

## Technology war – “The War of the Chips”

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There is currently a technology war centered around chips, particularly semiconductor chips. This is because chips are essential components in a wide range of devices, from smartphones to cars to medical equipment, and their production is crucial to the functioning of many industries.

The current chip shortage has been caused by a combination of factors, including the COVID-19 pandemic disrupting global supply chains, increased demand for electronics due to remote work and schooling, and geopolitical tensions between countries. This has led to a fierce competition among countries and companies to secure access to chip production and technology.

United States and China have been in a trade war that has included restrictions on the transfer of chip-making technology. In addition, countries like Taiwan and South Korea, which are major producers of semiconductors, are being courted by various countries for investment and partnerships.

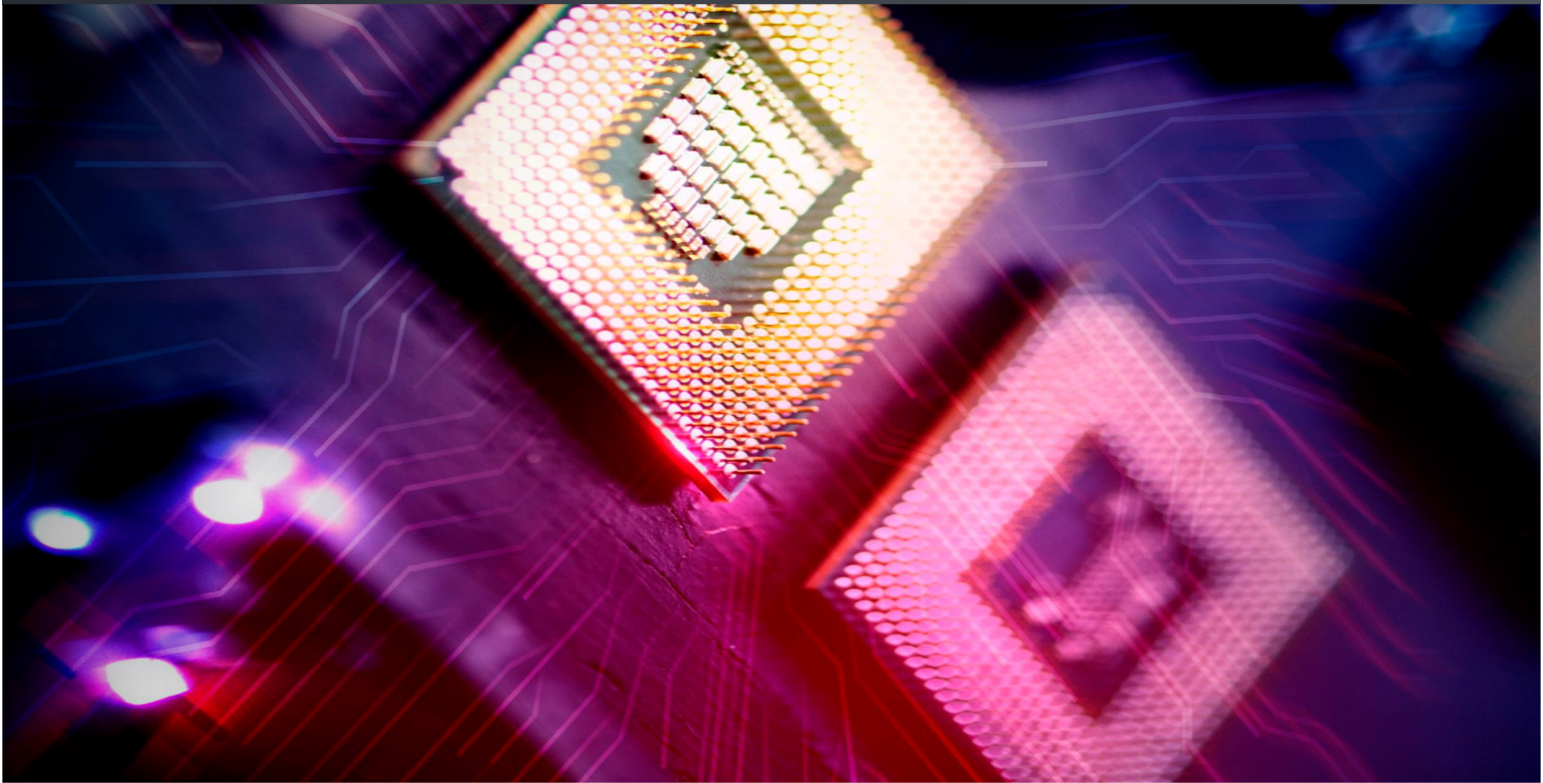
This “war” highlights the challenges faced by China in the semiconductor industry and the actions taken by the US, Japan, and the Netherlands to limit China's access to advanced chip-making technology. China has its own chip foundries, but they currently only supply low-end processors for autos and appliances, and the country relies heavily on foreign technology for advanced applications such as computer servers and AI.

The US government, under President Trump, has been cutting off China's access to a growing array of tools to make chips for advanced applications. Japan and the Netherlands have also joined in limiting access to technology that they believe might be used to make weapons. Chinese President Xi Jinping has accused the US of trying to block China's development with a campaign of "containment and suppression."

Despite this, China has been slow to retaliate against US companies, possibly to avoid disrupting its own industries that assemble most of the world's smartphones, tablet computers, and other consumer electronics, which rely heavily on imported foreign chips. They import more than \$300 billion worth of foreign chips every year. However, the Chinese government is investing billions of dollars to accelerate chip development and reduce its reliance on foreign technology.

One of China's main obstacles is its inability to purchase a machine from a Dutch company, ASML, that uses ultraviolet light to etch circuits into silicon chips on a nanometre scale. Without access to this technology, Chinese efforts to develop advanced semiconductors are stalled, which is currently China's loudest complaint.

To produce these processor chips, approximately 1,500 steps are required, which involves a range of specialized technologies that are owned by various suppliers across the globe, including the US, Europe, Japan, and other countries. This highlights the global nature of the semiconductor industry and the intricate supply chain involved in producing advanced technology products.



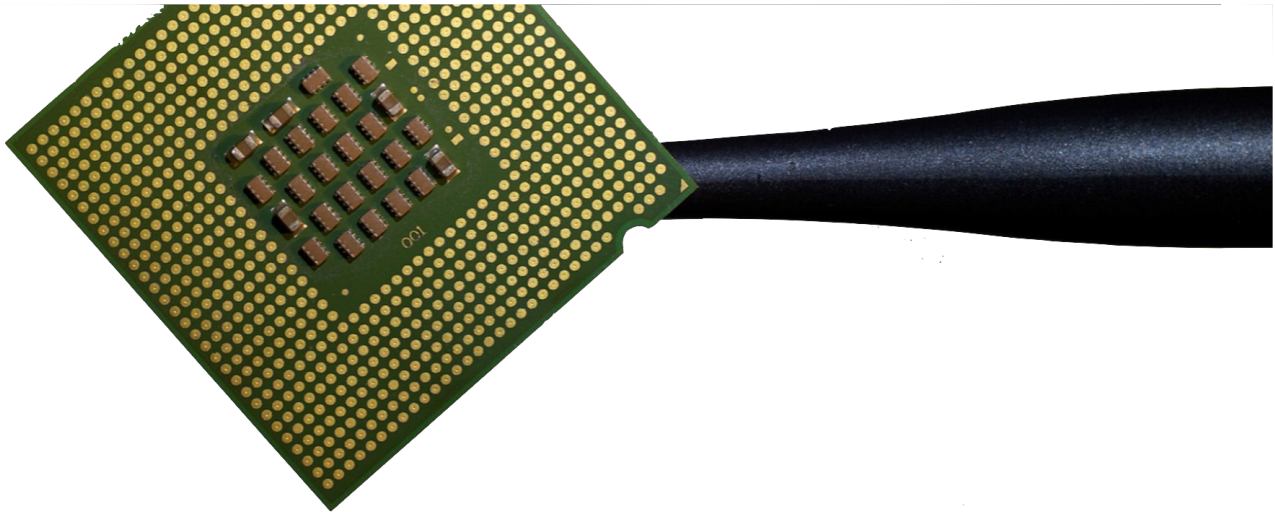
At the moment, no single country or company can independently produce all the necessary technologies for processor chip production, which is why it is crucial for countries to collaborate and engage in technology-sharing to advance the industry.

However, tensions between countries over technology and intellectual property rights have made this collaboration more difficult in recent years. The conflict over technology and intellectual property rights between countries such as the US and China has raised concerns about the possibility of the world decoupling or splitting into separate spheres with incompatible technology standards. This could mean that computers, smartphones, and other products manufactured in one region may not work in others due to differences in technological standards.

This would not only increase costs for consumers but also potentially slow down innovation as companies and countries would have to create separate products and technologies to cater to different markets. This would be particularly problematic for global technology companies that rely on a standardized approach to their products and services across different markets.

The possibility of decoupling also has broader implications for the global economy, as technological advancements have been a major driver of growth and productivity in recent years. A split in technology standards could lead to a fragmentation of the global economy, with countries and regions developing their own distinct technologies and industries, potentially limiting the potential for innovation and growth.

The current state of US-China relations is the most strained it has been in decades, with multiple contentious issues at play, including security concerns, Beijing's handling of Hong Kong and the Muslim minority population, territorial disputes, and China's sizable trade surpluses.



Tech industry consultants warn that Chinese industries could “hit a wall” resulting to a significant setback if they are unable to obtain next-generation chips or the necessary tools to manufacture them by 2025 or 2026. On the other hand, China may still have some bargaining power in the market due to its status as the primary source of batteries for electric vehicles.

Japan recently joined the US in restricting the export of chip-making equipment, which was seen as a move to increase pressure on China. Although the announcement did not explicitly name China, the Japanese trade minister stated that the country does not want its technology to be used for military purposes. In response, a spokeswoman from the Chinese foreign ministry cautioned Japan against weaponizing technology and trade issues, stating that such actions would not only harm China but also hurt Japan itself.

Chinese concerns heightened following President Joe Biden's extension of restrictions imposed by his predecessor, Donald Trump, on the technology used for manufacturing chips. Furthermore, Biden prohibited Americans from providing support to Chinese manufacturers for certain processes. To support domestic chip manufacturers, the Chinese government is increasing its funding, with experts estimating that it already provides up to \$30 billion per year in research grants and other subsidies. YMTC, China's largest producer of memory chips, received a \$7 billion investment from two official funds this year, according to financial information provider Tianyancha.

"Semiconductors are the main battleground of the current technology war between China and the US." In the February issue of the journal of the Chinese Academy of Sciences, Junwei Luo urged the need for "self-reliance and self-improvement in semiconductors." However, the amount of money required for such a move is enormous. Taiwan Semiconductor Manufacturing Corp. (TSMC), the global leader in the industry, is currently in the third year of a three-year plan worth \$100 billion to expand its research and production capabilities. According to industry researchers, developers such as Huawei Technologies Ltd. and VeriSilicon Holdings Co. have the ability to design logic chips for smartphones that are as powerful as those from major players like Intel Corp., Apple Inc., Samsung Electronics Co., and Arm Ltd. However, they are unable to produce these chips without the precision technology provided by TSMC and other foreign foundries.

In 2019, the former U.S. President, Trump, dealt a severe blow to Huawei's smartphone business by prohibiting the company from purchasing American chips and other technologies. The U.S. government accused China's leading global tech brand of potentially aiding Chinese espionage, an allegation that Huawei has refuted. In 2020, the White House tightened restrictions by preventing TSMC and other foreign foundries from using American technology to produce chips for Huawei. Subsequently, in August of that year, the U.S. government imposed new constraints on Chinese chip designers by restricting the electronic design automation (EDA) software, along with governments from Asia, Europe, and other regions, to curtail the spread of dual-use technologies that could be utilized to manufacture weapons. In December, President Biden added YMTC, the memory chip manufacturer, and a few other Chinese companies to a blacklist, limiting access to chips produced using U.S. tools or processes.

China's foundries have the ability to etch circuits with a minimum distance of 28 nanometres between them, which is much larger than the precision of global competitors like TSMC, who can etch circuits as close as 3 nanometres apart and are moving towards 2 nanometres. To manufacture the most advanced chips, a very complicated process recipe, EUV (extreme ultraviolet lithography) tools, and tens of billions of dollars are required.

According to researchers, China's ruling party is attempting to cultivate its own tool vendors. However, it is believed that they are significantly behind the global network that extends across many countries. Huawei, on the other hand, revealed in a video on its website in December that it was developing EUV technology. However, experts estimate that creating a machine comparable to ASML's could cost \$5 billion and necessitate a decade of research. Huawei did not respond to a request for comment. The day when China can produce its own EUV machine is believed to be a long way off.

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