select Committee reviewed and that included either an ASML repair subsidiary in China and SiEn or SwaySure, none had been approved by BIS at the time the Select Committee reviewed the information.[121] However, these are only those licenses that ASML requested through the United States. As noted, most ASML exports to the PRC, even for entities there restricted by the U.S., do not generally require approval from BIS, as they are exports from the Netherlands and have been exempted from the FDPR. Therefore, the fact that ASML's applications for U.S. export licenses to SwaySure and SiEn had not been approved, denied, or returned without action does not mean ASML has been entirely prevented from providing advanced repair and maintenance services to these companies. Rather,

it suggests that ASML is even trying to use its U.S. subsidiaries to meet the full maintenance needs of SwaySure, SiEn, and other problematic companies in the PRC. Stated plainly, ASML is doing its best to maintain the equipment of Huawei's leading fabricators, which are in turn working very closely with their affiliate, SiCarrier, which is a major competitor of ASML within China. As noted above, this investigation did not address any potentially illegal activity, and this report does not claim or posit that ASML's activity discussed above violated any applicable law.

<u>Key Finding 7</u>. After placing SMIC on the Entity List with a permissive licensing policy in 2020, BIS granted licenses to export SME to SMIC thereafter.

BIS has allowed Toolmakers to ship SME to restricted PRC semiconductor manufacturers, particularly SMIC. BIS placed SMIC on the Entity List in December 2020. However, that Entity Listing included a permissive licensing policy, with a presumption of denial only for SME that was "uniquely required" for 10 nm nodes and below, with all other SME subject to a case-by-case licensing policy.[122]

Data the Select Committee reviewed relating to licenses covered the time period beginning immediately after SMIC's addition to the Entity List – under a permissive licensing policy – up to the launch of this investigation. From January 2021 through December 2024, one Toolmaker requested 196 licenses for exporting controlled items to SMIC or one of its restricted affiliates. Of these, under the permissive licensing policy established in 2020, 110 were approved, 32 were returned without action, 32 remain pending, and only 22 were denied.[123] In a separate example over a similar time period (January 2021 to September 2024, governed by the same permissive licensing policy from 2020), a different Toolmaker requested 66 licenses for exports to SMIC or SMIC affiliates —usually to many affiliates in the same license application.[124] BIS approved 39 of those 66 applications, nine remained pending, 13 were returned without action, and 5 were denied.[125] So in these two Toolmakers' examples, for license applications requesting authorization to export SME to entities that were specifically restricted by BIS for their links to China's military-industrial complex, BIS approved over half of the license applications.

In the instances noted above, the exports to SMIC that BIS approved may have been for foundational or legacy SME and were very likely not for advanced SME (the specific items licensed for export were not specified in data provided to the Select Committee).

RECOMMENDATIONS

The Toolmakers' work has propelled computing power and efficiency all across the world in astounding ways. Their commercial success is a testament to the prosperity and innovation the United States, Japan, and the Netherlands have built and must continue to support. The Toolmakers are selling more and more of their capable tools to the PRC, a designated foreign adversary and strategic competitor to the United States, particularly its SOEs and its most dangerous technology firms. With the PRC now representing such a large share of these Toolmakers' revenues, the CCP is increasingly able to threaten these companies' short-term growth even as it seeks and is taking active steps to replace them in the medium and long term. If these companies will not restrict their own sales, whether for self-interest or the national security interest of the U.S. and her allies, then our governments must do so, including restricting the export of advanced SME (which makes headlines at the leading edge), foundational SME (which forms the bulk behind that spearhead), and components and servicing contracts used to make and support this equipment.

Specifically, **the Select Committee makes nine recommendations to expand export restrictions, improve enforcement, and provide for American and allied technological leadership**: (I) aligning allied export controls with U.S. controls; (II) expanded country-wide controls on SME to China; (III) stricter controls on restricted entities, particularly by increasing controls on non-U.S. Toolmakers; (IV) strengthening anti-diversion measures for any permitted SME exports; (V) restricting the use of Chinese SME; (VI) expanding controls on components crucial to the production of SME; (VII) increasing resourcing and personnel for BIS, as well as for the State Department to improve export control diplomacy and coordination among allies; (VIII) incentivizing private actors to improve export control compliance; and (IX) efforts to ensure continued U.S. and allied innovation and leadership in SME.

I. The Executive Branch should employ incentives and leverage so that our allied and partner nations, particularly the Netherlands and Japan, become fully aligned with U.S. export control policy and enforcement.

This should include: harmonizing restrictions on the export to China of critical SME and components; aligning policies on intellectual property transfers and technical servicing; and establishing joint enforcement mechanisms to prevent circumvention. The Secretary of State, in coordination with the Secretary of Commerce, should assess the extent to which the Netherlands and Japan are complying with existing export-control arrangements with the U.S. and determine what additional actions are necessary to achieve alignment in both policy and enforcement.

Traditional diplomacy by the United States should continue, but creative approaches are needed to identify potential policies to incentivize compliance as well as points of asymmetric leverage that could be effectively employed with allied SME-producing nations. This should include varying instruments across economic sectors where those nations have significant equities. The United States should also account for export control alignment in ongoing trade negotiations. Specific angles to pursue might include offering tariff reductions or more favorable treatment in SME-related areas of trade policy. For example, any finalized deal with the European Union or Japan should include restrictions on ASML's and TEL's ability to sell advanced and foundational SME into China, potentially paired with joint investment into the SME ecosystem across the three markets.

While the main objective behind such coordination and cooperation is to bolster the overall effectiveness of export controls on SME, doing so would have the added benefit of ensuring a more level playing field for U.S. Toolmakers and accelerating the technology ecosystem for all Toolmakers. As shown in this investigation's findings, U.S Toolmakers are more constrained than non-U.S. Toolmakers in exporting SME to China. The United States should ensure that other nations are not undermining U.S. export-control policies. Short-term pain for the SME industry should be borne equally by Toolmakers from all allied SME-producing nations, not by U.S. Toolmakers alone.

Harmonized controls on exports to China country-wide, enforced evenly, would provide Toolmakers with market certainty and predictability that is currently lacking. This would both ensure the effectiveness of national security related controls while resolving the dilemma the Toolmakers currently face: selling to China accelerates Chinese indigenization, leading to a loss of market share to Chinese competitors first in China and then globally.

II. BIS should dramatically expand country-wide controls for the PRC, with a licensing policy of presumption of denial, to apply to *any SME and related components and consumables*, that can be used in an advanced or foundational fab, utilizing FDPR authority if necessary.

Country-wide restrictions are most effective, and they make diversion difficult. Currently, the PRC-wide controls apply to over three dozen chokepoint SME and related components but have been only applied to tools that are necessary for manufacturing *advanced* but not foundational or legacy chips. This narrow application was designed to not impact foundational or legacy production. In doing so, it does not limit advanced production as much as it could and allows increased PRC market share in foundational and legacy production. *Node-agnostic* SME, which is necessary for producing any level of sophistication of chip,

including advanced chips, is not controlled country-wide. We should engage in robust diplomacy to encourage our allies to control such tools country-wide. But if they do not, BIS should thoughtfully and unilaterally control them using FDPR authority, leveraging the new SME FDPR created by BIS in December 2024 that controls any foreign-made SME that contains an integrated circuit made with U.S. technology or software – thus capturing foreign SME in a broad but necessary manner. Because virtually any complex SME contains an integrated circuit, it is straightforward for BIS to apply jurisdiction to such SME even if it is foreign-made. Expanded country-wide controls are essential to prevent the PRC from continuing to buy more SME than any other country. The country-wide controls should potentially include:

- All SME capable of processing 300 mm (i.e., 12-inch) wafers. These wafers are the largest and most advanced and are used widely for fabs producing chips around 90 nm and below, and *exclusively* for advanced and foundational nodes, which are critical for today's military systems. This control would capture every possible tool that can be used in an advanced line and would be virtually impossible to design around. By comparison, the three-dozen-plus country-wide chokepoint controls, while crucially important, include technical parameters that companies can attempt to design around to achieve advanced capabilities.[126] Licenses should be approved only in cases where a Chinese company makes a substantial quantity of a comparable tool.
- All node-agnostic SME that the U.S. government has already identified as chokepoints. This list, which BIS produced for a set of fab-specific but not PRC-wide restrictions,[127] is contained in Export Control Classification Numbers (ECCN) 3B993 and 3B994, covering ion implanters, etchers, deposition tools, annealing tools, cleaning tools, process control tools, and lithography tools (including less advanced DUV immersion lithography including the ASML NXT:1980i and 1970i, as well as older immersion tools no longer in production). The NXT:1980i and 1970i are controlled to advanced logic fabs (14 nm and below) because they can help achieve up to 7 nm production, but the PRC continues to stockpile them, purportedly for legacy fabs (as they are useful for 28 nm fabs), and could be diverting them to advanced production. A country-wide restriction is the most direct way to prevent this outcome. Controls on 300 mm-capable SME tools would cover many but not all tools listed in 3B993, making it necessary to pursue both controls.

- More chokepoint components and consumables necessary for producing advanced SME and chips. This should include applying the FDPR to all PRC-based SME companies on the Entity List.

These restrictions would not only protect the national security of the United States, but also that of the Netherlands and Japan. As shown above, these controls would work most effectively if applied directly by our allies in Amsterdam and Tokyo, following diplomatic engagement and coordination with the U.S. government. However, as Chairman Moolenaar and Ranking Member Krishnamoorthi wrote in private letters to the Japanese and Dutch governments in October 2024, while "[w]e acknowledge and commend [your countries'] role[s] as . . . longstanding partner[s] of the United States on PRC-focused export controls and recognize the perceived cost of enacting SME export controls . . . the success of our multilateral controls depends on our ability to rapidly update and strengthen them to get ahead of PRC efforts to circumvent them. If our multilateral controls take a year or more to update, their effectiveness will be eroded."[128]

III. BIS should expand the list of restricted entities, while ensuring *all* allied SME is prohibited from these entities to match current U.S. controls, with a licensing policy of presumption of denial. While diplomatic alignment is preferred, we should be prepared to use the FDPR rule if necessary.

The threshold for automatically adding a logic chip manufacturer to the Entity List should be scaled up from the current ≤16/14nm node threshold to ≤45 nm, which military systems are critically reliant on. Expanding controls will help degrade the PRC's military capabilities while ensuring that U.S. and allied militaries do not become reliant on PRC legacy chips. 2) BIS should add the CXMT and logic chip manufacturers meeting these thresholds to the Entity List. 3) controls should include exports of all U.S. and allied SME to all restricted entities and restrictions on allied servicing and persons' support for *advanced* entities. Allies should institute these controls. If the preferred path of diplomacy does not achieve this, BIS should unilaterally control foreign tools using the FDPR, leveraging the new Footnote 5 FDPR created by BIS in December 2024 that controls any foreign-made SME which contains an integrated circuit made with U.S. technology or software. And BIS should implement restrictions on servicing by foreign persons by issuing guidance emphasizing the applicability of General Prohibition 10, i.e., that advanced PRC fabs have likely acquired SME and related components in violation of export controls[129] and/or are likely to produce chips in violation of export controls,[130] thus imposing a requirement to have a license in order to "service" or "use" SME or components installed in PRC fabs. BIS could consider granting such licenses, but should only do so where such servicing is

necessary to and capable of ensuring the integrity of the underlying export-controlled item, such as some lithography machines.

IV. BIS should pursue five measures to prevent diversion of SME that remains permitted for sale to the PRC.

First, BIS should ensure any subsidiary or affiliate of a PRC fab on the Entity List or subject to advanced-node end-use controls is automatically subject to same restrictions. This would be a lower threshold than the 50 percent ownership requirement in BIS's recently published Affiliates Rule which applies globally.[131] Second, BIS should require all SME exporters to sell SME only to final, ultimate end users, with rigorous requirements that the SME companies perform routine inspections in fabs to verify that the SME is being used only for unrestricted levels of production. Third, BIS should require all SME exporters to provide notifications to BIS about SME being exported, modeled off of the notification requirements in License Exception Restricted Fabrication Facility (RFF). Fourth, BIS should mandate the use of location-tracking technology in appropriate SME so that SME companies can continually verify locations of SME and report those locations to BIS in instances where suspected violations have occurred. Fifth, BIS should increase enforcement under its "knowledge" standard, ensuring that companies cannot allow their products to enter China in violation of export controls but avoid any repercussions for these violations simply because there is an intermediary actor as a middleman in a third country.

V. BIS should prohibit any fabs worldwide using U.S. and allied SME from using Chinese SME.

The PRC will follow the CCP playbook of selling abroad at below-market pricing driven by Chinese state subsidies to undercut and dominate global markets and displace the Toolmakers. BIS should act now to restrict the use of PRC SME outside of the PRC. First, BIS should require, as a condition for export of U.S. SME, that PRC SME cannot be used in the same fab anywhere in the world. As discussed above, given the necessary servicing contracts to support SME, the presence of PRC SME in the same fab provides PRC-based personnel with access to these sensitive facilities. Second, BIS should initiate an investigation of imports of PRC SME into the United States, via its Information and Communications Technology and Services (ICTS) authorities.[132] Third, BIS should focus its Section 232 investigation on PRC SME while exempting allied SME. This would strengthen imports from the non-U.S. Toolmakers and expand other markets for SME as the PRC market closes. Exempting allied SME would also counteract potential for rising costs for the ongoing U.S. fab buildout.

VI. BIS should restrict the export of components that are important to the production of SME.

BIS should issue a Notice of Proposed Rulemaking (NPRM) and seek comment from the SME industry, particularly regarding which components are crucial for SME. This NPRM should include the option for confidential submissions from these companies regarding critical components, given the commercially sensitive nature of details about their supply chains. Resulting restrictions and lists of important components should be updated annually with industry input to ensure these restrictions keep pace with rapidly developing technology in the production of semiconductors.

These six measures would dramatically enhance our national security by addressing the PRC's production of advanced and foundational chips and the SME itself. Unless the PRC entirely adjusts its military posture and improves its human rights record, the U.S. and our allies have no choice but to take action to ensure our innovation is not perpetuating great harms.

- Without the tens of billions of dollars of SME that these five Toolmakers sell to the PRC every year, the PRC's production of advanced chips – essential to the CCP's next-generation AI applications that threaten our military forces and human rights around the world – would grind to a halt, and the growth in its production of foundational chips would cease. Combined with restrictions on the exports of advanced chips, the data and computing centers that are the planned fuel of the PLA's "intelligentized" warfare concept would be unable to expand and the CCP eventually would burn through its existing stocks of advanced chips, giving us the necessary time to invest in our own semiconductor production capacity and reinforce our lead.

- Robust U.S. and allied restrictions on SME exports to the PRC – and import restrictions on the use of Chinese SME outside of China – could even slow the PRC's dangerous trend of SME indigenization by decreasing the number of semiconductor manufacturers available both inside and outside the PRC as customers to Chinese SME companies. SME makers in the PRC cannot succeed without customer scale and continual customer adoption and engineering feedback. This helps them develop extensive know-how to produce and refine their machines to reliably and cost-effectively produce advanced chips at commercial volumes.[133] To effectively address the profound national security threat posed by the

PRC's SME indigenization, a wide range of restrictions on the export of SME to all of the PRC is critical. Controls on only a limited set of SME creates a market opening for PRC SME makers to indigenize only small amounts of controlled SME to sustain Chinese volume chip production. Then Chinese SME companies will slowly work to replace more U.S. and allied SME in fabs one-by-one, while benefiting from the learning opportunities of working with high-volume PRC fabs. Comprehensive SME export controls and import restrictions on Chinese SME will foreclose this strategy by forcing the PRC to attempt to indigenize every type of SME at once, while facing a declining PRC fab market within which to innovate and experiment.

- Restricting components used to make SME will slow Chinese companies from indigenizing their own SME to replace the Toolmakers in Chinese fabs. SME companies make only some components in-house, and often source half or more from third-party vendors. Denying access to these components will force Chinese SME makers to indigenize more components to produce their SME.

In addition to these restrictions, we need to invest in programs, ideas, and talent that enable the U.S. and allies to maintain semiconductor leadership over the PRC and ensure that sensitive semiconductor technology does not fall into the hands of the PRC for use in ways that harm our national security and foreign policy interests. The U.S. and allies only have the ability to export-control SME because we collectively are the world's leading innovators in SME. We must double down on our success.

VII. Congress should enact legislation to bolster BIS's resources and personnel.

BIS needs dramatically expanded appropriations to expand its enforcement and analytic capacity, and to modernize its IT systems. Second, BIS needs more flexible hiring authorities to better attract top experts and build BIS into a top hub of U.S. government national security policymaking, technical analysis, and strategic foresight. Third, BIS simply needs more people, and the number of attorneys, enforcement professionals, and other relevant staff dedicated to the PRC mission should be significantly increased, without cuts elsewhere.

Congress should also surge resources and personnel to other agencies that are key to executing robust SME export controls, including the State Department given its central role in facilitating coordination between the U.S., Japan, and the

Netherlands and the Intelligence Community given its essential function in helping BIS understand the threat landscape. We should also offer U.S. government expertise to the Dutch and Japanese governments, to ensure our common understanding of the profound nature of the threat posed by the CCP's semiconductor strategy to their own national security interests.

VIII. Congress should enact bipartisan legislation to create a new export control whistleblower incentive program to financially incentivize insiders – including in the PRC itself – to bring information about serious violations to BIS's attention.

IX. Congress and other export control policymakers should support SME firms in the U.S. and our allied nations.

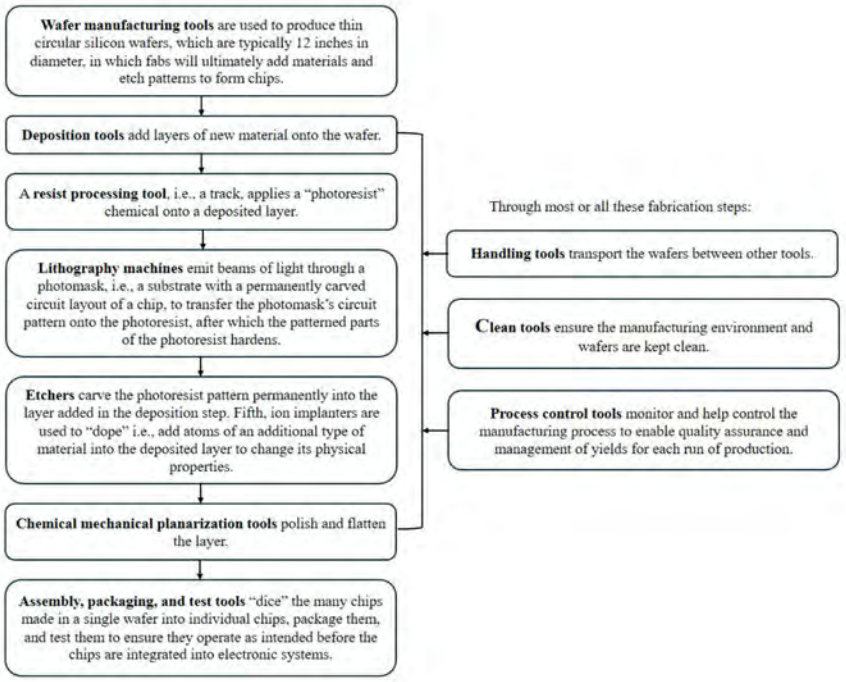
U.S. and allied nations' SME firms must thrive even in an environment where they no longer sell massive quantities of SME to the PRC in a manner that threatens our national security. BIS, the National Security Council, and other makers of export control policy should establish a regular schedule for communicating with U.S. and allied SME firms. This should improve communication of policymakers' concerns about specific potential customers of SME firms, policymakers' proposed intent for future policy, SME firms' technical expertise regarding the criticality of particular technologies and components, and SME firms' experiences with current and proposed export controls. To provide for a steady pipeline of talent, Congress should pass legislation to ensure communities where SME and other semiconductor firms are located have robust vocational training programs, and to attract the world's top talent to work at U.S. SME firms.

CONCLUSION

The PRC is already fervently seeking to build a world-leading semiconductor manufacturing industry from raw materials through SME to finished product. The CCP, its SOEs, and its vassal national champions will continue striving for this goal regardless of any export restrictions or relaxations thereof. Their achievement of this goal would cause great harm to our national security, our fundamental interests, and human rights. Thus, the United States and our allies should ensure the CCP's pursuit of this goal is as challenging and expensive as possible. Forcing the CCP to rely on SME built in the PRC will both slow its domestic manufacturing of advanced semiconductors and make more difficult and costly its bid to build highly advanced SME. The CCP has openly declared since at least 2015 its intent to be a world-leading manufacturer of the most advanced SME – and to supplant U.S. and allied Toolmakers as global leaders. It is far past time that the Toolmakers start treating the CCP and its national champions as threats to their corporate longevity, rather than as valued customers. And since they have not yet done so, it is imperative that the governments of the United States, the Netherlands, and Japan prevent the Toolmakers and aspiring competitors from selling to our adversaries the tools to build their own foundries for forging the means with which they would seek military supremacy, promote digital authoritarianism globally, and sink the world into a new dark age, made more sinister and more protracted by the technologies these foundries will place in the hands of the Chinese Communist Party.

Appendix 1: Types of semiconductor manufacturing equipment

Manufacturing a single chip requires over a hundred different pieces of SME, including for the following key steps in the manufacturing process:



[1] These companies are: Applied Materials, Inc. (Applied), Advanced Semiconductor Materials Lithography (ASML), KLA Corporation (KLA), Lam Research Corporation (Lam), and Tokyo Electron Ltd. (TEL).
[2] The 2024 revenue numbers represent the sum of each Toolmaker's revenue in its fiscal year 2024, with one Toolmaker's data representing its calendar year rather than fiscal year. The time periods for each company's fiscal year 2024 do not necessary overlap precisely with each other or with calendar year 2024. As also noted in the Scope of Investigation, financial or other information regarding the Toolmakers in this report that refers to a year is generally referring to a fiscal year.
[3] Where companies' fiscal year end dates differed, data was characterized to prioritize capturing change or continuity within an individual company year-over-year rather than change or continuity in the given calendar year. One company's data is based upon calendar year data rather than its fiscal year data. Where data was only available for part of a fiscal year, such data was annualized for comparison purposes.
[4] ASML and TEL provided figures in Euros and Japanese Yen, respectively. Findings in this report reflect conversion of these figures to U.S. Dollars using a conversion rate of 1.14 Euros to USD and 0.0071 Japanese Yen to USD. Statements about data combined across companies represent an averaging of the two companies' gross financials from each company's individual fiscal year (i.e. not adjusted to align calendar year data across the companies). Any percentage or share of revenue calculation is a percentage of the absolute financial numbers against each other, not an average of each company's percentage shares (i.e. it is weighted to account for companies' different amounts of revenue).
[5] Each Toolmaker stated that its respective operations fully complied with or had sufficient procedures in place to comply with applicable export controls.
[6] These categories generally align with U.S. policy, as current U.S. export control primarily restrict chips at the "advanced" thresholds, as discussed in Finding 1.
[7] In 2024, ASML sold 583 total units (of them 418 were lithography systems) for 21.8 billion Euros of system sales revenue, averaging a per-unit revenue of $42.4 million, which includes a high number of lower cost systems such as dry lithography machines. *See* ASML Holding NV, *Statutory Interim Report 2025*, Jul. 16, 2025, available at https://ourbrand.asml.com/m/35105224f04184ea/original/Statutory-Interim-Report-2025.pdf .
[8] SEMI, *Global Semiconductor Equipment Billings Surged to $117 Billion in 2024, SEMI Reports*, Apr. 9, 2025, available at https://www.semi.org/en/semi-press-release/global-semiconductor-equipment-billings-surged-to-117-billion-dollars-in-2024-semi-reports (for the overall market size of $117.1 billion in 2024, compared to the $97.5 billion for the 5 companies in our dataset).
[9] David Keohane & Kana Inagaki, *Canon Plans to Disrupt Chipmaking with Low-Cost "Stamp" Machine, Ars Technica*, Jan. 29, 2024, available at https://arstechnica.com/reviews/2024/01/canon-plans-to-disrupt-chipmaking-with-low-cost-stamp-machine/.
[10] China's State Strategic Advisory Committee for Building China into a Manufacturing Superpower set out the "Roadmap of Major Technical Domains for *Made in China 2025*" on 29 October 2015, available at https://cset.georgetown.edu/wp-content/uploads/t0181_Made_in_China_roadmap_EN.pdf.
[11] *Id.*
[12] Gregory C. Allen, *The True Impact of Allied Export Controls on the U.S. and Chinese Semiconductor Manufacturing Equipment Industries*, Ctr. for Strategic & Int'l Studies, Nov. 26, 2024, available at https://www.csis.org/analysis/true-impact-allied-export-

controls-us-and-chinese-semiconductor-manufacturing-equipment; Stephen Ezell, *How Innovative Is China in Semiconductors?*, Info. Tech. & Innovation Found., Aug. 19, 2024, available at https://itif.org/publications/2024/08/19/how-innovative-is-china-in-semiconductors/.

[13] Documents on File with the Select Committee.

[14] The State Strategic Advisory Committee for Building China into a Manufacturing Superpower, *Roadmap of Major Technical Domains for Made in China 2025*, trans. Center for Security and Emerging Technology Oct. 29, 2015, available at https://cset.georgetown.edu/wp-content/uploads/t0181_Made_in_China_roadmap_EN.pdf. Chart is adapted from graphics contained in the cited document.

[15] Reuters*, China Sets Up Third Fund With $47.5 Billion to Boost Semiconductor Sector*, May 27, 2024, available at https://www.reuters.com/technology/china-sets-up-475-bln-state-fund-boost-semiconductor-industry-2024-05-27/

[16] Economist Intelligence Unit, *China Boosts State-Led Chip Investment*, Mar. 13, 2024, available at https://www.eiu.com/n/china-boosts-state-led-chip-investment/.

[17] ASML Holding N.V., *2024 Annual Report* (U.S. GAAP basis) (2024), available at https://ourbrand.asml.com/m/79d325b168e0fd7e/original/2024-Annual-Report-based-on-US-GAAP.pdf.

[18] *Id.*

[19] Documents on File with the Select Committee; **申請號** (Application Number) CN202110524685.X, **中國國家知識**產權局 (China National Intellectual Property Administration), **發明專利申請** (Patent Application) (filed 2021).

[20] Will Hunt, Saif M. Khan & Dahlia Peterson, *China's Progress in Semiconductor Manufacturing Equipment: Accelerants and Policy Implications*, Center for Security and Emerging Technology, Georgetown University, Mar. 2021, available at https://cset.georgetown.edu/publication/chinas-progress-in-semiconductor-manufacturing-equipment/..

[21] *See* supra note 14.

[22] Eleanor Olcott et.al., *Satellite Images Reveal Huawei's Advanced Chip Production Line in China*, Fin. Times, May 4, 2025, available at https://www.ft.com/content/afd618f8-12c9-4297-b2a9-49f7dc548da4; Bloomberg News, *Key Taiwan Tech Firms Helping Huawei With China Chip Plants*, Oct. 2, 2023, available at https://www.bloomberg.com/news/articles/2023-10-03/taiwan-tech-companies-are-helping-huawei-build-a-secretnetwork-of-chip-plants?embedded-checkout=true; Baidu Knowledge, *HW and the Chinese Academy of Sciences jointly applied for a new type of Dram patent*, May 2023, available at https://tieba.baidu.com/p/8408915949; Baidu Knowledge, *Is Shengweixu related to Huawei?* Apr. 2, 2024, available at https://zhidao.baidu.com/question/251654298276890444.html.

[23] Protecting Against National Security Threats to the Communications Supply Chain Through FCC Programs—Huawei Designation, Order, PS Docket No. 19-351, DA 20-690, Jun. 30, 2020, available at https://www.fcc.gov/document/fcc-designates-huawei-national-security-threat; Katie Bo Lillis, *FBI Investigation Determined Chinese-Made Huawei Equipment Could Disrupt US Nuclear Arsenal Communications*, CNN, Jul. 25, 2022, available at https://www.cnn.com/2022/07/23/politics/fbi-investigation-huawei-china-defense-department-communications-nuclear.

[24] Mercedes Ruehl and James Kynge, *Huawei's Red Hot Semiconductor Acquisition Trail*, Fin. Times, Jan. 13, 2021, available at https://www.ft.com/content/12d07421-76eb-4f6b-b11f-3569cf88c2c9; Itsuro Fujino, *Huawei Invested in 60-Plus China Chip Firms Since U.S. Sanctions*, Nikkei Asia, May 30, 2025, available at

https://asia.nikkei.com/Spotlight/Huawei-crackdown/Huawei-invested-in-60-plus-China-chip-firms-since-US-sanctions.

[25] The 16/14 nm node for logic, broadly commercialized in the mid-2010s, represents a cutline for advanced chips due to the follow reasons. First, it involves a technological step change involving the use of FinFETs (i.e. the first type of more complex-shaped "non-planar" transistors). Second, the PRC continues to have limited wafer fab capacity at this level. Third, it is the technology level relevant to advanced computing chips such as GPUs. Most of the world's logic wafer capacity remains at nodes above 16/14 nm, since older logic nodes remain commercially viable even as the technology frontier advances. By contrast, memory fabs are continually upgraded over time, so the memory thresholds—even though they represent the technology frontier of the late 2010s to early 2020s—generally capture most memory production in China. The DRAM threshold covers chips meeting any of three distinct parameters to cover advanced nodes and HBM: "A memory cell area of less than 0.0026 μm^2; (ii) A memory density greater than 0.20 gigabits per square millimeter; or (iii) More than 3000 through-silicon vias per die." *See* the EAR definition of "Advanced-node Integrated Circuits (Advanced-Node IC" for all advanced-node thresholds in https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-772/section-772.1.

[26] These are found in BIS Export Control Classification Numbers (ECCNs) 3B001 and 3B002. 15 C.F.R. § 774 Supp. No. 1 (2025), available at https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-774.

[27] Foreign-Produced Direct Product Rule Additions, and Refinements to Controls for Advanced Computing and Semiconductor Manufacturing Items, 89 Fed. Reg. 96,790, Dec. 5, 2024, available at https://www.federalregister.gov/documents/2024/12/05/2024-28270/foreign-produced-direct-product-rule-additions-and-refinements-to-controls-for-advanced-computing.

[28] Gregory C. Allen, *CSIS Translation: Updated Japanese Export Controls on High-Performance Semiconductor Manufacturing Equipment*, Center for Strategic and Int'l Studies, Jul. 18, 2023, available at https://csis-website-prod.s3.amazonaws.com/s3fs-public/2023-07/230718_CSISTranslations_JapaneseExportControls_0.pdf; Ministerial Order Amending the Advanced Semiconductor Manufacturing Equipment Regulation, Stcrt. 2025, 1894 (Neth.), available at https://zoek.officielebekendmakingen.nl/stcrt-2025-1894.html.

[29] *Id.*

[30] Advanced node-agnostic SME is SME that is used for advanced production, but also necessary for foundational or legacy production. Therefore, controlling it China-wide would impact legacy non-advanced production. This SME is distinct from the over three dozen types of advanced SME necessary *only* for advanced production and controlled China-wide.

[31] Affiliates of entities on these lists are not necessarily subject to the same restrictions as the listed entities themselves. As discussed in this report, BIS's recently published Affiliates Rule does explicitly subject companies owned 50% or more by a listed entity to the same restrictions as that listed entity.

[32] Bureau of Industry and Security, *Guidance on End-User and End-Use Controls and U.S. Person Controls*, U.S. Dep't of Commerce, available at https://www.bis.gov/licensing/guidance-on-end-user-and-end-use-controls-and-us-person-controls.

[33] William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116-283, § 1260H, 134 Stat. 3965, 4190 (2020).

[34] 90 Fed. Reg. 47,201.

[35] *Id.*

[36] 89 Fed. Reg. 96,790.

[37] Bureau of Industry and Security FY26 Budget: Export Controls and the AI Arms Race, Hearing Before the Subcomm. On South and Central Asia of the H. Comm. On Foreign Affs., 119th Cong., Jun. 12 2025, video at https://foreignaffairs.house.gov/committee-activity/hearings/bureau-of-industry-and-security-fy26-budget-export-controls-and-the-ai-arms-race.
[38] Zijing Wu & Eleanor Olcott, *Huawei Improves AI Chip Production in Boost for China's Tech Goals,* Fin. Times, Feb. 24, 2025, available at https://www.ft.com/content/f46b7f6d-62ed-4b64-8ad7-2417e5ab34f6. Specifically, this source suggests Huawei will produce 300,000 Ascend 910Bs and 100,000 Ascend 910Cs. Given that 910Bs are half as powerful as 910Cs, the aggregate number of 910C-equivalents is 250,000 (i.e. 150,000 plus 100,000).
[39] Dylan Patel, AJ Kourabi, Myron Xie, & Jeff Koch, *Huawei Ascend Production Ramp: Die Banks, TSMC Continued Production, HBM is The Bottleneck*, September 8, 2025, available at https://semianalysis.com/2025/09/08/huawei-ascend-production-ramp.
[40] Barath Harithas, The AI Diffusion Framework: Securing U.S. AI Leadership While Preempting Strategic Drift, Center for Strategic and International Studies (CSIS), Feb. 18, 2025, available at https://www.csis.org/analysis/ai-diffusion-framework-securing-us-ai-leadership-while-preempting-strategic-drift.
[41] The Huawei Ascend 910C achieves up to 800 16-bit TeraFLOPS, while the B100 achieves 1,750 16-bit TeraFLOPS, the B200 achieves 2,250-2,500 16-bit TeraFLOPS, and the B300 includes 50% more performance than the capability of B200s for 4-bit computations.
[42] Some of the Toolmakers stated that this significant increase in 2023 and 2024 resulted from some non-PRC customers of the Toolmakers reducing capital expenditures in 2023 and accordingly reducing their purchases from the Toolmakers. To make up for this lost revenue, the Toolmakers began shipping backlogged orders from 2021 and 2022 to customers in China.
[43] Documents on File with the Select Committee.
[44] Reuters, *ASML CEO: Would not change 2030 growth targets if China excluded*, Reuters, Nov. 11, 2022, available at https://www.reuters.com/technology/asml-ceo-would-not-change-2030-growth-targets-if-china-excluded-2022-11-11/.
[45] Ian Cohen, *KLA Looking to Repurpose Products, Expecting Revenue Hit from Chip Controls*, Communications Litigation Today, Oct. 28, 2022, available at https://communicationslitigationtoday.com/article/2022/10/28/kla-looking-to-repurpose-products-expecting-revenue-hit-from-chip-controls-2210270018?BC=bc_6748553a432ac. The full quote from Mr. Wallace is as follows: "[T]his is not an area where we're going to provide much insight. I think from the standpoint, I think what you mean is that we see the Memory restrictions coming, right, because we talked about the Logic ones. We were not surprised by the export controls that were implemented. And as we've mentioned, we've been working with the government officials as they've implemented those. So we're not surprised by that. When I talk to customers about their plans in China, I think, a lot of what they're doing is trying to figure out what are the implications of those extensions and what's the long-term viability. So I would say that it's a much better question to ask them than us. And ultimately, from our standpoint, frankly, it doesn't matter that much because if they choose not to invest there, what they're doing is investing to support demand and they'll move that investment to where they could do it."
[46] Documents on File with the Select Committee.
[47] U.S. Department of Defense, *Entities Identified as Chinese Military Companies Operating in the United States*, Jan. 7, 2025, available at https://media.defense.gov/2025/Jan/07/2003625471/-1/-1/1/ENTITIES-IDENTIFIED-

AS-CHINESE-MILITARY-COMPANIES-OPERATING-IN-THE-UNITED-STATES.PDF.

[48] Peter Elstron & Allen Wan, *China Secretly Transforms Huawei Into Most Powerful Chip War Weapon*, Bloomberg, Dec. 1, 2023, available at https://www.bloomberg.com/graphics/2023-china-huawei-semiconductor/.

[49] H. Select Committee on China, *Letter to Commerce Secretary Gina Raimondo Urging Action Against Huawei's Clandestine Chip Network*, Oct. 16, 2024, available at https://selectcommitteeontheccp.house.gov/media/letters/letter-secretary-raimondo-urging-action-against-huaweis-clandestine-chip-network

[50] Cheng Ting-Fang & Lauly Li, *Huawei Ramps Up Chip Investment in Fight for Survival*, Nikkei Asia, Jan. 13, 2021, available at https://asia.nikkei.com/Spotlight/Huawei-crackdown/Huawei-ramps-up-chip-investment-in-fight-for-survival.

[51] *See* supra note 22.

[52] Id.

[53] International Department of the Central Committee of the Communist Party of China, *Full Text of the Report to the 20th National Congress of the Communist Party of China*, Oct. 2022, available at https://www.idcpc.org.cn/english2023/tjzl/cpcjj/20thPartyCongrssReport/.

[54] "Intelligentized warfare" is also noted in the U.S. DOD's annual China Military Power Report as the PLA's "vision of future conflict" that is "defined by the expanded use of AI, quantum computing, big data, and other advanced technologies at every level of warfare." *See* U.S. Department of Defense, Military and Security Developments Involving the People's Republic of China 2024, Dec. 18, 2024, available at https://media.defense.gov/2024/Dec/18/2003615520/-1/-1/0/MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA-2024.PDF.

[55] Koichiro Takagi, "Is the PLA Overestimating the Potential of Artificial Intelligence?" *Joint Force Quarterly* 116, available at https://digitalcommons.ndu.edu/cgi/viewcontent.cgi?article=1189&context=joint-force-quarterly.

[56] Josh Chin, *China Is Using the Private Sector to Advance Military AI*, Wall St. J., Sept. 3, 2025, available at https://www.wsj.com/world/china/china-military-ai-partners-7836a2bc?gaa_at=eafs&gaa_n=ASWzDAi-6zKCJJ17DiQ9t2RVmFJnyzAsDC-F8oLZRocrUXI1KSsIoSIsbpanouPmkF4%3D&gaa_ts=68bf35eb&gaa_sig=T51JJAbar5D7ii3ds0DxXbH-dMXG_S8Jv_G6w_9coWTnhw6E6lonQuOZRFfBSQzSrg9kfe5Pcx3kLxnkItla6Q%3D%3D.

[57] *Id.*

[58] *See* supra notes 53 and 54.

[59] U.S. Department of Commerce, Bureau of Industry and Security, *Additions and Revisions to the Entity List and Conforming Removal from the Unverified List*, Dec. 19, 2022, available at https://www.federalregister.gov/documents/2022/12/19/2022-27151/additions-and-revisions-to-the-entity-list-and-conforming-removal-from-the-unverified-list.

[60] Nuzigum Setiwaldi, *Surveillance Tech Series: Hikvision's Links to Human Rights Abuses in East Turkistan*, Uyghur Human Rights Project, Oct. 17, 2023, available at https://uhrp.org/report/hikvisions-links-to-human-rights-abuses-in-east-turkistan/; Mike Gallagher & Raja Krishnamoorthi, *Letter to FBI Director Christopher Wray Requesting Briefing on CCP Espionage Activities on U.S. Military Bases*, House Select Committee on the Chinese Communist Party, July 15, 2025, available at https://selectcommitteeontheccp.house.gov/sites/evo-

subsites/selectcommitteeontheccp.house.gov/files/evo-media-document/07.15.25_letter-to-fbi.pdf.

[61] Documents on File with the Select Committee.

[62] Cheng Ting-Fang & Lauly Li, *China's Sicarrier Emerges as Challenger to ASML, Other Chip-Tool Titans, Nikkei Asia*, Nov. 8, 2025, available at https://asia.nikkei.com/business/tech/semiconductors/china-s-sicarrier-emerges-as-challenger-to-asml-other-chip-tool-titans.

[63] Barry Collins, *Huawei Sells Honor: But Will the U.S. Let It Back In?,* Forbes, Nov. 17, 2020, available at https://www.forbes.com/sites/barrycollins/2020/11/17/huawei-sells-honor-but-will-the-us-let-it-back-in/.

[64] *China Chipmaker PXW May Help Huawei Get Around U.S. Sanctions*, Bloomberg News, Oct. 5, 2022, available at https://www.bloomberg.com/news/articles/2022-10-05/secretive-chip-startup-may-help-huawei-circumvent-us-sanctions; Shanghai Stock Exchange, *Yaxiang System Integration Technology (Suzhou) Co., Ltd. 2022 Annual Report* (亚翔系统集成科技（苏州）股份有限公司 2022 年年度报告), Mar. 10, 2023, available at https://static.sse.com.cn/disclosure/listedinfo/announcement/c/new/2023-03-10/603929_20230310_DTHM.pdf.

[65] Bureau of Industry and Security, Department of Commerce, *Additions and Modifications to the Entity List; Removals From the Validated End-User (VEU) Program*, Federal Register, Dec. 5, 2024, available at https://www.federalregister.gov/documents/2024/12/05/2024-28267/additions-and-modifications-to-the-entity-list-removals-from-the-validated-end-user-veu-program.

[66] Che Pan et al*., SiCarrier, Huawei Partner in Chips, Seeks $2.8 Billion in Funds, Sources Say*, Reuters, May 13, 2025, available at https://www.reuters.com/world/china/sicarrier-huawei-partner-chips-seeks-28-billion-funds-sources-say-2025-05-13/.

[67] Applied Materials, Inc., *Form 10-Q for the Quarterly Period Ended July 28, 2024*, Jul. 28, 2024, available at https://www.sec.gov/Archives/edgar/data/6951/000000695124000032/amat-20240728.htm.

[68] Cheng Ting-Fang, *Huawei-linked Chip Chemical Supplier Aims to Replace Shin-Etsu, JSR, DuPont,* Nikkei Asia, May 28, 2025, available at https://asia.nikkei.com/Spotlight/Supply-Chain/Huawei-linked-chip-chemical-supplier-aims-to-replace-Shin-Etsu-JSR-DuPont; Zhuhai Cornerstone Technology Co., Ltd. [珠海基石科技有限公司], Chinese Corporate Disclosures, accessed 2024-12-05.

[69] *Id*.

[70] **申請號** (Application Number) CN119920673A, 中國國家知識產權局 (China National Intellectual Property Administration), **發明專利申請** (Patent Application), Plasma Processing Device and Etching Equipment (filed Dec. 12, 2024) (published May 2, 2025); Shenzhen Xinkailai Industrial Machinery Co., Ltd. [深圳市新凯来工业机器有限公司], Chinese Corporate Disclosures, 2024-12-24.

[71] Zijing Wu & Eleanor Olcott, *China trials its first advanced tools for AI chipmaking*, Financial Times, available at https://www.ft.com/content/8fd79522-e34f-4633-bc87-ef0aae2d9159; Shanghai Yuliangsheng Technology Co., Ltd. [上海宇量昇科技有限公司], Chinese Corporate Disclosures, accessed 2024-12-05.

[72] *See* supra note 48; ZETOP Technologies Co., Ltd. [长光集智光学科技有限公司], Chinese Corporate Disclosures, accessed 2024-12-05.

[73] All the entities highlighted in red except for PXW were a top 30 customer in China of all five Toolmakers. PXW has been a top 30 customer in China of only the non-U.S.

Toolmakers. Chinese Corporate Disclosures for respective entities. Documents on File with the Select Committee.
[74] Documents on File with the Select Committee.
[75] Department of Defense, *Notice of Availability of Designation of Chinese Military Companies*, Federal Register, Jan. 7, 2025, available at https://www.federalregister.gov/documents/2025/01/07/2025-00070/notice-of-availability-of-designation-of-chinese-military-companies.
[76] Changxin Jidian (Beijing) Memory Technology Co., Ltd. [长鑫集电（北京）存储技术有限公司], Chinese Corporate Disclosures, 2024-06-19; Documents on File with the Select Committee.
[77] Changxin Jidian (Beijing) Memory Technology Co., Ltd. [长鑫集电（北京）存储技术有限公司], Chinese Corporate Disclosures, 2024-06-19; Changxin Technology Group Co., Ltd. [长鑫科技集团股份有限公司], Chinese Corporate Disclosures, 2024-06-11.]
[78] Fanny Potkin & Eduardo Baptista, *Chinese Firms Make Headway in Producing High Bandwidth Memory for AI Chipsets*, May 14, 2024, available at https://www.reuters.com/technology/chinese-firms-make-headway-producing-high-bandwidth-memory-ai-chipsets-2024-05-14/?.
[79] *See* supra note 37.
[80] *See* supra note 22.
[81] Shenzhen Pengxinwei IC Manufacturing Co. [深圳市鹏芯微集成电路制造有限公司], Chinese Corporate Disclosures, 2022-07-04.
[82] Documents on File with the Select Committee.
[83] Documents on File with the Select Committee.
[84] ASML and TEL are subject to Dutch and Japanese export controls, respectively, for most of their exports. A smaller subset of their activities which involve items subject to the U.S. Export Administration Regulations (EAR) is subject to U.S. export controls.
[85] *See* supra note 33; Bureau of Industry and Security, *Entity List* (Supplement No. 4 to Part 744 of the Export Administration Regulations), available at https://www.ecfr.gov/current/title-15/subtitle-B/chapter-VII/subchapter-C/part-744/appendix-Supplement%20No.%204%20to%20Part%20744; Office of Foreign Assets Control, *Chinese Military Companies Sanctions*, Dec. 16, 2021, available at https://ofac.treasury.gov/sanctions-programs-and-country-information/chinese-military-companies-sanctions.
[86] There are two definitions of sales to restricted entities, as discussed elsewhere. The first definition encompasses sales to entities which were restricted as of February 2025 and in some cases June 2025. The second definition encompasses only sales to entities which were restricted at the time the sale was made. Under both definitions, TEL and ASML sales greatly increased. Under the first definition, U.S. Toolmakers' sales decreased, while under the second definition they remained roughly steady (growing a total of 16% over 2 years).
[87] Documents on File with the Select Committee.
[88] Documents on File with the Select Committee.
[89] Documents on File with the Select Committee. This excludes Applied Materials as its provided data in this category reflects revenue from companies that were restricted entities as of November 2024 and does not include known affiliates of listed entities. For the other Toolmakers, provided data reflects revenue from companies that were restricted entities as of February 2025 and includes known affiliates of listed entities.
[90] Documents on File with the Select Committee.
[91] *See supra* note 84.
[92] As also noted in note 89, this excludes Applied Materials as its provided data in this category reflects revenue from companies that were restricted entities as of November

2024 and does not include known affiliates of listed entities. For the other Toolmakers, provided data reflects revenue from companies that were restricted entities as of February 2025 and includes known affiliates of listed entities.
[93] Documents on File with the Select Committee.
[94] Documents on File with the Select Committee.
[95] Documents on File with the Select Committee.
[96] Data provided by Applied Materials only reflected revenue from transactions with entities that were listed as restricted entities as of November 2024. Accordingly, the figure for Applied is not limited to revenue only from those entities that were restricted at the time of sale.
[97] Documents on File with the Select Committee.
[98] Documents on File with the Select Committee.
[99] Documents on File with the Select Committee.
[100] Documents on File with the Select Committee.
[101] Documents on File with the Select Committee.
[102] Documents on File with the Select Committee.
[103] Documents on File with the Select Committee.
[104] Documents on File with the Select Committee.
[105] State-owned entities (SOEs) as used here means entities of which the government of the PRC is, as reported to the Select Committee, a 50.1% or greater ultimate beneficial owner.
[106] Documents on File with the Select Committee. ASML stated to the Select Committee that work with these smaller nodes (3-5 nm) could only possibly be achieved in combination with the use of advanced deposition and etching equipment. ASML also stated this would result in a "yield that would likely be economically unjustifiable."
[107] ASML Holding N.V., Statement Regarding Export Control Regulations Dutch Government (June 30, 2023), https://www.asml.com/en/news/press-releases/2023/statement-regarding-export-control-regulations-dutch-government.
[108] Anton Shilov, *Update: ASML Denies Report It Was Working on China-Specific Lithography Tools*, Tom's Hardware, Jul. 6, 2025, available at https://www.tomshardware.com/news/asml-may-release-china-specific-versions-of-lithography-tools-report.
[109] Qianer Liu, *China Close to Shipping 5 nm Chips, Despite Western Curbs*, Ars Technica, Feb. 6, 2024, available at https://arstechnica.com/gadgets/2024/02/china-close-to-shipping-5nm-chips-despite-western-curbs/; Qianer Liu, *China on Cusp of Next-Generation Chip Production Despite US Curbs*, Fin. Times, Feb. 6, 2024, available at https://www.ft.com/content/b5e0dba3-689f-4d0e-88f6-673ff4452977; Documents on File with the Select Committee.
[110] *Id.*
[111] ASML Holding N.V., *Statement Regarding Dutch Government's Updated Export-License Requirement*, Sept. 6, 2024, available at https://www.asml.com/en/news/press-releases/2024/dutch-governments-updated-export-license-requirement.
[112] Documents on File with the Select Committee.
[113] For overall lithography unit sales (the denominator in the stated percentage), *see* ASML Holding N.V., 2024 Annual Report (U.S. GAAP basis), at 67. The sales specific to China (the numerator) were available in data reviewed by the Select Committee.
[114] The numerator for these percentages is a combination of the two categories above, while the denominator (all ASML sales, including those outside of China) also includes sales of EUV (outside of China), though ASML reported no sales of EUV machines to China 2022 to 2024.

[115] ASML Holding N.V., *Q1 2025 First Quarter Earnings Conference Call*, transcript available via Yahoo Finance, Apr. 16, 2025, available at https://finance.yahoo.com/quote/ASME.DE/earnings/ASME.DE-Q1-2025-earnings_call-333979.html.
[116] Documents on File with the Select Committee.
[117] ASML, 2024 Annual Report, *see* supra note 16.
[118] *Id.*
[119] Charlotte Trueman, *ASML Plans "New" Reuse and Repair Center in Beijing Amid Ongoing US-China Chip War*, Datacenter Dynamics, Mar. 10, 2025, available at https://www.datacenterdynamics.com/en/news/asml-plans-new-reuse-and-repair-center-in-beijing-amid-ongoing-us-china-chip-war/.
[120] Documents on File with the Select Committee.
[121] Documents on File with the Select Committee.
[122] U.S. Department of Commerce, Bureau of Industry and Security*, 77 Entity List Additions Revised*, Dec. 18, 2020, available at https://www.bis.doc.gov/index.php/documents/about-bis/2700-77-entity-list-additions-revised/file.
[123] Documents on File with the Select Committee.
[124] Documents on File with the Select Committee.
[125] Documents on File with the Select Committee.
[126] Because this control would impact significant amounts of legacy production in the PRC, one option to limit the risk of any global supply chain impact could be to grandfather servicing if existing installed legacy capacity that is assessed not to present a major national security risk. This would reflect the Select Committee's objective of protecting U.S. and allied national security and values, and not causing secondary disruptions beyond what is necessary to achieve such aims.
[127] BIS controls tools listed in ECCNs 3B993 and 3B994 when produced in certain foreign countries (but not close allies) and destined for a specific Chinese entity on the Entity List. *See* 15 CFR 742.6(a)(11). Controls on U.S.-origin tools to fabs on the Entity List always apply to *all* tools, although there is one exception where the U.S. exporters can claim License Exception Restricted Fabrication Facility (RFF) for exports to Entity Listed fab XMC that are not listed in ECCNs 3B993 and 3B994. This again is an example of a fab-specific restriction using these ECCNs.
[128] Letters on File with the Select Committee.
[129] Under rulemaking BIS issued in December 2024, Chinese SME companies must receive a license from BIS before transferring any of a broad range of SME to restricted entities, including those in the PRC. Bureau of Industry and Security, Department of Commerce, *Foreign-Produced Direct Product Rule Additions, and Refinements to Controls for Advanced Computing and Semiconductor Manufacturing Items*, Federal Register, Dec. 5, 2024, available at https://www.federalregister.gov/documents/2024/12/05/2024-28270/foreign-produced-direct-product-rule-additions-and-refinements-to-controls-for-advanced-computing. Additionally, there is a high risk that controlled U.S. SME and related components are being diverted to restricted entities.
[130] Chinese fabs producing *any* chip for Huawei would require a U.S. export license. Additionally, Chinese fabs must obtain a U.S. export license before transferring 16/14 nm or below logic chips to Chinese customers, unless they are producing a chip with less than 30 billion transistors and are using an approved outsourced semiconductor assembly and test (OSAT) facility. *See* 15 C.F.R. § 774, Supplement No. 1, Note 1 to 3A090.a. In two specific examples, SMIC is purportedly illicitly producing controlled Huawei Ascend chips, and CXMT is likely to produce HBM that will be incorporated into controlled AI chips, including Huawei Ascend chips.

[131] *See* supra note 34.
[132] 15 C.F.R. § 791 (2025); Exec. Order No. 13873, 3 C.F.R. § 13873 (2020).
[133] *See* supra note 20.