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Research Article

Between Sanctions and Subsidies: Geoeconomic Lessons from the Semiconductor Ecosystem

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Abstract

Semiconductors have become the quintessential strategic industry of the twenty-first century, sitting at the crossroads of economic competitiveness and national security. In recent years, major powers have deployed a mix of coercive and supportive measures that are transforming the sector's geography. On one side, export controls and investment screening seek to deny adversaries access to critical technologies; on the other, industrial policies aim to secure supplies and sustain technological leadership. This paper maps these concurrent policies across leading economies and interprets them through a geoeconomic lens – as instruments designed to shift the global distribution of capabilities. By linking denial and inducement strategies within a unified analytical framework, it highlights how the semiconductor race exemplifies the broader tension between economic interdependence and national security in the global order.

Keywords: Semiconductors, export controls, investment screening, industrial policy, economic statecraft, supply-chain security, geoeconomics
JEL Classification: F13, F51, F52, L52, L63

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1. Introduction

Semiconductors are the archetypal strategic industry of the twenty-first century. Today, semiconductors enable nearly all downstream technologies as well as most economic and social interactions. Powering research and boosting productivity, including through AI, semiconductors are also critical to future growth and wellbeing. Due to their application in the military and intelligence spheres, semiconductors are also indispensable to security and power projection.

Two events drew attention to the critical role of semiconductors. The first was the shortage of semiconductors that followed the COVID-19 pandemic, which impaired activity in key sectors with broad economic repercussions in 2021. The second was the rapid rise of China, which raised concerns over the security of digital communications and over the deployment of new civilian technologies in the military domain (Kania and Laskai, 2021). These concerns are compounded by China's territorial claims over Taiwan, which plays a central role in the production of advanced semiconductors.

As a result, the industry became the focus of intense policy scrutiny from an economic and a security perspective. Major global powers have recently introduced a raft of measures likely to reshape the geography of the sector. These measures span denial and inducement. On one hand, export controls and investment screening aim to deny critical technologies to adversaries. On the other hand, revived industrial policy is designed to ensure critical supplies or maintain a strategic lead.

The objectives vary across countries. The United States – the pivotal player in the sector – seeks to maintain its technological edge by bolstering domestic production of advanced and security-critical devices while denying such technologies to its adversaries. China – the lead contender – has mobilized vast resources to reduce its dependence on US-controlled technologies and to catch up to the technological frontier. Other relevant actors aim either to maintain their strategic role in the supply chain or secure critical supplies.

This struggle sits at the intersection of long-standing debates in international political economy and security studies about how technology reshapes the foundations of global order (Gilpin 1981; Keohane and Nye 1977; Strange 1988). Against this backdrop, this paper documents the policies adopted by major actors, discussing how these interventions seek to reshape the distribution of systemic capabilities (Waltz 1981; Lee 2024). Given the global nature of the semiconductor industry and the action-reaction dynamic of the unfolding struggle over technological supremacy, this paper takes a global view. Particular attention is nonetheless paid to the policies of the United States, which is the first mover and the pivotal actor in the sector. The paper is structured as follows. In Section 2, we discuss the theoretical framing. In Section 3, we discuss the relevant literature. In Section 4, we provide background on semiconductors and the semiconductor industry. In Section 5, we discuss the complex relationship of the sector with security. Section 6 discusses how states, chiefly the US, strive to deny semiconductor technology to their adversaries; Section 7 discusses inducements, in the form of state support to the semiconductor industry, and the potential outcome of such support. Section 8 concludes.

2. Theoretical framing

This paper approaches developments in the semiconductor industry through a geoeconomic lens. Following Lee (2024), we understand geoeconomics as the study of how economics, technological innovation and geography affect the global distribution of capabilities – intended as the means that states can deploy to achieve their foreign policy objectives.

Lee (2024) illustrates this definition through the example of China's first island chain. The first island chain is a chain of US-aligned islands (including Taiwan) off China's coast. US access to this geographic feature can limit China's ability to project power in the western Pacific, while increasing the regional influence of the US and its allies. Although China can circumvent this obstacle through sophisticated weaponry, control over the island chain structurally shifts the overall distribution of capabilities.

This framing neatly lends itself to describe the role of the semiconductor industry. Control over this strategic industry tilts the balance of capabilities, enabling the incumbent to grow faster and deploy more sophisticated tools of power projection. Ding and Dafoe's (2021) discussion of strategic assets stresses of the strategic nature of the industry. In their paper, they identify three logics under which an asset can be deemed "strategic" in an economic or military sense. Under the cumulative-strategic logic, strategic assets are the result of cumulative protracted investments that are difficult to replicate (such as aircraft engines). Under the infrastructure-strategic logic, strategic assets are those that generate positive country-level spillovers (such as railways). Under the dependency-strategic logic, the supply of strategic assets is limited and thus weaponizable (such as rare earths). The semiconductor industry ticks all three boxes: it is the result of massive investments and characterized by high barriers to entry; it generates vast domestic spillovers both in the economic and military domains; and finally, it is extremely concentrated, and thus weaponizable.

Lee's (2024) definition of geoeconomics is rooted in Waltz's (1979) structural realism and differs from the study of economic statecraft (Baldwin 2020) and the related literature on weaponized interdependence (Farrell and Newman 2019). Following Lee's (2024) distinction, the study of economic statecraft emphasizes the instrumental use of economic tools by states to achieve foreign policy goals, while geoeconomics is focused on the factors that determine the distribution of capabilities. The study of the semiconductor industry, however, lays bare the feedback loops between the two concepts, showing how states' policies can both respond to and reshape global distribution of capabilities.

Following the logic of weaponized interdependence (Farrell and Newman 2019), cross-border production networks display chokepoints that states can control. In the semiconductor industry, states exploit these chokepoints to deny critical technologies to their adversaries but also intervene in the market to reinforce their control over the critical nodes. Weaponized interdependence in the sector is thus a means deployed to geoeconomic ends.

While we argue that the struggle over the sector has the potential to alter the balance of capabilities, the net assessment remains clouded by several factors. First, the effectiveness of restrictive measures depends on enforcement capacity and international cooperation. Second, the struggle is characterized by action-reaction spirals that may lead to the weaponization of other economic sectors, escalating the conflict and altering the balance of forces. Finally, the struggle will increase costs and heighten uncertainty for the productive ecosystem, at the risk of degrading the very object of contention, with ripple effects on the rest of the economy.

3. Literature Review

Research on semiconductors has expanded rapidly in recent years, producing detailed accounts of both the industry's structure and the policies that shape it. Multiple contributions have documented the globally integrated yet geographically concentrated nature of semiconductor supply chains (Khan 2021; Varas et al. 2021; OECD 2024a), the scale of subsidies and industrial policies used to attract investment (OECD 2019; Bown and Wang 2024; Goldberg et al. 2024; Hufbauer and Hogan 2025; Varadarajan et al. 2024), and the growing resort to export controls and investment screening as tools of denial (Khan 2020; Chorzempa et al. 2024; Voetelink 2023; Crosignani et al. 2024). This literature provides a rich empirical basis, but it tends to analyze inducement and denial separately and rarely connects them to broader questions of international order.

In international relations, several traditions illuminate how technology and economics shape systemic power. Gilpin (1981) argues that uneven economic and technological growth shifts the distribution of capabilities and, over time, unsettles international orders. Strange (1988) extends this by defining structural power – rooted in control over security, production, finance, and knowledge – as foundational to how the international system is organized. Building on this lineage, Bracken (2018) discusses how emerging technologies reshape established orders. With a tighter focus on the sector, Miller (2022) traces the pivotal role of semiconductors in the US Cold War strategy. Together, these works underscore that control over key technologies has enduring systemic consequences.

A second strand of international relations literature accounts for the specific geoeconomic strategies that states currently use to secure or deny such control. Luttwak (1990) introduces the notion of geoeconomics to describe the rise of economic rivalry as an alternative to military conflict. Baldwin (2020) discusses economic statecraft as the instrumental use of economic tools for foreign policy purposes, while Farrell and Newman (2019) show how interdependence can be weaponized through the exploitation of network chokepoints. Christie and Wigell (2024) discuss the applicability of traditional security concepts in the economic security domain, such as economic security dilemmas and cross-domain action-reaction spirals.

To this literature, this paper advances two contributions. First, it documents the policies of denial and inducement now transforming the semiconductor sector, showing how governments have committed hundreds of billions of dollars in investment while introducing unprecedented restrictions on technology transfer. Second, it interprets these actions jointly through a geoeconomic lens, conceptualizing them as attempts to shift the distribution of capabilities in the international system.

4. Background on Semiconductors

The semiconductor industry is widely recognized as a critical input to the rest of the economy. According to the Semiconductor Industry Association, semiconductor sales reached USD 630 billion in 2024 (SIA 2025). As the enabling element for any electronic device, semiconductors play a much larger role than what industry turnover suggests. In many sectors, semiconductors are as important an input as raw energy (Ding and Dafoe 2021; OECD 2023). Indeed, the post-pandemic global chip shortage showed that the lack of unsophisticated devices can cause disruption in large sectors of the economy. Looking ahead, the growth of the digital sector and the mass deployment of AI and connected devices are likely to make the sector even more central to the economy and security.

By most classifications, there are three broad families of semiconductors: logic chips, memory chips, and DAOs devices (discrete, analog and others) (OECD 2024a). Logic chips include central processing units (CPUs), graphic processing units (GPUs), microcontroller units (MCUs),[1] and other programmable or task-specific devices.[2] These devices perform high-frequency binary operations and are at the core of computation. Memory chips allow for the storage of information and include volatile[3]

[1] CPUs are the primary processors that handle a wide range of computing tasks, from running software applications to managing system operations. GPUs specialize in rendering images and videos, making them crucial for gaming, graphic design, and other visually intensive applications. MCUs are smaller, specialized processors typically found in home appliances, automotive controls, and smart devices.

[2] These include Field Programmable Gate Arrays (FPGAs), and Application Specific Integrated Circuits (ASICs).

[3] Devices that store data temporarily and require a source of power to retain information, including Dynamic Random Access Memory (DRAM) and Static Random Access Memory (SRAM) devices.

and non-volatile[4] memory devices. Among these, high-grade GPUs and high bandwidth memory (HBM) chips, a particular type of volatile memory, have recently gained prominence because of their central role in the training of AI models. Finally, DAOs include discrete chips, which typically perform a single electrical function, and analog chips, which convert and modify signals from the physical world (such as sound or temperature) into digital signals or vice versa. These are used in power management and in radio transmission. While certain devices find predominant use in individual applications (such as GPUs in the training of AI models and DAOs in the industrial sector), others are used across the board. Further, different semiconductor types generally work as complements in final products. Smartphones, for instance, incorporate the three types in almost equal parts (Varas et. al. 2021).

Chips are extremely sophisticated devices. Transistor size plays a predominant role in public discourse. Smaller transistors increase power efficiency and computational speed, enabling cutting edge application. Training of AI models, for instance, requires single-digit nanometer-scale devices, which are extremely complex and expensive to produce. However, not all devices need to be cutting-edge: simpler electronics require less sophisticated devices. Further, transistor size is not the only measure of complexity in semiconductor manufacturing. Materials and design also matter. While logic and memory devices are generally made of silicon, DAOs can be made of different compounds, depending on the application. For instance, silicon carbide (SiC) chips find use in power applications and gallium nitride (GaN) in telecommunications. These devices are less sophisticated in terms of transistor size, but the materials involved require complex processing. Finally, performance per transistor size can also be improved through design or manufacturing, as in the case of systems on a chip (SoC) or in 3D stacking.[5]

Semiconductor production is generally described as comprising three stages: design, fabrication, and assembly, testing, and packaging (ATP). The design stage consists of setting the requirements of the chip, designing its architecture, and validating its design. This stage requires sophisticated software applications (electronic design automation, EDA) and intellectual property (IP). The fabrication stage consists of printing the integrated circuit on a silicon wafer and may include complex manufacturing processes like extreme ultraviolet lithography (EUV). The design and fabrication stages display very high levels of R&D and capital expenditures, making the industry amongst the most knowledge- and capital-intensive (Varas et al. 2021). Finally, ATP involves dicing the wafers into individual chips, packaging them into

[4] Devices that do not require a source of power to store information, such as flash memory, including Not And (NAND) and Not Or (NOR) devices.

[5] SoCs are integrated circuits that combine all essential components of a computer on a single chip, improving efficiency and reducing size. 3D stacking involves vertically stacking multiple semiconductor layers to form a single chip, increasing memory capacity and performance while saving space.

frames or shells, and testing them. Parts of this stage are lower-skill and labor-intensive, and thus often outsourced to lower unit labor cost countries. Firms in the industry follow one of two different business models. In the model, a first set of firms specializes in chip design (fabless is a contraction of fabrication-less), while a second set of firms – foundries – specializes in fabrication. The rise of the fabless-foundry model contributes to specialization and geographic dispersion in the industry.

Recent work shows the semiconductor industry to be among the most concentrated industries providing upstream inputs to the rest of the economy (OECD 2023). In terms of revenue, the top 20 firms account for more than 80 percent of the total industry, compared to 20 percent for the broader manufacturing sector (OECD 2019). Concentration in certain afferent industries, such as chip-design software and semiconductor manufacturing equipment (SME), is extreme.

The concentration is also geographic. Chip design capabilities are concentrated in the US and South Korea. Fabrication capacity is concentrated in the US, South Korea and Taiwan, with the production of cutting-edge logic devices almost entirely concentrated in Taiwan. Software design tools and core IP are concentrated in the US and Europe, while the production of SME is concentrated in the US, Europe and Japan. China plays a significant role in ATP and is rapidly gaining ground in design and fabrication capacity (Table 1), while Southeast Asia also has a growing role in ATP. Because of the high degree of geographic specialization, the industry is extremely interdependent: the production of a logic chip for a smartphone, for instance, involves at least six different countries.

TABLE 1. Market share by industry segment

	Value add	United States	S. Korea	Japan	Taiwan	Europe	China	Other
EDA	1.5	96	<1	3	0	0	<1	0
Core IP	0.9	52	0	0	1	43	2	2
Wafers	2.5	0	10	56	16	14	4	0
Fab Tools	14.9	44	2	29	<1	23	1	1
ATP tools	2.5	23	0	44	2	6	9	7
Design	29.8	47	19	10	6	10	5	3
Fab	38.4	33	22	10	19	8	7	1
ATP	9.6	28	13	7	29	5	14	4
Total value add		39	16	14	12	11	6	2

Note: Europe includes the UK.

Source: Adapted from Khan (2021).

5. Semiconductors and Security

The critical role that semiconductors play in security and the pendulum on their status between a strategic and a market commodity is best illustrated by the history of the sector in the US. The United States pioneered early breakthroughs in semiconductor technology in the 1950s and 1960s, with the invention of the transistor and the integrated circuit, establishing itself as the global leader. This was sustained by strong government support through contracts for defense and space programs. Government support for the sector was part of a Cold War strategy which saw the deployment of semiconductors in the military and intelligence domain as an offset to the increasing, though technologically less advanced, military might of the USSR. Developments such as precision-guided munitions and signals intelligence proved critical in shifting the balance of capabilities to the US advantage. Given their role in the US security strategy, maintaining leadership in the sector constituted a strategic prerogative; semiconductor technology thus remained closely controlled (Miller, 2022).

With the end of the Cold War, as government contracts dwindled, US chipmakers started advocating for open trade and reduced government involvement. A consensus formed in Washington around the idea that it was possible to "run faster" than rivals – retaining leadership through a combination of intense innovation and minimal export controls (Miller 2022). This strategy was based on the *innovation-leadership-control* cycle, whereby opening the sector to the mass market would provide a much greater source of funding for R&D than government support, which would in turn ensure US technological leadership. This lead was reinforced by selective export controls aimed at keeping adversaries behind in technology by one or two generations – a gap considered sufficient in the light of the US's role as the sole global superpower. Finally, controls on older technologies were relaxed to tap the mass market to fund the R&D that would keep the cycle going. Incidentally, the roll-back of controls also allowed them to cut costs by offshoring parts of the sectors that were not deemed critical, including the most labor-intensive processes, to East Asia.[6]

However, practice defied theory, and the US progressively lost its edge. Despite the appealing logic of the "run faster" paradigm – which neatly reconciled market and security requirements – weak protection of leading technologies, weak enforcement of controls on exports, slower than anticipated innovation in the US on one hand, and the ingenuity and vast resources deployed by competitors on the other, conjured to progressively erode the US lead in many segments of the industry (Casey 2023).

[6] Offshoring was also the result of active industrial policy in recipient countries. A textbook example is Taiwan which, since the early '70s, supported the creation of a network of specialized and innovative firms, attracting foreign investment and financing R&D activities.

Meanwhile, China's technological prowess grew dramatically, sparking security concerns. During the 2000s and 2010s, China carved itself an increasingly important role in certain areas of the industry (Miller, 2022). In 2014, the Chinese government launched the "Big Fund" to reduce dependency on chip imports and boost domestic production of advanced semiconductors. By the late 2010s, Huawei was making significant strides in designing cutting-edge devices. As a result, fears grew that China's state-backed investments would weaken the US strategic edge in semiconductors, enabling China to acquire superior capabilities in the fields of cyber warfare, signals intelligence, and advanced (including AI-powered) weapons systems (ODNI, 2024).

In the late 2010s, the US government began to take a more aggressive stance, taking steps to restrict Chinese companies from acquiring US assets, intellectual property and cutting-edge technology. In 2018, the Trump administration blocked semiconductor exports to the Chinese telecom giant ZTE. In 2019, it was Huawei's turn. Found in violation of US export controls, the company was subject to increasingly tight controls, which would eventually sever almost entirely its access to US semiconductor-related technology (Farrell and Newman 2023). Similar restrictions were also imposed on many other top Chinese tech companies.

Amid escalating geopolitical tensions, the Biden Administration further tightened the policy stance. This marked the demise of the "run faster" paradigm. In its place, in 2022, Security Adviser Jake Sullivan articulated a new paradigm, dubbed "small yard – high fence". Certain technologies (including semiconductors) could no longer be shared with adversaries because they acted as "force multipliers" (Sullivan 2022) – that is, when employed with a combat force, they could significantly increase its combat potential (US Department of Defense 2009). In a neat break with the past, the US no longer sought relative but rather absolute advantage. The result was a significant expansion of US export controls and investment screening measures in the semiconductor sector. Alongside the 2022 CHIPS and Science Act, these are among the key drivers of the ongoing transformation in the industry.

6. Measures of Denial: The Resurgence of Export Controls and Investment Screening

Export controls

Export controls are a key tool of foreign and security policy, which limits the export, re-export, or transfer of specific goods and services to certain countries, *end-users*, or for nefarious *end-uses*. Modern-day export controls trace back to wartime measures such as the UK and US Trading with the Enemy Acts of 1914 and 1917. Wartime measures evolved over time into peacetime arrangements like the Wassenaar Arrangement (focused on dual-use technologies, including semiconductors),[7] which constitutes the basis of modern-day controls, often supplemented with unilateral measures (Kerr and Casey 2021).[8] Despite their central role in international security, the overall footprint of export controls on international commerce is relatively small. For instance, only 1.3 percent of US trade takes place under export licenses (BIS 2023a).

The US displays the broadest and most far-reaching system of export controls. Governed by the Export Control Reform Act of 2018, US export controls on dual-use items are implemented through the Export Administration Regulations (EAR). The EAR regulates exports on the basis of the item that is exported,[9] the country of destination,[10] the end-users,[11] and the end-uses that the item is intended to serve. Exports are not banned *tout court*, but require licenses, which are issued depending on the rationale for which the specific item is controlled and its destination.

Notably, US controls have a wide extraterritorial reach. Two features contribute to this. First, US export controls apply to goods and services that contain a *de-minimis* US content. This is typically set at 10-20 percent, but it can go much lower for foreign-made items if they contain certain high-end US-origin content. Second, under the recently introduced Foreign Direct Product Rule (FDPR), certain items that are produced abroad remain under US jurisdiction if they are the direct product of US-origin technology, software or equipment.[12]

As a result of the "run faster" paradigm (see section 5), until 2022, the export control regime on semiconductors was relatively mild. The US imposed controls on these controls applied to all Chinese subjects, but licenses were generally granted unless the subject was a military end-user (Khan 2020). Since 2022, the US has enacted policies that reshape the tenets of its export control strategy. First, they ended the attempts to discriminate among end-users, imposing restrictive country-wide licensing requirements on China and other countries deemed to pose circumvention risks. Second, they

[7] The other main international agreements are the Nuclear Suppliers Group (NSG) concerning nuclear material and related technology; the Australia Group (AG) concerning biological and chemical weapons and related material; and the Missile Technology Control Regime (MTCR) concerning missiles and related technology.

[8] The number of unilateral measures increased substantially in recent years, particularly from the US, as they are faster to enact and can be effectively enforced through extraterritorial measures and collaboration with key allies. The growth in unilateral measures also reflects the fact that Russia's membership of the Wassenaar Arrangement has slowed significantly the deliberations of the group as decision require unanimity among members.

[9] 15 C.F.R. Part 774, Supp. No. 1.

[10] 15 C.F.R. Part 738, Supp. No. 1; 15 C.F.R. Part 740, Supp. No. 1.

[11] 15 C.F.R. Part 744, Supp. No. 4.

[12] The Foreign Direct Product Rule (FDPR), was introduced in 1959 to place controls on the transfer of certain items made abroad with the benefit of US technologies. In simple terms, the FDPR allows the BIS to regulate the reexport and transfer of foreign-made items if their production involves certain US technology, software or equipment. It does this by defining that technology, software and equipment as subject to the EAR (Export Compliance Training Institute 2022; BIS 2024; Voetelink 2023). While the *de minimis* rule focuses on content thresholds, the FDPR targets items derived from US intellectual property, regardless of physical US components.

significantly increased the number of covered technologies, both in semiconductors and in manufacturing equipment. Third, for the most sensitive items, they shifted from an *allowed save exceptions* to a *barred save exceptions* approach, imposing worldwide licensing requirements. Fourth, they vastly expand US extraterritorial reach (Dohmen and Feldgoise 2023; Allen 2024; Harithas and Schumacher 2024).

Stricter US controls were also accompanied by an expansion of *end-user* controls (the entity list) and a tightening of licensing policies. Since 2019, the number of Chinese entities on the entity list jumped from over 250 to over 900 (Figure 1), encompassing most key players in China's tech space (Chorzempa et al. 2024). Between 2018 and 2022, license approvals to China fell by 10 percent in number and 20 percent in value (Figure 2), while processing time doubled. In 2025, the US restricted its Validated End User program, forcing previously authorized foreign chip producers to request licenses to import SME to operate their plants in China.[13] As the US administration stopped publishing licensing statistics, it is unfortunately impossible to assess the full impact of the post-2022 controls on licensing. Finally, the US actively sought to increase cooperation with its closest allies to enforce common controls. This is eminently visible in the cooperation with the Netherlands and Japan to align controls on SME (Allen and Benson 2023; Allen et al. 2023; US-China Economic and Security

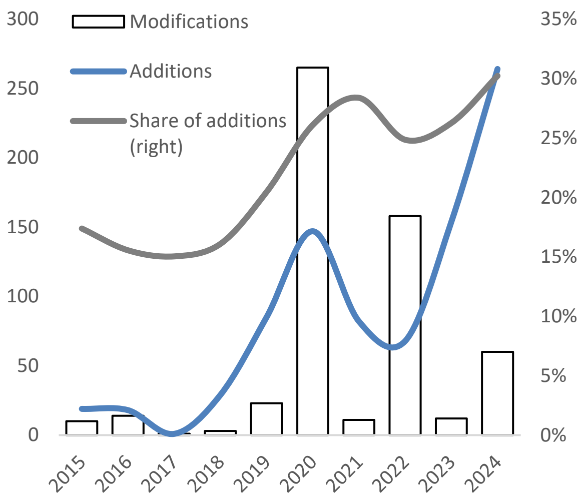

FIGURE 1. China additions to the entity list

Note: Additions indicates the number of entities added to the entity list each year. Modification indicates the number of changes in the regime applicable to entities on the list.
Source: Authors elaboration from BIS entity list.

[13] Revocation of Validated End-User Authorizations in the People's Republic of China, 90 Fed. Reg. 42321 (Sept. 2, 2025) (Doc. No. 2025-16735).

Review Commission 2024). Post-2022 controls, however, are also formally structured to incentivize cooperation. For instance, the US controls embed license exceptions for the export of selected SME, quantum and advanced manufacturing technologies to countries that implement similar controls.[14] Exports from countries with similar controls are also spared from certain US extraterritorial rules.[15]

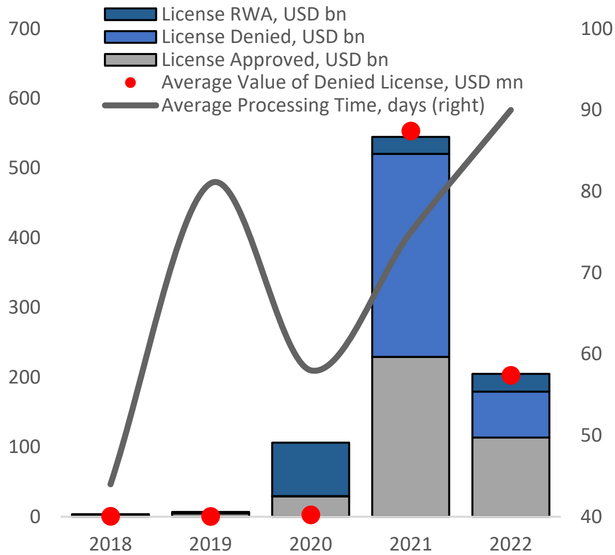

FIGURE 2. Outcomes of license requests to China

Note: RWA = Returned Without Action.

Source: Authors' elaborations from BIS (2023).

Investment screening

Alongside export controls, investment screening is a key tool of economic statecraft. Investment screening in sensitive sectors such as semiconductors became significantly tighter in the wake of the COVID-19 pandemic in 2019 and of recent geopolitical tensions. In 2018, the US enacted the Foreign Investment Risk Review Modernization Act. In the midst of the pandemic, the largest European countries enacted similar laws to protect distressed national assets from opportunistic foreign takeovers (Bencivelli et al. 2023). In 2020, China too enacted the Foreign

[14] 15 C.F.R. § 740.24.

[15] 15 C.F.R. § 742.4.

Investment Law.[16] G7 governments made extensive use of investment screening authorities in the semiconductor sector, blocking Chinese acquisitions over security concerns. While a comprehensive review is beyond the scope of this paper, some examples are indicative of the trend.

In 2016, the *Committee on Foreign Investment in the United States* (CFIUS) intervened to block the acquisition of Global Communications Semiconductors, a semiconductor manufacturer, by China's San'an Optoelectronics (Trade Practitioner 2016). In 2017, acting on CFIUS's recommendation, President Trump blocked the acquisition of Lattice Semiconductor, a specialized semiconductor design company, by China-backed Canyon Bridge (Trade Practitioner 2017). The following year, President Trump also halted Broadcom's hostile takeover of Qualcomm Incorporated, a major semiconductor intellectual property player, emphasizing the threat to US technological leadership and national security (Trade Practitioner 2018a). In 2018, CFIUS blocked the acquisition of Xcerra Corporation, a semiconductor testing company, by Hubei Xinyan Equity Investment, a Chinese government-backed fund (Trade practitioner 2018b). The global nature of semiconductor firms and the increasing assertiveness of US authorities are also leading to an increase in CFIUS action to block transactions outside of the US borders (Van Grack and Brower 2021).

As for other G7 countries, in 2021, Italy blocked the acquisition of LPE, a semiconductor equipment manufacturer, by Shenzen Investment Holdings (Brambilla and Lepido 2021). In 2022, the UK blocked the acquisition of Newport Wafer Fab, a semiconductor production company, by the Chinese company Nexperia on national security grounds (Gross and Pickard 2022). In the same year, Germany blocked the sale of Elmos Semiconductor, which makes chips for the automotive industry, from selling its factory in Dortmund to Silex, a Swedish subsidiary of China's Sai Microelectronics (Cooban and Stern 2022). These actions sum to a trend of increasing use of investment screening power in the sector.

7. Measures of Inducement: Resurgent Industrial olicy

Having discussed the measures that countries take to control technology flows towards adversaries, we now turn to the second prong of the policy pincer that is reshaping the sector – the measures that states are deploying to induce the private sector to alter productive structures and geography in their favor.

One key feature that makes semiconductors a strategic asset is the scale and complexity of investment required to produce them. Each new generation of chip

[16] The law imposes restrictions on foreign investments in sectors listed in the "Negative List". While semiconductors are not part of this list, investments in the sector may still be subject to National Security Review, which also covers critical technologies related to national security.

technology requires substantial R&D expenditures, specialized talent and fabrication capacity, with a single cutting-edge fab costing on average around USD 20 billion. Left entirely to market forces, such investments may be underprovided, due to demand volatility and long payback horizons.

This is why semiconductors have long been the object of public intervention. In today's context, however, public investment has also become a geoeconomic tool deployed to secure control over strategically significant nodes, shape global supply networks, and influence the distribution of systemic technological capabilities. Based on government budgets, we estimate that the key global players plan to inject over USD 400 billion into the sector over the next five-to-ten years (Table 2), catalyzing private investments exceeding USD 700 billion (Figure 3). These are large numbers. For perspective, the OECD estimates that the semiconductor industry received 0.7 percent of revenue in subsidies over the 2005-2019 period (OECD 2024b). In 2022, with industry sales at USD 600 billion, this would correspond to just over USD 4 billion in subsidies worldwide. Thanks to current support, the industry will receive an average of USD 40 billion per year over the next ten years – a 10-fold increase over the 2005-2019 period.

TABLE 2. Government incentives in semiconductors by country and type (USD billion)

	US	EU[i]	Korea	Taiwan	Japan	China
Direct grants	46.7	48.1	6.4	-	22.7	-
Tax incentives	85	0.5	21[ii]	15.8	N/A	N/A
Subsidized credit	6	-	12.4	-	-	-
Share purchase	-	0.2	0.8	-	-	76.5
Unclear/unspecified	-	-	1	9.9	4.1	66[iii]
Total	138[iv] *(0.5% of GDP)*	49 *(0.3% of GDP)*	42 *(2.4% of GDP)*	26 *(3.4% of GDP)*	27 *(0.6% of GDP)*	142.5 *(0.8% of GDP)*
Time horizon	5 years (2022-27)	9 years (2021-30)	7 years (2023-30)	10 years (2023-33)	9 years (2021-30)	10 years (2019-29)

Notes: (i) This reflects the budgets of the EU's main economies: Germany, France, Italy and Spain. (ii) Authors' estimate based on announced investments and applicable government incentives. (iii) Author's elaboration, based on Varadarajan et al (2024) estimates of municipal funds for semiconductor projects, and national funding trends. (iv) The figure excludes up to USD 75 billion in subsidized credit from the private sector.

Source: Authors' elaboration based on: Varadarajan et al (2024), Chorzempa (2024), and public news and announcements.

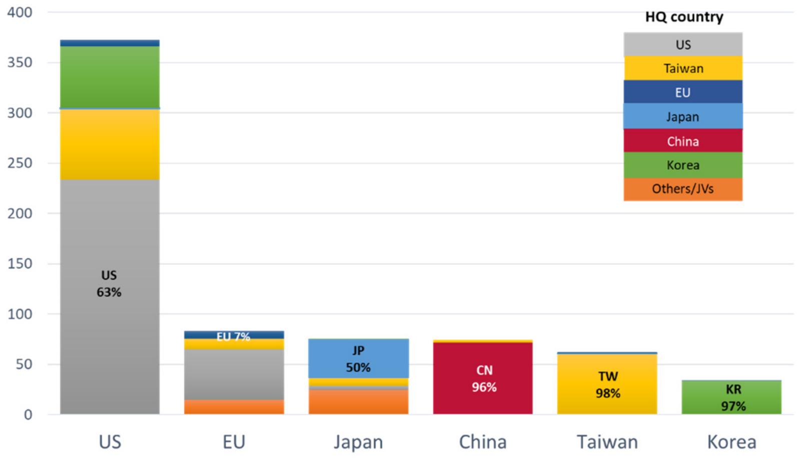

FIGURE 3. Semiconductor investments announced since 2021, by HQ country (USD bn)

Note: Figures refer to investment in projects to be completed by 2030.

Source: Authors' elaboration based on GMF Semiconductor Investment Tracker *and public news and announcements.*

The United States

The US is the world leader in the most R&D-intensive components of the value chain, such as chip design, chip design software, semiconductor manufacturing equipment and is home to leading global chipmakers. However, it lacks significant advanced fabrication capacity, which has been mostly outsourced to Asia. The fabrication of the most advanced logic chips is currently located in Taiwan and South Korea, and 97 percent of ATP is performed outside the country. To address this strategic gap, the CHIPS and Science Act[17] – signed into law in August 2022 – explicitly aims to restore US leadership in the manufacturing of advanced semiconductors. The Act commits USD 138 billion in incentives to the semiconductor industry over the 2022-2027 period (Table 3). This figure increases to 213 billion once subsidized private sector lending is included.

The Act also provides a 25 percent tax credit for investments in semiconductor manufacturing facilities, worth an estimated 85 billion.[18] States such as Texas, Arizona,

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[17] US Congress, CHIPS and Science Act, Pub. L. No. 117-167, 136 Stat. 1366 (2022),

[18] The Congressional Budget Office originally estimated that the tax credits would cost USD 24 billion, but reputable projections suggest that the actual figure could exceed 85 billion (Chorzempa 2024). The tax credit is available to any facility whose primary purpose is the manufacturing of semiconductors and semiconductor manufacturing equipment (thus excluding administrative areas of fabrication facilities). This includes facilities for producing chips, chipmaking equipment, and wafers, but excludes those that manufacture underlying materials such as polysilicon.

TABLE 3. Semiconductor investment and fiscal multiplier

Country	**Public incentives (USD bn)**	**Private investments (USD bn)**	**Multiplier**
US *(2022-27)*	138	373.1	2.7
EU *(2021-30)*	49	87.4	1.8
Korea *(2023-30)*	42	105	2.5
Taiwan *(2023-33)*	26	62	2.4
Japan *(2021-30)*	27	75.2	2.8
China *(2019-29)*	142.5	74.5	0.5

Source: Authors' elaboration.

and Oregon have supplemented these federal efforts with their own grants and tax credits.[19] Beyond its economic objectives, the Act reflects a broader geoeconomic strategy that leverages global value chains as instruments of national power (Luo and Van Assche 2023). Indeed, to guarantee the safe use of US funds, companies receiving subsidies under the CHIPS and Science Act are prohibited from increasing the production of chips below 28nm in "countries of concern", including China and Russia, for the subsequent 10 years.[20,21]

Beyond domestic measures, as part of the US friend-shoring strategy, the country also promoted the "Chip 4 alliance", which comprises the US, Taiwan, Japan, and South Korea. The alliance aims to enhance cooperation between the members on the design and production of sophisticated semiconductors (Benson et al. 2023).

The impact of the CHIPS and Science Act is already visible in hard economic data, with construction spending for computer and electronics manufacturing increasing fourfold since its enactment (Van Nostrand et al. 2023). Since 2021, chipmakers have announced planned investments totaling USD 370 billion. Leading investors include Intel and Micron Technology, along with Taiwan's Taiwan Semiconductor Manufacturing Company (TSMC) and Korea's Samsung Electronics, collectively

[19] The Texas CHIPS Act establishes a USD 1.36 billion fund to provide grants for semiconductor R&D and manufacturing projects, and the creation of advanced R&D centers. The Oregon CHIPS Fund has approved USD 190 million in loans and grants to support chipmakers' capital investments. Arizona has allocated USD 100 million to stimulate growth in its semiconductor industry. Colorado has introduced a USD 75 million CHIPS Refundable Tax Credit program.

[20] Preventing the Improper Use of CHIPS Act Funding, Final Rule. Federal Register 2023-20471 (88 FR 65600).

[21] The statute also gives the US government the authority to designate other countries as "foreign countries of concern" if they are found to be engaged in conduct considered harmful to national security or foreign policy of the US.

receiving more than two-thirds of direct grants allocated under the CHIPS and Science Act (Figure 4).[22]

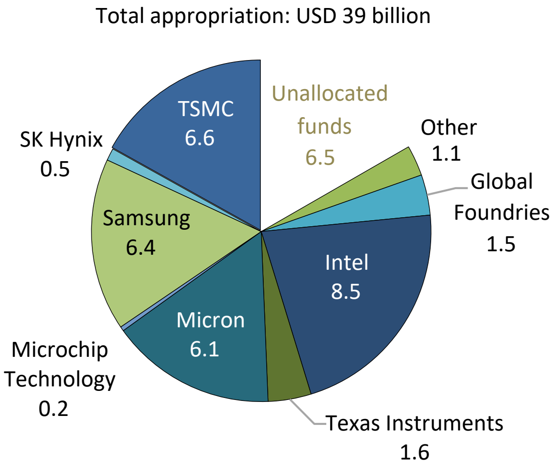

FIGURE 4. Allocated funds under the CHIPS and Science Act (USD billion)

Note: Values in USD billion. "Other" includes: Absolics, Amkor Technology, BAE Systems, Entegris, GlobalWafers, Polar Semiconductor, Rocket Lab, and Rogue Valley Microdevices.
Source: CHIPS for America News & Releases.

China

China leads the world in ATP capacity and wafer fabrication for mature chips and raw materials, but its semiconductor industry lags in sophistication. China's domestic industry lacks leading firms in high-end logic, advanced analog, and cutting-edge memory markets. It also lacks advanced capacity in semiconductor manufacturing equipment and in chip-design software. This creates chokepoints where the country remains heavily dependent on imports.

To address these dependencies and accelerate the development of a robust domestic semiconductor ecosystem, China launched the "National IC Promotion Guidelines" in 2014 and the "Made in China 2025" plan in 2015. These were initially framed as part of China's broader industrial upgrading agenda, aimed at propelling the nation into advanced manufacturing and avoiding the so-called "middle-income trap". More recently, however, China's strategy has shifted toward an explicit technological self-reliance campaign in response to geopolitical pressures.

[22] The Trump administration is currently reviewing existing agreements under the Chips and Science Act to ensure alignment with the new policy direction. For now, however, chipmakers continue to receive disbursements under previously approved grants, keeping construction and expansion plans on track.

The 14th Five-Year Plan (2021–2025) for the first time had a chapter dedicated to "scientific and technological self-reliance and self-improvement" as the core driver of national development (CSET 2021). Semiconductors are named as critical areas where China must achieve breakthroughs, reflecting that the chip effort has become a central pillar of state strategy, not just an industry initiative.

Quantifying Chinese semiconductor investment is challenging, as national policy guidelines lack specific monetary values and implementation rests with provincial authorities. An exception is represented by the "Big Fund", established by the central government to provide targeted support through direct investments (China MoF 2014). The fund raised USD 99.5 billion in three phases between 2014 and 2024. Alongside the Big Fund, at least 15 provincial and municipal funds have been established since 2015, for an estimated combined capital of USD 50 billion.[23] The Chinese government also provides other forms of support to the semiconductor sector, including concessional loans, reduced utility rates, and subsidized land prices.[24]

In 2023, it further enhanced support by increasing the pre-tax deduction for R&D expenses to 220 percent for Chinese chipmakers, a policy set to remain in effect through the end of 2027.[25] In sum, attempting to take all these factors together, we estimate China's direct support to the sector in the decade starting in 2019 to be about USD 140 billion (0.8 percent of GDP). As a result, since 2021, chipmakers in China have committed over USD 75 billion in new investments, primarily focusing on legacy technology nodes. Domestic companies account for 95 percent of these investments (Figure 5).

[23] In addition, Huawei has reportedly received an estimated USD 30 billion in state funding from the government and the Shenzhen city since it moved into chip production in 2022, according to the Washington-based Semiconductor Industry Association. However, Huawei denied that the government is giving it support to develop semiconductor technologies.

[24] OECD (2019) revealed that, from 2014 to 2018, the benefits from below-market loans for China's four major state-backed semiconductor firms (Tsinghua Unigroup, SMIC, JCET and Hua Hong) amounted to USD 4.85 billion. Tsinghua Unigroup alone obtained USD 22 billion in favourable loans from Chinese state banks in that period. The study also estimates that, in terms of benefits for firms, total public support over the period amounted to more than 40percent of SMIC's revenues, 30percent for Tsinghua Unigroup, and over 20percent for Hua Hong (compared to 10percent of revenues for STMicroelectronics, and less than 5percent for TSMC, Samsung Electronics, Infineon and Intel).

[25] Chip technology R&D expenses are eligible for a 120percent deduction on top of the 100percent general R&D credit, resulting in a total deduction of 220percent. Additionally, up to 80percent of outsourced foreign research costs can be deducted, provided that these costs do not exceed two-thirds of the total R&D expenses. This approach reflects China's focus on increasing the long-term technological capabilities of its domestic companies, regardless of where the know-how originates.

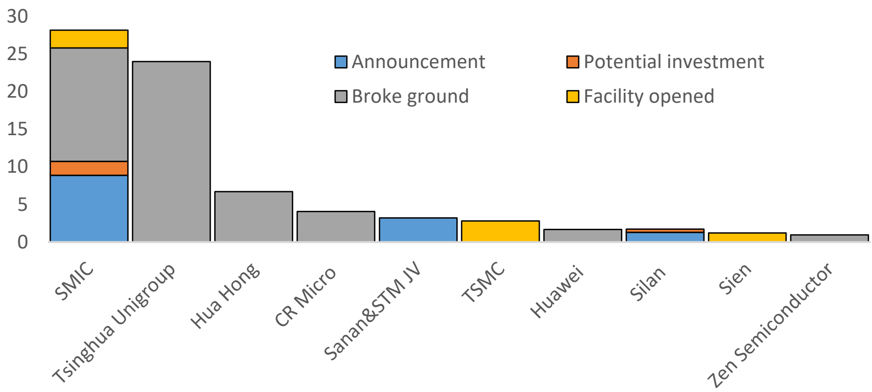

FIGURE 5. China semiconductor investments announced since 2021 (USD bn)

Source: Authors' own computations based on public news and announcements.

The fiscal multiplier – that is, the private sector response – of the incentives however is unusually low at 0.5, against the 1.8-2.8 range of other countries (Table 4). While this may reflect the extraordinary level of government support to the sector, it could also be a result of lower transparency in private investment plans. With such levels of investment, China seems poised to strengthen its position. Whether and within what timeframe this could lead to breakthroughs to cutting-edge technologies remains an open question.

TABLE 4. US subsidies to chipmakers

Overall funding	**137.7 bn**
of which	
Capex	124 bn
R&D and workforce	13.7 bn
of which	
Direct subsidy	46.7 bn
Tax incentive	85 bn
For up to 75bn in subsidized credit	6 bn

Source: Authors' elaboration

The European Union

The EU is a global leader in specific segments of the value chain and has fabrication capacity to cater to domestic downstream manufacturing. In particular, the EU leads in the advanced lithography technology – notably, Dutch company ASML Holding is the sole world producer of Extreme Ultraviolet (EUV) lithography machines (in the Netherlands). The EU also houses prominent research centers such as the

Interuniversity Microelectronics Center (IMEC) in Belgium. Finally, Europe hosts several chip manufacturers that cater to automotive and other domestic manufacturing industries. The EU, however, lacks production capacity for cutting-edge devices.

To boost the EU's position, the 2021 *Digital Compass* (European Commission 2021) sets the target of doubling its global production share to 20 percent by 2030. The EU Chips Act[26] is the primary instrument to achieve this goal, aiming to inject around USD 50 billion of public subsidies and catalyze private investments for a similar amount. The Act aims to strengthen Europe's research and technology leadership and to address the "strategic dependencies" in the design and production of semiconductors. The EU's approach is framed around the concept of "strategic autonomy" and economic resilience, shying away from geopolitical goals. No provision in the EU Chips Act limits companies from expanding production in China or elsewhere. This stands in sharp contrast with the approaches of the US and China, which place a heavy premium on security and tech primacy. This difference likely stems from the EU architecture, where national security remains a prerogative of member states.

The EU Chips Act relies mainly on national budgets, with limited EU funds tapped only for R&D activities. This creates issues of comparability, as national budgets do not necessarily earmark funds over consistent timespans and might be subject to revisions. With this in mind, we estimate that the largest EU Member states budgeted for USD 49 billion in support of the industry (Table 5).

TABLE 5. EU incentives in semiconductors by country and type (USD bn) billion pledged (Acton and Chazan 2024).

	Germany	**Spain**	**France**	**Italy**
Direct grants	21	12.5	4.9	3.6
Tax incentives	-	-	-	0.5
Share purchase	-	0.2	-	-
Total	21	13	5	4
	(0.5% of GDP)	*(0.8% of GDP)*	*(0.2% of GDP)*	*(0.2% of GDP)*
Time horizon	6 years	5 years	9 years	8 years
	(2024-30)	(2022-27)	(2021-30)	(2022-30)

Source: Authors' elaborations.

[26] Regulation (EU) 2023/1781 of the European Parliament and of the Council of 13 September 2023 establishing a framework of measures for strengthening Europe's semiconductor ecosystem and amending Regulation (EU) 2021/694 (Chips Act), OJ L 229, 18.9.2023, p. 1–65.

The EU Chips Act has been criticized as overly ambitious and lacking in strategic focus (Kleinhans 2024; European Court of Auditors 2025). While the objective to reach a 20 percent market share reflects the wish to return to a dominant role in semiconductor manufacturing, questions have been raised on whether the EU ever held such a role.[27] Funding, in addition, appears inadequate to meet the objective. According to some estimates, the EU would need to deploy over 100 billion in additional resources (Timmers 2022). Partly due to the lack of strategic focus in Europe's measures, partly due to the financial difficulties of the key investor (Intel), investments in the EU are struggling to break ground. Catalyzed by national subsidies, the firm pledged to invest USD 50 billion in the Union, out of 87 billion in total pledges (Figure 6). Due to financial difficulties, however, the firm backtracked on 40 billion out of the 50 billion pledged (Acton and Chazan 2024).

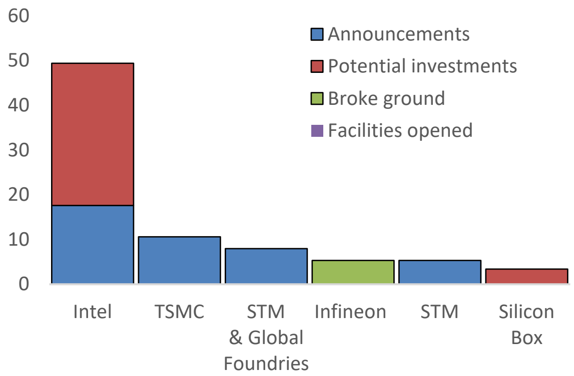

FIGURE 6. EU investment progress, by company (USD bn)

Source: Authors' elaboration based on GMF Semiconductor Investment Tracker and public news and announcements.

Japan

Japan is a global leader in semiconductor materials and equipment. Its global market share, however, has declined significantly over the years, falling from 50 percent in the 1980s to 9 percent in 2022.[28] In addition, according to government estimates, the

[27] According to Varas et al. (2021), in the 1990s Europe held 44 percent of global manufacturing capacity. This estimate, however, has been questioned as more accurate accounting appears to indicate that Europe historically only held a 10 percent share (Kleinhans 2021).

[28] Analysts attribute the decline in Japan's market share to three main factors: (i) the industry's focus on memory chips at the expense of logic chips; (ii) the offshoring of production and the global shift to a fabless model of chip design and manufacturing; and (iii) the 1986 US-Japan Semiconductor Agreement, which negotiated a 20percent market share for the US industry in Japan and committed Japan to allowing greater foreign competition in its market.

Japanese semiconductor industry currently lags technology leaders by about 10 years (Japan METI 2024). The government strategy for the sector is articulated by the 2022 Economic Security Promotion Act, which designates semiconductors among "specified critical materials" essential to the country's strategic interests (Tomoshige 2023), framing semiconductor policy as a matter of national economic security.

The overarching goal of the Act is to reduce Japan's dependence on foreign suppliers for critical chips. To revive its once-dominant semiconductor industry, the government committed USD 27 billion to projects under its Semiconductor Revitalization Strategy: a level of resources that, relative to GDP, exceeds that of the US Chips and Sciences Act (see Table 2). This funding supports a range of initiatives, including R&D for the Rapidus Consortium, a group of Japanese firms established in 2022 to produce cutting-edge chips in collaboration with IBM and the European IMEC (Satoh 2025). In addition, Japan introduced a corporate tax credit of up to 20 percent for semiconductor firms in fiscal year 2024, valid for ten years.[29]

These efforts are yielding results. Since 2022, chipmakers have announced nearly USD 70 billion in investments in the country. The majority of the investment stems from the Rapidus consortium, which successfully produced the first 2nm transistor in July, and the Japan Advanced Semiconductor Manufacturing (JASM) joint venture, primarily funded by TSMC (Figure 7).

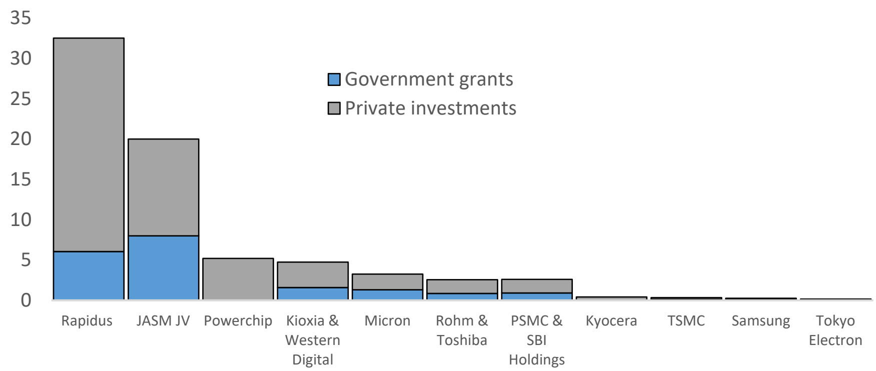

FIGURE 7. Japan investments announced since 2021 (USD bn)

Source: Authors' own computations based on public news and announcements.

[29] Moreover, in line with recent export restrictions by the United States and the Netherlands, Japan has listed 23 types of semiconductor technology now subject to export restrictions, effective July 23, 2023. These restrictions include advanced microchip manufacturing equipment, such as machines for depositing films on silicon wafers, and devices for etching microscopic circuits. For China, this amounts to a ban similar to the US export restrictions.

South Korea

South Korea plays a pivotal role in the production of memory devices. Its leading firms, Samsung and SK Hynix, control 70 percent of the global DRAM market and 50 percent of global NAND flash production. The country occupies a delicate geopolitical position, being a US ally while maintaining deep economic ties with China. In response to the unfolding contest between the two, South Korea enacted the 2023 K-Chips Act, signaling a strategic effort to safeguard its technological leadership.

A central objective of the Act is to secure "super-gap" technologies, meaning ensuring that critical chip intellectual property and know-how are developed domestically to maintain a competitive edge. To achieve this, the K-chips Act raises the tax credit for semiconductor investments, providing an estimated USD 21 billion in support for companies over the next 7 years (Varadarajan et al. 2024). Other measures include a 19 billion package primarily aimed at providing low-interest loans to chipmakers, and a 1 billion fund to support domestic AI chipmakers, to be spent by 2027.

The country is investing heavily in the construction of the world's largest semiconductor cluster, with the goal of attracting a total of USD 470 billion in private investment over the next two decades.[30] In the short term, 105 billion will be invested in projects to be completed in the coming years (Figure 8).

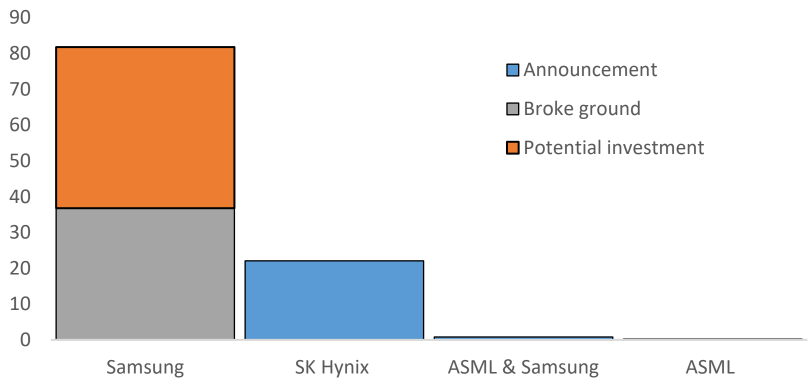

FIGURE 8. Korea investments announced since 2021 (USD bn)

Notes: For Samsung and SK Hynix the investment figures represent planned expenditures by 2030, rather than the investment planned over the entire two-decade period. "Announcements" refer to public statements or disclosures made by companies, while "Potential investments" refer to projects under consideration or industry rumors about upcoming investments that have not yet been formally confirmed.
Source: Authors' elaboration based on public news and announcements.

[30] The two-decade plan includes a USD 375 billion investment by Samsung, while SK Hynix is set to invest 91 billion in memory chip production in Yongin (Gyeonggi). The government said the region will also house smaller chip design and materials companies.

Taiwan

Taiwan is the global powerhouse in logic semiconductors, producing 18 percent of global semiconductor capacity and dominating advanced chips under 7nm (Varadarajan et al. 2024), with TSMC at the forefront. The country's semiconductor policy is deeply intertwined with its national security strategy, often referred to as the "Silicon Shield" – a term that reflects the notion that Taiwan's leadership in high-end chip manufacturing serves as a deterrent against aggression from China (Powers-Riggs and Bresnick, 2025). Recent policy initiatives aim to reinforce this strategic buffer by maintaining technological supremacy.

The Taiwanese government has offered approximately USD 16 billion in tax incentives and launched the "Taiwan Silicon Valley" initiative to strengthen industrial clusters, backed by USD 620 million from the 2024 budget. Further, Taiwan launched a chip-based Industrial Innovation Program office, supported by USD 9.27 billion in funding for the period from 2024 to 2033.[31] Government incentive programs are driving over USD 60 billion in semiconductor investments in Taiwan, primarily from domestic chipmakers (Figure 9).

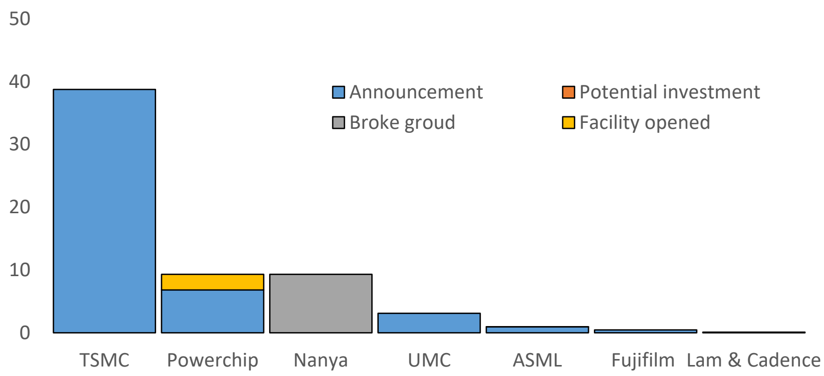

FIGURE 9. Taiwan investments announced since 2021 (USD bn)

Note: "Announcements" refer to public statements or disclosures made by companies, while "Potential investments" refer to projects under consideration or industry rumors about upcoming investments that have not yet been formally confirmed.

Source: Authors' elaboration based on public news and announcements.

[31] In addition to these incentives, Taiwan allocated a total of USD 26.6 billion in government-backed loans from 2019 to 2024 through the "Investing in Taiwan" program, aiming to attract investments in innovation industries such as semiconductors, green technologies, and biotech.

8. Perspectives and Considerations

So far, we discussed the structure of the semiconductor industry and the main policy levers that are being pulled to reengineer it for a world of heightened economic and national security concerns. Restrictive measures are fragmenting the market while unprecedented cash injections are reconfiguring production across geography. These actions, which rely on complex mechanisms of economic statecraft (Farrell and Newman 2019) are intended to shift the structural balance of capabilities (Lee 2024). As different actors pull in different directions, it is difficult to tell where the chip may fall. Nonetheless, some effects are visible.

On one hand, measures of denial are diverting China's path of technological development, slowing down its progress as it strives to find a path that is independent from Western technology (Triolo 2024; Allen 2025b; Miller 2025).

In the immediate aftermath of the 2022 controls, China's import of semiconductors dropped significantly,[32] and comparatively more than general imports (Figure 10).[33] Imports of semiconductors returned to their pre-2022 levels in late 2024, reportedly driven by stockpiling in anticipation of further restrictions (Allen 2025b; Yang et al. 2024). While this is insufficient to establish a causal link, it is indicative of disruption. Notably, the founder of path-breaking Chinese AI company DeepSeek recognized export controls as the company's single greatest challenge (Allen 2025b; Miller 2025). In 2025, despite a partial relaxation of US controls (Acton et al. 2025; Freifeld 2025; Krishnamoorthi 2025), the Chinese government discouraged companies from relying on US devices in a bid to foster domestic production (Wu et al. 2025).

Export controls also had a major impact on China's imports of SME. As Figure 10 shows, imports of photolithography equipment (mostly from the Netherlands) skyrocketed in conjunction with the implementation of the 2022 controls. This phenomenon reflects the mass purchases of Deep Ultraviolet (DUV) equipment ahead of the entry into force of additional Dutch and US controls at the end of 2023. Dutch and US controls were further tightened in the last quarter of 2024, causing another rush to import to-be-controlled technologies (Allen 2025a). DUV equipment is less advanced than the (already controlled) EUV technology required to manufacture the most advanced chips (Miller 2025). Sophisticated uses of these machines can nonetheless enable production of devices only a few generations back from the cutting edge.

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[32] This refers to China's imports from the rest of the world. Although very broad, this is a preferable measure to imports form the US and US-aligned countries as it covers also potential circumvention of export controls via third countries. According to Allen (2025) China was able to smuggle large quantities of advanced chips from Taiwan.

[33] China's economy displayed wide fluctuations in these years. It grew at over 8 percent in 2021, slowed sharply to 3 percent in 2022 to then return to grow around the government's target of 5 percent. As imports are related to the country's economic performance, it is important to benchmark semiconductor imports against the country's total imports. slowed sharply in 2022, growing at 3.1 percent, from 8.6 in 2021. China's economy return (Source: World Bank, WDI)

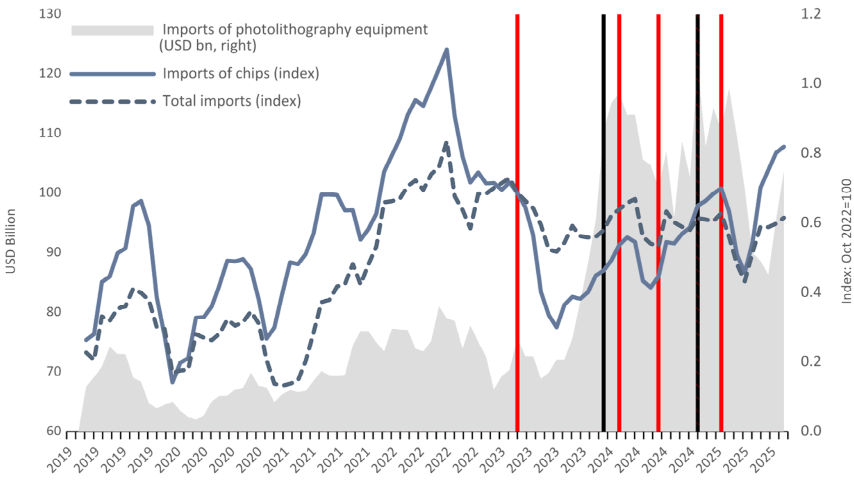

FIGURE 10. Impact of export controls on China imports

Note: (1) 3-month moving averages of trade data. (2) Total imports and imports of chips (HS codes 85423190 and 85423290) are indexed to 100 in October 2022, the entry into force of the first set of US export controls. (3) Imports of photolithography equipment (HS code 84862039) is shown in USD bn on the right axis. (4) Red and black vertical lines show export control measures implemented by the US and the Netherlands respectively.

Source: Author's elaboration from TDM data.

Expert commentary suggests that despite the progress of Chinese firms in producing advanced devices (7nm, against 2-3nm at the cutting edge), this is likely limited by the SME equipment utilized, and by the tightening of SME controls. As in the case of advanced military technologies, the complexity of the technologies involved in chip production constitutes a formidable barrier to independent production (Gilli and Gilli 2019). Export controls thus appear to pose substantial constraints to China's progress in the sector (Miller 2025; Allen 2025b; Harithas 2024; Triolo 2024).

Nonetheless, these effects may be transitory. The effectiveness of export controls depends on enforcement capacity and collaboration between like-minded countries and with the private sector. Further, export controls come at a cost. In response to US controls, China imposed controls on critical materials, such as gallium and germanium, of which it is the world's main supplier. These materials play an important role in the manufacturing of certain semiconductors, particularly with defense applications (Baskaran and Schwarz 2024). A total ban on the exports of such materials has been estimated to cost up to USD 9 billion to the US economy (0.03 percent of GDP), most of which is in the semiconductor sector (Nassar et al. 2024). As the US further turns the screws, China imposed additional controls on rare earth elements.

On the other hand, measures of inducement are shifting the geography of production in favor of the US. Between 2022 and 2025, construction work was ongoing at 89 sites, where new fabs will become operational over the next two years (SEMI 2023; 2025). Most of these are located in the US, which counts 22 projects, followed by China with 16. US-aligned countries make up for the rest. By 2032, it is estimated that up to 150 additional fabs might be in operation. As a result, the US could see a major increase in its market share by 2032, particularly in the advanced logic segment, where the US could jump from virtually nothing to nearly 30 percent of global production (Varadarajan et al. 2024). Gaining a substantial share of the advanced logic sector, the US appears poised to reinforce its leading position in the industry.

At the same time, China could make significant gains in the non-edge logic semiconductors, where Chinese demand is still very import-dependent. The bulk of China's additional capacity appears to be catered to domestic demand. Thus, concerns with oversupply in this production appears unlikely (Goujon et al. 2024; Benson et al. 2024; Ebrahimi 2024). Increased domestic capacity in this segment, however, will further entrench China's leading position in the manufacturing of downstream electronics, and learning-by-doing increases the chances of breakthroughs into advanced logic production despite the stringent export controls.

As for the EU, due to the limited size of public resources made available, and the comparatively lower level of leverage they seem to achieve, it appears unlikely that it will achieve its target to double its market share by 2030. Nonetheless, the EU will continue playing a critical role in segments of the industry where it holds dominant positions.

Across the board, it is worth noting that vast government and private sector capital outlays are no guarantee of success. Transferring or starting from scratch the production of advanced technologies is notoriously complex, and the economic viability of the projects is far from ensured.

In addition, despite the increased onshore production, the industry will remain tightly interdependent, with no country poised to achieve self-sufficiency. Varas et al. (2021) estimate that complete manufacturing self-sufficiency in the US would require over USD 400 billion in government incentives and cost more than USD 1 trillion over ten years.

As government interventions alter the supply-demand balance, the sector may suffer collateral damage. On the supply side, heavy government intervention will boost production in advanced economies, where the cost of inputs may lead to higher end-market prices. On the demand side, restrictive measures may fragment the markets. The combination of increased costs and fragmented markets may trim profits in the sector, undermining its ability to sustain the extremely high capital outlays and research budget necessary to maintain the technological edge.

In sum, given their strategic nature, semiconductors have become a core arena of geoeconomic rivalry. Through measures of denial and inducement, states are attempting to reshape the geography of the sector and thus the global distribution of technological capabilities. The US and China remain the main actors. Around them, other, mostly US-aligned economies pursue strategies to safeguard access and retain strategic roles in the supply chain. Yet the struggle for control of the sector may strain its economic viability. In this sense, the semiconductor race exemplifies the broader challenge of balancing economic interdependence with national security in critical sectors (Muzinich 2023).

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REFERENCES

Acton, M., and G. Chazan. 2024. *Intel Outlines Plans to Cut Costs and Boost Chip Business in Turnaround Push*. Financial Times, September 16, 2024. https://www.ft.com/content/91925f08-0e05-4dbc-93e6-ada61af8c8ee.

Acton, M., D. Sevastopulo, T. Bradshaw, and M. McCormick. 2025. *Donald Trump Opens Door to Nvidia Selling Advanced AI Chips to China for a Fee*. *Financial Times*, August 11, 2025. https://www.ft.com/content/0dbd7fee-66b0-4e08-916f debfbb580f8c.

Allen, G. C. 2024. *Understanding the Biden Administration's Updated Export Controls*. Washington, DC: Center for Strategic and International Studies. https://www.csis .org/analysis/understanding-biden-administrations-updated-export-controls.

Allen, G. C. 2025a. *CSIS Translation: Updated Dutch Export Controls on Semiconductor Manufacturing Equipment and Related Government Documents*. Washington DC: Center for Strategic and International Studies (CSIS), March 3, 2025. https://www.csis.org/analysis/csis-translation-updated-dutch-exportcontrols-semiconductor-manufacturing-equipment.

Allen, G. C. 2025b. *DeepSeek, Export Controls, and the Future of the U.S.-China AI Race*. Washington, DC: Center for Strategic and International Studies. https://w ww.csis.org/analysis/deepseek-huawei-export-controls-and-future-us-china-ai race.

Allen, G. C., and E. Benson. 2023. *Clues to the U.S.-Dutch-Japanese Semiconductor Export Controls Deal Are Hiding in Plain Sight*. Washington, DC: Center for Strategic and International Studies. https://www.csis.org/analysis/clues-us-dutch japanese-semiconductor-export-controls-deal-are-hiding-plain-sight.

Allen, G. C., E. Benson, and M. Putnam. 2023. *Japan and the Netherlands Announce Plans for New Export Controls on Semiconductor Equipment*. Washington, DC: Center for Strategic and International Studies. https://www.csis.org/analysis/japan-and-netherlands-announce-plans-new-export-controls-semiconductor-equipment.

Baldwin, D. A. 2020. *Economic Statecraft: New Edition*. Princeton, NJ: Princeton University Press.

Baskaran, G., and M. Schwarz. 2024. *From Mine to Microchip: Addressing Critical Mineral Supply Chain Risks in Semiconductor Production*. Washington, DC: Center for Strategic and International Studies. https://www.csis.org/analysis/minemicrochip.

Bencivelli, L., V. Faubert, F. Le Gallo, and P. Négrin. 2023. *Who's Afraid of Foreign Investment Screening?* Banque de France Working Paper No. 927. Paris: Banque de France. https://www.banque-france.fr/system/files/2023-11/DT927_0.pdf.

Benson, E., J. Quitzon, and W. A. Reinsch. 2023. *Securing Semiconductor Supply Chains in the Indo-Pacific Economic Framework for Prosperity*. Washington, DC: Center for Strategic and International Studies. https://www.csis.org/analysis/securing-semiconductor-supply-chains-indo-pacific-economic-framework-prosperity.

Benson, E., C. Mouradian, and P. Alvarez-Aragones. 2024. *Evaluating Chip Overcapacity and the Transatlantic Trade Tool Kit*. Washington, DC: Center for Strategic and International Studies. https://www.csis.org/analysis/evaluating-chip-overcapacity-and-transatlantic-trade-tool-kit.

Bown, C. P., and D. Wang. 2024. "Semiconductors and Modern Industrial Policy". *Journal of Economic Perspectives* 38 (4): 81–110. https://doi.org/10.1257/jep.38.4.81.

Bracken, P. 2018. "New Technologies and International Order". In *Strategic Latency: Red, White, and Blue — Managing the National and International Security Consequences of Disruptive Technologies*, edited by Z. S. Davis and M. Nacht, pp. 104–114. Livermore, CA: Center for Global Security Research, Lawrence Livermore National Laboratory. https://cgsr.llnl.gov/sites/cgsr/files/202408/STATEGIC_LATENCY_Book-WEB.pdf.

Brambilla, A., and D. Lepido. 2021. *China Targeted Milan Semiconductor Firm Before Draghi's Veto*. Bloomberg, April 9,2021. https://www.bloomberg.com/news/articles/2021-04-09/china-targeted-milan-semiconductor-firm-before-draghi-s-veto.

Bureau of Industry and Security (BIS). 2023a. *Annual Report to Congress: Fiscal Year 2021*. Washington, DC: US Department of Commerce. https://www.bis.doc.gov/index.php/documents/about-bis/newsroom/3569-bis-fiscal-year-2023-annual-report/file.

Bureau of Industry and Security (BIS). 2023b. *Analysis of U.S. Trade with China, 2022*. Washington, DC: US Department of Commerce. https://www.bis.doc.gov/index.php/country-papers/3420-2022-statistical-analysis-of-us-trade-with-china/file.

Casey, C. A. 2023. *Export Controls—International Coordination: Issues for Congress*. CRS Report R47684. Washington, DC: Congressional Research Service. https://crsreports.congress.gov/product/pdf/R/R47684.

Center for Security and Emerging Technology (CSET). 2021. *Outline of the People's Republic of China's 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035*. Washington, DC: Center for

Security and Emerging Technology (CSET). https://cset.georgetown.edu/publication/china-14th-five-year-plan/.

China, Ministry of Finance (China MoF). 2014. *National Integrated Circuit Industry Investment Fund Officially Established*. Beijing: Ministry of Finance of the People's Republic of China (China MoF), October 14, 2014. https://www.mof.gov.cn/zhengwuxinxi/caizhengxinwen/201410/t20141014_1149902.html.

Chorzempa, M. 2024. *The U.S. and Korean CHIPS Acts Are Spurring Investment but at a High Cost*. PIIE RealTime Economics, June 10,2024. https://www.piie.com/blogs/realtime-economics/2024/us-and-koreanchips-acts-are-spurring-investment-high-cost.

Chorzempa, M., M. E. Lovely, and Y. Wan. 2024. *The Rise of U.S. Economic Sanctions on China: Analysis of a New PIIE Dataset*. Peterson Institute for International Economics Policy Brief 24-14 (December2024).https://www.piie.com/sites/default/files/2024-12/pb24-14.pdf.

Christie, E. H., and M. Wigell. 2024. *The Economic Security Dilemma*. *PRISM* 10 (4): 1–13. https://ndupress.ndu.edu/Portals/68/240805_2_Christie-Wigell%20-%20Econ%20Sec%20Dilemma%20-%20MM.pdf.

Cooban, A., and C. Stern. 2022. *Germany Blocks Sale of Chip Factory to China Over Security Fears*. CNN Business, November 9, 2022. https://edition.cnn.com/2022/11/09/tech/germany-blocks-chip-factory-sale-china.

Crosignani, M., L. Han, M. Macchiavelli, and A. F. Silva. 2024. *Geopolitical Risk and Decoupling: Evidence from U.S. Export Controls.* Federal Reserve Bank of New York Staff Report No. 1096. New York: Federal Reserve Bank of New York, April 2024. https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr1096.pdf.

Ding, J., and A. Dafoe. 2021. "The Logic of Strategic Assets: From Oil to AI". *Security Studies* 30 (2): 182–212. https://doi.org/10.1080/09636412.2021.1915583.

Dohmen, H., and J. Feldgoise. 2023. *A Bigger Yard, a Higher Fence: Understanding BIS's Expanded Controls on Advanced Computing Exports*. Center for Security and Emerging Technology (CSET), December 4, 2023. https://cset.georgetown.edu/article/bis-2023-update-explainer.

Ebrahimi, A. 2024. *China's Mature Node Overcapacity: Unfounded Fears*. Paris: Institut Français des Relations Internationales. https://www.ifri.org/en/memos/chinas-mature-node-overcapacity-unfounded-fears.

European Court of Auditors (ECA). 2025. *The EU's Strategy for Microchips: Special Report 12/2025.* Luxembourg: European Court of Auditors. https://www.eca.europa.eu/EN/publications/SR-2025-12.

Export Compliance Training Institute (ECTI). 2022. *Understanding the Foreign Direct Product Rule.* https://learnexportcompliance.com/insights/understanding-the-foreign-direct-product-rule.

European Commission. 2021. *2030 Digital Compass: The European Way for the Digital Decade.* Brussels: European Commission, March 9, 2021. https://eurlex.europa.eu/legal-content/EN/TXT/?uri=celex:52021DC0118.

Farrell, H., and A. Newman. 2019. "Weaponized Interdependence: How Global Economic Networks Shape State Coercion". *International Security* 44 (1): 42–79. https://doi.org/10.1162/ISEC_a_00351.

Farrell, H., and A. Newman. 2023. *Underground Empire: How America Weaponized the World Economy*. New York: Henry Holt & Company.

Freifeld, K. 2025. *US Licenses Nvidia to Export Chips to China, Official Says*. Reuters, August 8, 2025. https://www.reuters.com/world/china/us-licenses-nvidia-export-chips-china-official-says-2025-08-08/.

Gilli, A., and M. Gilli. 2019. "Why China Has Not Caught Up Yet: Military-Technological Superiority and the Limits of Imitation, Reverse Engineering, and Cyber Espionage". *International Security* 43 (3): 141–189. https://doi.org/10.1162/isec_a_00337.

Gilpin, R. 1981. *War and Change in World Politics*. Cambridge University Press.

Goldberg, P., R. Juhász, N. Lane, G. LoForte, and J. Thurk. 2024. *Industrial Policy in the Global Semiconductor Sector*. NBER Working Paper No. 32651. Cambridge, MA: National Bureau of Economic Research. https://www.nber.org/papers/w32651.

Gross, A., and J. Pickard. 2022. *Newport Wafer Fab's Sale to Nexperia Blocked by UK Ministers*. Financial Times, November 16, 2022. https://www.ft.com/content/cdaddf62-72f7-4789-890c-69f1ce196748.

Goujon, R., J.-P. Kleinhans, and L. Gormley. 2024. *Thin Ice: US Pathways to Regulating China-Sourced Legacy Chips*. New York: Rhodium Group. May 13, 2024. https://rhg.com/research/thin-ice-us-pathways-to-regulating-china-sourced-legacy-chips/.

Harithas, B. 2024. *Securing the AGI Laurel: Export Controls, the Compute Gap, and China's Counterstrategy*. Washington, DC: Center for Strategic and International Studies. https://www.csis.org/analysis/securing-agi-laurel-export-controls-compute-gap-and-chinas-counterstrategy.

Harithas, B., and A. Schumacher. 2024. *Where the Chips Fall: U.S. Export Controls Under the Biden Administration from 2022 to 2024*. Washington, DC: Center for Strategic and International Studies. https://www.csis.org/analysis/where-chips-fall-us-export-controls-under-biden-administration-2022-2024.

Hufbauer, G. C., and M. Hogan. 2025. *Industrial Policy through the CHIPS and Science Act: A Preliminary Report.* PIIE Briefing 25-1. January 2025. Washington, DC: Peterson Institute for International Economics. https://www.piie.com/sites/default/files/2025-01/piieb25-1.pdf.

Japan, Ministry of Economy, Trade and Industry (METI). 2024. *Outline of Semiconductor Revitalization Strategy in Japan.* Tokyo: Ministry of Economy, Trade and Industry (METI), July 2024. https://www.meti.go.jp/english/policy/0704_001.pdf.

Kania, E., and L. Laskai. 2021. *Myths and Realities of China's Military-Civil Fusion Strategy*. Washington, DC: Center for a New American Security. January 28, 2021. https://www.cnas.org/publications/reports/myths-and-realities-of-chinas-military-civil.

Keohane, R. O., and J. S. Nye. 1977. *Power and Interdependence: World Politics in Transition*. Boston: Little, Brown.

Kerr, P. K., and C. A. Casey. 2021. *The U.S. Export Control System and the Export Control Reform Act of 2018*. CRS Report R46814. Washington, DC: Congressional Research Service. https://crsreports.congress.gov/product/pdf/R/R46814.

Khan, S. 2020. *U.S. Semiconductor Exports to China: Current Policies and Trends*. Washington, DC: Center for Security and Emerging Technology (CSET). https://cset.georgetown.edu/publication/u-s-semiconductor-exports-to-china-current-policies-and-trends/.

Khan, S. 2021. *The Semiconductor Supply Chain: Assessing National Competitiveness*. Washington, DC: Center for Security and Emerging Technology (CSET). https://cset.georgetown.edu/publication/the-semiconductor-supply-chain/.

Kleinhans, J. P. 2021. *Europe Didn't Have 44 Percent of Global Chip Production Capacity in the 90s. Sorry*. LinkedIn post, December2021. https://www.linkedin.com/pulse/europe-didnt-have-44-global-chip-production-capacity-90s-kleinhans.

Kleinhans, J. P. 2024. *The Missing Strategy in Europe's Chips Ambitions*. Interface, published July 30, 2024. https://www.interface-eu.org/publications/europe-semiconductor-strategy.

Krishnamoorthi, R. 2025. *Letter to President Donald J. Trump on Export Controls*. Washington, DC: Democrats, House Select Committee on the Strategic Competition between the United States and the Chinese Communist Party, August 15, 2025. https://democrats-selectcommitteeontheccp.house.gov/sites/evo-subsites/democrats-selectcommitteeontheccp.house.gov/files/evo-media-document/2025.08.15-krishnamoorthi-letter-to-president-trump-export-controls_0.pdf.

Lee, J. 2024. "Defining Geoeconomics, Economic Statecraft, and the Political Economy of National Security". In *The Oxford Handbook of Geoeconomics and Economic Statecraft*, edited by V. K. Aggarwal and T. M. Cheung. Oxford: Oxford University Press.

Luo, Y., and A. Van Assche. 2023. "The Rise of Techno-Geopolitical Uncertainty: Implications of the United States CHIPS and Science Act". *Journal of International Business Studies* 54: 1423–1440. https://doi.org/10.1057/s41267-023-00620-3.

Luttwak, E. N. 1990. "From Geopolitics to Geo-Economics: Logic of Conflict, Grammar of Commerce". *The National Interest*, no. 20 (Summer): 17–23. https://www.jstor.org/stable/42894676.

Miller, C. 2022. *Chip War: The Fight for the World's Most Critical Technology*. New York: Simon & Schuster.

Miller, C. 2025. *How U.S. Export Controls Have (and Haven't) Curbed Chinese AI*. AI Frontiers, July 8, 2025. https://ai-frontiers.org/articles/us-chip-export-controls-china-ai.

Muzinich, J. 2023. *American National Security Has an Economic Blindspot*. Foreign Affairs, August 3, 2023. https://www.foreignaffairs.com/united-states/american-national-security-has-economic-blindspot.

Nassar, N., E. Shojaeddini, E. Alonso, B. Jaskula and A. Tolcin. 2024. *Quantifying Potential Effects of China's Gallium and Germanium Export Restrictions on the U.S. Economy*. Washington DC: UD Department of the Interior, US Geological Survey. https://pubs.usgs.gov/publication/ofr20241057/full.

Organization for Economic Co-operation and Development (OECD). 2019. "Measuring Distortions in International Markets: The Semiconductor Value Chain". OECD Trade Policy Papers, No. 234. *Paris: OECD Publishing*. https://doi.org/10.1787/8fe4491d-en.

Organization for Economic Co-operation and Development (OECD). 2023. "Vulnerabilities in the Semiconductor Supply Chain". OECD Science, Technology and Industry Working Papers, No. 05. *Paris: OECD Publishing*. https://doi.org/10.1787/6bed616f-en.

Organization for Economic Co-operation and Development (OECD). 2024a. "Chips, Nodes and Wafers: A Taxonomy for Semiconductor Data Collection". *Paris: OECD Publishing*. August 2024. https://doi.org/10.1787/f68de895-en

Organization for Economic Co-operation and Development (OECD). 2024b. "Measuring Industrial Subsidies". *Paris: OECD Publishing*. https://www.oecd.org/en/publications/measuring-industrial-subsidies_781417028471.html.

Office of the Director of National Intelligence (ODNI). 2024. *Annual Threat Assessment of the U.S. Intelligence Community*. Washington, DC: Office of the Director of National Intelligence. https://www.odni.gov/files/ODNI/documents/assessments/ATA-2024Unclassified-Report.pdf.

Powers-Riggs, A., and S. Bresnick. 2025. *Taiwan's Silicon Shield Is Turning Into a Target.* Lawfare, August 21, 2025. https://www.lawfaremedia.org/article/taiwans-silicon-shield-is-turning-into-a-target.

Satoh, R. 2025. *Japan's Rapidus Touts 2-nm Milestone in Race to Catch TSMC, Samsung*. Nikkei Asia, July 18, 2025. Archived at https://archive.is/05Siz.

SEMI. 2023. *World Fab Forecast: Trends and Forecast*. San Jose CA: SEMI. https://de170d6b23836ee9498a9e3cbe05dc55738dcbe22366a8963ae7.ssl.cf1.rackcdn.com/2388052-1660348-001.pdf.

SEMI. 2025. *Eighteen New Semiconductor Fabs to Start Construction in 2025, SEMI Reports*. San Jose CA: *SEMI Press Release*, January 7, 2025. https://www.semi.org/en/semi-press-release/eighteen-new-semiconductor-fabs-to-start-construction-in-2025-semi-reports.

Semiconductor Industry Association (SIA). 2025. *State of the U.S. Semiconductor Industry 2025*. Washington, DC: SIA, July 7, 2025. https://www.semiconductors.org/wp-content/uploads/2025/07/SIA-State-of-the-Industry-Report-2025.pdf.

Sullivan, J. 2022. *Remarks by National Security Advisor Jake Sullivan at the Special Competitive Studies Project Global Emerging Technologies Summit*. Washington, DC: The White House, September 16, 2022. https://bidenwhitehouse.archives.gov/briefing-room/speeches-remarks/2022/09/16/remarks-by-national-security-advisor-jake-sullivan-at-the-special-competitive-studies-project-global-emerging-technologies-summit/.

Strange, S. 1988. *States and Markets*. London: Pinter.

Timmers, P. 2022. *How Europe Aims to Achieve Strategic Autonomy for Semicondu ctors*. *Brookings Institution*, August 9, 2022. https://www.brookings.edu/articles/how-europe-aims-to-achieve-strategic-autonomy-for-semiconductors/.

Tomoshige, H. 2023. *Japan's Semiconductor Revival.* East Asia Forum, September 27, 2023. https://eastasiaforum.org/2023/09/27/japans-semiconductor-revival/.

Trade Practitioner. 2016. *CFIUS Filing Withdrawn, Deal Abandoned: San'an Optoelectronics and GCS Holdings.* The Trade Practitioner, September 1, 2016. https://www.tradepractitioner.com/2016/09/sanan-optoelectronics-and-gcs-holdings-abandon-proposed-merger/.

Trade Practitioner. 2017. *Presidential Order on CFIUS Filing: Canyon Bridge Capital Partners, China Venture Capital Fund, and Lattice Semiconductor*. The Trade Practitioner, September 13, 2017. https://www.tradepractitioner.com/2017/09/canyon-bridge-china-venture-capital-fund-lattice-semiconductor/.

Trade Practitioner. 2018a. *CFIUS Deal Abandoned, Presidential Order: Broadcom and Qualcomm*. The Trade Practitioner, March 17, 2018. https://www.tradepractitioner.com/2018/03/cfius-deal-abandoned-presidential-order-broadcom-and-qualcomm/.

Trade Practitioner. 2018b. "*CFIUS Filing Withdrawn, Deal Abandoned: Unic Capital Management, China Integrated Circuit Industry Investment Fund and Xcerra, Inc.* The Trade Practitioner, March 1, 2018. https://www.tradepractitioner.com/2018/03/upcomingnew-cfius-filing-unic-capital-management-china-integrated-circuit-industry-investment-fund-and-xcerra-inc/.

Triolo, P. 2024. *The Evolution of China's Semiconductor Industry under U.S. Export Controls*. American Affairs, November 20, 2024. https://americanaffairsjournal.org/202|4/11/the-evolution-of-chinas-semiconductor-industry-under-u-s-export-controls/.

US-China Economic and Security Review Commission (USCC). 2024. *2024 Report to Congress*. Washington, DC: USCC, November 19, 2024. https://www.uscc.gov/annual-report/2024-annual-report-congress.

US Department of Defense. 2009. *Dictionary of Military and Associated Terms (JP 1-02)*. Washington, DC: Department of Defense. https://jitc.fhu.disa.mil/jitc_dri|/pdfs/jp1_02.pdf.

Van Grack, B., and J. Brower. 2021. *CFIUS's Expanding Jurisdiction in the Magnachip Acquisition*. Lawfare, October 11, 2021. https://www.lawfaremedia.org/article/cfiuss-expanding-jurisdiction-magnachip-acquisition.

Van Nostrand, E., T. Sinclair, S. Gupta. 2023. *Unpacking the Boom in U.S. Construction of Manufacturing Facilities*. US Department of the Treasury, June 2023. https://home.treasury.gov/news/featured-stories/unpacking-the-boom-in-us-construction-of-manufacturing-facilities.

Varadarajan, R., I. Koch-Weser, C. Richard, J. Fitzgerald, J. Singh, M. Thornton, and R. Casanova. 2024. *Emerging Resilience in the Semiconductor Supply Chain*. Boston: Boston Consulting Group. Also published with SIA. https://www.semiconductors.org/wpcontent/uploads/2024/05/Report_Emerging-Resilience-in-the-Semiconductor-Supply-Chain.pdf.

Varas, A., R. Varadarajan, R. Palma, J. Goodrich, and F. Yinug. 2021. *Strengthening the Global Semiconductor Supply Chain in an Uncertain Era*. Boston: Boston Consulting Group and Semiconductor Industry Association, April 2021. https://www.semiconductors.org/wp-content/uploads/2021/05/BCG-x-SIA-Strengthening-the-Global-Semiconductor-Value-Chain-April-2021_1.pdf.

Voetelink, J. 2023. "The Extraterritorial Reach of US Export Control Law: The Foreign Direct Product Rules". *Journal of Strategic Trade Control*. https://doi.org/10.25518/2952-7597.57.

Waltz, K. N. 1979. *Theory of International Politics*. Reading, MA: Addison-Wesley.

Wu, Z., C. Leng, and T. Bradshaw. 2025. *China Bans Tech Companies from Buying Nvidia's AI Chips*. Financial Times, September 17, 2025. https://www.ft.com/content/12adf92d-3e34-428a-8d61-c9169511915c.

Yang, H., F. Potkin, and K. Freifeld. 2024. *Exclusive: Chinese Firms Stockpile High-End Samsung Chips as They Await New US Curbs, Say Sources*. Reuters, August 6, 2024. https://www.reuters.com/technology/chinese-firms-stockpile-high-end-samsung-chips-they-await-new-us-curbs-say-2024-08-06.