THE STUDENT'S PRESS
MONTHLY MANAGEMENT E-RELEASE
APRIL'26

Chip Wars: The Tiny Technology Powering a Giant Global Rivalry

The World's Smallest Weapon

In every phone, every vehicle, and every rocket lies a microscopic piece of silicon. The semiconductor chip or the silicon chip in which billions of switches known as transistors work together in order to process the information essential to our modern world. The technology that was once dismissed as the sidelines of computer history has emerged as the modern battlefield for the global contest for global dominance.

The Chokepoints of the Chip World

The chip supply chain is remarkably concentrated. American companies sell the majority of chips and the software for making them, with Nvidia at the forefront, entering the world of artificial intelligence. The Netherlands-based company ASML is the only commercial supplier of extreme ultraviolet (EUV) lithography systems, tools for the most advanced chips. One country, one company, and one machine producer is what gets the crossroads of this semiconducting industry worth more than half a trillion dollars, with about 90% of those chips produced by Taiwan's TSMC (Chris Miller, Chip War, 2022; Taiwan News, 2025).

A War Fought with Export Controls

Having identified this weakness, the United States is now trying to turn chips into the key to victory. The CHIPS and Science Act, from August 2022, focused on providing $52.7 billion to revive domestic chip manufacturing and a 25% tax credit to the chip factory (CNN, 2022; Forvis Mazars, 2022). In addition, the United States Department of Commerce (US DoC) imposed export control restrictions on China in October 2022, curbing the supply of advanced AI chips and hardware for their manufacture. In contrast, China is making large investments in self-sufficiency campaigns, including in May 2024, releasing the third phase of the state-controlled "Big Fund" with 344 billion yuan (about $47.5 billion) aimed at the funding of China's semiconductor industry (Caixin, 2024). It has also responded with its control over key minerals. In August 2023, China began imposing export licenses for gallium and germanium, and for antimony in September 2024. In December 2024, it imposed additional restrictions on exports of certain dual-use items to the United States in response to tighter US semiconductor export controls. These measures affected strategically important materials used in various high-technology industries. China is responsible for



approximately 94% of the world's production of gallium (EU report, 2024), hence the direct impact on chipmakers. production of gallium (EU report, 2024), hence the direct impact on chipmakers.

Why the Whole World Is Being Pulled In

Japan, South Korea, the European Union, and Taiwan have all announced subsidies and partnerships to secure their position in the supply chain. Chips are also the engine of artificial intelligence: training and running AI models means performing enormous numbers of calculations, which are done on specialized processors such as Nvidia's GPUs so the countries and companies with the most advanced chips can build the most powerful AI systems, which are reshaping economies and defense alike. The US export controls of October 2022 were explicitly aimed at limiting China's access to advanced computing for military modernization, including nuclear weapons development, and for surveillance (BIS, 2022). Advanced chips sit inside everything from radar and missile guidance to intelligence analysis and drones, so a country's chip capability directly shapes its military strength.

Chips, Power, and the Road Ahead

Indeed, for India, the prevailing scenario holds a chance of getting a share out of the country being a favorite location to manufacture semiconductors, accessing the international supply chain via the India Semiconductor Mission and related chip manufacturing projects. Above all, the debate indicates that power is in nanometers, and whichever country controls the former controls the latter.

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The Invisible Foundations of Modern Power

Picture an ordinary morning. Your phone alarm goes off, your phone pays for your coffee, your phone calls a taxi, and your smartwatch counts your heartbeats on the way to work. It's hard to imagine any of these things existing without something pretty extraordinary: a sliver of silicon containing billions of switches, all of which open and close billions of times per second to carry out their instructions. We don't often think about the chips that make our devices function, but we might think about buildings. And governments have begun to worry that they think about little else. Underneath all our comfortable technology is a silent battle, one that is being increasingly fought out in trade, diplomacy, and military might.

The Global Architecture of Semiconductor Power

The technology attracts considerable attention because of the sheer complexity involved in developing it. Cutting-edge chips are made of circuits, which are a few nanometers wide, about thousands of times thinner than a human hair. They are made in sterile rooms like a hospital operating room. Hundreds of steps and specialized equipment are needed to make such a computer chip, and only one company, The Dutch firm ASML is the only supplier of commercial extreme ultraviolet (EUV) lithography. In older, deep ultraviolet (DUV) technology, it faces competition from Nikon and Canon of Japan, and Chinese firms are overtaking. American companies such as Nvidia and Qualcomm dominate design, Taiwan's TSMC is the largest manufacturer in the world of sophisticated processors, and South Korea's Samsung is its only rival.



Such interdependence has in the past acted as a guarantor of peace, but the illusion has been punctured. Beginning in 2022, Washington has imposed restrictions on the export of cutting-edge computer chips and the equipment needed to manufacture them in order to deprive China of this strategic asset, while at the same time the American CHIPS and Science Act is supposed to accelerate domestic production, and China is responding by introducing a big state program and developing alternatives. Sanctions may weaken a competitor but rarely eliminate him, and China has options for reducing America's



influence over the supply of gallium and germanium, two key metals in semiconductors.

The most pressing concern for companies is what compromises in the name of security are worth. Tight inventory management and exclusive supplier contracts were once viewed as rational choices in the pursuit of profitability, but the disruptions in supply chains in 2021 have made executives reevaluate their risk exposure. Investments are also difficult to justify given the huge costs associated with building a fabrication plant, which exceeds 20 billion dollars, and so the decisions on where to allocate resources are increasingly being dictated by subsidies. Yet subsidy races can lead to duplication and overcapacity, and small countries unable to compete must accept whatever terms are offered.

India illustrates the balancing act well. It supplies a large proportion of the world's chip design engineers but has historically lacked fabrication. The India Semiconductor Mission, launched in 2021 with roughly ₹76,000 crore, is set to change this. Tata Electronics is building a fabrication plant in Dholera, Gujarat, with Taiwan's PSMC, Micron's Sanand facility, and Tata's Assam plant targeting packaging. By concentrating on mature-node chips for automobiles and appliances, India hopes to become a credible alternative in a diversified supply chain.

The Future of Technological Power: Competition Without Compromise

The chip wars expose the fundamental convergence of technology and power; the winner picks the direction in which mankind will develop artificial intelligence and the fate of world economies, as well as the global geopolitical balance. Decoupling will lead to disaster, and the same goes for unchecked technological euphoria. The best way forward is to pursue a balanced policy, ensuring the multiplicity of sources of critical technologies without giving up on the spirit of cooperation that has made humanity achieve so many incredible feats. Next time you press a button on your smartphone, remember that you are a part of something bigger than yourself.

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