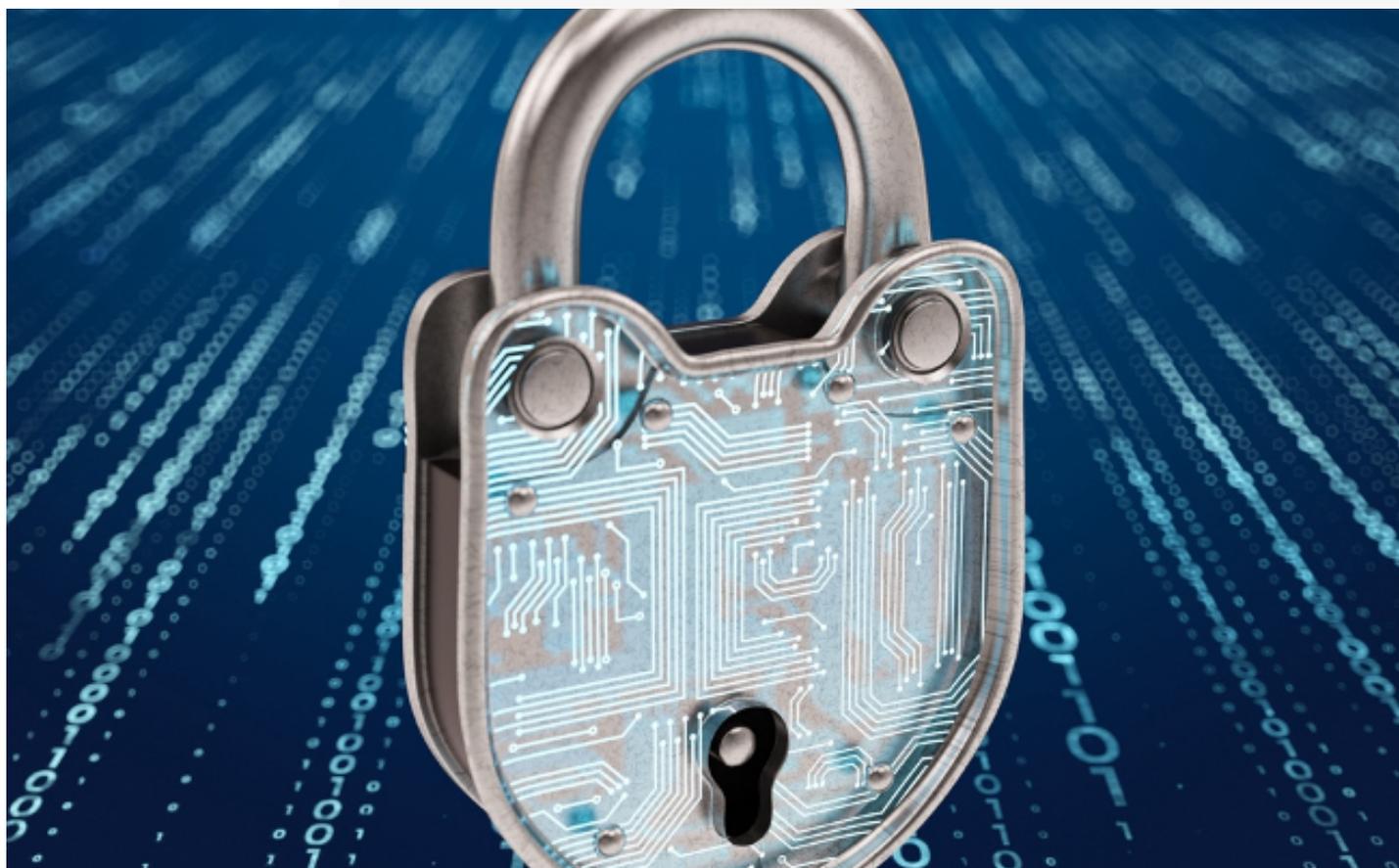


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WHY CHIP PRODUCTION IS A NATIONAL SECURITY ISSUE



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INTRODUCTION

When we talk about “semiconductors,” we are talking about microchips. Microchips are in everything from cars to cell phones to missiles but having the fastest and most powerful microchips is essential to maintaining a military advantage (Zeiger, 2022). Nowadays the production of microchips grows exponentially and Moore, an electronics engineer who went on to run Intel predicted that the number of transistors on a silicon chip would double roughly every two years (Gianfagna, 2021). This projection is now known as Moore’s Law. Sixty years ago, four transistors could fit on a given chip, whereas today the number is closer to 11.8 billion (Heffernan, 2022).

However, this era is facing a chip shortage due to strong demand and no supply. This goes back to COVID-19 lockdowns in the second quarter of 2020, when demand for work-from-home technology increased exponentially and automakers found themselves competing for the semiconductor capacities located in Asian foundries (J. P. Morgan, 2022). Furthermore, on the 9th August, 2022 US President Biden signed the CHIPS and Science Act of 2022 (the “CHIPS Plus Act”) (H. R. 4346 The CHIPS and Science Act of 2022).

The CHIPS Plus Act provides substantial opportunities and financial incentives to manufacturers in the semiconductor supply chain. It amends legislation and appropriates funding for semiconductor incentives originally in the National Defence Authorization Act (“NDAA”) for 2021 (117th Congress Public Law, 2022). It is based on eligibility requirements and prohibitions that companies should take into account as they consider pursuing incentive funding to expand domestic manufacturing in the semiconductor supply chain (King&Spalding, 2022). Analysts are concerned that the act does not address security issues, such as the Chinese government’s heavy subsidies as well as state-sponsored cyber-espionage (Lohman, 2022).

TAIWAN'S SUPREMACY IN MANUFACTURING MICROCHIPS

Taiwan is the world’s largest microchip manufacturer, manufacturing 65 percent of the microchips used in everything from smartphones to missiles. This is compared to the US at 10 percent and China at 5 percent, whereas South Korea and Japan produce the rest.

More importantly, Taiwan manufactures 90 percent of the world’s advanced microchips. However, the world’s dependence on Taiwan’s chips has protected itself from a potential invasion or trade sanctions from China (Zeiger, 2022).

USA & CHINA

All major U.S. defence systems and platforms rely on semiconductors for their performance. Consequently, the erosion of U.S. capabilities in microelectronics directly threatens the United States’ ability to defend itself and its allies. Here’s why CHIPS Act is important; it ensures that the US semiconductor supply chain is secure and does not rely on countries like China. Additionally, the act is a long-term plan to promote research and development to the US (Zeiger, 2022). Foundries, located in the US may still rely on cheap parts from Chinese companies that are sponsored by the government. However, the Commerce Department’s Bureau of Industry and Security (BIS) implemented new restrictions in August that limit the ability of U.S. companies to export technologies used in the design and manufacturing of advanced semiconductors without prior approval from the department. The restrictions cover two specific types of semiconductors often used for military purposes. While the export rules apply broadly, China is expected to be among the countries facing the most significant impact due to concerns about using US technology in Chinese military equipment.

Chris Miller, a professor at the Fletcher School of Law and Diplomacy of Tufts University wrote the book “Chip War: The Fight for the World’s Most Critical Technology,” in which he argues that the next era, including the rivalry between the US and China, will be all about computing power (Miller, 2022). Miller outlines the nature of the coming battle over semiconductors, defining how the power to produce leading-edge chips fell into the hands of just five companies: three from the US, one from Japan and one from the Netherlands (Chitkara, 2022).

In an interview with “Protocol”, Miller argues that whilst semiconductors are undoubtedly important in advances in specific types of munitions, they are also used to integrate new munitions and transfer information between them, essentially demonstrating that advanced semiconductors are necessary at every stage of the process (Chitkara, 2022). Militaries are confronting semiconductors increasingly frequently, and their ability to access the right types of semiconductors and more advanced chips is crucial for every aspect of the modern battlefield.

UKRAINE

Ukraine's two leading suppliers of neon, which produce about half the world's supply of the key ingredient for making chips, stopped their operations as soon following the outbreak of the Russian invasion of Ukraine, threatening to raise prices and aggravate the semiconductor shortage (McCrea, 2022). Some 45 to 54 percent of the world's semiconductor-grade neon used to make chips comes from two Ukrainian companies, Ingas and Cryoin (McCrea, 2022). Companies elsewhere could initiate neon production, but it would take nine months to two years to increase it, according to Richard Barnett, Chief Marketing Officer of Supplyframe, which provides market intelligence to companies across the global electronics sectors (Alper, 2022).

RUSSIA

Russia has some domestic chipmaking capacity but it's very limited, both in terms of the level of advancement and capacity. Even in Moscow, it's easy to find lots of foreign and often American produced chips. Many of these chips are easy to buy commercially. The fact that every military in the world is trying to use commercial chips in their systems has been a standardization factor, but it has presented some challenges too (Sheftalovich & Cerulus, 2022). Russia doesn't know whether the chips it is buying have been sabotaged in any way. Every country has that problem, but the US, for example, is relying on chip fabs in the US or friendly countries, whereas Russia is relying almost exclusively on chips produced in unfriendly countries (Chitkara, 2022).

EU CHIPS ACT

Even the European Union, in its own Chips Act, a copy of U.S. legislation, has approved \$46 billion in subsidies, and member states like Germany have allocated billions more. This makes semiconductor funding a national security issue (European Commission, 2022).

Kurt Sievers, chief executive officer of NXP Semiconductors, a leading chips designer and maker founded in the Netherlands, warned that the bloc's intended investment into the semiconductor industry isn't enough to reach its 2030 targets (Fiedler, 2022). Indeed, Sievers argued that “We have calculated that we would need €500 billion investment in Europe to reach the 20 percent market share goal formulated in the EU Chips Act” (Fiedler, 2022).

CONCLUSION

The pandemic, the Russian invasion of Ukraine, and increasing tensions between the U.S and China have exposed supply chain vulnerabilities due to shifting geopolitics (Zeiger, 2022).

The Russia-Ukraine war is contributing to the semiconductor supply chain issues and the chip shortage that has impacted the industry for the past two years. The most immediate risk is the supply of specific raw materials used in semiconductor manufacturing such as neon and palladium. Whilst the impacts of inflation and indirect supply-chain effects appear to be manageable in the near term, the potential for longer-term impacts is yet to be determined and will be predicated on how events continue to unfold (Clark & Jones, 2022).

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