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The New Jedi Order: global chip war and the semiconductor industry

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Content

Executive Summary

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- **A new hope: the ongoing recovery in the chip market.** The chip market generated almost USD700bn of revenue last year, up by +21% y/y, and is expected to record a CAGR of roughly +10% over the upcoming year to become a trillion-dollar market by 2029/2030. The rebound has followed two years of weak performance (+1% in 2022 and -10% in 2023) inherited from the painful period of post-pandemic chip shortages and the sudden boom in demand for computing devices. Future revenues are expected to be mostly driven by the gradual integration of generative AI tools into electronic devices (+8% CAGR over the 2024-28 period for wearables) and computing solutions (+12% CAGR), but also a full-scale deployment of the 5G technology into the mobile market (+12% CAGR) and skyrocketing investment into data centers (+15-20% CAGR).

- **Fragmented across the galaxy: the chip supply chain has become increasingly complex and scattered around the globe.** The semiconductor supply chain is divided into different pools of expertise/lead capacity, where one or two countries tend to dominate. In a nutshell, China controls raw material supply via its large reserves and refining capacities of rare earth elements, while the US is leading the IP and design segments, China and Taiwan have the biggest manufacturing capacities and Southeast Asia has specialized into the Assembly, Test & Packaging (ATP) segment. Europe looks like the underdog in that industry but shows a real expertise in the equipment market, as well as in automotive chips, thanks to strategic partnerships with the biggest European OEMs.

- **The Empires strike each other: geopolitical tensions are on the rise.** Economic superpowers have implemented competing chip policies as trade tensions intensify. Like China and the US, Europe unveiled its own version of chip industrial policy with the European Chip Act and set a bold target to reach 20% of domestic production of chips by 2030. But unlike its peers, Europe's target looks to be out of reach at this stage, notably given a huge differential in capital investments with China and the US, which have both deployed over USD100bn in grants and loans to develop their capacities and strengthen their industries. We are also seeing a race for tech leadership between nations, putting semiconductors at the center of a geopolitical game in which they are being used as a bargaining chip to increase economic influence and/or contain expansion from rivals. From a market perspective, further trade tensions will not challenge the AI-driven rally over the long run but they could pave the way for further "Deepseek-like" episodes as investor scrutiny is increasing.

- **Europe needs to use the force of its brain rather than showing muscles.** The chip industry is a very cost-intensive one, both in the R&D phase and the industrial phase: a modern fab costs about USD15-20bn. Europe is starting from too far behind to expect to narrow the gap with peers quickly while low productivity limits its ability to be competitive in the market. Besides, from an industrial standpoint, it would not be relevant for Europe to start producing chips for consumer electronics and computers as such products are not manufactured in Europe. Instead, it would make sense to target and develop chip capacities on the basis of potential synergy with industries in which Europe has champions, such as automotive, chemicals, defense or health care.

- **How can the European Jedi make a return?** As chips are core to many sectors from auto to defense to AI, we stress that investments to support these sectors should partly be directed towards semiconductors. In particular, we outline the following five steps for Europe to get back into the global chip race:

  1. Set up a clear and coordinated roadmap to develop a semiconductor expertise in industries in which Europe has an economic or strategic interest (i.e. auto, defense or health care). An early investment could favor economic synergy while supporting the development of an expertise leadership that would be helpful, especially when Europe intends to increase and modernize its military capacities. A portion of the expected increase in defense spending (~3% of GDP with a targeted 35-40% ratio allocated to equipment/R&D) could help funding new chip capabilities.

  2. Develop and support its expertise in semiconductor equipment to defend current leadership in this segment. This would imply investing further to increase capacities while replicating success to help develop new actors, and also protecting against unfair competition and industrial espionage.

  3. Increasing further partnerships between corporates and engineering schools to create a proper domestic ecosystem dedicated to AI and new-technology R&D. Europe should leverage its engineering expertise to reduce by half the current 40-50% mobility ratio of European PhDs graduate in the tech sector In this context, realigning the European chip act target of 20% of market share by 2030 with a specific focus on upstream activities would be more appropriate.

  4. Dedicate at least 0.5% of GDP annually (EUR35-40bn), to R&D and new capacities via the promotion of investments from Asian and US foundries on European soil (tax reduction, favored loans, public funds, fast-track process for acquiring lands etc.). Complementary to the Chip Act funding scheme, this could be implemented by tapping into existing funds and facilities such as the Connecting Europe Facility, the InvestEU capability of the EIB etc.

  5. Devote at least 10-15% of the European InvestAI initiative (i.e. EUR20-30bn) to broad-scale investment into data centers and to the sourcing and development of a secured supply-chain entirely dedicated to Europe.

Chip wars: who's ruling the galaxy?

The semiconductor supply chain goes beyond foundries in Asia. The semiconductor supply chain is a highly intricate and globalized process that involves multiple critical steps, each requiring specialized expertise and coordination across different regions. Within this process there are upstream and downstream inputs. Upstream refers to the early stages of the supply chain, primarily involving research, raw materials and manufacturing equipment, with four critical segments:

1- Raw materials: high-purity silicon wafers, rare earth elements, chemicals and gases essential for chip fabrication.

2- Equipment: highly specialized tools such as photolithography machines, etching systems and deposition equipment, which enable precise semiconductor production.

3-Electronic Design Automation (EDA) software: software tools that enable engineers to create, simulate and optimize semiconductor architecture before physical production begins.

4- Design & Intellectual Property (IP): conceptualization, engineering and verification of semiconductor architecture before they proceed to fabrication.

The upstream phase is critical in the development and improvement of modern semiconductors, which have become smaller but substantially more powerful and efficient in terms of capacity. This phase is highly research-intensive and requires a high level of expertise, coming before an order is placed with plants to manufacture chips. The downstream phase focuses on the later stages of the process in which fabricated semiconductors are assembled, distributed and integrated into final products. Here there are three critical segments:

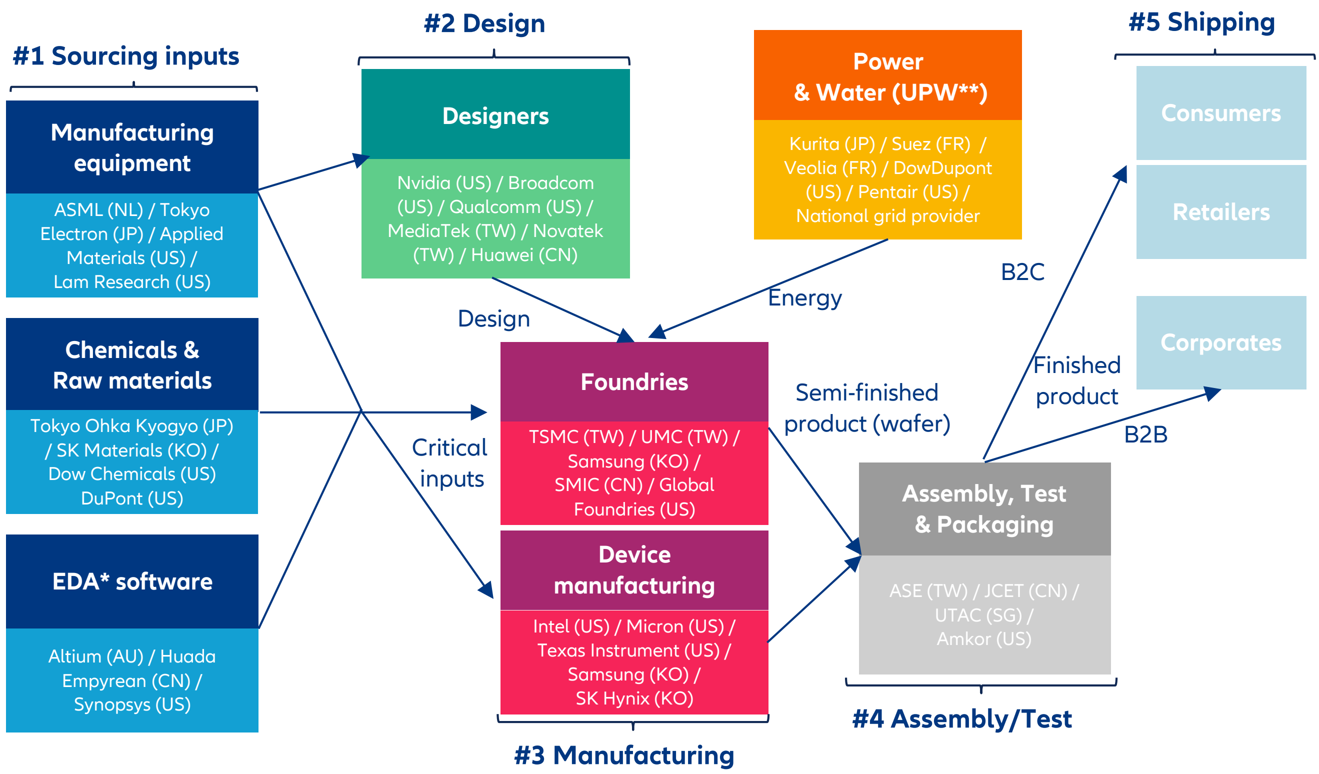
1- Testing & Packaging: chips undergo rigorous quality checks before being encapsulated in protective casings.

2- Distribution & Logistics: semiconductors are transported to various industries, including consumer electronics, automotive and telecommunications.

3- End-Product Manufacturing: final assembly occurs when chips are integrated into smartphones, computers, vehicles and industrial systems.

The final product is either shipped directly to consumers or via a retailer for sale or to a third-party wholesaler that deals with corporate equipment resources. The interdependence between upstream and downstream actors highlights the semiconductor industry's complexity and its vulnerability to disruptions. Any disruption in upstream supply – such as material shortages – can have cascading effects downstream, delaying product manufacturing and shipping to final customers, as highlighted in recent years, especially amid trade tensions between the US and China.

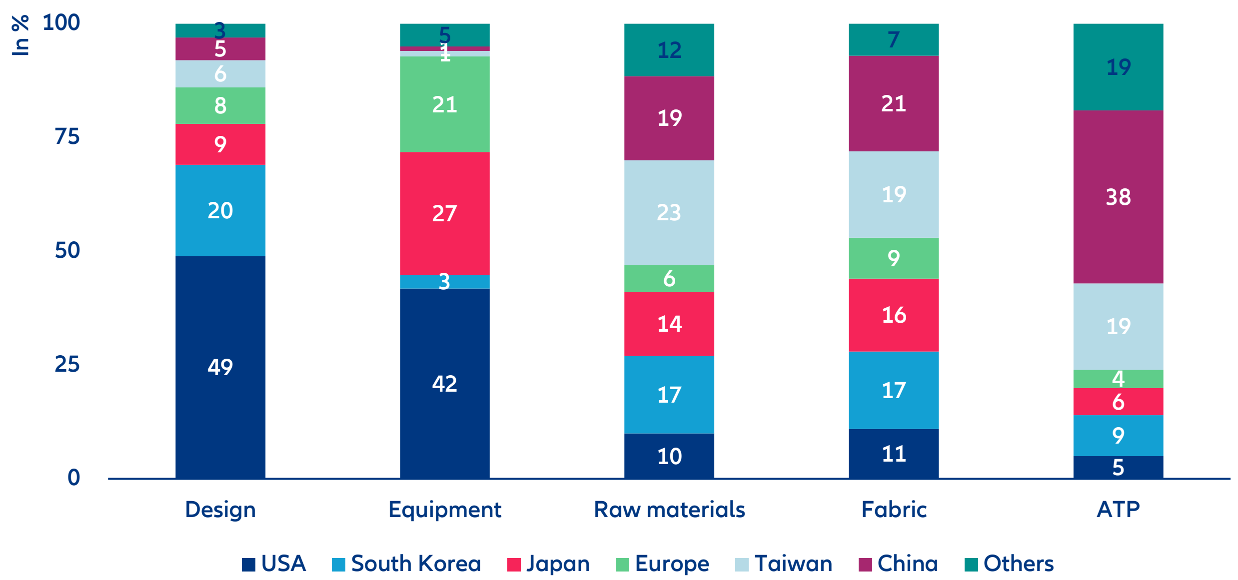
Figure 1: The five critical steps of the semiconductor supply chain



Sources: PIIE, Allianz Research

Specialization is distributed unevenly around the world. Asia, Europe and North America dominate different stages of production. The US leads in the design and intellectual property (IP) phase, home to major semiconductor firms, electronic design automation (EDA) providers and IP licensors. This dominance stems from advanced R&D capabilities, a strong talent pool and heavy investment in cutting-edge chip architecture. Europe excels in semiconductor manufacturing equipment, with some firms leading in the supply of critical tools for lithography, etching and deposition. European firms provide essential high-precision machinery used in advanced fabrication processes, making them indispensable to global semiconductor production. In this segment, US and Japanese firms are prominent actors as well and together generate more value-added than Europe (42% and 27%, respectively, vs. 21%, see Figure 2). However, the fabrication phase is mostly concentrated in Asia, particularly in Taiwan, South Korea and China, where leading semiconductor foundries manufacture the most advanced chips. Taiwan notably dominates high-end semiconductor fabrication, producing the majority of the world's most advanced logic chips. South Korea focuses on both logic and memory semiconductors, while China is rapidly developing its manufacturing capabilities despite geopolitical constraints. The assembly, testing and packaging phase is primarily located in Southeast Asia, with countries such as Malaysia, Vietnam and the Philippines specializing in back-end semiconductor processing. This regional distribution allows for cost-efficient labor while maintaining proximity to major fabrication hubs. But such an unbalanced distribution of expertise and/or manufacturing capacities is the crux of the problem, making the supply chain at risk of both domestic and external shocks, especially with demand exponentially increasing amid widespread automation and digitalization.

Figure 2: Regional breakdown of the value-added generated for each segment of the semiconductor supply chain (2021)



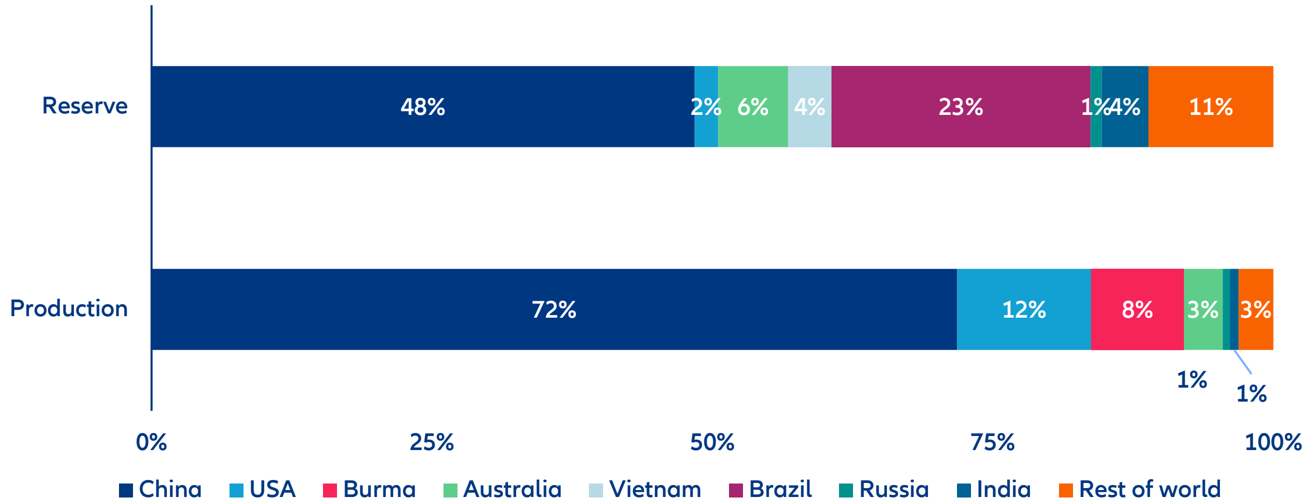
Sources: Semiconductor Industry Agency, Allianz Research

There are three major monopoly risks: rare earth resources, design and foundry.

1- China plays a critical role as a supplier of mineral resources essential for semiconductor production, particularly in sourcing and processing rare earth elements (REEs) and other key materials. Rare earth metals like neodymium, dysprosium and terbium are crucial for semiconductor manufacturing equipment, while elements such as gallium (98% of global production), germanium (roughly 60%), silicium (85%) or indium (~70%) are used directly in chip fabrication. China dominates the global production and refining of these materials, controlling over 60-70% of the rare earth supply chain. Any trade restrictions, export controls or geopolitical tensions affecting China's mineral exports can create significant bottlenecks, impacting the availability of raw materials for semiconductor manufacturing worldwide. This dependency has led other nations to explore supply-chain diversification and domestic mining initiatives as China owns "only" half of world's reserves of REE. However, the highly specialized refining process still makes China a dominant force in the global semiconductor ecosystem.

2- Taiwan is the biggest foundry worldwide, accounting for around 70% of the segment's revenue. Taiwan holds a dominant position in the global foundry business, with its success largely driven by TSMC (Taiwan Semiconductor Manufacturing Company), the world's leading contract chip manufacturer. TSMC specializes in advanced semiconductor fabrication, producing the most cutting-edge chips at 5nm, 3nm and below, supplying major industries from consumer electronics to AI and automotive. Taiwan's dominance stems from early government support, massive R&D investments, a highly skilled workforce and close partnerships with the so-called "Magnificent 7" group of big tech firms in US. However, this centralization presents a major risk to the semiconductor supply chain. Given Taiwan's geopolitical tensions and exposure to natural disasters, any disruption – whether from geopolitical conflict, trade restrictions or earthquakes – could severely impact global chip availability, affecting industries worldwide. To mitigate this risk, companies and governments are investing in diversified manufacturing, with new fabs coming up in the US and Europe, but replicating Taiwan's expertise remains a long-term challenge.

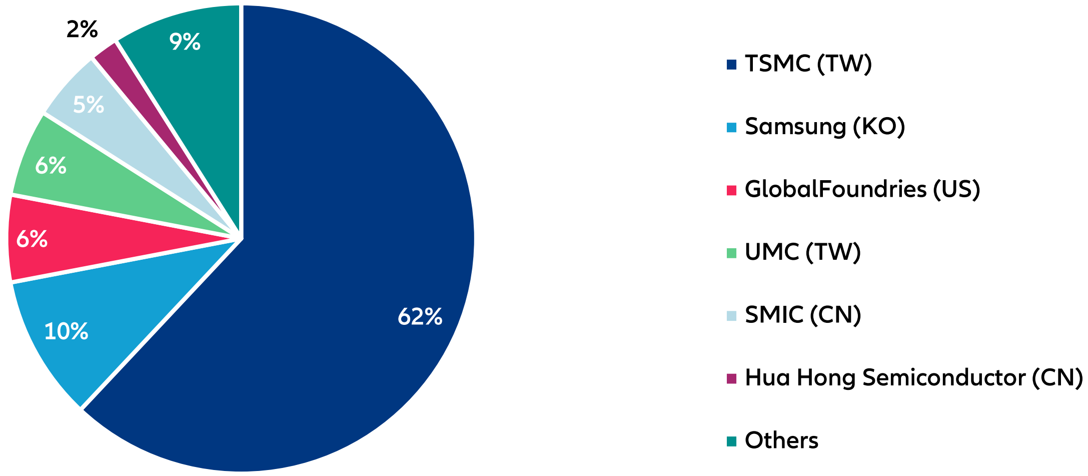
Figure 3: Rare earth production and reserves per geography breakdown



Sources: US Geological survey (January 2025), Allianz Research

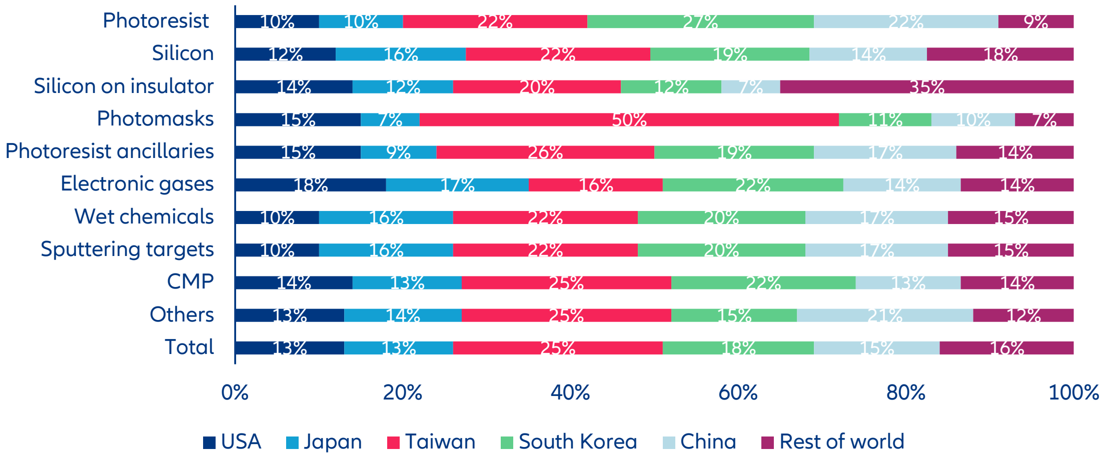
Alongside the manufacturing process, Taiwan is also specialized in the production of materials that are used as inputs to produce semi-finished wafers that will be sent to test and assembly plants generally located in neighboring Asian countries. This allows Taiwanese firms to maintain some control over the functioning of the manufacturing phase, though we also note a strong weight of South Korea and to a lesser extent China in providing such critical materials. With a rough weight of 25% of total sales cumulated of wafer materials, European and American companies definitely have a reduced impact and influence over the whole fabrication phase of a chip.

Figure 4: Market share of global foundries per revenue breakdown



Sources: 2023 corporate filings, Visual Capitalist, Allianz Research

Figure 5: Wafer fabrication material sales per geography breakdown (2022)



Sources: SEMI, Allianz Research

3- The US dominates the global chip design industry, primarily due to its early leadership in semiconductor research, strong intellectual property (IP) protections and advanced innovation ecosystems. US firms excel in designing high-performance processors, graphics chips and AI accelerators, which power everything from consumer electronics to cloud computing and autonomous systems. This leadership is reinforced by extensive investments in electronic design automation (EDA) software, which is essential for creating complex semiconductor architecture. Additionally, close collaboration with leading semiconductor manufacturers and access to a deep talent pool have allowed US companies to push the boundaries of chip performance, power efficiency and scalability. The high level of expertise and strongly capital-intensive process broadly contributed to create imbalances to the benefit of strongly capitalized US technology companies that use their large funding capacities as leverage to defend their technological lead while crushing competition. However, this concentration of design expertise presents risks to the global supply chain. Trade restrictions, export controls or geopolitical tensions could limit access to cutting-edge chip designs in certain regions, disrupting production and innovation worldwide. Additionally, reliance on a small group of firms for advanced semiconductor architecture creates potential bottlenecks, particularly if demand surges beyond capacity, while generating dependencies that might result in a weaponization of the industry in case of conflict.

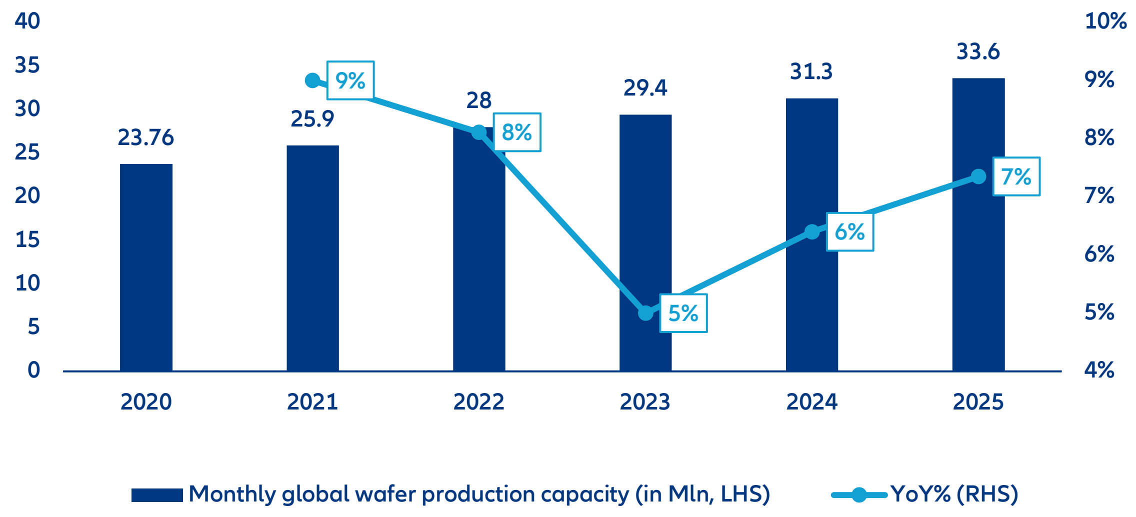
Figure 6: Number and market share of US semiconductor companies amid the top 10 biggest annual revenue

Sources: Bloomberg, Allianz Research

The AI bonanza is expected to ensure a bright future for chips…while increasing shortage risks

Lessons from the chip shortage. Between 2020 and 2023, the global semiconductor industry experienced a significant chip shortage, profoundly impacting various sectors. The Covid-19 pandemic disrupted supply chains and led to a +13% surge in global demand for personal computers as remote work and education became the new normal. This sudden increase strained semiconductor production capacities. By 2021, lead times for semiconductor orders extended to 22.2 weeks, up from 12.2 weeks in February 2020. The shortage began to ease in 2022 as supply improved and demand for consumer electronics slowed. The automotive industry was notably affected, with over 9.5mn units of global light-vehicle production lost in 2021 due to chip shortages, and an additional 3mn units impacted in 2022. The episode was a reality check for the whole industry, revealing not just the risks of over-concentration on one main foundry in Asia but also how limited capacities make it difficult to scale up production efficiently to align with sudden rises in demand. Since 2022, the global semiconductor industry has seen a significant expansion in manufacturing capacity, driven by substantial investments across various regions. In the US, the CHIPS and Science Act has been a catalyst for growth, with over 90 new manufacturing projects announced, totaling nearly USD450bn in investments across 28 states as of August 2024. These initiatives are projected to triple US fab capacity by 2032 (+203%) compared to 2022. In Europe, the European CHIPS Act has spurred numerous projects, contributing to the global expansion of semiconductor manufacturing. China also initiated the third phase of its Integrated Circuit Industry Investment Fund (ICIIF) last year, aiming to bolster its domestic chip production capabilities. Collectively, these efforts are expected to have increased global semiconductor manufacturing capacity to over 30mn wafers per month by 2024, +6.4% from the previous year.

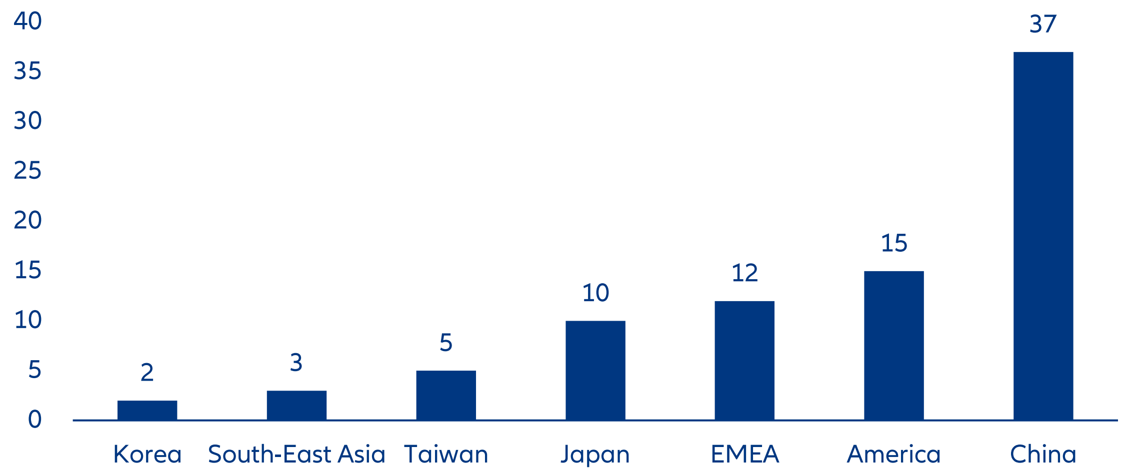
Figure 7: Global wafer production capacity (200mm equivalent)



Sources: World Fab (Q2 2024 update), Allianz Research

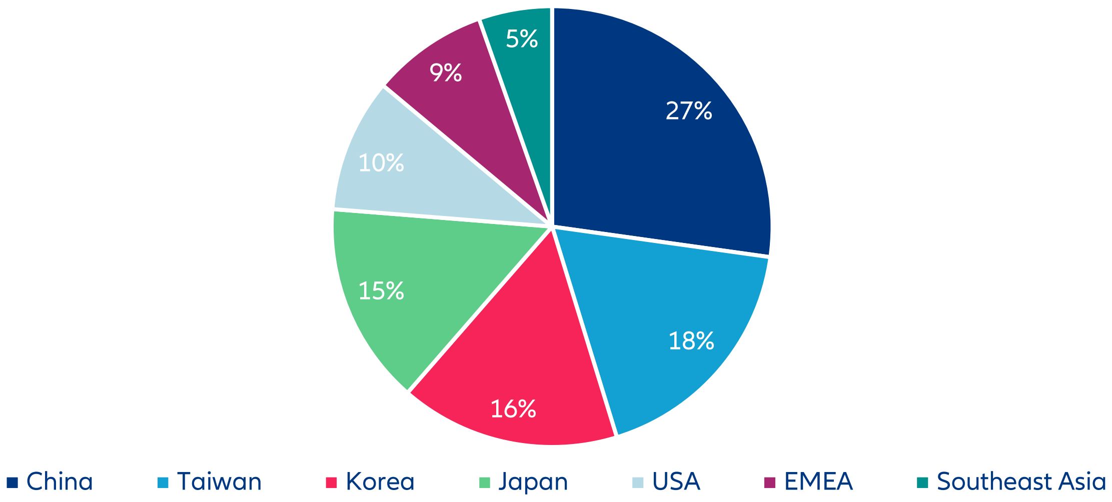
The rise of fab projects since 2022 highlights the large-scale and deep transition of the global economy toward a new digital and chip-intensive model. China is leading the trend with 37 new fab starting projects announced over the 2023-2025 period, followed by North America (15), EMEA (12) regions and Japan (10). While some new fab projects have been relocated to America and Europe to de-risk the manufacturing process from Asia and improve supply-chain resilience, most remain located in Asia, a well-developed, high performing and less expensive manufacturing hub. Despite the global increase in foundry investment worldwide since 2022, the Asian continent remains the main foundry by far, especially with the significant increase of Chinese production capacities in recent years (now over a quarter of global capacity).

Figure 8: New chip fab starting construction over the period 2023-2025



Sources: Bloomberg, Allianz Research

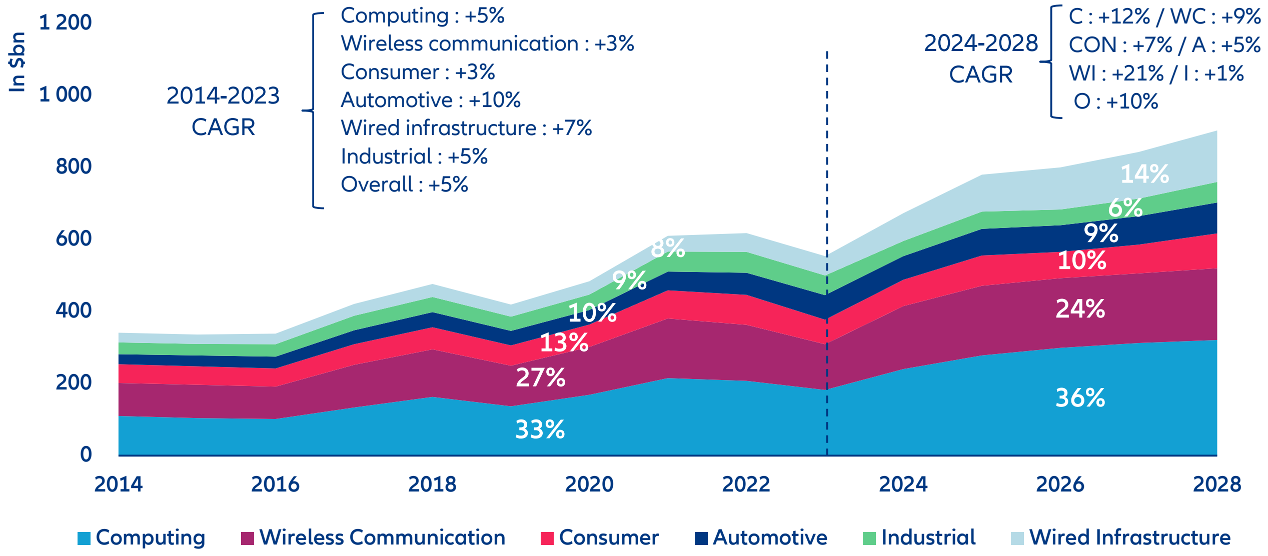
Figure 9: Semiconduction production capacity per geography breakdown (100-300 mm wafers, 2024)



Sources: World Fab (2024 forecasts), Allianz Research

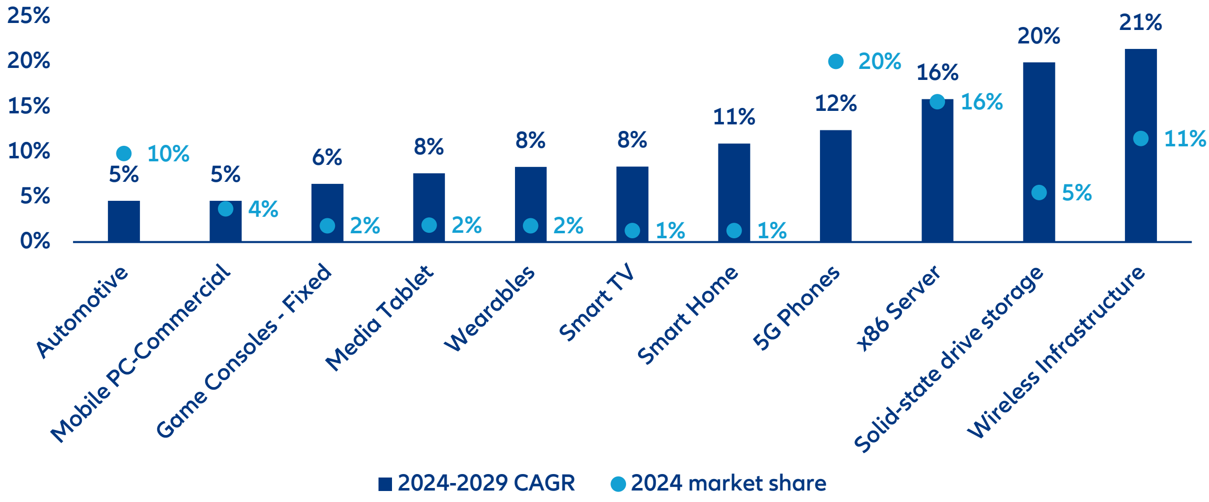
AI, 5G, cloud services, supercomputers and data centers are fueling the chip frenzy. Over the next five years, semiconductor revenue growth will be driven mainly by AI, data centers, automotive and consumer electronics. AI-related chips, including GPUs, TPUs and custom accelerators, are projected to exceed USD150bn in revenue by 2025 (and over USD300bn as a whole), fueled by demand for generative AI and large-scale machine learning applications. Data centers will remain a significant driver, with cloud providers increasing investments in high-performance computing and AI accelerators, pushing server processor revenues to double by 2028 to over USD160bn (x86 server), compared to 2023. Additionally, consumer electronics, particularly smartphones, smart home equipment and wearables, will drive chip demand with advancements in 5G modems, AI-powered mobile processors, AI-generative solutions for home devices and AR/VR technologies. In the automotive sector, the shift to electric vehicles (EVs) and advanced driver-assistance systems (ADAS) is expected to fuel the demand for chips but growth potential looks more tepid (+5% CAGR for 2024-2028) due to a lackluster demand for auto in Europe and the US and a more gradual than expected electrification of the fleet. The overall semiconductor market is expected to outpace USD900bn by 2028 and is likely to outpace USD1trn by 2029/2030, representing a CAGR of +10% from its 2023 level.

Figure 10: Semiconductor revenue per industry segment (history & forecasts)



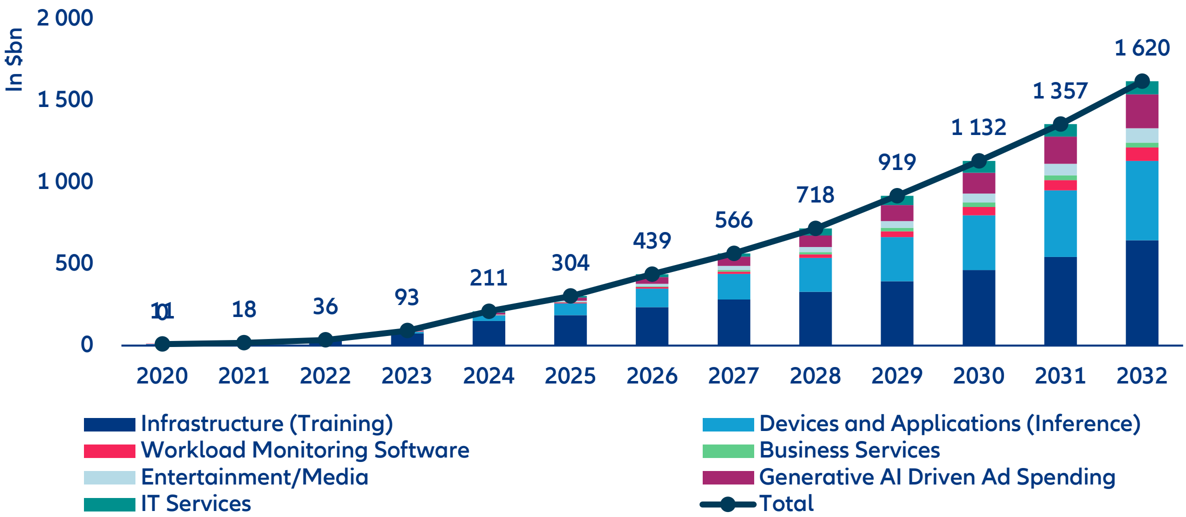
Sources: Semiconductor Industry Agency, Allianz Research

Figure 11: 2024-28 CAGR of global chip revenue per activity breakdown



Sources: Bloomberg Intelligence, Allianz Research

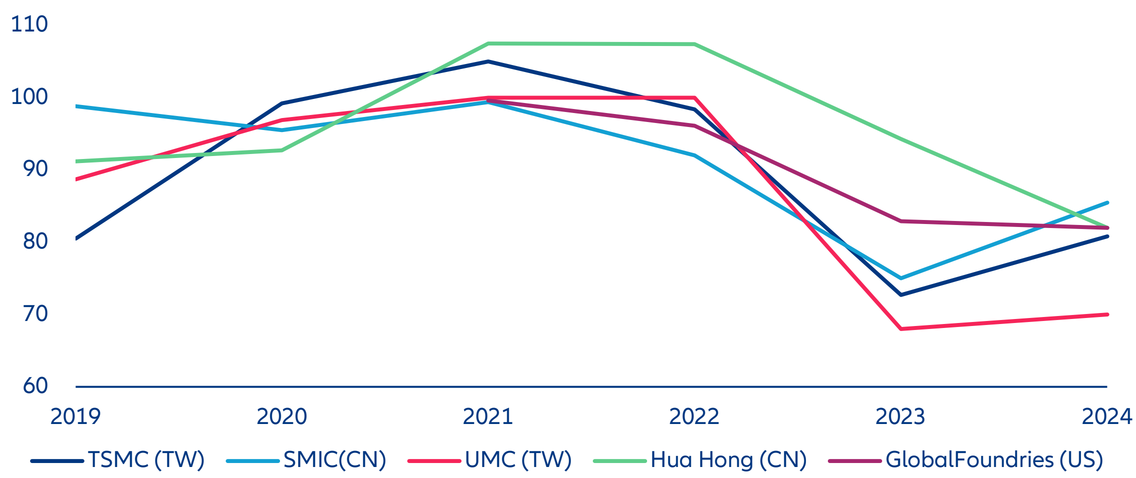
Figure 12: Estimated revenue to be generated by AI industry by application breakdown



Sources: Bloomberg Intelligence, Allianz Research

While shortage risks look under control, geopolitical tensions could be the next cloud on the horizon. Global leader TSMC is running its plants at 80% capacity today, down from almost 100% in 2021 at the peak of the shortage period. But there are other clouds looming over the sector, especially as demand for AI-driven technology is still in its early phase and is expected to ramp up as soon as 2025. Moreover, the return of President Trump has signaled a new wave of protectionism. His first mandate saw the first round of retaliatory measures on chip exports to China, which have continued to tighten since then.

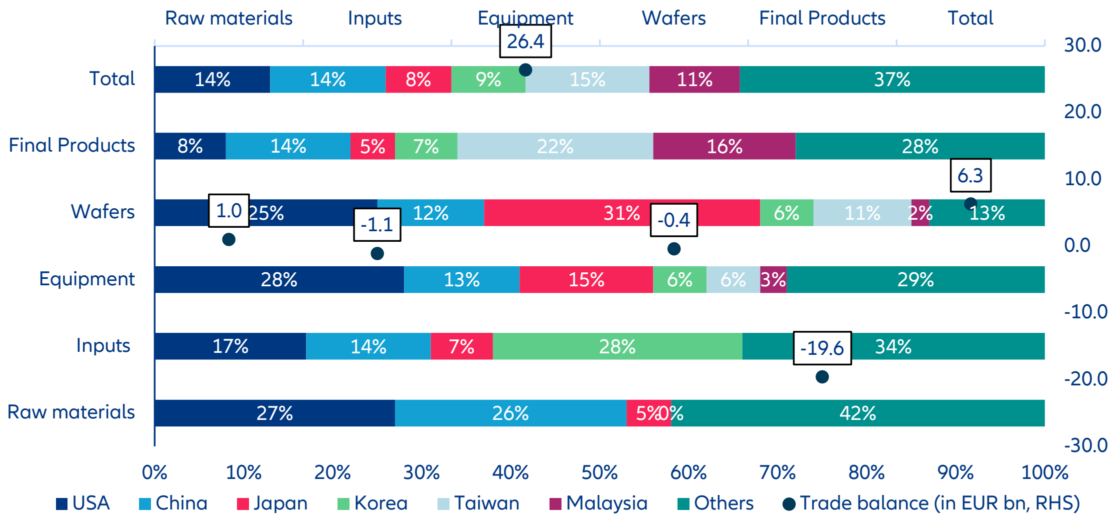
Figure 13: Capacity utilization rate of main foundries



Sources: Bloomberg, Allianz Research

How is Europe competing in the chip industry? With a well-recognized specialization. Europe has established itself as a leader in the semiconductor equipment industry, leveraging advanced technology and specialized expertise to gain a competitive edge. In 2023, European suppliers accounted for 29% (USD31bn) of global revenue from wafer processing equipment (WEF), highlighting their significant role in the sector. A key asset contributing to Europe's technological advantage is its specialization in Extreme Ultraviolet (EUV) lithography. This cutting-edge technology is essential for producing advanced semiconductor chips and European companies are at the forefront of its development and manufacturing. Roughly 80% (USD24bn) of European revenue into WEF segment comes from patterning activity, which consists of imprinting intricate features from a circuit onto silicon wafers, and the rest from deposition (12%) and metrology & inspection (8%). The specialization of Europe is reflected in trade figures as equipment is the only segment of the semiconductor supply chain whose trade balance is positive, and in this case specifically clearly positive (EUR26.4bn in 2023).

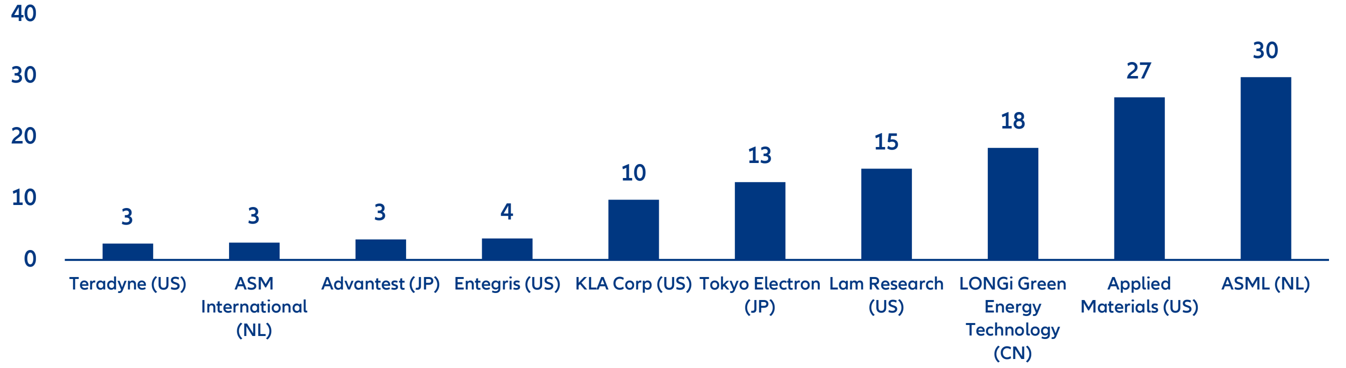
Figure 14: European import dependency within the semiconductor supply chain (% of imports from main trade importing partners & trade balance for each segment, 2023)



Sources: European Commission, Allianz Research

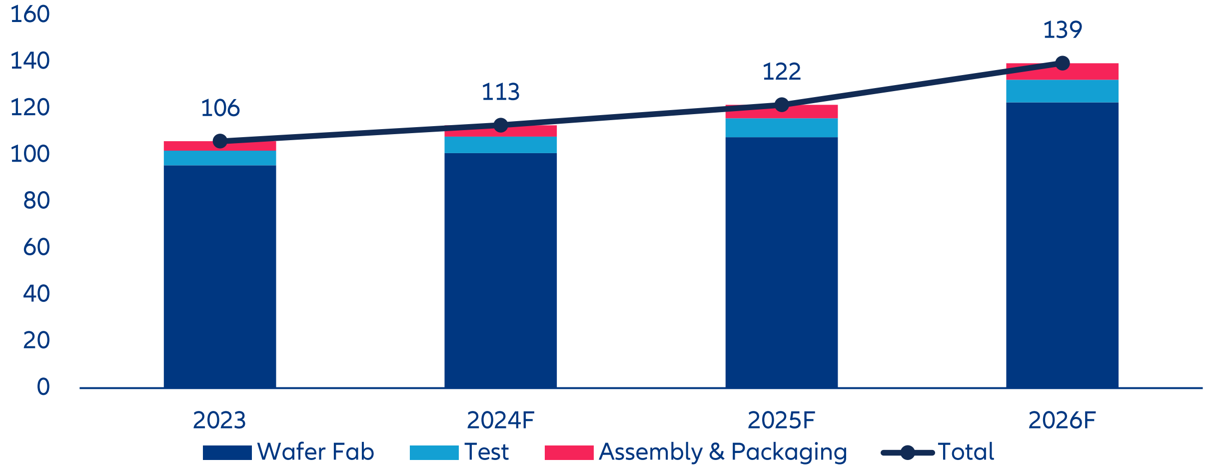
Europe is also home to a handful of leading companies. Unlike the US or Japan, Europe does not have as much of a pool of technology firms that are leaders in their activity. But there are some, like the Dutch companies ASML, which produces lithography devices, and ASM, which works on deposition activity. These companies are among the top 10 largest in the equipment segment, respectively ranked #1 and #9 based on 2023 revenue. The European industrial ecosystem also has a strong interconnexion between the automotive and semiconductor sectors that has resulted in the development of well-recognized expertise – notably in Germany where the auto industry is an economic heavyweight – in automotive chips but also affiliated tools like ADAS technology, sensors, optical solutions and power-related semiconductors. The equipment market revenue outpaced the threshold of USD100 bn in 2023 and is expected to grow at a +10% CAGR by 2026.

Figure 15: Top 10 semiconductor equipment companies by revenue in 2023



Sources: 2023 corporate filings, Allianz Research

Figure 16: Semiconductor equipment revenue forecasts (in USD bn)



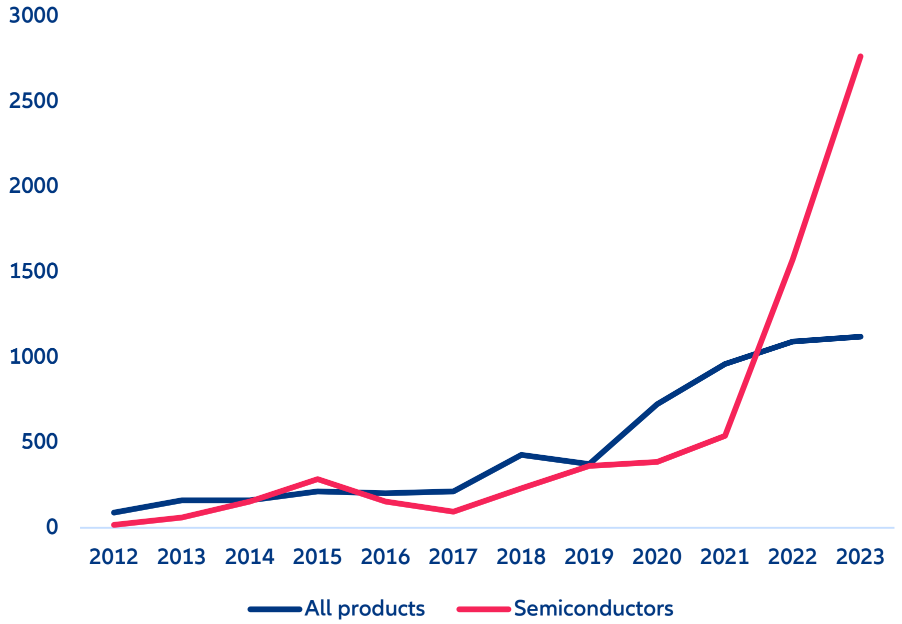
Sources: SEMI (December 2024), Allianz Research

The Empires strike each other: China's ambitions and US counter measures

The global semiconductor industry has become a focal point of geopolitical tension, with major economies implementing strategic policies to secure their positions in this critical sector. The US, EU and China have each launched initiatives aimed at bolstering their domestic semiconductor capabilities, leading to an interplay of cooperation and competition amid a complex and fragmented supply chain.

China: Pursuing semiconductor self-sufficiency. China has long prioritized the development of an independent semiconductor industry to reduce reliance on foreign technology. In 2014, the Chinese government established the China Integrated Circuit Industry Investment Fund, commonly known as the „Big Fund," injecting USD21bn to support domestic chipmakers and related enterprises. This fund aimed to foster partnerships, facilitate mergers and

Figure 17: Number of trade policies by product categories (2010=100)

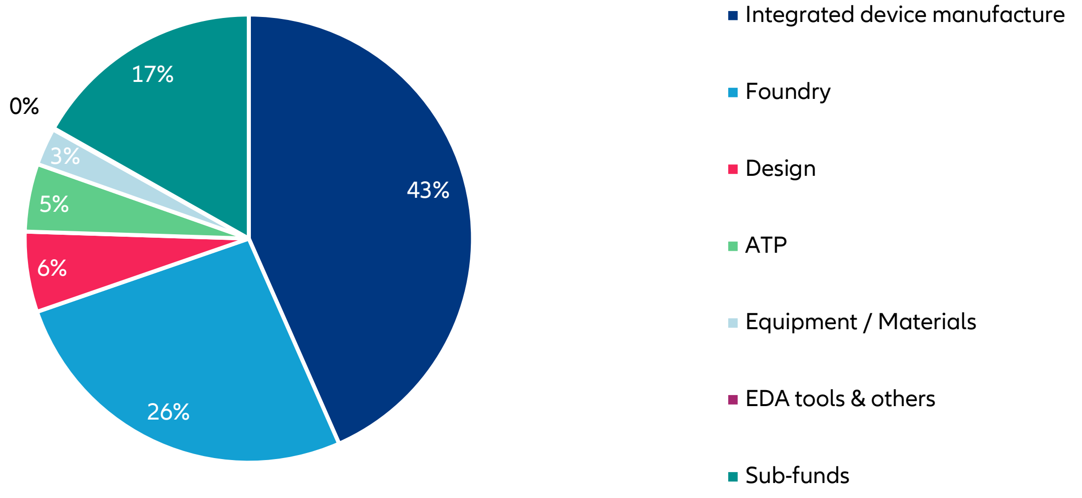


Sources: GTA, Allianz Research

acquisitions and stimulate innovation within the industry. The "Made in China 2025" plan launched in 2015 initiative outlined specific goals to elevate China's position in the global semiconductor landscape and had already set ambitious targets for domestic chip production, aiming for 70% self-sufficiency by 2025. The government encouraged collaboration between academic institutions, research centers and industry players to drive innovation and technological advancements. To attract investments and support domestic companies, China offered tax breaks, subsidies and other financial incentives to firms engaged in semiconductor research, design and manufacturing. As a result, the share of domestically produced chips in China's market grew, with self-sufficiency levels reaching approximately 30% by 2020. China also became a leader in semiconductor patent applications, accounting for 55% of global filings in 2021–2022, indicating a robust focus on innovation. Despite these advancements, Chinese firms remained behind global leaders in producing leading-edge logic chips, with a lag of approximately five years in high-volume manufacturing of advanced semiconductors. The domestic industry heavily relied on imported semiconductor manufacturing equipment, particularly for advanced lithography, which is essential for producing cutting-edge chips. Quality and yields are also continuing to remain a challenge. For instance, Huawei's initial yield rate for its Ascend 910C AI processors was around 20% in 2024; recent efforts have managed to improve this metric to 40% but the firm still has a long way to go.

Chinese specialization into chip fab: an expensive process. Through three phases launched in 2014 (USD19bn), 2019 (USD28bn) and 2024 (USD47.5bn), the state-backed investment fund amounts to close to USD100bn, to which should be added diverse grants, equity investments and low-interest loans. As of 2021, the Chinese government had invested over USD120bn into domestic semiconductor companies and equipment, which means about USD150bn over the past decade, according to our estimates. The third phase of the investment increases the total funding package to over USD200bn or 30% of the estimated annual chip revenue in 2024. Since 2022, we note that China has ramped up investments in its semiconductor foundry ecosystem, aiming to reduce reliance on foreign technology and enhance domestic production capacity while the US has tightened again its trade policy toward China on chip exports

Figure 18: Share of National IC Fund phases 1 & 2 investment by segment %

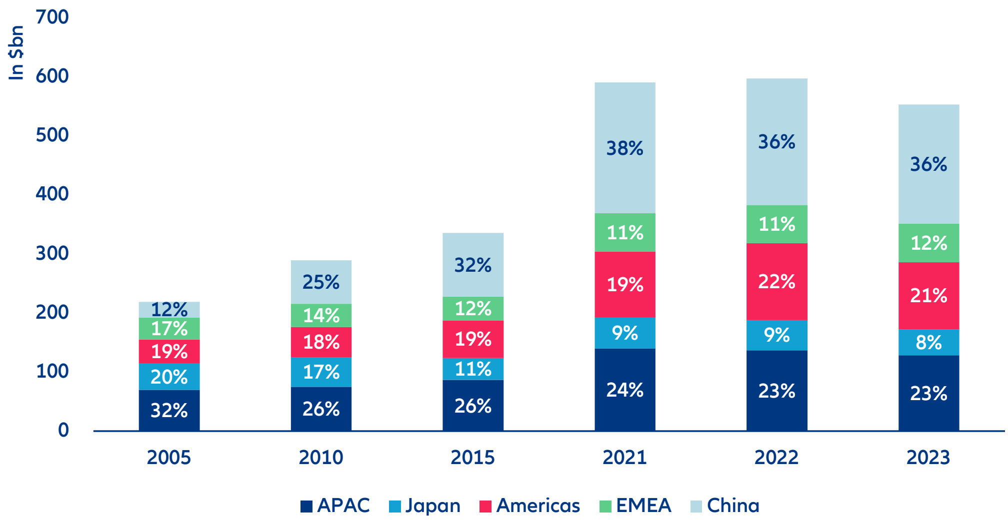


Sources: Semiconductor Industry Association, Allianz Research

A fruitful strategy: from small to large global contender to the crown. Overall, China alone generates over a third of total revenue from the semiconductor industry (36% in 2023), or as much that the global Asia-Pacific region including Japan, and 15% more than the US. The tremendous growth testifies to the rapid expansion and massive investments made over the past decade to bridge the gap with its Asian neighbours and the US. In 2005, China's share of total revenue was only 12%. But this rapid growth is expected to further intensify trade friction and amplify risks of geopolitical conflicts between China and western economies in the future as the Asian economy now has a strong influence on various critical steps of the semiconductor supply chain, notably in raw materials and the manufacturing process of wafers, and to a lesser extent on equipment as well. The export curb applied by the US against China since 2018 was an unexpected boost to chip investment in China and ultimately did not really prevent the Asian economy from developing a competitive and large chip industry. If western economies still have some lead in the design and IP segments over China, notably on cutting-edge chips, the gap is narrowing. Like the US, China can rely on its national champions like Huawei or Alibaba to develop in-house modern chip and cloud solutions to tap the AI boom and compete with the US to become the most technologically advanced nation.

Industrial synergy is the key to success. China has significantly increased its semiconductor revenue by deeply integrating its chip industry with key economic sectors such as automotive, consumer electronics, industrial manufacturing and AI-driven applications. This strategy ensures high domestic demand, reducing reliance on foreign suppliers and fostering local innovation. In the automotive sector, Chinese firms are ramping up production of automotive-grade semiconductors, especially for electric vehicles (EVs) and autonomous driving. In consumer electronics, companies leverage domestic chips for smartphones, wearables and home appliances, strengthening national tech giants. Meanwhile, in industrial automation and manufacturing, China integrates semiconductors into robotics, smart factories and IoT applications, enhancing efficiency and digital transformation. Additionally, AI and cloud computing drive demand for high-performance chips, with major investments in data centers and AI accelerators. This synergistic approach boosts semiconductor sales and ensures a sustainable growth model, positioning China as a rising power in the global chip market.

Figure 19: Chip revenue per geography breakdown



Sources: Semiconductor Industry Agency, Allianz Research

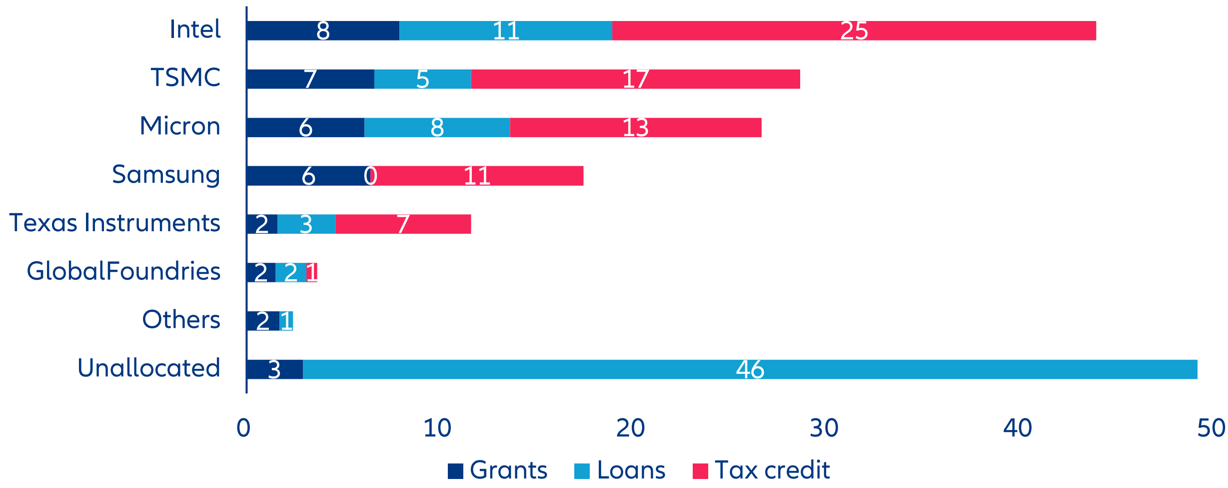
Figure 20: 2024-2028 Expected semiconductor revenue per industry and country segment

	Automotive	Computing	Consumer	Industrial	Wired Infrastructure	Wireless Communication
Americas	2%	15%	8%	1%	20%	10%
EMEA	3%	9%	8%	2%	21%	9%
Japan	0%	10%	5%	-2%	22%	3%
China	13%	11%	8%	3%	26%	6%
APAC	0%	11%	7%	-1%	17%	15%
World	**5%**	**12%**	**7%**	**1%**	**21%**	**9%**

Sources: Semiconductor Industry Agency, Allianz Research

The US: The CHIPS and Science Act. In 1990, the US accounted for approximately 37% of global semiconductor manufacturing capacity. By 2022, this share had diminished to about 12%, well behind Asian countries. This decline raised concerns about US technological leadership and economic security – especially amid chip shortages and after the supply-chain disruptions caused by the pandemic. In August 2022, the US enacted the CHIPS and Science Act, allocating over USD52bn to enhance domestic semiconductor manufacturing, research and workforce development. Of this, USD39bn was designated for manufacturing incentives, while USD13.2bn was allocated to support R&D and workforce training. The act also offered a 25% investment tax credit for capital expenses related to semiconductor manufacturing and equipment. By December 2024, the US Department of Commerce had finalized USD30.6bn in funding awards to 19 companies, with an additional USD1.7bn proposed for 13 more. Major beneficiaries TSMC, Intel and Samsung Electronics each received over USD6bn to establish or expand their US operations. However, the CHIPS Act also imposes restrictions to protect national security interests. Recipients of funding are prohibited from expanding semiconductor manufacturing in China and other countries deemed national security threats for a period of 10 years. This measure aims to prevent advanced technologies from bolstering rival economies. In February 2025, the Trump administration signaled potential revisions to the CHIPS Act, expressing concerns over the efficiency of federal subsidies. Discussions include delaying payments, modifying agreements to remove specific requirements such as union labor and childcare provisions and tightening rules regarding investments in China. These proposed changes have introduced uncertainty for companies relying on CHIPS Act funding for their US projects.

Figure 21: US fund allocated under the CHIPS act (in USD bn)



Sources: Bloomberg, Allianz Research

US protectionism as shield to secure a technological edge

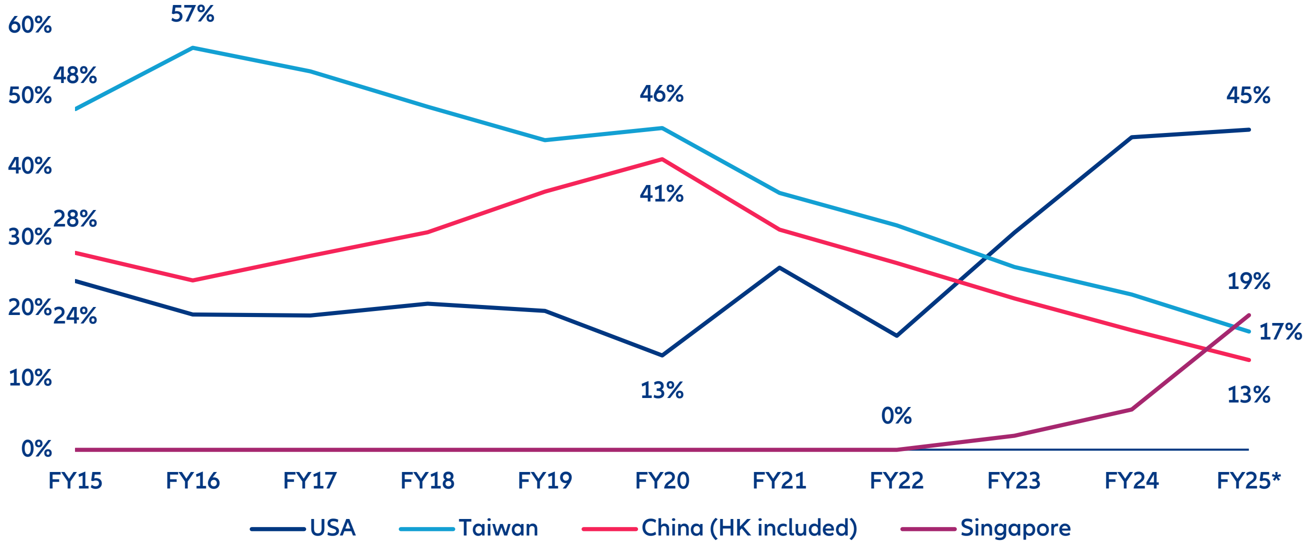
A tense relationship between the US and China. Since 2018, the US has progressively tightened restrictions on China's access to advanced semiconductor technology. The policy began with the addition of Huawei to the Entity List, barring US firms from supplying critical components without special licenses. In 2020, export controls were expanded to prevent Chinese companies from acquiring chips made with US technology, even if manufactured overseas. In 2022, the CHIPS and Science Act was signed, injecting USD52bn into domestic semiconductor manufacturing to reduce reliance on foreign supply chains. By October 2024, the US imposed new export controls on 24 types of semiconductor manufacturing equipment and three software tools, further limiting China's ability to produce advanced chips. In early 2025, the Commerce Department announced stricter enforcement, threatening significant fines for violations of export restrictions. These policies reflect Washington's long-term strategy to curb China's semiconductor ambitions and protect US technological leadership.

Efficiency of restrictions in question. An overview of the geographical revenue breakdown of the world leader in cutting-edge chips, the US firm Nvidia, shows a lower dependency toward China, whose the share has declined from 41% to 13% since 2020. This has not had any damaging impact on the revenue-generation capacities of the company, as seen in its record results last year (USD61bn of revenue, up +126% y/y/USD30bn of profits, up +580% y/y). However, restrictions from the US did not prevent China from developing a critical role in the global semiconductor market. The curb on chips prompted China to promote further in-house solutions to gain into autonomy from the US. In parallel, there could also be certain trade loopholes that provide China with some access to US technology via a third-country partner like Singapore (cf. Nvidia revenue), while supplying US firms with local production. Indeed, we notice a surprising correlation between the decline of US imports of semiconductors from China since 2018 and a substantial rise of imports from other Asian countries like Vietnam and Thailand, which assemble and package chips produced in China and Taiwan. The recent success of China's Deepseek, which may have benefited export-restricted GPU produced by the US firm Nvidia, is another example of China's high level of adaptability to overcome hurdles in this regard.

Figure 22: Nasdaq Golden Dragon index (Chinese Tech stocks listed in the US)

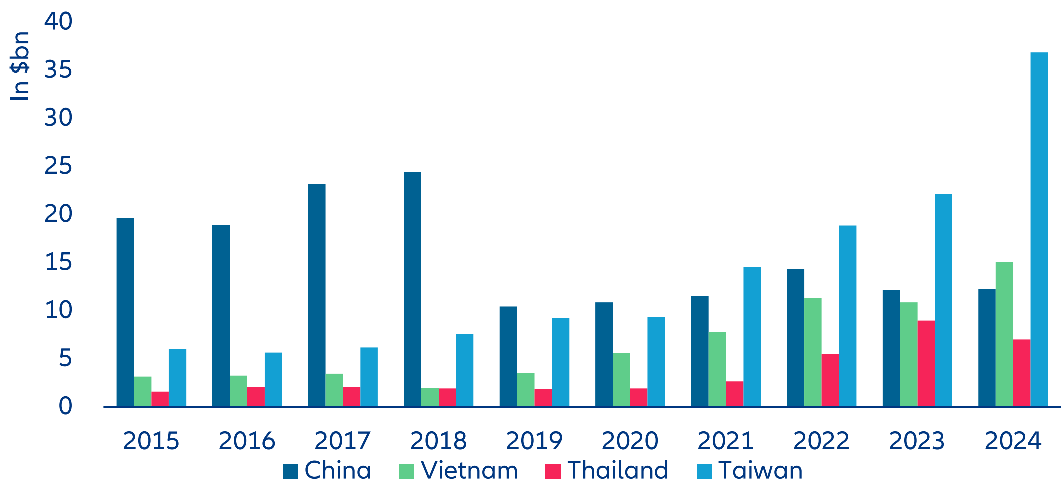
Sources: Refinitiv, Allianz Research

Figure 23: Geography breakdown of Nvidia annual revenue



*Data as of Q3 2024.
Sources: Refinitiv, Allianz Research

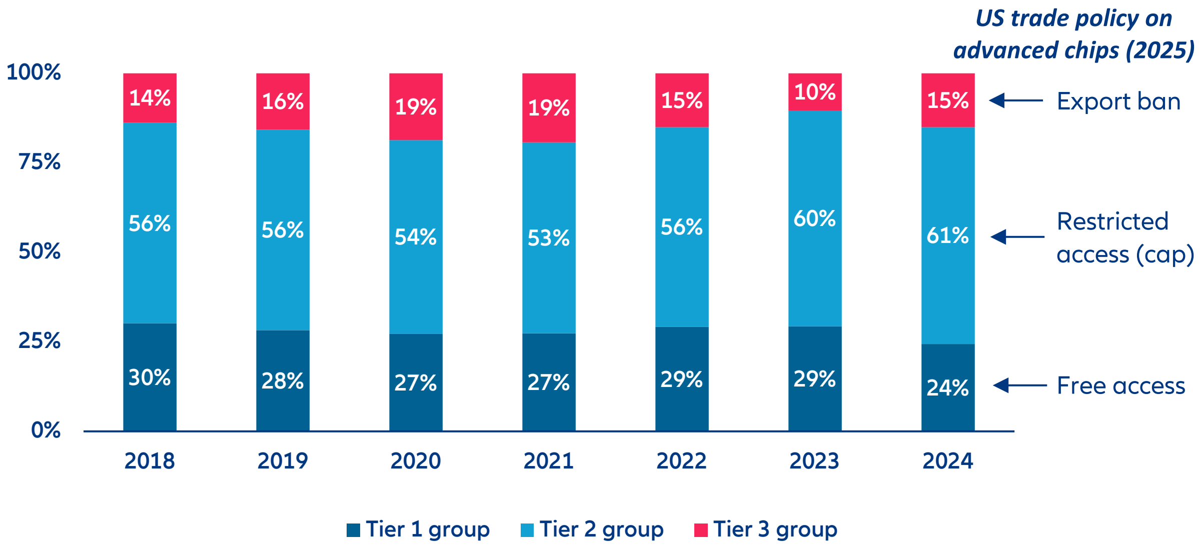
Figure 24: US annual imports of semiconductor and other electronic components from Asia



Sources: US International Trade Administration, Allianz Research

Toward a further weaponization of chips? As semiconductors have become increasingly important over the past decade, the industry has become a form of geopolitical leverage used by nations to extend their influence over their partners and contain ambitions from rival countries. The strong imbalances observed over the whole semiconductor supply chain pave the way for further bargaining strategies in bilateral or multilateral talks in a world that tends to be more protectionist, and even isolationist. For instance, earlier this year, the US adopted ea policy limiting free access to its most advanced chips to a small group of 18 countries, including notably Japan, Germany, South Korea, Taiwan and France (Tier 1 nations). A second group of countries will have restricted access (cap threshold for this Tier 2 group) while a third one including notably China and Russia will not be authorized to receive these products. By this "tiering" of trade partners, the US uses a discriminatory approach, regulating access to advanced technology to a group of "friends", strengthening in the meantime the business dependency of these nations toward American cutting-edge chips that could be weaponized by the US administration in case of disputes. China is doing the same by keeping a tight rein on rare earth exports, which have been subject to restrictions since last year. With increasing adoption of AI technology, semiconductors are expected to play a critical role in our economies as a vector of innovation and productivity. In this context, their role in future geopolitical and trade conflicts could see them become one of the biggest, if not the biggest, drivers of soft power.

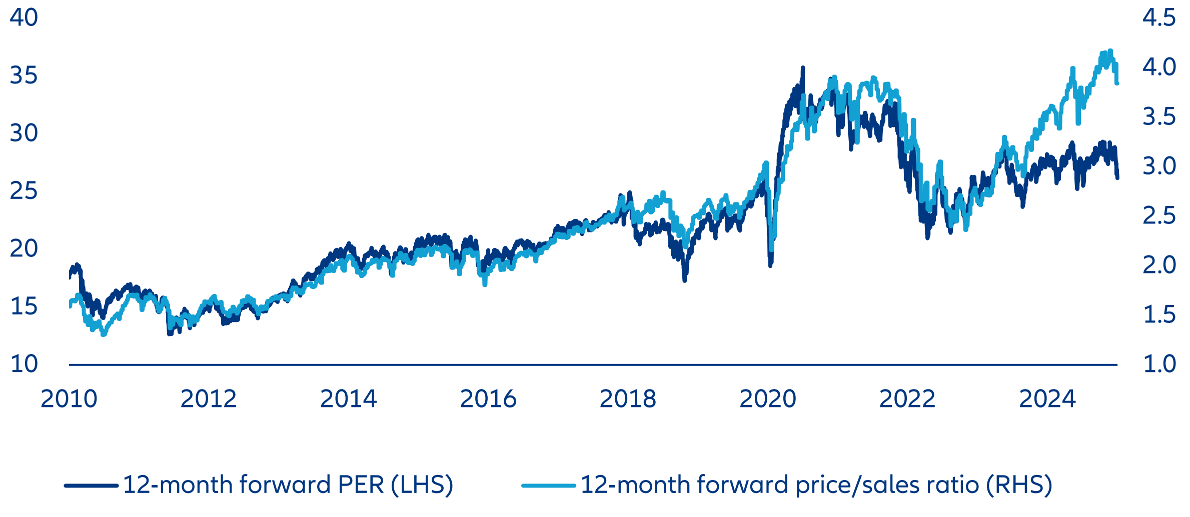
Figure 25: US semiconductor exports per country categorization based on US tiering policy on advanced chips trade



Sources: US International Trade Administration, Allianz Research

With great power comes great responsibility. A quick look at the volatility of equity markets over the past two-three years showcases the stellar performance of tech-related stocks and notably companies whose main revenue are related directly (chip design/equipment provider) or indirectly (cloud services, electric vehicles) to the semiconductor industry. The gradual expansion of AI-driven solutions and infrastructure and overall expectations about the growth potential of this new economy are fueling the hype. The multiplication of multi-billion investments from large corporates into AI-related and/or data center projects over the past months have broadly contributed to stir up market interest for tech firms. However, this comes with risks as the industry's supply chain is extremely fragmented across the globe and is at the heart of the current China-US race for global economic leadership. AI gave a strong boost to US equity to bring it to a record level last year, but it also translated into a massive disconnect between share prices and corporate fundamentals as performance was not driven by real financial performance but expected performance. In that way, the current valuation of US tech stocks looks extremely stretched, and consequently vulnerable to external shocks as it is mostly dependent on market sentiment. The Deepseek episode this year, which caused the biggest ever daily loss for a single stock – Nvidia lost USD590bn following a -17% decline on 27 January 2025 – is a good example, reflecting some fragility of this segment. Although we do not believe that such an event challenges the overall market appetite for chip stocks – especially as a further democratization of LLM models and other AI-driven solutions is positive for semiconductors – it would in our view increase the level of investor scrutiny over future developments in technology, trade and/or geopolitical tensions.

Figure 26: US technology Nasdaq Composite index (12-month forward price/sales and price/earnings ratios)



Sources: Refinitiv, Allianz Research

Box - Tariffs unlikely to target friendly partners but remaining CHIPS Act funding at risk

Chips are under the "tariff radar" of the new US administration. US president Donald Trump recently announced his intent to implement new tariff measures targeting the semiconductor industry, intensifying the ongoing US-China trade tensions. For US tech companies, tariffs on chips are a true source of worry since they absorb over half of global production, according to the Semiconductor Industry Association (SIA) and are strongly dependent on the Asia continent for supply (80% of US imports in 2024) and demand as well (almost 60% of US exports). Increasing tariffs from 0% to 25% will not be neutral but we do not consider it a game-changer for the US industry as China accounted for less than 10% of US imports last year. We estimate an additional cost of around US3bn, which could be absorbed directly by companies. It could be more harmful for the tech industry if the US tariff policy on China is not based only on the final place from where the chip is shipped but rather integrates the whole supply chain of semiconductors and focus on the place where the semi-finished wafer is manufactured before being tested and assembled. Against that backdrop, the "tariff cost" might be far more painful: we estimate the additional costs of a 25% tariff on the whole Asian continent at roughly US30bn. If the tariff excluded friendly partners such as Japan, South Korea and Taiwan, the additional cost would be half of that.

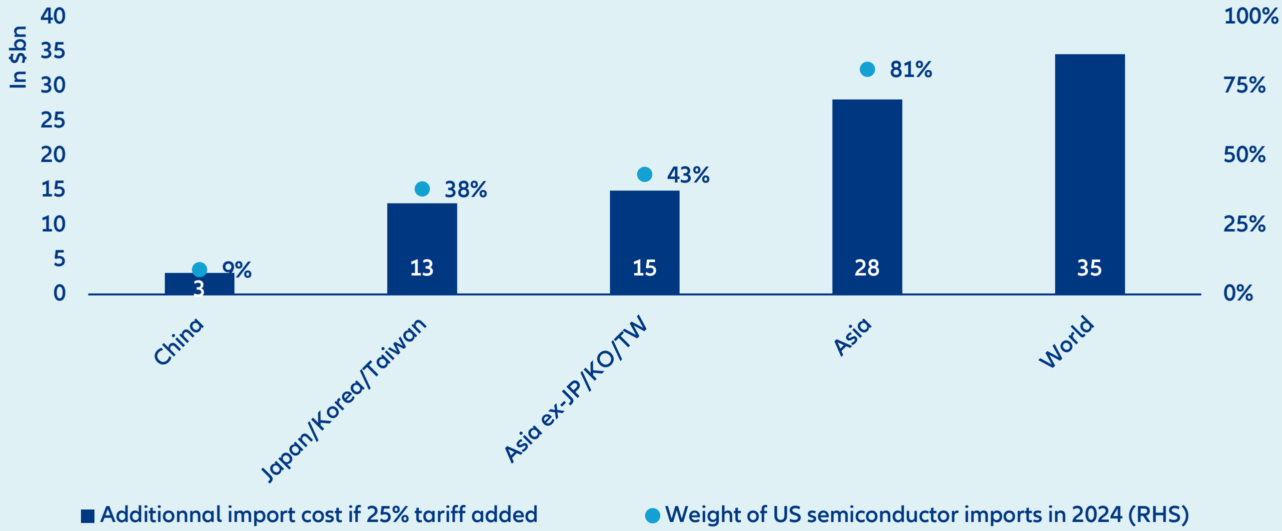
Figure 27: Main trade partners for the US for semiconductors (based on 2024 trade data, in USD)

#	Top 5 Export	Top 5 Import	Top 5 surplus	Top 5 deficit
1	Mexico (16.5 bn / 24%)	Taiwan (36.9 bn / 27%)	Mexico (8.1 bn)	Taiwan (-31.6 bn)
2	China (10.5 bn / 15%)	Malaysia (17.6 bn / 13%)	Hong Kong (3.5 bn)	Vietnam (-12.0 bn)
3	Malaysia (8.4 bn / 12%)	Vietnam (15.1 bn / 11%)	Brazil (1.5 bn)	Malaysia (-9.2 bn)
4	Taiwan (5.3 bn / 8%)	China (12.3 bn / 9%)	Canada (0,9 bn)	South Korea (-8.1 bn)
5	Hong Kong (3.6 bn / 5%)	South Korea (11.2 bn / 8%)	Singapore (0.7 bn)	Thailand (-5.5 bn)
	Total (70.1 bn)	**Total (138.5 bn)**		**Total (-68.4 bn)**

NAICS code used is 3344. Sources: US International Trade Administration, Allianz Research

Beyond tariffs, the future of the CHIPS act is key for the industry. The new US administration is considering tightening funding conditions and notably limiting outsourcing to countries that present some risks for national security. China is clearly targeted by this clause. While there could be some positive externalities to tariffs, in the form of larger investments into domestic production capacities, such a policy could be efficient only if it comes with an attractive fiscal and legal framework set-up. Otherwise, it could be counter-productive and deter foreign companies from investing in the US. It would be risky for US to adopt a harsh stance on both fiscal and trade policy due to the high level of dependency of the tech industry on Asian and especially Taiwanese suppliers. A too restrictive framework in the US could urge them to redirect their interest toward other nations in Europe, Asia and even potentially more toward China.

Figure 28: Additional cost of a 25% tariff on US semiconductor imports (based on 2024 trade data)



Sources: US International Trade Administration, Allianz Research

Firms are also throwing their hat in the race in as they aim to increase resilience & autonomy. Across industries – from cars to smartphones to cloud servers – companies have learned that semiconductors are a strategic lifeblood. The experiences of 2020–2022 dramatically illustrated the cost of supply-chain fragility, and firms have responded with unprecedented initiatives to strengthen their chip supply lines, including:

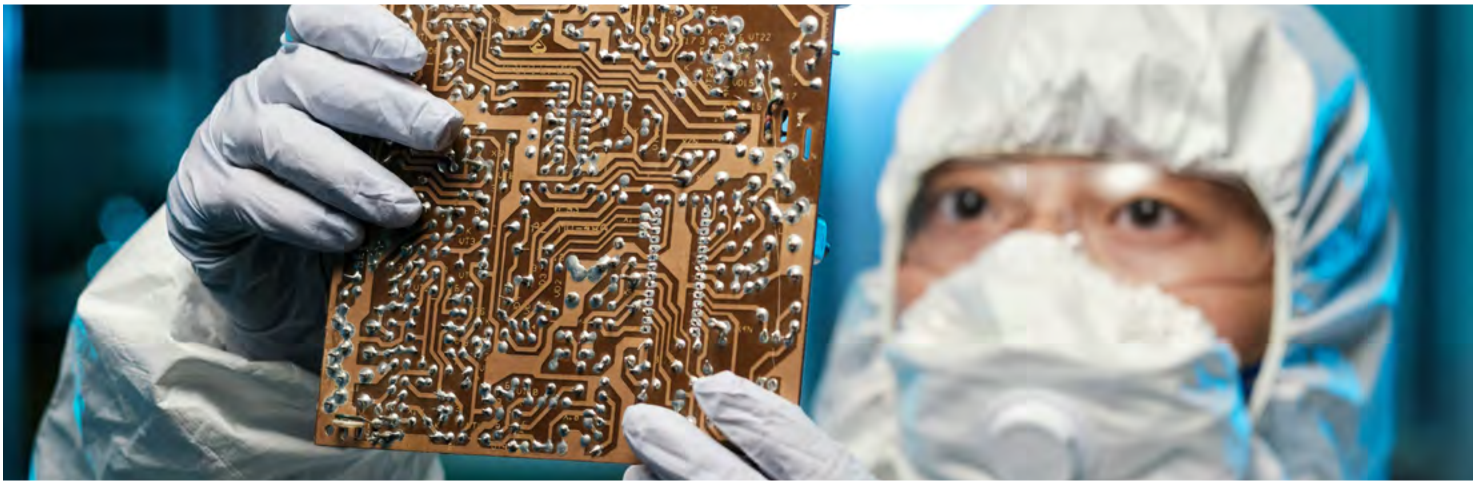
- **Stronger integration and collaboration:** Companies that once simply bought chips now co-create them. Automakers are working hand-in-hand with chip designers and fabs, and Big Tech is designing custom silicon and even partnering in fab investments. This blurs industry boundaries but ensures that product OEMs have far more visibility and influence over their semiconductor supply.

- **Diversification and flexibility:** "Single-sourcing" is longer an option in chip supply chain management. Whether it is having multiple chip suppliers, multiple chip designs or multiple fabs in different regions, firms are building in options. This inherently adds resilience – if one source falters, another can pick up the slack. Tesla rewriting software to use alternative chips mid-production is a vivid example of flexibility saving the day, and that mindset is spreading to others.

- **Inventory and investment as insurance policy:** Companies are willing to hold more inventory and invest upfront (or pay more per chip) to avoid the catastrophic losses of halted production lines. Toyota's six-month chip stockpile policy went from an outlier to a case study in the auto industry. Likewise, the billions committed to new fabs and custom chip R&D are essentially an insurance premium global industry is paying for a more secure future supply.

- **Market resilience and innovation:** In-house chip development and greater competition among suppliers (encouraged by multi-sourcing) is also driving innovation and performance gains. Consumers may see benefits in the form of better products – e.g. Apple's M-series chips enabling cooler, longer-lasting laptops or AWS's Graviton lowering cloud costs. From a market perspective, these innovations can increase competition (ARM chips vs x86, etc.). There is a risk that not all custom chip efforts succeed, but even failures will yield lessons and perhaps spin off tech talent into the ecosystem.

The semiconductor supply chain is certainly not immune to future shocks – the industry will always have cyclicality and its inherent complexity means there could be hiccups in the future. However, proactive measures by firms in key industries mean the chain is becoming more robust. A shortage of one particular chip is less likely to cripple a whole product line because backups or redesigns are more readily available. And if a geopolitical crisis or natural disaster strikes a major production hub, precautionary inventories and the existence of additional fabs in other regions means more resilience than in the past. The changes underway – from Tesla's agile engineering to Ford's chip design aspirations – underscore that sentiment. The broader industry trend is one of convergence: tech companies are becoming chip makers, chip makers are becoming closer partners to device makers and even car companies are aiming to act like tech firms.



The return of the European jedi?

The European "Cheap" Act?

The EU, recognizing the strategic importance of semiconductors for economic and technological sovereignty, introduced the European Chips Act in 2023 as a landmark initiative to bolster the continent's semiconductor ecosystem. With a commitment to mobilizing over EUR43bn in public and private investments, the Act aims to strengthen Europe's domestic chip production capacity, reduce reliance on foreign suppliers and enhance resilience against global supply-chain disruptions. One of its primary objectives is to double Europe's global market share in semiconductor manufacturing from approximately 10% to 20% by 2030, ensuring that the region can meet its own demand for critical chips used in industries such as automotive, telecommunications and defense.

A significant milestone under this initiative was reached in February 2025, when the European Commission approved EUR92mn in state aid for Infineon Technologies to construct a new semiconductor manufacturing plant in Dresden, Germany. This facility, named MEGAFAB-DD, marks Infineon's largest single investment, amounting to EUR3.5bn, and is expected to be operational by 2027, with full production capacity anticipated by 2031. Once completed, the plant will significantly enhance Europe's capacity to produce advanced semiconductors, contributing to the EU's efforts to establish greater technological self-sufficiency.

Despite these ambitious initiatives, challenges remain regarding the effectiveness and implementation of the European Chips Act. While the Act has succeeded in stimulating investment and attracting high-profile semiconductor projects, it lacks a comprehensive long-term strategy with clearly defined policy objectives. Key concerns include insufficient funding (only EUR6bn per year over seven years) compared to the scale of global competition, particularly when measured against the USD52.7bn CHIPS Act in the US and China's multi-billion-dollar investments in semiconductor self-sufficiency. Additionally, Europe's reliance on foreign foundries, particularly TSMC and Intel, raises questions about how much true sovereignty can be achieved. Furthermore, the Act faces hurdles in balancing state aid with competition laws, ensuring fair distribution of funds among EU member states and fostering an innovation ecosystem that can compete with leading semiconductor hubs like Taiwan and South Korea. Without a cohesive, long-term industrial policy that supports not only manufacturing but also chip design, R&D and supply chain integration, the EU may struggle to achieve its ambitious semiconductor production goals.

The way forward for Europe

Europe has also engaged in the subsidy race to bring chip manufacturers on the continent. So far, this policy seems to have had some positive results. Intel announced in June that it is setting up large operations in German with a EUR30bn investment (with the German government providing EUR10bn). In August, TSMC also announced a plan to build a plant in Germany alongside Bosch (EUR5bn of public investment). STMicro and GlobalFoundries also announced a partnership to build a facility in France worth EUR7.5bn (EUR2.9bn from the French government). Similar announcements should follow from other players in the coming quarters. Such facilities won't produce cutting-edge chips (≤ 9nm) used in smartphone, servers or computers as Europe does not manufacture these products locally.

To secure its semiconductor supply chain, Europe needs to focus on developing a long-term strategy and setting realistic targets for the short term:

- **Set up a clear and coordinated roadmap to develop semiconductor expertise in industries in which Europe has an economic or strategic interest** (i.e. auto, defense or health care). Even though these sectors have limited growth potential at this stage (resp. +7%, +5% and +9% 2025-2028 CAGR), an early investment in these domains could favor economic synergy while supporting the development of an expertise leadership that would be helpful, especially at a time when Europe intends to increase and modernize its military capacities. As part of increasing defense spending to 3% of GDP, a portion of the allocation to equipment (procurement ratio to be lifted toward 35%-40% vs. roughly 25% today) could be specifically allocated to chip capacities. Likewise, a portion of the investments required to boost the automotive sector (e.g. 15-20%) could be allocated to semiconductors

- **Develop and support its expertise in semiconductor equipment to defend current leadership in that segment.** This would imply investing further into that domain to increase capacities while replicating its success to develop new actors, while also protecting it against unfair competition and industrial espionage. In particular, Europe should have a continent-wide strategy for trade related to chips. Leveraging the role of ASML exports could be a key component of such policies.

- **Increasing further partnerships between corporates and engineering schools to create a proper domestic ecosystem dedicated to AI and new-technology R&D.** Investing in R&D to catch up with the most advanced players in IP, EDA and chip design would be a relevant strategy. Current plans are too small to have an impact: the EUR11bn for R&D up to 2030 in the EU Chips Act is money that has been redirected from other programs and that was already earmarked for projects related to semiconductors. Europe should leverage engineering expertise to reduce by half the current 40-50% ratio of European PhDs in the tech sector moving overseas once they graduate, and also develop a European fabless-type model focusing on IP, design and equipment domains where Europe can compete with peers. In this context, realigning the European Chip act target of 20% of market share by 2030 with a specific focus on upstream activities would also help as it will be expensive and efficient to try to bridge the gap with Asian peers on fab capacities.

- **Dedicate at least 0.5% of GDP annually (EUR35-40bn) to R&D and new capacities** via the promotion of investments from Asian and US foundries on European soil (tax reduction, favored loans, public funds, fast-track process for acquiring lands etc.).

- **Devote at least 10-15% of broad-scale investment into data centers** (EUR20-30 bn of the recent European InvestAI initiative amount announced in February) to the sourcing and development of a secured supply chain entirely dedicated to Europe.

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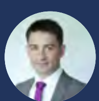

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