KAUTILYA SCHOOL OF PUBLIC POLICY

# Issue Brief Series

**"Silicon Sovereignty: Chinese Semiconductor Industry and USA's Technology Controls"**

**Issue Brief: IB-2025-19**

Submitted by: Harish Nandha RK (MPP Cohort: 2024-26)

Under the Supervision of: Ambassador D.B. Venkatesh Varma, Visiting Instructor at Kautilya School of Public Policy.

***Cite this Report*** *as RK, Harish Nandha. (2025). Silicon Sovereignty: Chinese Semiconductor Industry and USA's Technology Controls [online]. Available at: https://kspp.edu.in//issue-brief/silicon-sovreignty-chinese-semiconductor-industry-and-usa's-technology-controls*

# Silicon Sovereignty: Chinese Semiconductor Industry and USA's Technology Controls


**Abstract:**

This issue brief examines the geopolitical and economic implications of the U.S.-China semiconductor conflict, framing it as a struggle for technological dominance and national security. It traces China's rise as a global technology power through initiatives like "Made in China 2025" and its pursuit of semiconductor self-sufficiency. The U.S. response, centered on export controls, sanctions, and the "small yard, high fence" strategy, seeks to curtail China's access to advanced chips and semiconductor manufacturing equipment. The issue brief highlights the impact of these restrictions, including declines in Chinese chip output and increased state-led investments in mature node manufacturing and domestic innovation. It also underscores China's countermeasures, from diversifying supply chains to exploiting loopholes and weaponizing rare earth exports. The issue brief concludes by emphasizing lessons for India, advocating for domestic semiconductor capacity and strategic alliances to navigate a "geoeconomic war" era. Ultimately, it argues that semiconductors are pivotal to future power dynamics and technological sovereignty.


## Introduction

With the fall of the Soviet Union in 1991, there was only one superpower since then – the United States of America. This one superpower exerted a lot of influence on other countries, made a lot of friends, foes and allies, and had a huge role in shaping the world order. This country was also the largest economy in the world, giving it a prominent role in setting the world order.

But this dominance was soon to be threatened by an Asian dragon, whose rise to the global arena – in terms of money and might, as well as in terms of the influence this country was able to exert on other countries. Although there are questions as to whether this influence was built through legitimate "soft power" or through other tools such as "debt trap", there is no question that today if there is one country that can challenge the global stance of the USA, it is this country. This country is also the second largest economy in the world, the second largest populated country, the world's manufacturing hub, has the world's largest army and many more.

These factors eventually gave rise to the tensions between a global superpower, the USA, and an emerging superpower, China. After the Second World War, these two countries have decided to fight – although the scale of this new warfare amounts to billions to trillions of dollars, they are fighting over a resource that is in nanometers scale – the semiconductor war. Apart from the 3 conventional arenas of war – land, water, air – the rise of cyberspace as the 4th domain of warfare has been prominent in the last few decades.

This paper discusses the conflicts between these 2 countries in the semiconductor arena and how these conflicts have shaped and are going to affect tomorrow's geopolitical scenario.

**China's rise as technological power**

| Industry | Global Output (Billions) | Leading Producer | Leader's Market Share |
|---|---|---|---|
| IT and Info. Services | $1,900 | USA | 36.4% |
| Computers & Electronics | $1,317 | China | 26.8% |
| Chemicals | $1,146 | China | 29.1% |
| Machinery and Equip. | $1,135 | China | 32.0% |
| Motor Vehicles | $1,093 | China | 24.3% |
| Basic Metals | $976 | China | 45.6% |
| Fabricated Metals | $846 | China | 25.6% |
| Pharmaceuticals | $696 | USA | 28.4% |
| Electrical Equipment | $602 | China | 36.1% |
| Other Transportation | $386 | USA | 34.5% |

*Figure 1: Top ten technologically advanced and strategically important industries (Source: Ezell, 2024)*

As seen in figure 1, out of the top ten "technologically advanced and strategically important" industries in the world, China has a leading market share in seven of them and the USA has a leading market share in only three of them. These are considered to be important because the collective production of these 10 industries represented 11.8% of the global economy in 2020, the same % 25 years earlier as well. This shows the importance of these industries in the global economy (Information Technology and Innovation Foundation, 2023). These industries have also consistently seen technological innovations, and are poised to grow technologically in the coming years, showing that China has a stronghold on the crucial industries, and more importantly the USA is not the market leader in these industries.

This growth can be attributed to the “Made in China 2025” strategy, unveiled in 2015, which wanted China to move from the “world’s factory for low cost goods” to a “global technology leader”. This strategy chose 10 key sectors where the government’s intervention and support would be huge. These 10 key sectors are as follows:

1. New energy vehicles
2. Next-generation ICT
3. Biotechnology
4. New materials
5. Aerospace
6. Ocean engineering and high-tech ships
7. Railway
8. Robotics
9. Power equipment
10. Agricultural machinery

Out of these 10 sectors, R&D focus was given to certain areas, as:

1. Supercomputers
2. Smart manufacturing products
3. Industrial robots
4. Robot - core components
5. Driver-assisted vehicles (Partially autonomous vehicles)
6. Smart car technology products
7. Advanced medical devices

The effects of this high focus is seen in the global market share China has captured. One observation here is that China is focusing on moving to reduce human intervention in tasks that can be automated and most importantly tasks where humans are bound to make errors – making sure these errors are reduced by means of providing them with adequate timely information.

These have to be seen in tandem with China's AI Vision. China wants to be the global leader in AI by 2030. And why is this? AI is everywhere around us, in our normal lives – in our smartphones, laptops, smart watches, etc. China wants to dominate this space and when China mentioned it wants to become a global technology leader, it actually meant this. This is substantiated by the fact that out of the global funding for AI, China's AI industry attracted 60% of it between 2013 and 2018 (China's Pursuit of Dual-use Technologies, n.d.). Today, the majority of the tech-supergiants have started using AI in their products and services. And AI is data hungry – the more data we feed it, the more smart it becomes. This is where China again has a competitive advantage – for example, with 1.18 billion mobile phone users, it has the world's largest number of mobile phone users (China: Smartphone Users 2027| Statista, 2025). China is sitting on this goldmine of data. With such huge amounts of data, China's AI Vision is truly achievable.

In this scenario, the question arises as to whether China has the resources and access to the critical components – the hardware and software – that can power the supercomputers, driver-assisted vehicles, robots, etc. The answer is : Not really. The critical hardware component under discussion here is: semiconductors.

Semiconductors are really a tiny piece of technology that power almost every type of technology today. Any technological product – laptops, smart watches, missiles, surveillance cameras – are powered by semiconductors today. An integrated circuit (IC) chip is the actual device that makes all technological products "smart". This IC chip is powered by semiconductors. In this paper, the words semiconductors and IC chips have been used interchangeably. But the irking point for China has been its place in the global semiconductor sector.

**China's place in the global semiconductor sector**

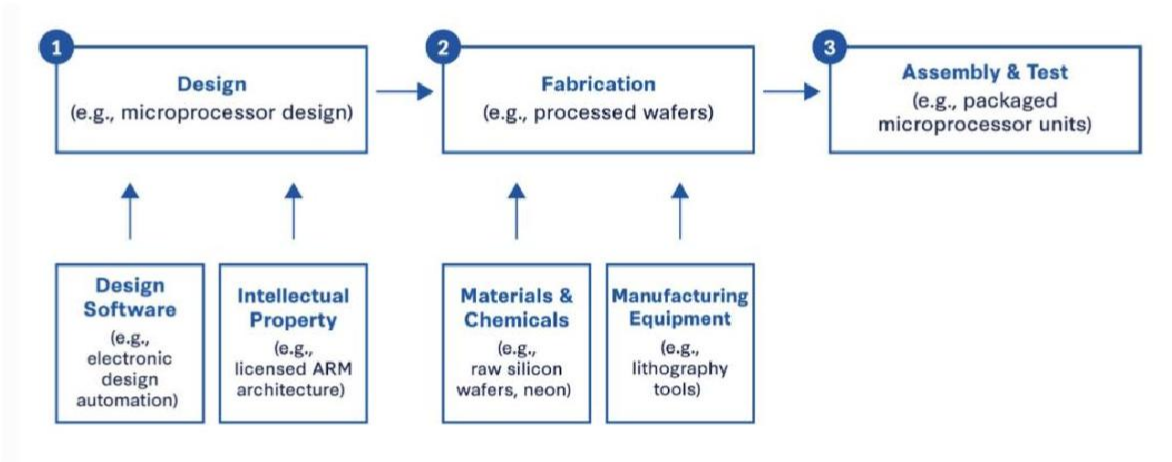


*Figure 2: Simplified Depiction of the Semiconductor Value Chain (Source: Thadani & Allen, 2024)*

The semiconductor value chain can be broadly divided into 3 segments:

1. Design segment

2. Fabrication segment

3. Assembly & test segment

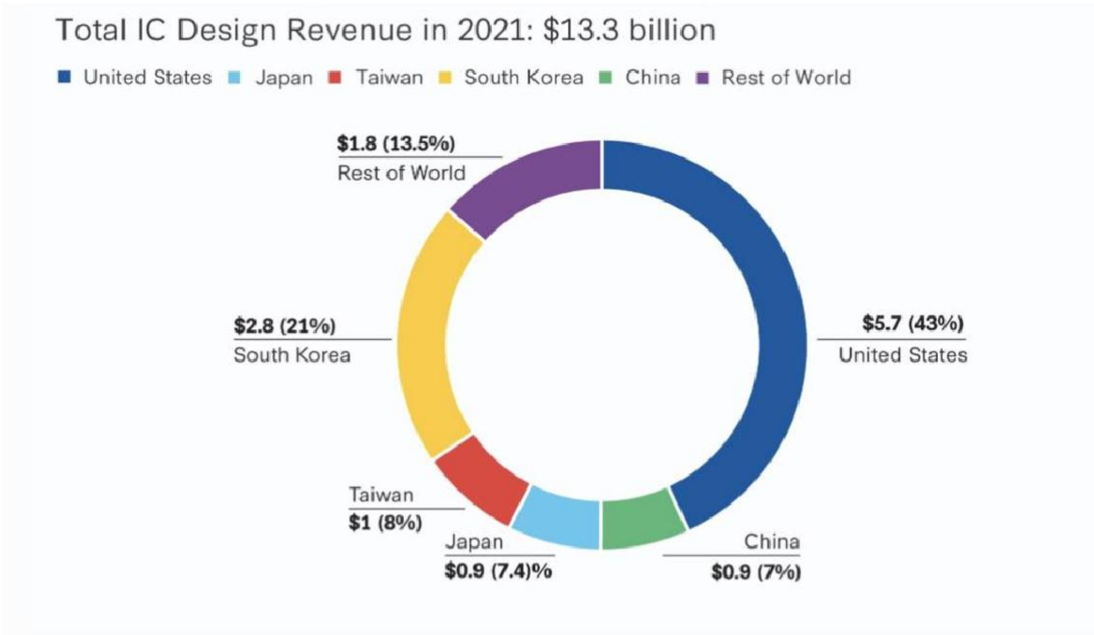


*Figure 3: Global IC Design Revenue by Country (2021, in billions) (Source: Thadani & Allen, 2024)*

In the Design segment, the USA holds more than 40% of the global market share. Although there are three stages in the Design segment, it is the design software sub-segment that garners more revenue. The software used to design ICs is known as Electronic Design Automation (EDA) software. As of 2021, three US-based firms hold more than 70% share of the global EDA market, whereas China's share in the same segment is just 7%, as seen in figure 4. Another interesting fact here is that the other market leaders in this EDA segment are also allies of the USA, namely South Korea, Taiwan and Japan (Thadani & Allen, 2024).

Out of all the raw and manufactured materials needed as inputs for the fabrication process, silicon wafers, photomasks and photoresists, and certain chemicals are necessary inputs. Today, only 5 companies in the world produce the silicon wafers and these firms are in Japan, South Korea, Germany, Taiwan and France. China has an edge in the supply of raw materials especially in materials like magnesium, low-grade gallium and tungsten. Japan, Taiwan and South Korea are the major suppliers of photoresists and photomasks (Thadani & Allen, 2024).

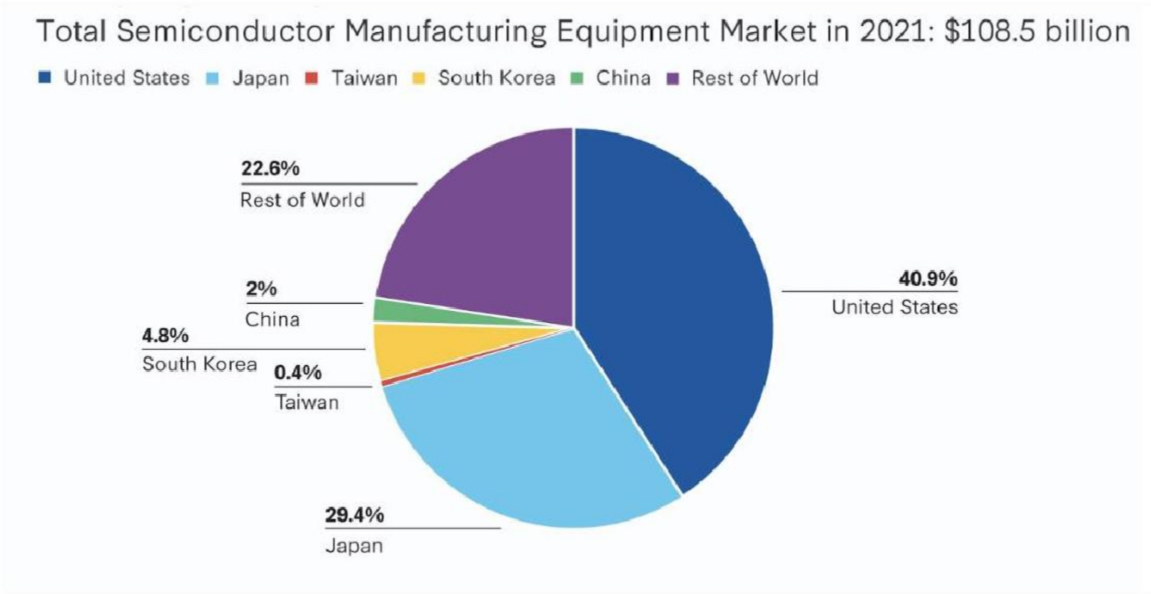


*Figure 4: Semiconductor Manufacturing Equipment Market Share by Company Headquarters (Source: Thadani & Allen, 2024)*

Next comes the Semiconductor Manufacturing Equipment (SME). USA and Japan are the market leaders in producing the equipment needed for testing, advanced packaging and the actual wafer fab equipment. In producing assembly equipment, Japan and Europe are market leaders. For producing advanced chips, such as the ones less than 5 nanometres, Extreme Ultraviolet Lithography (EUV) machine is crucial. As of 2025, only one company in the world produces this machine – ASML (Thadani & Allen, 2024).

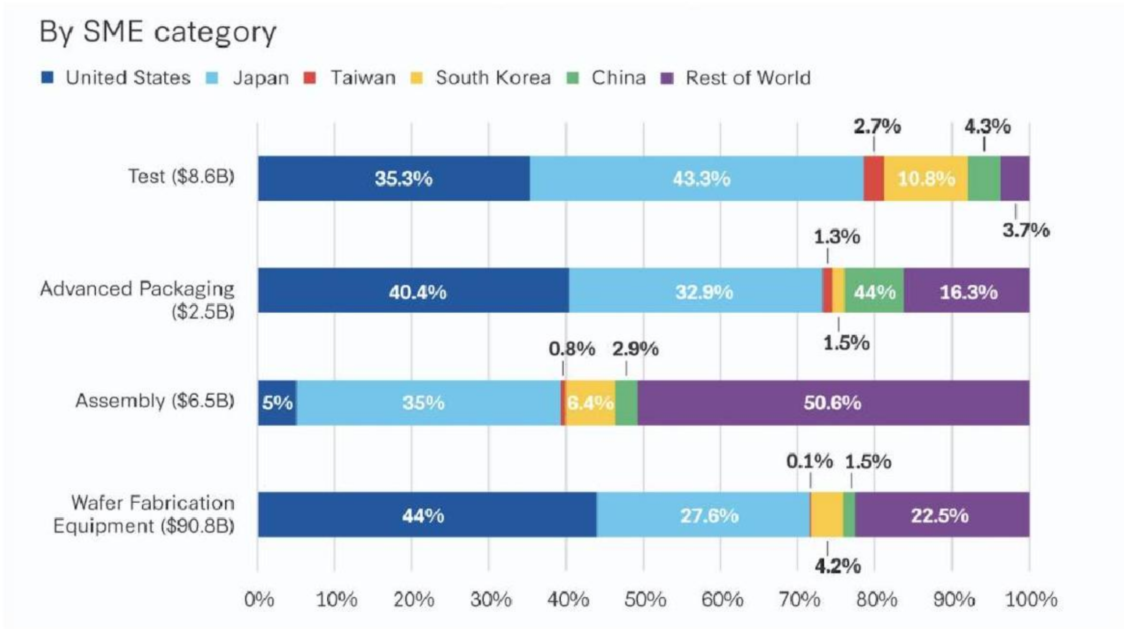


*Figure 5: Semiconductor Manufacturing Equipment Market Share by Company Headquarters, by SME Category (Source: Thadani & Allen, 2024)*

On a contrary note, China's share in producing testing equipment is only 4.3%, in producing advanced packaging equipment it is only 4.4%, in producing assembly equipment it is only 2.9% and in producing wafer fab equipment it is only 1.5%. This shows that China is heavily dependent on imports for producing the IC chips. In 2021, China was the largest purchaser of SME equipment with purchases worth $28 billion. This is crucial since China and Taiwan house a large number of Assembly, Testing and Packaging (ATP) facilities in the world. This is a contrarian situation because China imports the equipment needed to do the assembly, testing and packaging and then exports the finished goods – this puts China on the light of little value addition (Thadani & Allen, 2024).

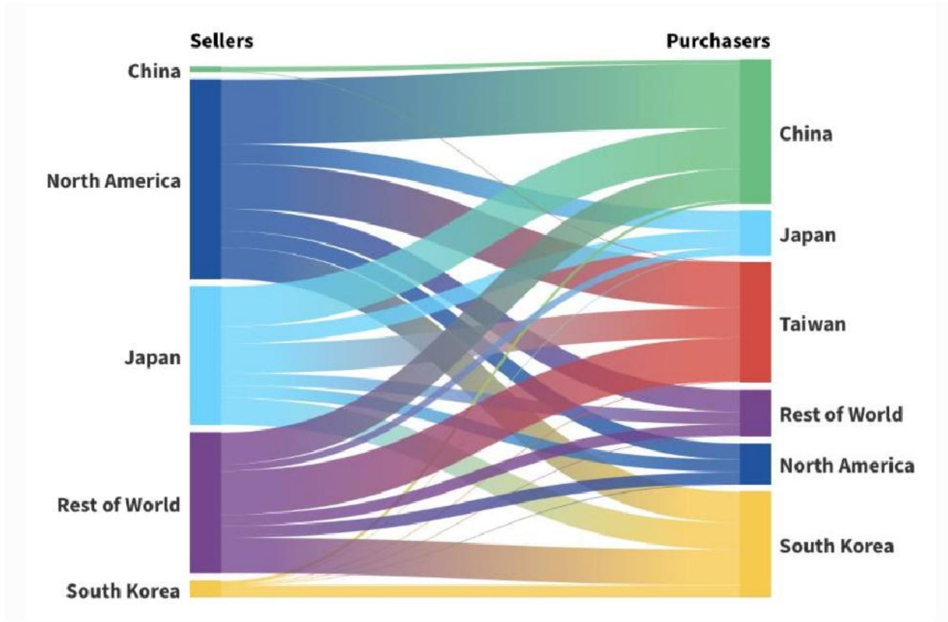


*Figure 6: Total Semiconductor Manufacturing Equipment Sales and Purchases in 2021 (Source: Thadani & Allen, 2024)*

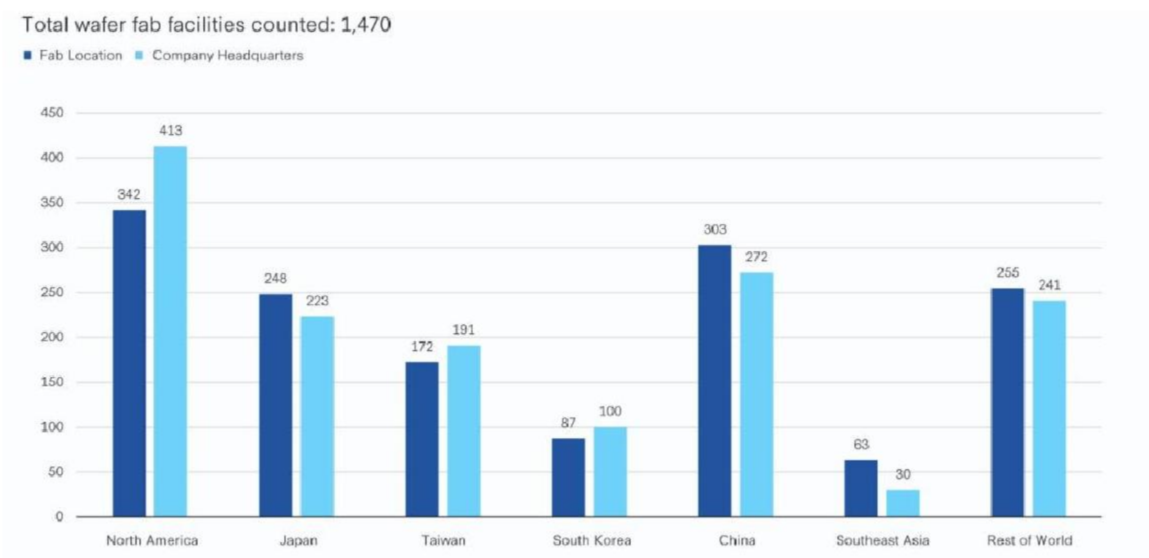


*Figure 7: Number of wafer fabs by fab location and company headquarters (Source: Thadani & Allen, 2024)*

As seen here, China has a large number of wafer fabs. But this does not mean that China is capable of producing advanced chips. TSMC produces more than 85% of the world's advanced chips, while Chinese fabs produce the legacy chips (>28 nm) that are used in many products such as automobiles, consumer electronics, certain defence technology, etc. (Davidson & Lin, 2025). The advanced chips (<16 nm) are necessary for technologies of the future, such as quantum computing, supercomputers, AI-integrated applications, etc. Also, an interesting observation here is that out of the total 1470 fabrication facilities in the world, 1215 are located in the Indo-Pacific region. This shows why the USA and China have become increasingly focused on this region in recent years.

**China's rise in the semiconductor industry**

With the given scenario where China's share in the global semiconductor industry's different segments are very minimal, China's strategies to address this situation is important to understand.

China's growth in the semiconductor industry is not a recent surprise. China has been pursuing its growth for a long time now. This is evidenced by the fact that the Chinese government made "semiconductors the country's top industrial innovation priority" in 2013. In 2014, China launched the "National Guidelines for Development and Promotion of the IC Industry", also called the "National IC Strategy". This strategy aimed to mobilize $150 billion investments, establish a fully "closed-loop semiconductor ecosystem" in China and make China the world's leading IC manufacturer by 2030. The Made in China 2025 strategy set a goal of achieving 40 percent self-sufficiency in semiconductors by 2020 and 70 percent self sufficiency by 2025.

All these efforts have paid dividends. For instance, from 2001 to 2016, the US' share of global value added in the semiconductor industry fell from 28 percent to 22 percent and Japan's share fell from 30 percent to 8 percent, while China's share grew from 8 percent to 31 percent. An interesting observation here is that China's growth in the same period in the global value added is higher than even Taiwan's (Ezell, 2024).

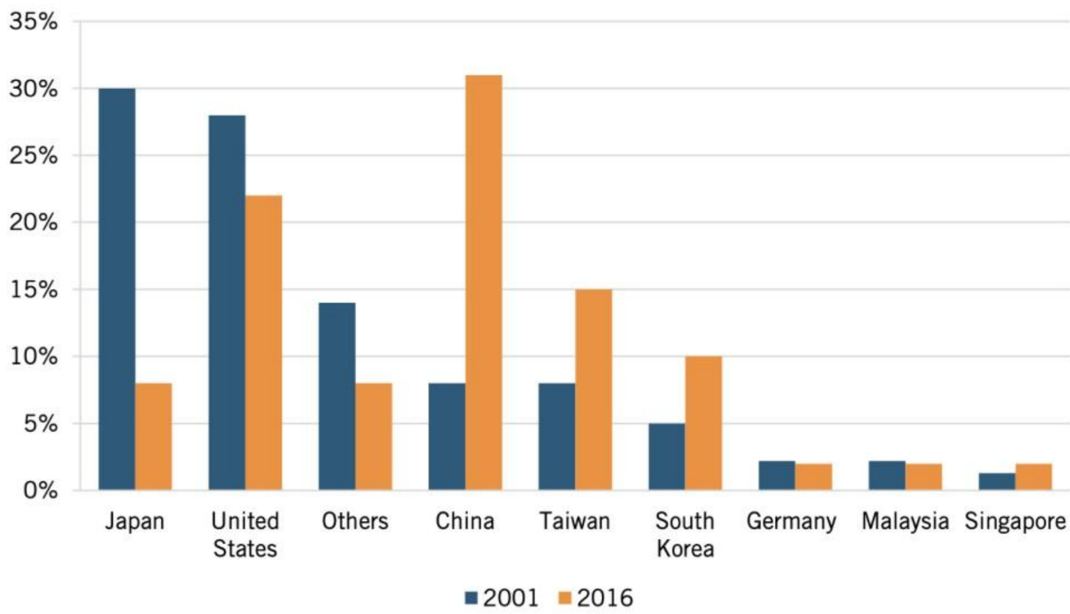


*Figure 8: Country share of value added in global semiconductor industry (Source: Ezell, 2024)*

China has invested heavily in building the domestic semiconductor sector, and importantly to make sure this sector is thriving independent of foreign support. The number of semiconductor design firms in China has increased from 582 in 2010 to 3243 in 2022 (Ezell, 2024).

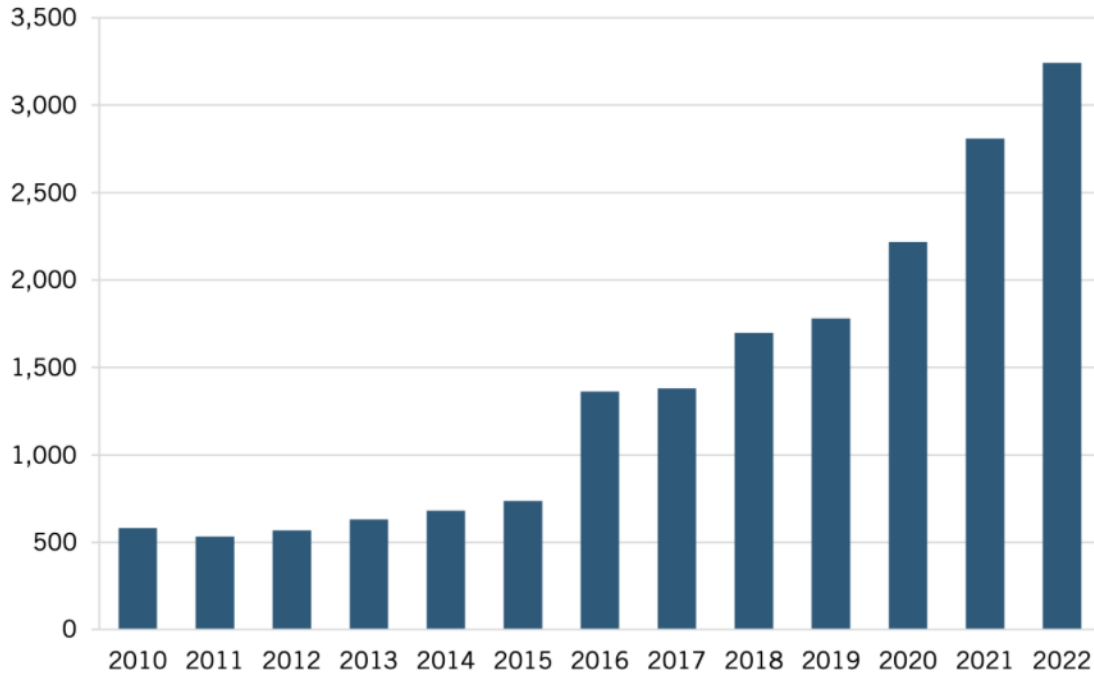


*Figure 9: Number of semiconductor design firms in China (Source: Ezell, 2024)*

China has been pushing to move from the traditional and industry-leading x86 and Arm instruction architecture, based on which Intel and AMD processors run, to the RISC-V instruction architecture. Chinese chip design firms have been designing chips using this RISC-V instruction architecture. Chinese scientists have proposed to develop space-borne computers using the RISC-V architecture, while T-Head, a Chinese fabless semiconductor company (owned by Alibaba Group) has started designing chips using this RISC-V architecture (Cao & Cao, 2023).

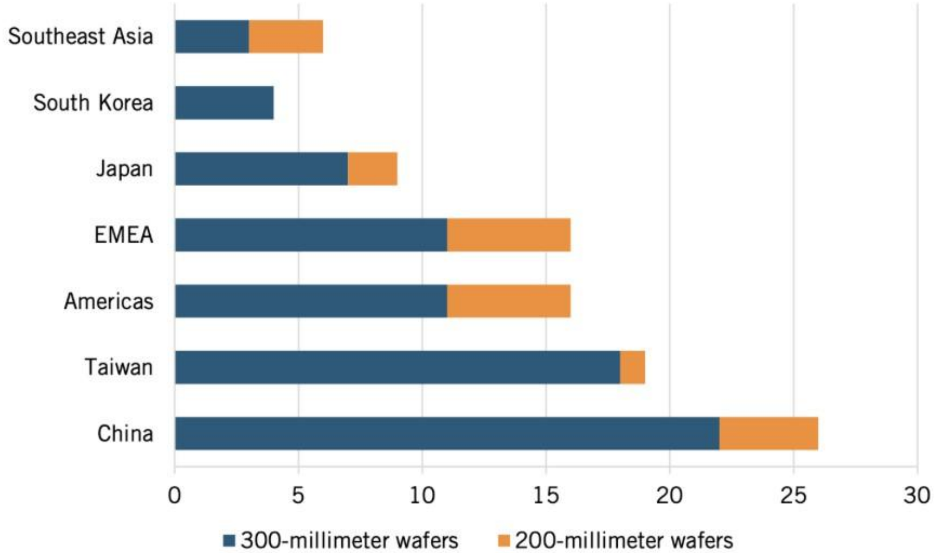


*Figure 10: New fabs and major expansions expected to come online, 2022-2026 (Source: Ezell, 2024)*

Chinese firm Huawei also launched its 7 nm Kirin 9000S chip in 2023. This came as a surprise since the US sanctions restricted the access of EUV technology and Semiconductor Manufacturing International Corporation (SMIC), China's leading semiconductor manufacturing company, manufactured this 7nm chip using the old Deep Ultraviolet (DUV) Lithography technology by employing a new technique called "double patterning" to produce this sub-20 nm chip using the existing DUV technology (Ezell, 2024).

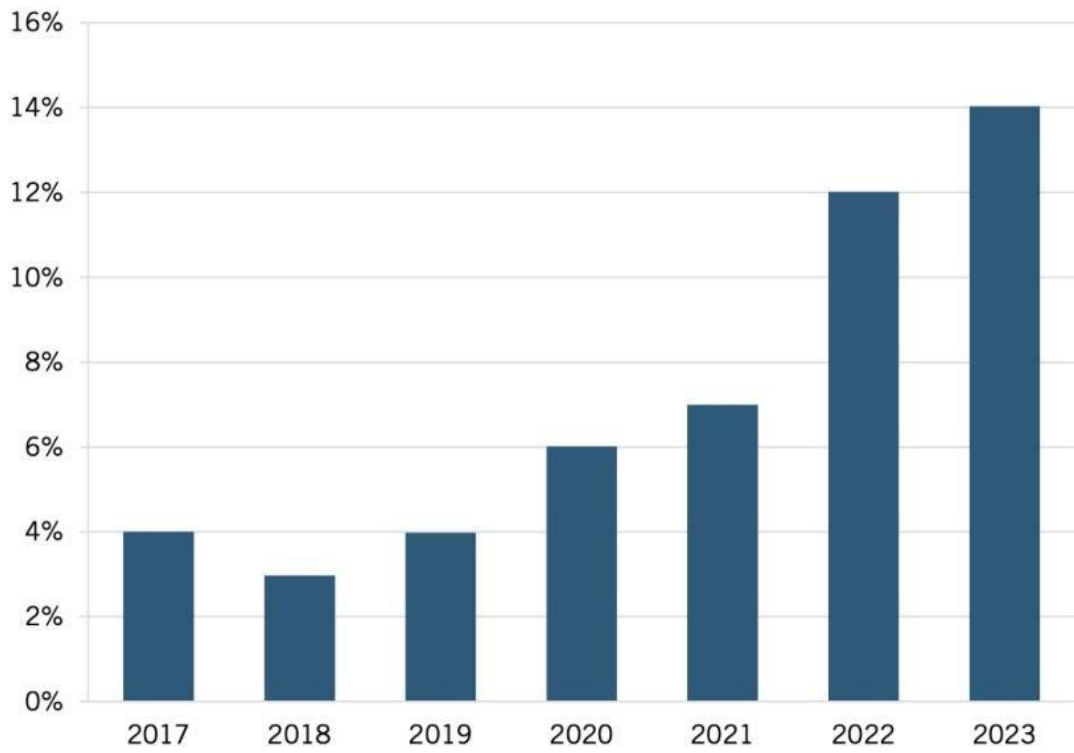


*Figure 11: Chinese chip-fabrication equipment makers' share of Chinese market (Source: Ezell, 2024)*

Adding to this, Chinese chip-fabrication equipment makers' share of the Chinese market is also steadily increasing. China is predicted to have 28 new fabs to begin operations before the end of 2024. China still has a strong lead in the ATP segment of the semiconductor industry. In 2021, out of the total 484 ATP facilities in the world, 134 (28%) were in China. China is also investing heavily on developing its own Semiconductor Manufacturing Equipment industry (Ezell, 2024; Thadani & Allen, 2024).

**Why does the US see China as a threat?**

"The greatest long-term threat to our nation's information and intellectual property, and to our economic vitality, is the counterintelligence and economic espionage threat from China."

– FBI Director Christopher Wray

"The eventual demise of capitalism and the ultimate victory of socialism will require a long historical process to reach completion"

– Xi Jin Ping

First things first, there is an ideological battle between the USA as the flagbearer of democracy and China as an existing symbol of victorious Socialism. This is one of the foremost reasons why the USA sees China as a threat.

With more than 600 operational nuclear warheads, China is expected to have more than 1000 nuclear warheads by 2030. China's arsenal of 400 intercontinental ballistic missiles are capable of reaching the continental frontiers of the USA. China's navy has more than 370 ships and submarines, and the Pentagon forecasts this number to go up to 395 by 2025, with 65 submarines, and by 2030 this number is forecast to increase to 435, with 80 submarines. Pentagon reports also show that China is developing and testing "advanced nuclear delivery systems including strategic hypersonic glide vehicles and fractional orbital bombardment systems" (Field, 2024).

In addition to this, China is also developing a "world class military" (Field, 2024). In the Fifth Plenum of the Chinese Communist Party held in 2020, it was declared that the "modernization of the armed forces is an indispensable element of the Party's national strategy to modernize the country". This shows that the development of the Chinese economy is closely linked to the development and advancement of the Chinese armed forces. (China's 2027 Goal

Marks the PLA's Centennial, Not an Expedited Military Modernization - Jamestown, 2021)

China aims to do this "modernizing" exercise using many methods. The most important among them is the integration of AI and big data technologies into the defence forces. China is also aiming to build "brain supremacy" – the ability to interfere with, disrupt and confuse the cognition of the enemy (China's Pursuit of Dual-use Technologies, n.d.). This "cognitive warfare" seems to be the latest domain of warfare, in addition to the cyber and space domains, apart from the conventional land, sea and air domains. This is where Xi Jinping's emphasis on "there is no national security without cybersecurity" is important (Jroberts, 2025). Thanks to intellectual property theft and economic espionage, China has been developing its domestic defence industry at a fast pace (Survey of Chinese Espionage in the United States Since 2000 | CSIS, n.d.). Although these two factors cannot be solely pointed at for China's defence development, these two have played an important role. Interestingly, China has also been involved in industrial espionage to gain access to the latest advancements in technology. This espionage has not been only against foreign companies, but also against domestic Chinese companies and universities.

This "modernizing" is also supported by China's Civil-Military Fusion strategy. Breaking the barriers between civil and military technologies, and developing dual use technologies is at the heart of Civil-Military Fusion strategy. Using civilian infrastructure and technologies, such as advances in quantum computing, super computing, AI, etc. are integrated into the defence forces and used for military purposes (The Chinese Communist Party's Military-Civil Fusion Policy - United States Department of State, 2020). China has established the Central Commission for Integrated Military and Civilian Development (CCIMCD) with the aim of cutting costs of developing such dual use technologies and integrating existing civilian technologies into the defence forces. (Lin, 2017).

China is also embracing "multi-domain precision warfare", a strategy where vast amounts of intelligence from various domains – air, sea, land, cyberspace and space – are integrated using latest technologies like AI and big data, to conduct precise strikes (Erwin & Erwin, 2024).

But why is this emphasis on development of defence capabilities a threat? As mentioned above, China has linked the development of its economy with the development of its defence forces. With this context, China's defence capabilities are bound to grow. But as seen from the above evidence, the "modern military", "brain supremacy" and the "multi-domain precision warfare" are all designed to enable the defence forces to make "smart decisions" based on data and latest technology. To make use of the vast amount of data China has, it needs corresponding advanced computing capabilities, which China is currently developing at a faster pace. China's supply chain – both domestic and global connections have enabled China to develop the latest technologies. Knowing that semiconductors will be of critical importance, China has also grown its semiconductor industry, as illustrated in the previous sections. When the US was the only superpower, it had an upper hand in many critical technologies. But the recent trends show that China is developing in a way that challenges the US dominance.

Apart from all these, the growth of China in the last three decades has irked the USA. The rise of China's political clout in international stages, especially in the Global South seems to be an irritant for the USA. With the growth of BRI, China has also taken a commanding position over the African countries, the European region, and the Latin American and South American region. Some of these regions have seen the West, led by the USA, play a key role in engaging in active conflicts or engaging in proxy wars.

All these regions are where the USA has allies or friends as well as has some foes. With China capitalizing on this fact and gaining an advantageous position, the global order built on the direction given by the USA is under threat, thus threatening the USA's position as a global leader.

**Sanctions as tool of coercion**

"We just pursued profit over national security." – This is what Commerce Secretary of the USA, Gina Raimondo had to say about the offshoring of critical manufacturing in allies such as Taiwan, Japan, etc. With the passage of time, the USA has come to understand that it is protecting the "Silicon Shield" surrounding Taiwan, and this is draining the resources of the US and is giving its rival, China, an upper hand with the threat of getting a hold over critical chokepoints, such as the Malacca Strait.

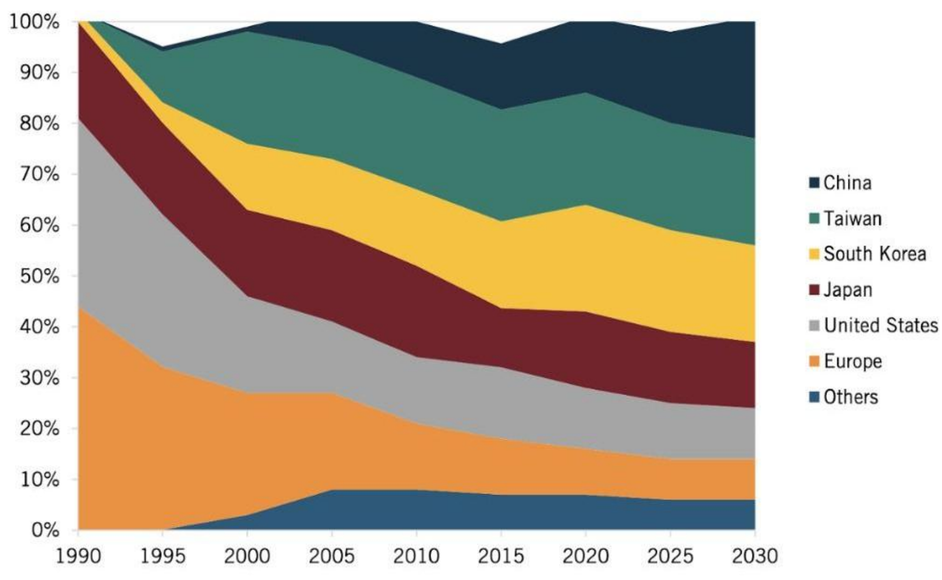


*Figure 12: Global semiconductor manufacturing capacity, 1990 – 2030 forecast*

*(Source: Ezell, 2024)*

This figure shows that the share of the US in global semiconductor production has reduced from 37% to 12% in the last three decades, while the share of China in the same domain during the same time period has increased from virtually nil to 12% (Ezell, 2024). As mentioned in the first section of this paper, out of the ten most advanced and critical technological industries, China leads in 7 of them while the USA leads in only 3 of them.

To address this problem, the US formed the “small yard high fence” strategy. This is a geoeconomic strategy where export controls and sanctions are placed on a small group of sectors while the impact of these restriction reverberate over a wide range of sectors (Cavanagh, 2023). Two forms of export controls need to be understood under this strategy.

First is the Entity List maintained by the Bureau of Industry and Security (BIS) of the US Commerce Department. Placing a company on the Entity List means that this company will face export restrictions. As a part of these export restrictions, US companies would not be allowed to export or transfer US-origin technology, software or components to them, without a special license. And these licenses are typically subject to a “presumption of denial” (US Government Restricts Certain Exports to Huawei and Affiliates by Adding It to Entity List While Permitting Temporary Narrow Exceptions, 2024).

Second is the Foreign Direct Product Rule (FDPR). This rule says that other countries (for example, South Korea or Taiwan) cannot export goods or services (such as advanced chips) manufactured by them using US-based technology (such as advanced EDA software developed by US-based firms). This limits the ability of countries like China to acquire products or services even from non-US suppliers. In this scenario, the FDPR has severely restricted China’s access to the latest technology since TSMC produces more than 85% of the advanced chips today, while Samsung is another global leader in semiconductor manufacturing (Reuters, 2022).

The timeline of the sanctions and export controls is shown below:


*Figure 13: Timeline of US export controls on China from 2018 to 2020*

*(Source: Author)*

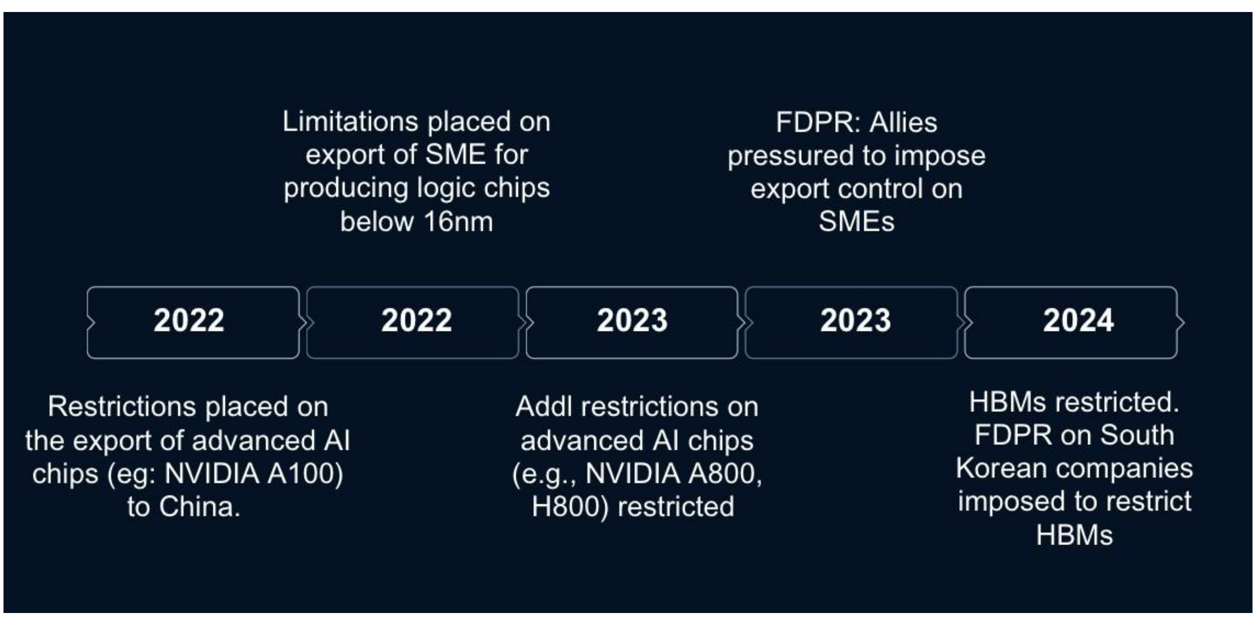


*Figure 14: Timeline of US export controls on China from 2022 to 2024*

*(Source: Author)*

All the tech-sanctions were imposed citing the reason that the Chinese companies had ties with the Chinese military or the US alleged that the Chinese companies might be forced to reveal confidential information about the US to the Chinese government. This has been corroborated by the recent allegations of the Chinese government spying on the African Union headquarters in Addis Ababa using equipment supplied by Huawei (Chaudhury, 2020).

The 2022 and 2023 export controls restricted the exports of logic chips, and not the export of advanced chips, such as AI-specific memory chips. The 2024 export controls rectified this by restricting the export of High-Bandwidth Memory (HBM), along with quantum computers, quantum sensors and related software, to China. Moreover, the US also placed end-use and end-user controls on the sale of even less advanced HBM chips. To put things simple, a HBM means a chip can process data faster and a low HBM means a chip will process data slower. An estimate says that roughly half of the manufacturing cost of an advanced NVIDIA AI chip is its HBM. With the new restrictions kicking in restricting the export of HBM, China's ability to develop advanced AI-chips is also crippled now. The HBM market is dominated by three companies: Micron, an American company, SK Hynix and Samsung, both South Korean companies. To prevent China from acquiring HBM from the latter two companies, US has applied foreign direct product rule on them citing the fact that these companies manufacture HBM using American SME (Allen, 2024).

In addition to these export controls, the US has reinvigorated efforts to bring back such critical manufacturing to the USA. It enacted the CHIPS and Science Act in 2022, which gave a 25% investment tax credit and mobilized $52 billion to support the semiconductor manufacturing industry, which includes setting up the "CHIPS for America Fund" (Gupta, Borges, & Leonard Palazzi, 2024).

**Impact of these sanctions and export controls**

The US tech export controls have affected China significantly. China's IC output dropped by 17% in the initial months of 2023 (Cao & Cao, 2023). Huawei, one of the largest companies in China, lost $49.6 billion in revenue in 2021 due to the export controls. Huawei's consumer electronics production suffered a major hit due to the lack of availability of ICs and semiconductors (Special, 2022). Major Chinese chipmakers experienced a revenue loss of $8.6 billion in 2022. The shares of major semiconductor manufacturers such as SMIC, Hua Hong Semiconductor, Shanghai Fudan Microelectronics fell sharply (Ng, 2022).

One of China's largest chipmakers, Yangtze Memory Technologies Co (YMTC), was reportedly laying off around 10 percent of its workforce due to the restrictions on chip making equipment (Zhang & Zhang, 2023).

As expected by the USA, its "small yard high fence" strategy seems to be working.

China's manufacturing output seems to have decreased after the export controls. China's access to SMEs and chips has affected its electronics manufacturing output. China'a lack of access to advanced chips has hindered its progress in the latest technologies.

**China's response:**

As expected, the Chinese government had increased funding in the form of direct subsidies and loans worth $1.8 billion to Chinese chipmakers (Cao & Cao, 2023). In 2023, YMTC received a total funding of $7.1 billion from the National Integrated Circuit Industry Investment Fund Company, which was created in 2014 to drive the semiconductor industry's growth (Shivakumar et al., 2024). China is seeing these export controls as an opportunity to accelerate its progress towards achieving the "closed-loop" semiconductor ecosystem. Heavy investments to increase the number of fab facilities have been noticed. Increased state-support to develop advanced chips, newer designs, increasing the production capacities are all seen. China has reduced its dependence on the US and has resorted to diversifying its supply chains by seeking support from countries like Singapore, Malaysia, etc (Hashmi & Hashmi, 2025).

Due to the restrictions on advanced chips, China has gone a step back and focused on mature node manufacturing (14 nm – 28 nm). This is evidenced by the fact that China's share in this segment grew from 18% in 2020 to 31.5% in 2024 (Hashmi & Hashmi, 2025). Similarly, in the 50 – 180 nm segment, China holds 24 percent of the global manufacturing capacity. As China is investing heavily in this mature node manufacturing, China's share in this 50 – 180 nm segment is projected to grow to 50 percent by 2030. This reminds of the Chinese "mass producing" strategy, where the market is flooded with these chips effectively darting out other competitors (Moriyasu, 2024).

Apart from this, Chinese companies have resorted to acquiring the chips and SMEs using third-party partners and offshore entities (Writer, 2023). Another strategy followed by the Chinese is to mark the shipments of these essential hardware and components as waste parts to bypass customs. And China had also gone on a shopping spree to buy Japanese and Dutch SMEs since there was some latency between announcement of these controls and implementing them (Shivakumar et al., 2024). Developing its own "double patterning" process to produce advanced semiconductors using existing DUV Lithography tools was another bypass mechanism (Ezell, 2024). China has also reinvigorated its Thousand Talents Plan using which it has been recruiting overseas Chinese experts to work in developing its own semiconductor industry, by giving them incentives and subsidies such as subsidized housing. (South China Morning Post, 2023).

Chinese organizations have been reportedly accessing cutting-edge chips using cloud computing services, such as Amazon Web Services. This means they are using the advanced chips without physically owning them (Fist et al., 2023). Chinese smugglers have come to the limelight in this chip war. The restricted advanced chips such as the NVIDIA A100, H100, Blackwell are being smuggled into China. Along with this, entire servers are being smuggled into China and traded in the black market. Each of these servers cost an approximate $300,00 and house advanced chips (Schneider, 2024).

Finally, as a response to these export controls, China has restricted the exports of gallium and germanium. This is important because China holds 60 percent of the market share of the global rare earth minerals extraction and 85 percent of rare earth minerals processing (Zhen & Zhen, 2023). This might be the first step of China trying to "weaponize" the rare earth minerals supply chain vulnerabilities.

**Lessons for India:**

India imports approximately 100% of advanced chips and approximately 80% of electronics. This puts India in a vulnerable position, especially in today's vulnerable geopolitical and geoeconomic scenario. India should build trusted, domestic capacity in semiconductors, batteries and AI. India should also reduce critical dependencies, especially in electronics, defense, and rare earths. China invested heavily in its domestic semiconductor manufacturing as a response. On the same lines, India needs to pursue its Make in India and Semiconductor Mission intensively.  India must scale up R&D with better funding, academia-industry collaboration, and IP creation. The U.S. worked with allies (Japan, Netherlands, Taiwan) to isolate China. India should strengthen alliances via QUAD, IPEF, and bilateral FTAs, securing access to critical technologies and markets.

## Conclusion:

We are living in an unstable world today. There are multiple crises around the world,  with multiple chokepoints. In a globalized world, India's many vulnerabilities are on the verge of getting exposed and many have gotten exposed already. It did not take much time for the USA to choke its rival China with many weapons. The same goes for the USA or any other country that India is dependent on, for doing the same towards India. India needs to manage these multiple contingencies tactically with an emphasis on soft power since India is in its growing and developing stage and any material damage will do only harm to India. It will be a challenging phase for India to navigate in this era of "geoeconomic war", but India has the capacity to get through this phase as well. These make one point clear: India is capable of achieving Silicon Sovereignty, but it is just a matter of time. And the crucial time to achieve this is "now."

**References**

Allen, G. C. (2024). Understanding the Biden administration's updated export controls.

https://www.csis.org/analysis/understanding-biden-administrations-updated-export-controls#:~:text=The%20ban%20also%20extends%20worldwide,Vietnam%20through%20its%20local%20subsidiaries.

Cao, A., & Cao, A. (2023, March 3). Alibaba's chip unit T-Head steps up RISC-V development as China pushes the open-source architecture in face of US sanctions. South China Morning Post. https://www.scmp.com/tech/big-tech/article/3212122/alibabas-chip-unit-t-head-steps-risc-v-development-china-pushes-open-source-architecture-face-us

Cavanagh, V. a. P. B. C. (2023, December 28). U.S. economic restrictions on China: Small yard, high fence? Georgetown Security Studies Review. https://georgetownsecuritystudiesreview.org/2023/12/26/u-s-economic-restrictions-on-china-small-yard-high-fence/

Chaudhury, D. R. (2020, December 27). China uses Huawei cameras to spy on African Union headquarters. The Economic Times. https://economictimes.indiatimes.com/news/international/world-news/china-uses-huawei-cameras-to-spy-on-african-unionheadquarters/articleshow/79981099.cms?from=mdr

China's 2027 goal marks the PLA's centennial, not an expedited military modernization - Jamestown. (2021, March 26). Jamestown. https://jamestown.org/program/chinas-2027-goal-marks-the-plas-centennial-not-an-expedited-military-modernization/

China's pursuit of dual-use technologies. (n.d.). IISS. https://www.iiss.org/research-paper//2018/12/emerging-technology-dominance

China: smartphone users 2027| Statista. (2025, January 27). Statista. https://www.statista.com/statistics/467160/forecast-of-smartphone-users-in-china/

Davidson, H., & Lin, C. (2025, April 2). How Taiwan secured semiconductor supremacy – and why it won't give it up. The Guardian. https://www.theguardian.com/world/article/2024/jul/19/taiwan-semiconductor-industry-booming#:~:text=Taiwan%20produces%20about%2090%25%20of,scientist%20at%20the%20Rand%20Corporation.

Erwin, S., & Erwin, S. (2024, December 18). Pentagon report highlights China's space advancements and AI-driven 'precision warfare.' SpaceNews. https://spacenews.com/pentagon-report-highlights-chinas-space-advancements-and-ai-driven-precision-warfare/

Ezell, S. (2024, November 25). How innovative is China in semiconductors? ITIF. https://itif.org/publications/2024/08/19/how-innovative-is-china-in-semiconductors/

Field, M. (2024, December 18). What the Pentagon's new report on Chinese military power reveals about capabilities, context, and consequences - War on the rocks. War on the Rocks. https://warontherocks.com/2024/12/what-the-pentagons-new-report-on-chinese-military-power-reveals-about-capabilities-context-and-consequences/

Fist, T., Heim, L., & Schneider, J. (2023, June 21). Chinese firms are evading chip controls. Foreign Policy.

https://foreignpolicy.com/2023/06/21/china-united-states-semiconductor-chips-sanctions-evasion/

Gupta, K., Borges, C., & Leonard Palazzi, A. (2024, July 9). Collateral Damage: The Domestic Impact of U.S. Semiconductor Export Controls. Center for Strategic and International Studies.

https://www.csis.org/analysis/collateral-damage-domestic-impact-us-semiconductor-export-controls

Hashmi, S., & Hashmi, S. (2025, January 7). China leads semiconductor race despite US sanctions. Still relying on foreign tech though. ThePrint. https://theprint.in/opinion/eye-on-china/china-semiconductor-industry-us-sanctions-relying-on-foreign-tech/2435527/?utm_source=chatgpt.com

Information Technology and Innovation Foundation. (2023, December 15). China is dominating advanced industries as US, G7, and OECD economies founder, ITIF finds in new industrial study. ITIF.

https://itif.org/publications/2023/12/13/china-is-dominating-advanced-industries-as-us-g7-and-oecd-economies-founder/

Jroberts. (2025, January 15). China's surveillance ecosystem and the global spread of its tools - Atlantic Council. Atlantic Council.

https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/chinese-surveillance-ecosystem-and-the-global-spread-of-its-tools/

Lin, L. (2017, April 11). China's Answer to the US Military-Industrial Complex. Thediplomat.com; The Diplomat.

https://thediplomat.com/2017/04/chinas-answer-to-the-us-military-industrial-complex/

Moriyasu, K. (2024, January 9). U.S. nervous about "flood" of older-generation chips from China. Nikkei Asia.

https://asia.nikkei.com/Business/Tech/Semiconductors/U.S.-nervous-about-flood-of-older-generation-chips-from-China

Ng, A. (2022, October 10). Hong Kong tech stocks drag market down 2%; Asia markets drop. CNBC. https://www.cnbc.com/2022/10/10/asia-markets-stocks-currencies-oil-economic-data.html

Reuters. (2022, October 8). Explainer-What is "FDPR" and why is the U.S. using it to cripple China's tech sector? The Economic Times.

https://economictimes.indiatimes.com/tech/technology/explainer-what-is-fdpr-and-why-is-the-u-s-using-it-to-cripple-chinas-tech-sector/articleshow/94726299.cms?from=mdr

Schneider, J. (2024, July 3). Smuggling A100s + Biden and Shakespeare. ChinaTalk. https://www.chinatalk.media/p/smuggling-a100s-biden-and-shakespear

Shivakumar, S., Wessner, C., & Howell, T. (2024). Balancing the ledger: Export controls on U.S. chip technology to China.

https://www.csis.org/analysis/balancing-ledger-export-controls-us-chip-technology-china

South China Morning Post. (2023, August 25). Tech war: China quietly recruits overseas chip talent as US tightens curbs. South China Morning Post.

https://www.scmp.com/tech/tech-war/article/3232287/tech-war-china-quietly-recruits-overseas-chip-talent-us-tightens-curbs

Special, E. S. (2022, March 28). US sanctions results in revenue decline for Huawei in 2021. The Economic Times.

https://economictimes.indiatimes.com/news/international/us/us-sanctions-results-in-revenue-decline-for-huawei-in-2021/articleshow/90502433.cms?from=mdr

Survey of Chinese espionage in the United States since 2000 | CSIS. (n.d.).

https://www.csis.org/programs/strategic-technologies-program/survey-chinese-espionage-united-states-2000

Thadani, A., & Allen, G. C. (2024). Mapping the Semiconductor Supply Chain: The Critical role of the Indo-Pacific Region. https://www.csis.org/analysis/mapping-semiconductor-supply-chain-critical-role-indo-pacific-region#_edn1

The Chinese Communist Party's Military-Civil Fusion Policy - United States Department of State. (2020, December 1). United States Department of State. https://2017-2021.state.gov/military-civil-fusion/

Mayer Brown. (2024, March 14). Insights | US government restricts certain exports to Huawei and affiliates by adding it to entity list while permitting temporary narrow exceptions. https://www.mayerbrown.com/en/insights/publications/2019/05/us-government-restricts-certain-exports-to-huawei-and-affiliates-by-adding-it-to-entity-list-while-permitting-temporary-narrow-exceptions

Zhang, L., & Zhang, L. (2023, June 29). Tech war: chairman of YMTC, China's top memory chip maker, warns of 'turbulence and disorder' in semiconductor sector amid geopolitical tensions. South China Morning Post. https://www.scmp.com/tech/tech-war/article/3225983/tech-war-chairman-ymtc-chinas-top-memory-chip-maker-warns-turbulence-and-disorder-semiconductore

Zhen, L., & Zhen, L. (2023, July 3). China curbs critical metal exports in retaliation for Western restrictions on chip industry. South China Morning Post. https://www.scmp.com/news/china/diplomacy/article/3226430/china-curbs-critical-metal-exports-retaliation-western-restrictions-chip-industry