Confluence INVESTMENT MANAGEMENT

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By Thomas Wash

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Chip War: Book Review

It was simple in the beginning. American firms developed all the designs for semiconductor chips, and Asian manufacturers turned them into reality. It was a match made in capitalist heaven. This all changed after the pandemic exposed supply chain vulnerabilities in the business model, and the situation only worsened after Russia's invasion of Ukraine. This has led to a rethink regarding the U.S.'s reliance on Taiwan-produced semiconductors. Thus, an industry model which previously had been based solely on working with the lowest-cost producer must now consider supply-chain security.

In his book *Chip War: The Fight for the World's Most Critical Technology,* Chris Miller discusses how semiconductors have become essential for economic and military ambitions. The author not only details how semiconductors originated but also how they became a linchpin in the global economy. In this report, we summarize the findings in Miller's book, including how chip manufacturers paved the way for globalization and a subsequent clash between global powers. Additionally, we provide our thoughts on the book and conclude with potential market ramifications.

Real Men Have Fabs

Unsurprisingly, the story begins in 1959 in what is now called Silicon Valley. A group of engineers, known as the "traitorous eight," left Shockley Semiconductor to form Fairchild Semiconductor. The eight-man startup helped develop the manufacturing process that allowed chips to go mainstream. Transitioning chips from being used primarily in labs and military goods (such as missile guidance systems) to everyday electronics was a long process, but it helped pave the way for modern-day supply chains.

Like any new technology, semiconductors were very expensive in the early stages of their development. Fairchild initially used the revenue it received from government contracts to help reduce the cost of its product to other customers. After securing a deal with NASA in 1960, the company cut the price of its chips from $120 to $15 in less than a year. The steep cut in the price of its products helped push semiconductors into the civilian market.

As demand grew for semiconductors, so did the need for additional workers. Despite being convenient, domestic factories were too expensive for those firms looking to ramp up their scale of production while keeping costs to a minimum. This need to meet consumer demand for more chips spawned companies that specialized in certain stages of production. Additionally, the cost to pay American engineers was high, which led firms to cut costs by offshoring their manufacturing to countries in Southeast Asia such as Japan, South Korea, and Taiwan.

Miller notes that the cost savings from outsourcing allowed firms to focus more on research and the more profitable areas of production. Although firms such as Micron Technology kept production in the U.S.,

chips were increasingly produced abroad. In 1964, Japan overtook the U.S. in the production of transistors, and within a decade, nearly all chipmakers had foreign assembly facilities. America's increasing reliance on foreign factories led to push back from government officials and firms. These concerns became even more dire when Taiwan Semiconductor Manufacturing Company (TSMC) monopolized the chip-production market.

Run Faster

Washington viewed the globalization of semiconductors as a way to keep Southeast Asian economies dependent on the U.S. for growth. The Pentagon thought integrating these countries into the American economy meant they would be less likely to build ties with rivals like Russia or China. However, military officials began to change their tune once national security flaws were exposed.

The U.S. government initially shrugged off complaints by American chipmakers concerning unfair trade practices. These firms believed that the foreign firms were stealing their ideas and undercutting prices, thus putting American businesses at a disadvantage. In response, Washington argued that American firms needed to innovate faster in order to maintain their competitive edge over foreign rivals. The recommendation annoyed American chipmakers and downplayed the severity of the threat that foreign firms posed to American interests. As a result, the U.S. not only lost much of its market share in making chips but its defense industry also became increasingly reliant on other countries for the parts needed for weapons.

Miller theorizes that Washington's indifference allowed foreign firms to increase their market share and cannibalize their American competitors. Furthermore, government support to their semiconductor industry through state aid and preferential financing also contributed to the success of these foreign firms. Despite some pushback from Washington, foreign firms were able to offer a variety of chips at a fraction of the cost of American firms. As a result, the foreign chips were used in more American goods as firms looked to keep costs down and inflate their profit margins.

Taiwan was the biggest user of this strategy. Its primary goal when entering the semiconductor industry was to become indispensable to the U.S. After Nixon normalized U.S. relations with China, Taiwan feared that growing Sino-American ties could make it vulnerable to a Chinese invasion. Consequently, it helped develop the biggest semiconductor company in the world. The business model was simple: if you design the chips, they will make them. This business model allowed the country to take over nearly 60% of the semiconductor production market as of 2021.

Bring It Back Home

Semiconductors have replaced steel as the critical raw material needed to maintain a sustained war effort. Although chips were used in weapons during the Vietnam War, their military capabilities weren't fully on display until the Persian Gulf War. Before that conflict, there were some doubts as to whether the U.S. could defeat Iraqi forces decisively, since its previous war effort in Vietnam had ended in a 20-year stalemate. Nevertheless, despite Iraqi soldiers having the most advanced Soviet weapons at their disposal, American troops were still able to defeat Iraq within months.

The Persian Gulf War demonstrated that having precise weapons was better than having more weapons. This reality is being put on display currently in Ukraine. Despite

the fact that Russia has more arms and soldiers, Ukraine has drastically beat early expectations of its quick defeat. Initial reports had predicted that the country would fall within days, and yet Ukrainian troops have largely pushed back Russian advances using the sophisticated weaponry provided by the West. Export controls on chips were also crucial as they prevented Russia from developing weapons of similar quality. In other words, with the help of semiconductors, small countries can defend themselves from a major power that lacks access to the same quality of weapons.

Semiconductors' pivotal role in modern warfare has encouraged China to invest heavily in developing its chipmaking capabilities. Beijing has invested billions in its semiconductor industry; however, rampant corruption and lack of expertise have prevented the country from becoming a significant player in the field. Because it no longer retains the same access to Silicon Valley, it has instead relied on advancing its semiconductor knowledge through the acquisition of Western companies. Although this strategy has helped speed up the learning curve, it has yet to close the information gap with its rivals.

The takeover of Taiwan would grant China access to TSMC's chipmaking facilities, but the U.S. still controls much of the equipment and software needed in order for the company to build its chips. However, this doesn't mean that China is unlikely to attempt to seize Taiwan. Miller explains that China's aggressive behavior toward Taiwan suggests it does not want the island nation to leave its orbit. Since TSMC holds many U.S. chip designs, a Chinese takeover of the island wouldn't be fruitless. Moreover, the potential disruption that would result from the invasion may be enough to spark a war between the U.S. and China.

Due to these circumstances, there is now a growing push by the American government to limit its supply chain exposure to Southeast Asian economies. Several semiconductor companies, TSMC included, are now building factories in the U.S. The construction of these factories will take years, and the costs will be high, but the construction of additional domestic semiconductor manufacturing facilities will make it easier for firms to protect their intellectual property. The downside is that domestic production of chips will make it challenging to control costs. It will likely take several years before these factories become operational and will cost billions of dollars. Transitioning from using global supply chains will, therefore, be a long process.

Our Thoughts and Conclusion

In short, *Chip War* by Chris Miller shows that globalization paved the way for other countries to benefit from semiconductors at America's expense. Initially, manufacturing outsourcing brought down prices and allowed firms to focus on more value-added forms of production. This not only helped consumers afford higher-quality goods at lower prices but also meant firms could maximize profits by lowering the cost of production. However, there was a catch. By permitting foreign factories to make their goods, American firms weakened their ability to protect their intellectual property and limited their capability to manufacture products during times of international crisis. The book's central theme is that semiconductors have become essential to understanding geopolitics. The rise of chip technology has led to international supply chains and technological war. The author concludes that the advancement of chips will continue to shape the global balance of power.

Based on his work, we believe that in a post-globalized world, American firms will be forced to reshore manufacturing to the U.S. or allied countries. The shift will likely be costly and time-consuming, but the magnitude will vary by industry. Strategically essential industries such as semiconductors will likely receive state support through subsidies and tax breaks. Therefore, the transition could happen sooner rather than later. This change should be favorable to the chip industry in the short-to-medium term as government assistance would lighten the cost burden of the transition. However, restrictions on where firms can sell their goods will hurt company revenues in the long term. Additionally, defense equities may benefit as shorter supply chains could give the Pentagon more significant input into the chipmaking process.

That said, nothing in life is free. Supply chains prioritizing security over low-cost producers will likely make electronics more expensive in the long run. Hence, inflation could rise above the 2% range that we are used to and approach the 3% level that the country experienced from 1990 until the financial crisis in 2008. Expectations of higher costs for chips may partially explain why firms such as Apple (AAPL, $150.82) want to test consumer resolve for more expensive electronics. However, the ride toward normalization will likely be a bumpy one as the entrance of new competitors from around the world will add to the volatility in semiconductor pricing as firms fight for market share.

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