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Book Review

***Chip War : The Fight For The World's Most Critical Technology* by Chris Miller (Simon & Schuster, 2022), pp. 356, Hardback, 2995 PKR**

Reviewed by Rubia Shoukat

Chip War: The Fight for the World's Most Critical Technology, recounts the rise of the chip industry and the outsized geopolitical implications of its ascendancy. Written by Chris Miller, the book comprises eight parts: (i) Cold War Chips; (ii) The Circuitry of the American World; (iii)Leadership Lost?; (iv) America Resurgent; (v) Integrated Circuits, Intergrated World?; (vi) Offshoring Innovation?; (vii) China's Challenge; and (viii) The Chip Choke. The book discusses how the fight for the 21st century's most critical technology has become a major source of hostility between the world's two technological powers.

Computer chips serve as the cornerstone for all forms of power in the modern world, be it military, economic or geopolitical. America's superpower status hinges on its control of chip development, enabling technological dominance. We rarely think about the significance of microchips, yet they are at the core of all modern innovations that have created the modern digital world. Control over development of computer chips manufacturing technologies and related innovations have created ongoing competition which has assumed a warlike environment.

However, the US is now concerned about the outsourcing of the chip technology to Taiwan, Korea and Europe. This policy is posing a challenge to US dominance in the tech field in addition to China which is spending more on development and production of high end chips than on oil, seeks to catch up, but still relies on import of cutting-edge chips. In August 2022, America introduced its CHIPS and Science Act, which aims to boost domestic production of semiconductors and impose new restrictions on China's chip manufacturing industry, using chips as a political tool. The US is, therefore, doing all in its power to deny China's access to this technology.

The book initially delves into the historical evolution of the chip industry, illuminating its profound geopolitical significance. In the era of Artificial Intelligence, it is commonly asserted that data is the new oil. However, a critical bottleneck lies not in data availability but in its processing. The late 1800s and early 1900s witnessed a growing need for human 'Computers' to perform tasks like payroll calculations, sales tracking, census analysis and data sorting. The US made a

groundbreaking contribution with ENIAC, a computer equipped with 18,000 vacuum tubes, designed to calculate artillery trajectories for the US Army. Engineer William Shockley's pioneering work in semiconductors opened the door to the invention of the transistor, known as the 'Little Brain Cell,' marking a pivotal step towards replacing human computation on a microscopic scale. Finally, Jack Kilby's innovation, the 'integrated circuit' or 'chip,' laid the foundation for the transformative advancements in computing which we witness today.

The author explains Moore's Law which describes exponential growth in computing power in the future, connecting it to the USSR's launching of a satellite and cosmonaut and the US determination to follow. The computer that guided the Apollo spacecraft and the Minuteman II missile provided the initial liftoff for America's integrated circuit industry. By the mid-1960s, the US military was using chips in weaponry of all types, from satellite to sonar, torpedoes to telemetry systems. Further, the author discusses how the US restricted the USSR from buying semiconductors through an organization called Coordinating Committee for Multilateral Export Controls (CoCom), forcing the USSR to work with less sophisticated machines and low quality materials, producing correspondingly less sophisticated chips. The rest of Miller's account unfolds the origins of the semiconductor industry, named Silicon Valley. High consumer demand motivated American firms such as Fairchild Semiconductor, Texas Instruments, AMD and Intel to take an early lead in designing and producing microchips.

In post-World War II, the US supported rebuilding of Japan as a 'transistor salesman' which was one of the pillars of the US-led Cold War strategy. The semiconductor collaboration that emerged between America and Japan involved a complex balance of relying on each other for supplies and customers. The author then discusses Akio Morita, the co-founder of Sony. He is the one who pioneered the use of chips in consumer electronics and is credited with reviving the Japanese economy after the war.

The book also highlights the presence of the US semiconductor assembly facilities 'from South Korea to Taiwan, Singapore to the Philippines that looks much like a map of American military bases across Asia.'

Later in the chapter, 'The Japan That Can Say No,' the author highlights how the US was vary of the development of advanced semicounductor technology, following the same path as that of TV and Camera industry where Japan surpassed the US. A key part of Silicon

Valley strategy was to outmanoeuvre Japan, where the South Korean company, Samsung, played a key role in finding cheaper supplies in Asia.

In the final sections of the book, Miller examines that under the leadership of Xi Jinping, China has focused on 'gaining breakthroughs in core technology as quickly as possible.' Most computers in China need US chips; however, chip designing and production was monopolized by a handful of companies which are located outside China.

The author has discussed the development of photo lithography through which production of smaller transistors was made possible, followed by the rise of Dutch company ASML's monopoly of the production of the extreme ultraviolet (EUV) lithography machines. This has made it far easier to act as a choke point in the chip making process.

As China rises to become an AI superpower, it will be needing advance nano chips designing and production capability. China has envisioned a plan called 'Made in China 2025' to reduce reliance on imported chips. Miller refers to this as a 'Sputnik moment' for China's chip ambitions. The Trump administration dealt a series of debilitating blows to China's semiconductor industry by placing export controls on all microchip products made in the US, and by coaxing similar commitments from its allies. Though the US has temporarily disrupted China's emerging microchip prowess, the US restrictions have also 'catalyzed a new wave of government support for Chinese chipmakers.'

The book is written in the context of the microchip rivalry between the US and China where Taiwan continues to be a major flashpoint, not merely for political or ideological reasons, but also from a national security perspective, given that Taiwanese microchip giant TSMC generates '37 percent of the world's computing power each year.' In the final chapter on *Chip War*, Miller returns to the 'Taiwan Dilemma,' where he theorizes different scenarios in which a China-Taiwan confrontation might occur, concluding that a disaster in Taiwan could 'well be more costly than the COVID pandemic' where the economic losses 'would be measured in the trillions.'

This book explains very complicated dynamics of the microchip industry in a palatable form. The readers can easily understand the history of the chip industry and its significance in the technological development of countries, ongoing trade war between the US and China, and big power contestation.