

Chip Wars

Main Takeaways

- semiconductors getting smaller and their fabrication is pivotal for the tech industry.
- US chip companies open their production facilities in Asian nations, likely due to lower labor costs.
- TSMC (the chip maker) makes Taiwan increasingly important.
- Chips are used for military advantage.
- More and more companies are designing semiconductors and outsourcing them to TSMC.

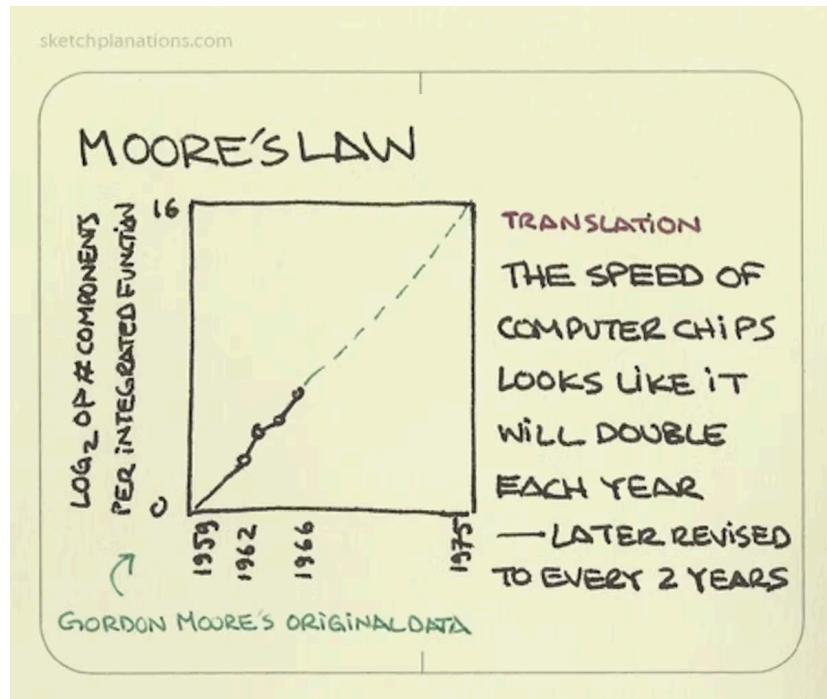
Summary

In 1961, Fairchild Semiconductor introduced a silicon chip with 4 transistors. These days Apple releases iPhones with more than 11.8 million transistors.

And while the microchip industry was dominated by the US and other distributed countries, China is trying to tip the scale and break free of this tech dependence they have on US.

Why do I say break free? Because in 1963, US semiconductor companies started shipping chips to Hong Kong for assembly. Fairchild (leader of this movement) initially paid its Hong Kong workers 25 cents an hour.

In 1965, Fairchild semiconductor co-founder Gordon Moore predicted that the maximum number of transistors on a single computer chip would double every year until 1975. His predicted growth rate in chip power, known as “Moore’s Law,” has proven true for over 50 years.



After quitting Fairchild, Gordon Moore and Bob Noyce founded Intel. in 1970, they developed the DRAM chip (dynamic random access memory) and later the 4004, the first microprocessor.

After WW2, the US government supported Japan to redevelop as the center of technology under an American-led system. However, when Japan surpassed the US in chip production in the late 1980s, the US government (and through which Intel as well as other Silicon Valley companies) sought a way to reduce their dependency on Japan.

With the South Korean government pledging to invest \$400 Million in its domestic chip industry, these American companies started arranging for Samsung to make chips under their brand names.

Military Implications of Chip Development

Businessman William Perry saw the potential in chip utilization in the army, and he pushed for improved weaponry like guided missiles through DARPA (the Defense Advanced Research Projects Agency).

DARPA later financed a program that enabled researchers at universities to design highly advanced chips, to "keep Moore's law alive" towards sustaining military advantage.

America showcased the chip-enhanced power of its military in the Persian Gulf War in January through its F-117 aircraft. The bombers used Sidewinder air-to-air missiles with semiconductor-driven guidance systems that were six times more accurate than the Vietnam-era version of the Sidewinder.

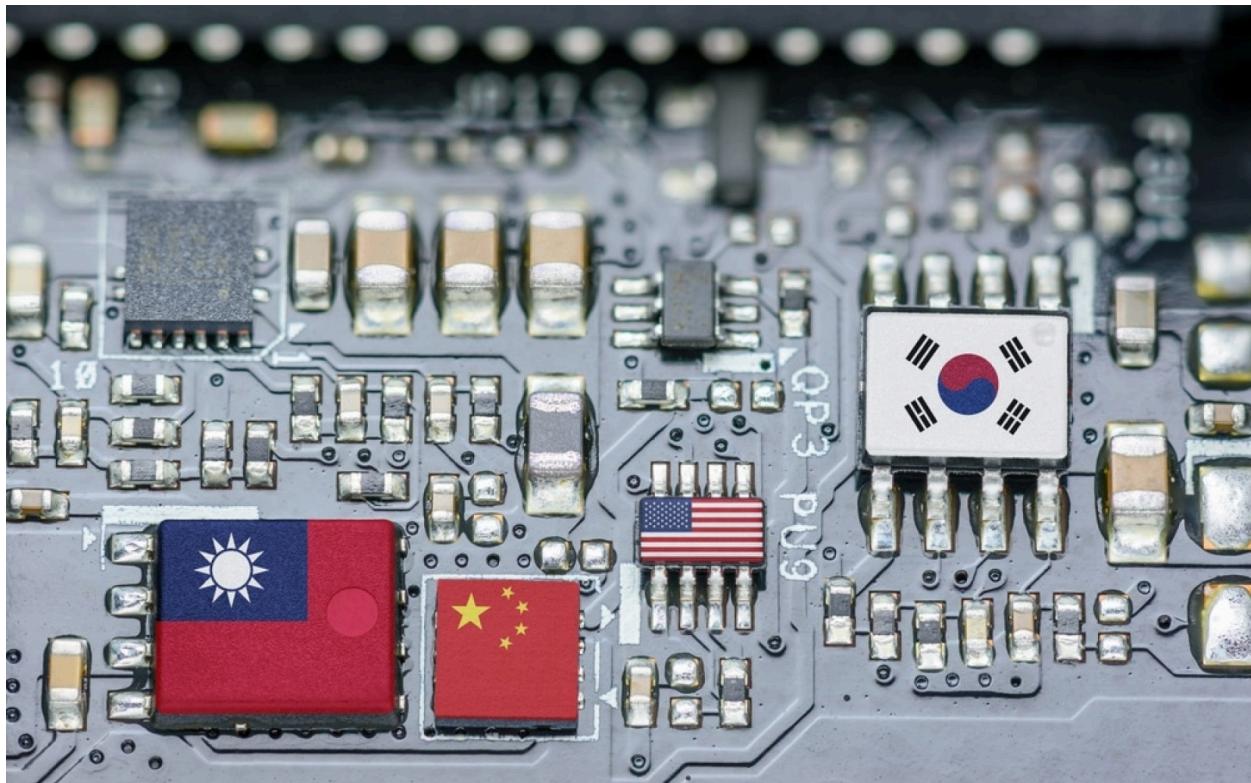
Taiwan - A Success Story

From the 1960s, Taiwan aimed to join international supply chains for semiconductors and through this fortify its security arrangement with the US.

By the 1990s, the dazzling development of TSMC was well underway.

TSMC supported by the rich Taiwanese citizens and the government also started attracting interest from other countries. At Researcher Morris Chang's urging, the Dutch semiconductor company Phillips acquired a 27.5% stake in TSMC.

With the chip fabrication shift to in Taiwan, Singapore, and South Korea, the US was left with 13% of global chip fabrication in 2010, compared to 37% in 1990.



Outsourcing Continues

Intel researchers discovered the potential of extreme ultraviolet light (EUV) in new types of lithography tools to make transistors even smaller.

However, as expected, Intel did not make its own EUV lithography tool. Neither did their Japanese competitors. Thus, the Dutch company ASML became the sole producer of EUV lithography tools.

This is mainly due to the cost of building an advanced logic fab-- roughly around \$20 billion. With only a few firms being able to afford this, "Fabless" chip firms that design semiconductors and outsource the production to TSMC and other similar foundries have proliferated since the 1980s.

Apple was the epitome of this outsourcing trend.

Finally, even though Intel had the capital to integrate EUV-based lithography into their foundry operations, they could not capitalize on it. Therefore, Samsung and TSMC produce today's most sophisticated processors.

Moore's Law Today

Although miniaturization is still happening, the Moore's Law standard of doubling the components on a semiconductor chip every two years has been broken.

China of Today

China is still dependent on chips and other products tech companies design in Silicon Valley. Even their army technologies use chips from American companies like Intel and Nvidia.

However, China's government has a plan -- Made in China 2025. They aim to decrease chip reliance on the US and increase domestic chip production.

Chinese state owns and finances many "private" equity investment firms, that constitute a collective effort to seize foreign chip firms.

Chinese telecom company Huawei is now among the three largest sellers of cell tower equipment.

Simultaneously while they break free from US chip dependence, China also invests in developing technologically sophisticated weapons like anti-ship missiles and anti-satellite weapons.

Because of this, Donald Trump (when he was president) banned exports of US chips to Huawei. This move ultimately forced Huawei to sell parts of its smartphone business.

With China dominating the EV industry with more affordable mass production, there is always a chance of China rising as a serious power in the chip industry.

Resources

