

# Global Chip War

## It's US vs. China for Now



Semiconductor becomes the new flashpoint as the two economic superpowers lock horns once again.

Michael Roberts, Economist, London, UK

**G**eopolitical rivalry is becoming more intense by the year. The most intense is not just military, but also technological. It is the war over semiconductor chips. The tit-for-tat battle between the United States and China over controlling semiconductor technology is now unremitting. In March this year, the Joe Biden administration revised rules, making it even harder for China to access US artificial intelligence (AI) chips and chip-making tools. In turn, China is aiming to remove the use of foreign chips from its technology systems. The country's officials reportedly told its telecom providers to replace foreign chips, such as those made by Intel and

AMD, by 2027. Microchips are the new oil—the scarce resource on which the modern world depends. Today, military, economic, and geopolitical power are built on a foundation of computer chips. Virtually everything from missiles to microwaves, smartphones to the stock market runs on chips. Until recently, America designed and built the fastest chips to maintain its lead as a superpower. But in the 21<sup>st</sup> century, America's edge has been undermined by competitors in Taiwan, South Korea, Europe, and, above all, China. Today, China spends more money each year importing chips than it spends importing oil and is pouring billions into a

chip-building initiative to catch up to the US.

There is now a new arms race: the battle over chips between the US and China. The US began with former President Trump's declaration of a 'national emergency' in May 2019, which saw the US Commerce Department add the Chinese mobile Huawei to its 'Entity List', citing surveillance concerns and links to Chinese state security. Then in November, the US banned carriers from buying Huawei and ZTE networking gear. And in the following March 2020, Donald Trump signed a bill that would reimburse the replacement of Chinese gear, spending an

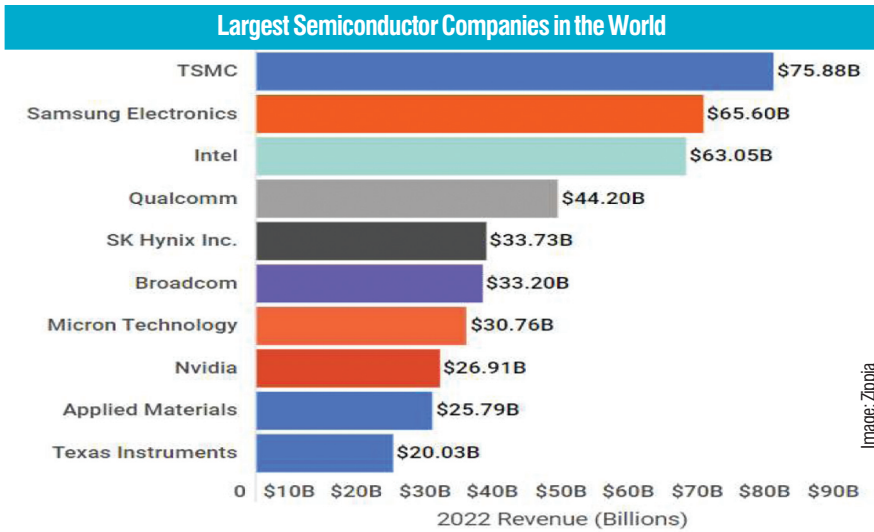


Image: Zippia

estimated \$1.8 bn. Huawei attempted to sue the FCC over these restrictions, but the court sided with the regulator. The tech war heated up rapidly in May 2020, when the US further restricted Huawei’s access to American equipment and software. This meant the Taiwan Semiconductor Manufacturing Company (TSMC), the world’s leading chipmaker, had to stop producing chips for Huawei—its then second-largest customer after Apple. Likewise, Samsung and SK Hynix had to stop selling chips to the Chinese brand. Washington also ratcheted up pressure by applying the so-called foreign direct product rule. This allowed the US to reach beyond borders and control products made outside the country if they were designed or manufactured using American technology.

Under Joe Biden, the US administration introduced the Chips Act as part of a series of measures designed to weaken China’s tech capabilities and global influence. The main goal of the US Act is to fund \$52 bn in manufacturing grants and research investment and to provide a 25% investment tax credit to chip producers in the US. But any entity that utilizes CHIPS funding is prohibited from “engaging in any significant transaction involving the material expansion of semiconductor manufacturing capacity in China”. The US is planning more sanctions including an export ban of semiconductor manufacturing equipment for NAND memory chips with more than 128 layers. The

aim is that by blocking China’s biggest NAND company and foreign company-owned memory chip fabs in mainland China, foreign memory chipmakers will have to locate outside China, as the world’s leading supplier, TSMC, is now

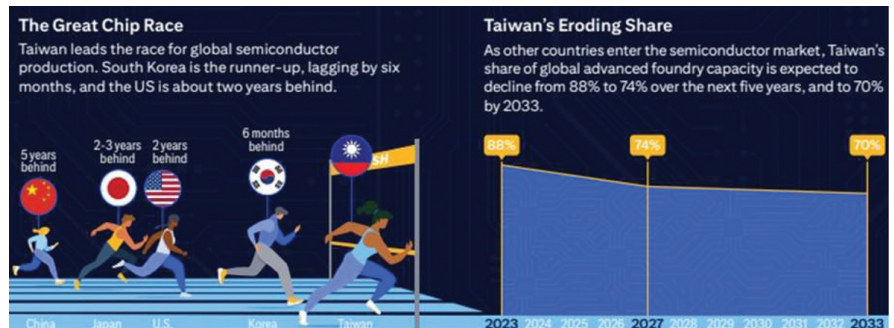


**Michael Roberts**

doing. TSMC has agreed to make its most advanced products in Arizona from 2028. The Taiwanese chip giant will make the latest cutting-edge 2-nanometre (nm) chips in a fabrication

plant, or fab, that it is building in Phoenix, marking an upgrade from its previous plans. That facility will be the company’s second in the US. The first, which is also in Arizona and was announced in 2020 under the Trump administration, will begin production next year. TSMC will increase its total investment in the US from \$40 bn to \$65 bn to build a third fab, with 2 nm or even more advanced technology, which will be operational by 2030. The US hopes the TSMC deal will mean that some of the most advanced chips used in AI could be partly made in the US by the end of the decade, reducing the reliance of chipmakers such as Nvidia and AMD on Asian production.

However, TSMC may be investing in a new plant in the US, but this has neither the scale nor the technological level of the company’s newest fabs in Taiwan. The fabs that Intel, TSMC, and Samsung are building in the US will mostly support the PC, smartphone, and server industries. But automakers, which have seen production getting disrupted due to chip supply bottlenecks, use less advanced chips that struggle to be viable in the US, where costs are higher. China is the world’s largest consumer of semiconductors. However, its self-sufficiency in manufacturing its chips is still relatively low. Now Beijing’s policy is a drive for self-sufficiency in chip production using all the financial and planning powers of the state. In 2014 China established a National IC Development Investment Fund. Later in 2015, the Made in China 2025 plan set an ambitious 70% self-sufficiency target by 2025, which is unlikely to be met given its current pace. Nevertheless, Chinese companies are

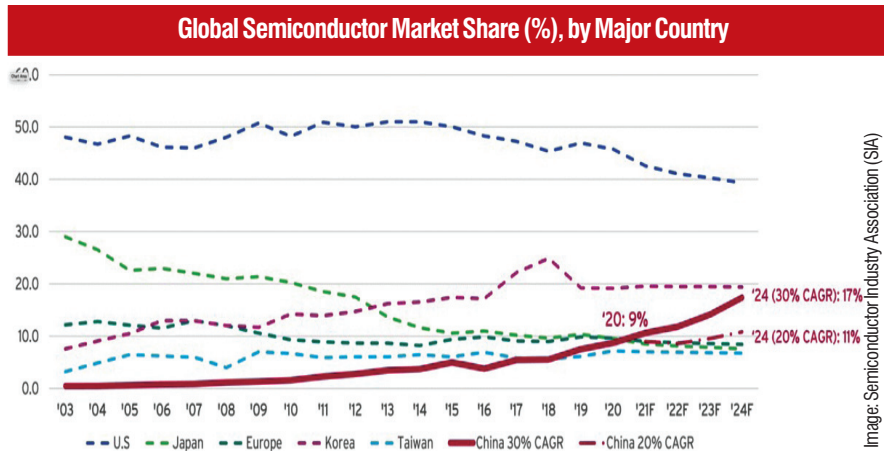


Source: Citi Research, TechInsights, SIA, and Gartner

trying to fill the technology void, with companies like Naura Technology Group and Shanghai Micro Electronics Equipment reportedly working on domestically made equivalents of chipmaking technologies. China’s chip investment finally paid off when SMIC made a 7 nm breakthrough in August 2022—a leap from 14 nm in just two years—faster than it took TSMC or Samsung.

China’s biggest chipmaker SMIC has put together new semiconductor production lines in Shanghai. In August 2023, Huawei surprised the industry and analysts with a 7 nm processor for its Mate 60 Pro premium smartphone launched. The phone helped it to increase shipments in China by nearly 50% in the fourth quarter. If the production works for smartphones, then Huawei’s most powerful AI processor, the Ascend 920, will also be produced at 5 nm by SMIC. This will narrow the gap between China’s AI chips and US Nvidia’s. China is still a generation behind the current cutting-edge 3 nm chips. But the technology gap is closing. AUKUS Pillar 2 focused research reveals that China is leading in high-impact research in 19 of these 23 technologies and has a commanding lead in hypersonics, electronic warfare and key undersea capabilities.

At the same time, China is retaliating against US blocks by restricting exports of two materials, gallium and germanium, which are key to the semiconductor industry. China is by far the biggest player in the global supply chain of gallium and germanium. It produces



80% of the world’s gallium and 60% of germanium, according to the Critical Raw Materials Alliance (CRMA) industry body. This tit-for-tat chip trade war is damaging Western chipmakers. Nvidia says that the new export restrictions will block sales of two high-end artificial intelligence chips it created for the Chinese market—A800 and H800. It said that one of its gaming chips will also be blocked. Nvidia is hit because China accounts for upto 25% of its revenues from data center chip sales. The Semiconductor Industry Association, which represents 99% of the US semiconductor industry by revenue, said the new restrictions “risk harming the US semiconductor ecosystem without advancing national security as they encourage overseas customers to look elsewhere”. Moreover, China has announced a plan to phase out foreign chipmakers from telecom equipment which could take a chunk out of Intel

and AMD’s revenue. Intel made 27% of its revenue from China in 2023, while AMD took in 15% from sales in the country last year.

### Competition or cooperation – A Hobson’s choice

The chips war and accompanying trade war between the two great economic powers can only be damaging for trade and technology globally. While competition can spur innovation and efficiency, it can also lead to wasteful duplication, excessive protectionism, and harmful confrontation. Cooperation, on the other hand, can foster mutual benefits, cost savings, and risk mitigation.

The chip industry is constantly evolving with new technologies, materials, architectures, and applications that can create new opportunities or challenges. For example, the emergence of quantum computing, neuromorphic computing, or carbon nanotubes could revolutionize or disrupt the existing paradigms of chip design and performance. Without cooperation and free development, technological progress could only get hampered for the world at large. The chip war between the US and China is a complex phenomenon. It is not a zero-sum game that can be won or lost by either side but a dynamic process that can be shaped by various factors. Governments of both countries need to seek ways to mitigate its negative effects and maximize its positive effects for their interests and global peace and prosperity. ■

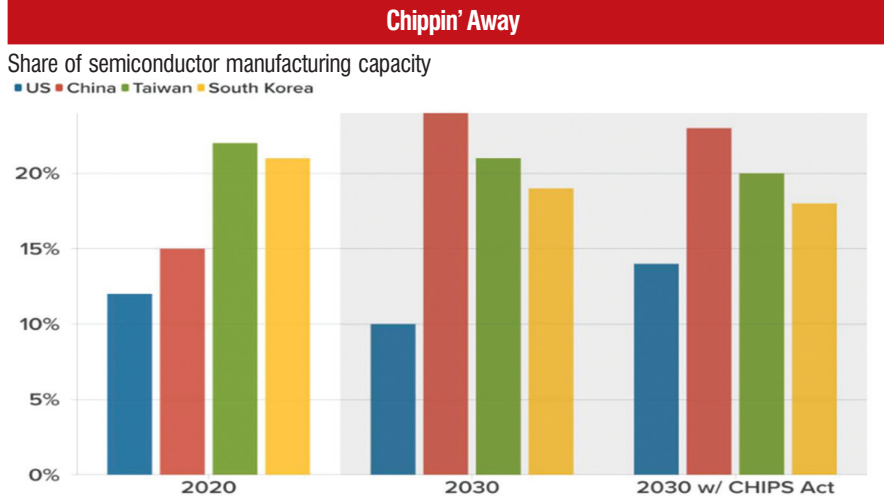


Image: Semiconductor Industry Association (SIA)