Semiconductors, Strategic Vulnerability and Selective Decoupling: China's Techno-Nationalist Response to US Restrictions

Sobia Hanif and Bazgha Murtaza*

Abstract

In the contemporary era marked by technological breakthroughs, advanced semiconductors are widely recognized as the "currency of power," with their control determining geopolitical leverage, national security, and digital supremacy. As the prime assets of modern economic and defence systems, command over high-end chips is redefining the power dynamics of the Twenty-first century. This study aims to investigate China's unprecedented push for technological self-sufficiency amid perceived vulnerabilities associated with its dependency on foreign sources for microchips and the weaponization of semiconductor value chains by the United States (US). This study examines the national security imperatives that shape states' behaviour in an anarchic system. Employing the qualitative case study approach, the study aims to investigate the significant ramifications of the US-China semiconductor rivalry for the stability of the global technopolitical and geopolitical order. Additionally, it aims to assess the policy approaches and national security priorities of China related to its techno-nationalist aspirations. The research findings reveal that the technological competition between the US and China is set to grow exponentially in transnational domains.

Keywords: Semiconductors, Techno-political Dynamics, US-China Tech war, Geopolitical Leverage

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Introduction

Semiconductors, widely recognized as the oil of the Twenty-first century, are the fundamental pillars of present technological advancements.[1] These microchips are manufactured from critical minerals and are capable of enabling a broad spectrum of essential tools ranging from consumer electronics to futuristic defence technologies.[2] Given their indispensable applications, they are regarded as geostrategic assets with their command becoming a crucial determinant for digital supremacy, economic resilience, national security, and global power.[3] The semiconductors have emerged as the central focus of the ongoing technological competition between the US and China, commonly referred to as the "chip war."[4] It revolves around the pursuit of technological supremacy.[5] At its core, this competition is a battle for dominance in the semiconductor sector.[6] The US holds a significant geopolitical control over the semiconductor supply chains by excelling in microchip fabrication, design, and software.[7] China, on the other hand, is aspiring to become a global technological hub and maintains an edge in the processing of critical earth minerals.[8] Viewing China's innovation imperative as a perceived threat, the US has imposed export restrictions on semiconductor-related technology on China.[9] Despite these attempts, China

[1] Chris Miller, *Chip War: The Fight for the World's Most Critical Technology* (New York: Simon & Schuster, 2022), 12, https://www.simonandschuster.com/books/Chip-War/Chris-Miller/9781982172008

[2] Kumar Priyadarshi, "7 Applications of Semiconductors in Daily Life," *TechoVedas*, October 8, 2023, https://techovedas.com/7-applications-of-semiconductors-in-daily-life/

[3] Robert Manning, "Emerging Technologies: New Challenges to Global Stability," Atlantic Council, May 1, 2020, http://www.jstor.org/stable/resrep26000

[4] Manal Hamdani and Ismail Belfencha, "Strategic Implications of the US-China Semiconductor Rivalry," *Discover Global Society* 2, no. 67 (2024): 2, https://doi.org/10.1007/s44282-024-00081-5

[5] Hemant Taneja and Fareed Zakaria, "AI and the New Digital Cold War," *Harvard Business Review*, September 6, 2023, https://hbr.org/2023/09/ai-and-the-new-digital-cold-war

[6] Drew Hooper, "Semiconductors & Geopolitics: Overview of Semiconductors Industry & US-China Geopolitics," Hooper Consulting, October 19, 2023, https://hooperco.org/semiconductors-and-geopolitics

[7] Qayyum Chaudhary, "Semi-Conductor Race in Indo Pacific," *Modern Diplomacy*, August 26, 2023, https://moderndiplomacy.eu/2023/08/26/semi-conductor-race-in-indo-pacific/

[8] Craig Hart, "Mapping China's Strategy for Rare Earths Dominance," Atlantic Council, June 2025, https://www.atlanticcouncil.org/wp-content/uploads/2025/06/Mapping-Chinas-strategy-for-rare-earths-dominance

[9] Hooper, Drew. "Semiconductors & Geopolitics: Overview of Semiconductors Industry & US-China Geopolitics." *Hooper Consulting*, October 19, 2023, https://hooperco.org/semiconductors-and-geopolitics

is focused on achieving semiconductor self-sufficiency through indigenous production to break free from external dependency.[10]

This paper aims to evaluate the dynamic nature of US-China semiconductor rivalry as the defining feature of contemporary global politics. It seeks to examine China's growing ambitions in fortifying its techno-security infrastructure by embracing domestic semiconductor production through state-backed investments. Furthermore, the study specifically investigates China's strategies for circumventing US semiconductor restrictions and developing local capacities to reduce its dependence on foreign supply chains.

China's Semiconductor Dilemma: Strategic Vulnerability Amid Foreign Dependence

In an era marked by innovative breakthroughs, the silicon-based advanced microchips are the fundamental imperatives of economic power and national security.[11] These critical miniature chips, manufactured from rare earth minerals like germanium, gallium, arsenic, and yttrium, are conductive to electricity under suitable conditions.[12] Possessing vast applications in advanced gadgets, they are central to electronic and digital technology. Furthermore, their dual-use nature, underpinning both economic prosperity and military superiority, has cemented microchips as the central arena for technopolitical rivalry. In the civilian sector, semiconductor chips enable a vast array of technological tools, including smartphones, televisions, electric vehicles, and laptops. They are also used in modern communication infrastructures that form the core foundation of the internet for driving global digital connections.[13] Equally critically, in the military sector, they are capable of enabling advanced weapon systems and

[10] "Xiconomics in Practice: How Xi Leads China in All-Out Effort to Tackle Tech 'Bottleneck' to Secure Development," *Global Times*, February 2, 2023, https://www.globaltimes.cn/page/202302/1284729.shtml

[11] Christopher Thomas, "A Semiconductor Strategy for the United States," Brookings Institution, November 2022, https://www.brookings.edu/articles/a-semiconductor-strategy-for-the-united-states.

[12] Liv McMahon and Shiona McCallum, "What Are Semiconductors and Why Is Trump Targeting Them?" *BBC*, April 14, 2025, https://www.bbc.com/news/technology-66394406

[13] Kumar Priyadarshi, "7 Applications of Semiconductors in Daily Life," *TechoVedas*, October 8, 2023, https://techovedas.com/7-applications-of-semiconductors-in-daily-life/

futuristic warfare technologies, thereby strengthening the strategic leverage of a state.[14]

Recognizing their versatile applicability, the cutting-edge semiconductor technology is currently shaping the trajectory of global tech regimes.[15] The US and China represent distinctive strengths in terms of semiconductor production, with the US leading in semiconductor design.[16] The worldwide Electronic Design Automation (EDA) market is heavily monopolized by the US-based software firms, mainly Synopsys, Siemens, and Cadence.[17] The EDA is a highly sensitive software that is used in fabricating and assembling sophisticated chips featuring billions of electronic components, thereby upgrading efficiency and minimizing design complexity.[18] In addition, the US has long maintained a competitive edge in semiconductor research and development through leading tech giants like Nvidia and Intel, which significantly contribute to advancing microchip technology.[19]

China, on the other hand, maintains a lead in software-driven innovation ecosystem and is experiencing rapid growth driven by the fusion of state-backed funding, a large pool of artificial intelligence (AI)-led data infrastructures, and private-sector innovation.[20] In 2017, China's Next Generation Artificial Intelligence Development Plan officially declared its goal to become a global leader in Artificial Intelligence by 2030. Its progress is evident in the emergence of DeepSeek, a leading Chinese AI

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[14] Sujai Shivakumar and Charles Wessner, "Semiconductors and National Defense: What Are the Stakes?" Center for Strategic & International Studies (CSIS), June 8, 2022, https://www.csis.org/analysis/semiconductors-and-national-defense-what-are-stakes

[15] Yue Wu, Jae Lung, and Kevin Tangonan, "U.S. Technological Decoupling from China: A Neoclassical Realist Explanation," *International Area Studies Review* 27, no. 3 (2024): 197–218, https://doi.org/10.69473/iasr.2024.27.3.197

[16] Hemant Taneja and Fareed Zakaria, "AI and the New Digital Cold War," *Harvard Business Review*, September 6, 2023, https://hbr.org/2023/09/ai-and-the-new-digital-cold-war

[17] Amandak, "Synopsys Accelerates Chip Design with NVIDIA Grace Blackwell and AI to Speed Electronic Design Automation," *SemiWiki* (forum thread), March 20, 2025, https://semiwiki.com/forum/threads/synopsys-accelerates-chip-design-with-nvidia-grace-blackwell-and-ai-to-speed-electronic-design-automation.22357

[18] Wei Xiong, David Wu, and Jeff Yeung, "Semiconductor Supply Chain Resilience and Disruption: Insights, Mitigation, and Future Directions," *International Journal of Production Research* (August 13, 2024), https://doi.org/10.1080/00207543.2024.2387074

[19] Timothy Costa, "Semiconductor Industry Accelerates Design Manufacturing With NVIDIA Blackwell and CUDA-X," NVIDIA Blog, May 18, 2025, https://blogs.nvidia.com/blog/semiconductor-industry-electronic-design-automation-blackwell-cuda-x

[20] Mark Greeven, "China and AI in 2025: What Global Executives Must Know to Stay Ahead," *Forbes*, December 23, 2024, https://www.forbes.com/sites/markgreeven/2024/12/23/china-and-ai-in-2025-what-global-executives-must-know-to-stay-ahead

Firm that surpassed US-based AI counterparts in terms of efficiency and performance.[21]

Despite possessing cutting-edge AI software infrastructures, China lags in the hardware domain, notably in advanced semiconductor chip fabrication.[22] This hardware deficit creates a fundamental constraint for China's AI strategic autonomy, making it heavily reliant on foreign chip markets for essential acquisitions. The majority of the semiconductor chips used in China's domestic electronic industries belong to the older generation due to its lack of indigenous production capacity for generating advanced chip nodes.[23] Before the enactment of the CHIPS Act by the US legislation in 2022, which aimed at bolstering domestic semiconductor manufacturing through substantial state-backed investments,[24] China imported approx--imately 83% of semiconductors from the US and its allies, including Japan, Australia, and Taiwan. However, after the US imposed restrictions on the export of semiconductors to China, its imports decreased by 10.8% in volume and 15.4% in value from these markets.[25] Despite being the world's largest semiconductor market, China fabricates only 30% of its indigenous semiconductors.[26] In essence, it is being ranked as the world's top consumer of semiconductors with the highest number of foreign providers for advanced chips that make up 70% of its domestic needs.[27]

China's heavy reliance on foreign supply chains for acquiring state-of-the-art semiconductor chips has raised significant concerns, particularly in the

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[21] Mark Craddock, "The AI Superpower Showdown: Inside the US-China Race for Technological Supremacy," *Medium*, January 28, 2025, https://medium.com/@mcraddock/inside-the-us-china-race-for-technological-supremacy-52cb5c3df063

[22] Stephen Ezell, "How Innovative Is China in Semiconductors?" Information Technology & Innovation Foundation (ITIF), August 19, 2024, https://itif.org/publications/2024/08/19/how-innovative-is-china-in-semiconductors

[23] Dwayne Woods, "The Silicon Sword Hanging Over China's Head," *Journal of Chinese Political Science* (March 5, 2024), https://doi.org/10.1007/s11366-024-09883-5

[24] Ed Barriball, "The CHIPS and Science Act: Here's What's in It," *McKinsey & Company*, October 4, 2022, https://www.mckinsey.com/industries/public-sector/our-insights/the-chips-and-science-act-heres-whats-in-it

[25] Che Pan, "Tech War: China Chip Imports Fall in 2023 but Semiconductors Remain Country's Largest Item Ahead of Crude Oil," *South China Morning Post*, January 12, 2024, https://www.scmp.com/tech/policy/article/3248269/tech-war-china-chip-imports-fall-2023-semiconductors-remain-countrys-largest-item-ahead-crude-oil

[26] U.S.-China Economic and Security Review Commission, "Made in China 2025: Evaluating China's Performance," November 14, 2025, https://www.uscc.gov/research/made-china-2025-evaluating-chinas-performance

[27] Masha Borak, "China Boosts Semiconductor Production in 2020, but Imports Keep Apace, Frustrating Self-Sufficiency Goals," *South China Morning Post*, January 19, 2021, https://www.scmp.com/tech/policy/article/3118327/china-boosts-semiconductor-production-2020-imports-keep-apace-frustrating-self-sufficiency-goals

US, regarding China's strategic doctrine of civil-military fusion (CMF), a national policy framework that integrates the deployment of high-tech chip technology in the defence sector.[28] The US policymakers are concerned about the potential misuse of cutting-edge technologies in military modernization beyond serving essential domestic digital infrastructure requirements. Moreover, China's joint ventures with foreign firms require tech-sharing in exchange for operating in the country. China has been accused by critics of having poor intellectual property (IP) regulations, resulting in IP theft and seizure of sensitive technical information from external companies.[29] Resultantly, these developments have contributed towards a reassessment of US policy towards China, indicating a calculated shift from collaboration towards containment.[30] Underscoring this strategic outlook, US Secretary of Commerce Gina Raimondo argued that the US will not let China lead this highly critical industry that is deeply associated with US economic resilience and state security.[31] Amid these concerns, the US began imposing strict export restrictions through measures like entity lists, foreign direct product rule, and export licensing requirements, thereby targeting its high-tech sector. These efforts, in particular, targeted China's access to chip-making tools to limit its growing ambitions in the technopolitical arena.[32] The effectiveness of the export restriction regimes is apparent in the notable decline of the US's high-tech exports for chipmaking equipment to China over the years that followed this calculated effort.[33]

Vulnerabilities associated with microchip dependency on external sources and the weaponization of semiconductor supply chains by the US have pushed China to pursue a more defensive strategy in order to reduce reliance

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[28] Ming Chu, "China's Defence Semiconductor Industrial Base in an Age of Globalisation: Cross-Strait Dynamics and Regional Security Implications," *Journal of Strategic Studies* 47, no. 5 (2024): 643–68, https://doi.org/10.1080/01402390.2023.2164852

[29] Pablo Fajgelbaum and Amit Khandelwal, "Economic Impacts of the US-China Trade War," National Bureau of Economic Research, December 2021, https://www.nber.org/papers/w29315

[30] Tao Liu and Wing Thye Woo, "Understanding the U.S.-China Trade War," *China Economic Journal* (July 6, 2018), https://doi.org/10.1080/17538963.2018.1516256

[31] Manal Hamdani and Ismail Belfencha, "Strategic Implications of the US-China Semiconductor Rivalry," *Discover Global Society* 2, no. 67 (2024): 2, https://doi.org/10.1007/s44282-024-00081-5

[32] Joseph Waring, "Analysis: Is US Squeeze on China Bolstering Its Self-Sufficiency?" *Mobile World Live*, December 12, 2024, https://www.mobileworldlive.com/huawei/analysis-is-us-squeeze-on-china-bolstering-its-self-sufficiency/

[33] "Chip Equipment Export to China Tumble as U.S. Pushes Decoupling," *Nikkei Asia*, March 29, 2023, https://asia.nikkei.com/Business/Tech/Semiconductors/Chip-equipment-exports-to-China-tumble-as-U.S.-pushes-decoupling

on imported microchip technology.[34] For this purpose, the Chinese government has adopted two approaches. Firstly, it became a strategic necessity to reduce reliance on foreign technology by developing all Chinese-centred chip manufacturing through indigenous production and self-sufficiency. Secondly, the Chinese Government aimed to secure alternative supply chains hosted by friendly nations and eventually possess and control all the segments of the supply chain independently.[35] To make these objectives realistic and achievable, the Chinese Government implemented a combination of policies, including tax incentives and subsidies for domestic semiconductor firms, research and development investments, and state-led funding through initiatives like Made in China (MIC) 2025 and the Big Fund. Additionally, it aimed at solidifying its control on the exports of rare earth minerals used in high-tech manufacturing while circumventing the critical US technology through third countries.[36] These efforts underscore China's ambitions to achieve self-sufficiency in the semiconductor sector and to decouple from foreign dependencies.[37]

Made in China 2025 Initiative

China's strategic vision aims at achieving breakthroughs in emerging technologies to drive rapid economic and defence upgradation. Indeed, Chinese President Xi Jinping has declared that securing the critical infrastructure in the digital age is central to China's national security and economic strength. Development of advanced semiconductor chips remains the nation's top innovation priority. In order to achieve this, China would have to produce cutting-edge semiconductor technology domestically.[38] Despite China's early tech dependency on foreign sources, its commitments to reduce this reliance began producing tangible outcomes even before the issuance of official legislative frameworks. This is evident in China's

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[34] "Xiconomics in Practice: How Xi Leads China in All-Out Effort to Tackle Tech 'Bottleneck' to Secure Development," *Global Times*, February 2, 2023, https://www.globaltimes.cn/page/202302/1284729.shtml

[35] Dwayne Woods, "The Silicon Sword Hanging Over China's Head," *Journal of Chinese Political Science* (March 5, 2024), https://doi.org/10.1007/s11366-024-09883-5

[36] Sujai Shivakumar, Charles Wessner, and Thomas Howell, "The Limits of Chip Export Controls in Meeting the China Challenge," Center for Strategic and International Studies (CSIS), April 14, 2025, https://www.csis.org/analysis/limits-chip-export-controls-meeting-china-challenge

[37] Philippe Legrain, "Why China Will Win the Trade War," *Foreign Policy*, April 13, 2018, https://foreignpolicy.com/2018/04/13/why-china-will-win-the-trade-war

[38] John VerWey, "Chinese Semiconductor Industrial Policy: Past and Present," *Journal of International Commerce and Economics* (July 2019), https://www.usitc.gov/publications/332/journals/chinese_semiconductor_industrial_policy_past_and_present_jice_july_2019

rapidly increasing shares across the global semiconductor value chain that surged from 8% to 31% between 2001 and 2016, reflecting its growing recognition of high-tech chips as an absolute necessity.[39]

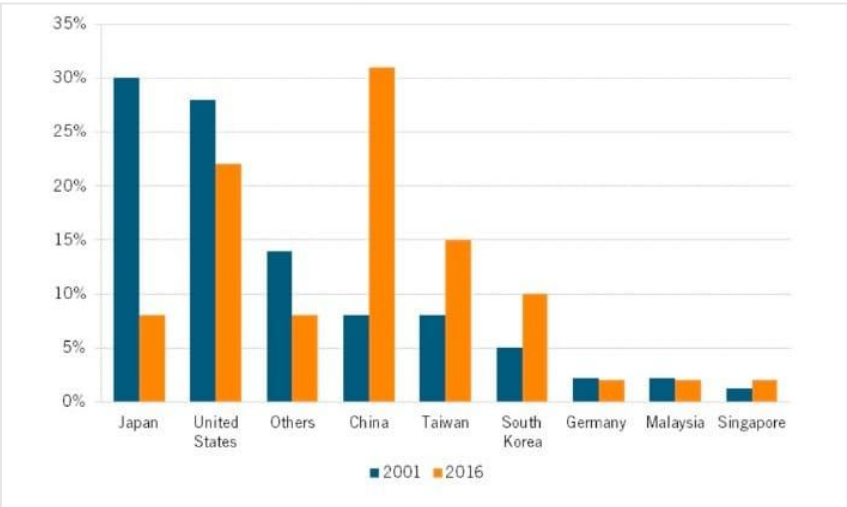

Figure 1: Net Production of Semiconductors in Global Tech Landscape (2001-2016)
Source: Ezell, Stephen. "How Innovative Is China in Semiconductors?" Information Technology and Innovation Foundation, Aug 19, 2024.

To institutionalize and keep up the momentum, the Chinese leadership has undertaken long-term policy initiatives for achieving the ultimate goal of self-sufficiency.[40] Central to this effort is the Made in China 2025 Initiative, a comprehensive industrial policy framework, launched by then Prime Minister Li Keqiang in 2015, that seeks to transform China into a global technological hub within a span of 10 years.[41] In particular, the MIC 2025 emphasizes modernizing industrial capacity through tech advancements.[42] Ten key sectors have been identified for industrial upgradation that include emerging technologies, aerospace, high-tech shipping, advanced medical devices, agricultural products, electrical tools, robotics, railway equipment, energy-efficient vehicles, and new materials. Altogether, these sectors make

[39] Stephen Ezell, "How Innovative Is China in Semiconductors?" Information Technology and Innovation Foundation (ITIF), August 19, 2024, https://itif.org/publications/2024/08/19/how-innovative-is-china-in-semiconductors
[40] Emily Jin, "A Policymaker's Guide to China's Technology Security Strategy," Information Technology and Innovation Foundation (ITIF), February 18, 2025, https://itif.org/publications/2025/02/18/a-policymakers-guide-to-chinas-technology-security-strategy
[41] "Made in China 2025," Institute for Security and Development Policy, June 2018, https://isdp.eu/wp-content/uploads/2018/06/Made-in-China
[42] Scott Kennedy, "Made in China 2025," Center for Strategic and International Studies (CSIS), June 1, 2015, https://www.csis.org/analysis/made-china-2025

up approximately 40% of China's global manufacturing output.[43] Acknowledging the integral role of advanced microchips in the hardware-driven semiconductor ecosystem, the strategic blueprint outlined the targeted ambition of securing a 70% self-sufficiency rate in semiconductor chip fabrication domestically by 2025.[44] In essence, the plan aimed to minimize dependency on external actors for advanced chips by embracing indigenous innovation in critical sectors that are deeply associated with national strength and digital competitiveness.[45]

Despite the ambitious goal of achieving 70% self-sufficiency in the semiconductor industry, China was able to achieve only 23.3% by 2023.[46] By the end of 2025, it is expected to reach around 30% according to projections.[47] This indicates a significant gap from the initial target due to its persistent reliance on foreign firms for advanced chip manufacturing tools, lack of skilled workforce for designing high-end chip nodes, and the mounting US export restrictions.[48]

[43] Jost Wübbeke et al., "Made in China 2025: The Making of a High-Tech Superpower and Consequences for Industrial Countries," MERICS, August 12, 2016, https://merics.org/en/report/made-china-2025

[44] "Was Made in China 2025 Successful?" U.S. Chamber of Commerce, May 5, 2025, https://www.uschamber.com/international/report-was-made-in-china-2025-successful

[45] James McBride and Andrew Chatzky, "Is 'Made in China 2025' a Threat to Global Trade?" Council on Foreign Relations, May 13, 2019, https://www.cfr.org/backgrounder/made-china-2025-threat-global-trade

[46] Chen Tung, "China's Semiconductor Self-Sufficiency Below 25%, Focused on Mature Process Chips," LinkedIn post, October 2023, https://www.linkedin.com/posts/tungchenyuan_chinas-semiconductor-selfsufficiency-below-activity-7273002417497989120-ZI9H

[47] U.S.-China Economic and Security Review Commission, "Made in China 2025: Evaluating China's Performance," November 14, 2025, https://www.uscc.gov/research/made-china-2025-evaluating-chinas-performance

[48] Reva Goujon, Jan Kleinhans, and Laura Gormley, "Thin Ice: US Pathways to Regulating China-Sourced Legacy Chips," Rhodium Group, May 13, 2024, https://rhg.com/research/thin-ice-us-pathways-to-regulating-china-sourced-legacy-chips

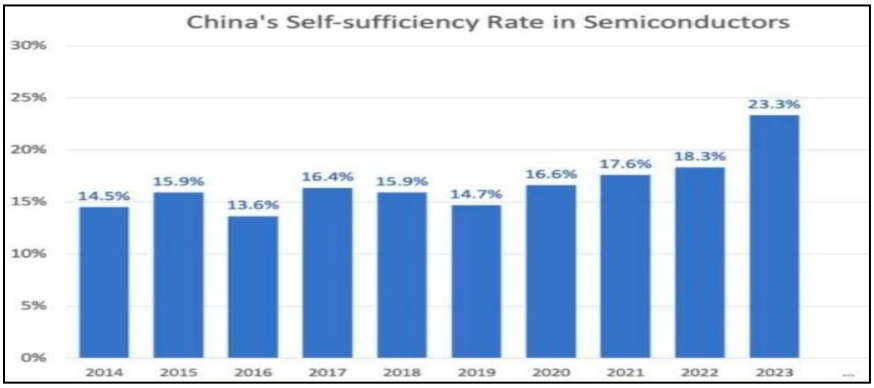

Figure 2: China's Semiconductor Self-Sufficiency Rate (2014-2023)
Source: Tung, Chen. 'China's Semiconductor Self-Sufficiency Below 25%, Focused on Mature Process Chips.' Tech Nights, Oct 2023.

Though China's self-sufficiency remains limited, a noticeable improvement is being observed in its domestic production capacity for legacy chips, which surged by 15% in 2024. In addition, its 2025 projections indicate a further rise by 14% which is likely to be one-third of global chip-making capacity.[49] Notably, Chinese high-tech firm Huawei yielded rates up to 40% in AI chip production in 2024. However, due to mounting export restrictions on advanced AI chips by President Trump in 2025, Huawei's founder, Ren Zhengfei, argued that Huawei's latest Ascend chip is one generation behind Nvidia's AI chips. In short, these developments underscore China's efforts and capacity in its growth in chip production through state-led subsidies for domestic firms to tackle the impact of mounting US export restrictions.[50]

China's Strategic Shift Towards State-Backed Investments: The Big Fund

Acknowledging the indispensable value of semiconductors in the geoeconomic arena, the Chinese leadership forged ahead in strengthening its domestic tech capabilities with a geopolitical vision of establishing an innovative and resilient high-tech infrastructure. This was further emphasized by the Chinese President Xi Jinping, who stressed the need to promote self-reliance and self-refinement, and to provide innovative

[49] SEMI, "Global Semiconductor Fab Capacity Projected to Expand 6% in 2024 and 7% in 2025, SEMI Reports," press release (Milpitas, CA), June 18, 2024, https://www.semi.org/en/news-media-press-releases/semi-press-releases/global-semiconductor-fab-capacity-projected-to-expand-6%25-in-2024-and-7%25-in-2025-semi-reports
[50] Paige West, "Global Semiconductor Fab Capacity Projected to Expand 6%," *Procurement Pro*, June 19, 2024, https://procurementpro.com/global-semiconductor-fab-capacity-projected-to-expand-

solutions to 'bottleneck' problems that hinder China's technological goals.[51] To put this vision into action, the Chinese Government launched the National Security Industry Investment Fund (NSIIF), also known as the 'Big Fund,' in 2014. It is a state-owned strategic investment fund that allocates substantial amounts of finance to Chinese domestic high-tech firms with a central objective of advancing the semiconductor industry and endorsing indigenous microchip production.[52]

In particular, the operational assessment and regulatory framework are carried out in a structured way. For example, the Ministry of Industry and Information Technology (MIIT) and the Ministry of Finance (MOF) jointly manage the policy direction of the fund by ensuring that its financial allocations align with the national industrial policy frameworks. The investment decisions are supervised by the China Development Bank, which is a major shareholder in this fund.[53]

The implementation mechanism of this fund has been executed through a phased approach with each phase reflecting a specific timeline, financial commitments, sectoral priorities, and key targeted objectives that are aimed at securing China's high-tech advancements.[54] The first phase of the Big Fund was officially launched in September 2014, with a capital investment of over 138.72 billion yuan. Its priority areas were raw materials, specialized equipment, microchip fabrication, designing, and packaging. The target was to upgrade China's indigenous technical foundations. To achieve this, the Fund allotted 65% of the grants to domestic chip-making fabs like Semiconductor Manufacturing International Corporation (SMIC) and Yangtze Memory Technologies Corporation (YMTC). In addition, 17% of the investments were directed to the firms dealing with designing semiconductor chips, 10% was allocated to the testing and packaging sector,

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[51] "Xiconomics in Practice: How Xi Leads China in All-Out Effort to Tackle Tech 'Bottleneck' to Secure Development," *Global Times*, February 2, 2023, https://www.globaltimes.cn/page/202302/1284729.shtml

[52] Baosi Meng, Jinxin Yao, and Xun Wu, "Misalignment and Unintended Consequences: Unraveling Governance Challenges in China's National Integrated Circuit Industry Investment Fund," *Science and Public Policy* (March 10, 2025), https://doi.org/10.1093/scipol/scaf005

[53] Lizzie Lee, "China's Big Fund 3.0: Xi's Boldest Gamble Yet for Chip Supremacy," *The Diplomat*, June 6, 2024, https://thediplomat.com/2024/06/chinas-big-fund-3-0-xis-boldest-gamble-yet-for-chip-supremacy/

[54] "China's Big Fund Phase Three Commences, Injecting 344 Billion RMB into Semiconductor Industry Growth," *TrendForce*, May 27, 2024, https://www.trendforce.com/news/2024/05/27/news-chinas-big-fund-phase-three-commences-injecting-344-billion-rmb-into-semiconductor-industry-growth/

and the remaining 4% was funnelled to equipment and material separately.[55] Phase I of this plan was operationalized till 2019. Resultantly, the major catalytic effect was that China achieved significant growth in domestic fab capacity and equipment manufacturing.[56]

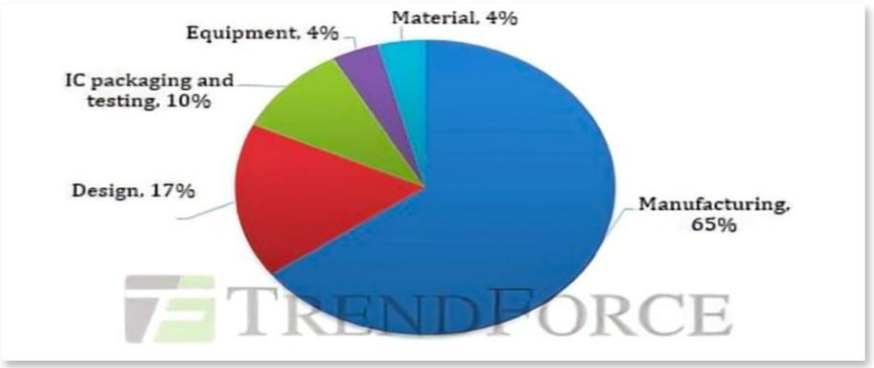

Figure 3: Big Funds' Contribution to China's Domestic Semiconductor Sector
Source: Jeter Teo, "TrendForce Says the Chinese Government Continues 'Big Fund' to Support Key Semiconductor Sectors in China, including Memory and IC Design," TrendForce, November 21, 2017.

Following the success of the first phase of Big Fund, the Chinese leadership launched its second phase in October 2019. This time, the capital investment was increased to approximately 204.2 billion yuan, from which 75% of the fiscal investment was allotted to wafer fabrication, 15% to semiconductor equipment and material, and the remaining 10% was designated to chip designing, packaging, and testing.[57] In response to the export restrictions imposed by the US on China, this phase invested about 60 billion yuan in more than forty domestic semiconductor firms in China with an aim of accelerating chip manufacturing capacity.[58]

The key achievement of Big Funds' investments underscores substantial growth in revenues of the integrated circuit (IC) industry across three major sectors, including IC design, IC manufacturing, and IC testing and

[55] Jeter Teo, "TrendForce Says the Chinese Government Continues 'Big Fund' to Support Key Semiconductor Sectors in China Including Memory and IC Design," *TrendForce*, November 21, 2017, https://www.trendforce.com/presscenter/news/20171121-9918.html
[56] "SMIC Receives Investment from China Integrated Circuit Industry Investment Fund," SMIC, February 13, 2015, https://www.smics.com/en/site/news_read/4541
[57] "China's National Chip Fund Raises $48bn to Help Local Firms," *Evertiq*, May 28, 2024, https://evertiq.com/news/55792
[58] Ma Jingjing, "China's 'Big Fund II' Makes Intensive Investments, As Country Aims to Overcome US Chip Ban," *Global Times*, March 30, 2023, https://www.globaltimes.cn/page/202303/1288294.shtml

packaging. Significant gains were noticed from 2019-2024, which reflect the direct impact of increased investment under phase II of the Big Fund.[59]

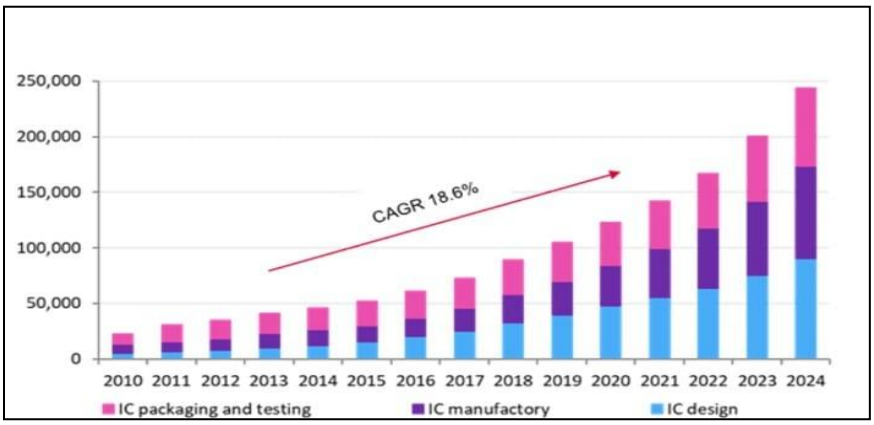

Figure 4: China IC Industry Revenue Development Trend
Source: "China's 28nm Chip Process Industry Set to Achieve Self-Reliance Within Two Years," Omdia, November 10, 2020.

In order to achieve higher rates of self-sufficiency in the semiconductor industry, Chinese leadership proceeded further and launched the third phase of Big Fund in May 2024, with a capital investment of over 344 billion yuan. It is the current and largest investment phase of the Big Fund that spans over 15 years. Priority areas for this phase are emerging technologies, supply chain resilience, advanced chip fabrication, and specialized semiconductor material.[60]These investments are viewed as a countermeasure to the US's CHIPS and Science Act, which allocates substantial funding for domestic chip fabrication in the US. In response to this, Phase II of the Big Fund explicitly focuses on supply chain robustness and advanced chip-nodes, which are crucial elements for China's technological aspirations.[61] Long-term strategic investments are aimed at increasing the competitiveness of the Chinese IC industry globally. In essence, this fund is playing a fundamental role in advancing China's

[59] "China's 28nm Chip Process Industry Set to Achieve Self-Reliance Within Two Years," *Omdia*, November 10, 2020, https://omdia.tech.informa.com/om014575/chinas-28nm-chip-process-industry-set-to-achieve-self-reliance-within-two-years

[60] "China Sets up Third Fund with $47.5 bln to Boost Semiconductor Sector," *Reuters*, May 27, 2024, https://www.reuters.com/technology/china-sets-up-475-bln-state-fund-boost-semiconductor-industry-2024-05-27/

[61] Joane, "China Launches $47.5 Billion Big Fund III to Boost Semiconductor Self-Sufficiency," *Gizmochina*, May 30, 2024, https://www.gizmochina.com/2024/05/30/china-launches-47-5-billion-big-fund-iii-to-boost-semiconductor-self-sufficiency

ambition to become a leading tech-power by strengthening a Chinese-centred tech architecture.[62]

Circumventing US Semiconductor Technology Via Third Parties

In October 2022, the US enforced strict export bans on China to limit its technological ambitions by restricting the supply of leading semiconductor chips and sophisticated chip-making equipment, which were essential for China's technological rise.[63] Despite the export restriction regimes, China has made significant strides in accessing next-generation semiconductor chips, which are vital for emerging technologies via third countries.[64]

Singapore is the leading exporter of semiconductor-related technology like lithography machines, deposition equipment, and wafer cleaning tools to China. In 2023, it exported $6.4 billion worth of US-origin chip-making equipment to China. Malaysia, on the other hand, exported $23 million worth of chip-related technology to China.[65] Taiwan, the global chip manufacturer, exported $90.4 billion worth of ICs, the finished semiconductor, to China. Recently, with the advent of the Chinese AI firm Deepseek, the investigations have revealed that the sophisticated H800 AI chips manufactured by the US tech giant Nvidia were initially shipped to Singapore and were exported to China.[66] In essence, the third countries enable China to indirectly procure restricted items and, hence, act as a gateway for technology transfer. The US authorities are responding to these unauthorized technological transfers stringently. Consequently, in May 2025, the US's law-making authorities passed a bill called the CHIPS Security Act to halt the illegal smuggling of Nvidia's cutting-edge chip nodes to China. The key provision of this bill calls for the imposition of harsh penalties on individuals involved in an illicit tech transfer. Additionally, it has proposed tracking mechanisms for exporting Nvidia's

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[62] Win Min and Han Wei, "China Piles $47.5 Billion Into 'Big Fund III' to Boost Chip Development," *Caixin Global*, May 28, 2024, https://www.caixinglobal.com/2024-05-28/china-piles-475-billion-into-big-fund-iii-to-boost-chip-development-102200633.html

[63] U.S. Congressional Research Service, Foreign Affairs, Defense, and Trade Division, *U.S.-China Technological "Decoupling"* (Washington, DC: Congressional Research Service, 2022).

[64] Sebastian Strangio, "Malaysia to Tighten Chip Controls After Pressure From US, Report Says," *The Diplomat*, March 25, 2025, https://thediplomat.com/2025/03/malaysia-to-tighten-chip-controls-after-pressure-from-us-report-says/

[65] Maria Wihardja and George Tan, "Will Southeast Asian Countries Pass the US' Heightened Export Controls?" *FULCRUM*, January 22, 2025, https://fulcrum.sg/will-southeast-asian-countries-pass-the-uss-heightened-export-controls/

[66] Willow Tohi, "Chinese Espionage? China's DeepSeek May Have Exploited Singapore to Obtain Nvidia Chips," *NewsTarget*, February 5, 2025, https://www.newstarget.com/2025-02-05-chinas-deepseek-may-have-exploited-singapore

chips by incorporating location-tracking technology within the chips. This legislative bill aims to curb China's technological progression, notably in application-specific integrated circuits.[67]

Taiwan's Semiconductor Manufacturing Company (TSMC) is the world's leading chip fabrication facility, which plays a significant role in global value chains.[68] By early 2025, TSMC shipped thousands of chips to China's domestic tech giant Huawei, despite its presence on the US Entity List. It sparked a huge concern in the US regarding non-compliance with the existing export restriction regimes. However, the US Department of Commerce issued an order to TSMC to halt further shipment of chips to China.[69] The Netherlands, on the other hand, is home to Advanced Semiconductor Materials Lithography (ASML), a Dutch company that retains a significant monopoly in producing and supplying Extreme Ultraviolet (EUV) lithographic machines. These machines are widely used in the fabrication of cutting-edge chips, which are below 7nm. While ASML is not allowed to provide high-end chip production machines to China, it still exports older-generation lithographic machines under the Dutch Government licenses, some of which have been revoked recently at the request of the US Government.[70] Despite the US attempts to hinder China's access to sensitive AI technology, China's growing ambitions in bolstering its technical capabilities through indigenous semiconductor production, state-backed investments, and acquisition of the critical US technology through intermediary nations highlight its efforts in achieving technological self-sufficiency.[71]

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[67] Mackenzie Ferguson, "US Lawmaker Cracks Down on Nvidia Chip Smuggling to China with New Bill," *Open Tools*, May 5, 2025, https://opentools.ai/news/us-lawmaker-cracks-down-on-nvidia-chip-smuggling-to-china-with-new-bill

[68] John Clements, "Semiconductor Geopolitics: The Strategic Role of Taiwan and Global Supply Chain Tensions," *The Looking Glass*, March 2, 2025, https://johnclements.com/the-looking-glass/business-strategy/taiwan-semiconductor-geopolitics/

[69] Karen Freifeld, "Report of TSMC Chips that Went to Huawei 'Huge Concern,' US Commerce Nominee Says," *Reuters*, February 27, 2025, https://www.reuters.com/technology/report-tsmc-chips-made-huawei-huge-concern-us-commerce-nominee-says

[70] Jack Simpson, "ASML Halts Hi-Tech Chip-Making Exports to China Reportedly After US Request," *The Guardian*, January 2, 2024, https://www.theguardian.com/technology/2024/jan/02/asml-halts-hi-tech-chip-making-exports-to-china-reportedly-after-us-request

[71] Qayyum Chaudhary, "Semi Conductor Race in Indo Pacific," *Modern Diplomacy*, August 26, 2023, https://moderndiplomacy.eu/2023/08/26/semi-conductor-race-in-indo-pacific/

China's Control Over Rare Earth Elements

Rare Earth Elements (REEs) are a group of 17 naturally occurring earth elements that encompass 15 lanthanide metals, along with two additional elements, yttrium and scandium.[72] Rare Earth Elements share their chemical properties with each other and are often present in the same geological mineral seams. Contrary to their name, they are not naturally scarce. In fact, they are rarely discovered in concentrated form that requires advanced extraction and refining techniques in order to obtain a usable rare earth element from within mineral deposits. In fact, it is the cost of extraction and refinement that makes them strategically valuable in the global value chains. As rare earth minerals are limited due to advanced refining and processing operations, this exacerbates dependencies and vulnerabilities.[73] They are essential metallic minerals and have a vast array of applications in defence systems, automotive industries, electronic industries, green technology, radar systems, medical devices, and computer hard drives.[74]

Moreover, they are typically used in the fabrication of advanced semiconductor chips and are at the cornerstone of contemporary technological advancements. The global Rare Earth industrial landscape is heavily monopolized by China. In the current geoeconomic sphere, China is regarded as the production hub for critical rare earth minerals. It retains significant geopolitical leverage over rare earths supply chains by specializing in large-scale mining and cutting-edge refining apparatus.[75] In particular, it has nearly 37% of natural rare earth reserves, 69.77% of production capacity, and 90% of refining and processing potential. Moreover, low production costs and advanced processing facilities have positioned China as a key player in this critical sector.[76]

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[72] Jason Burton, "US Geological Survey Releases 2022 List of Critical Minerals," U.S. Geological Survey, February 22, 2022, https://www.usgs.gov/news/national-news-release/us-geological-survey-releases-2022-list-critical-minerals

[73] John Zadeh, "Navigating the Critical Minerals Race: Supply Chain Geopolitics," *Discovery Alert*, April 15, 2025, https://discoveryalert.com.au/news/critical-minerals-us-china-competition-2025

[74] Neha Mishra, "Defence and Civilian Applications of Rare Earth Elements," *Journal of Air Power and Space Studies* 17, no. 3 (2022): 128–145, https://capsindia.org/wp-content/uploads/2023/01/APJ-Jul-Sep-2022

[75] Hemant Taneja and Fareed Zakaria, "AI and the New Digital Cold War," *Harvard Business Review*, September 6, 2023, https://hbr.org/2023/09/ai-and-the-new-digital-cold-war

[76] Madhumitha Jaganmohan, "Distribution of Rare Earths Production Worldwide as of 2024, by Country," *Statista*, February 25, 2025, https://www.statista.com/statistics/270277/mining-of-rare-earths-by-country.

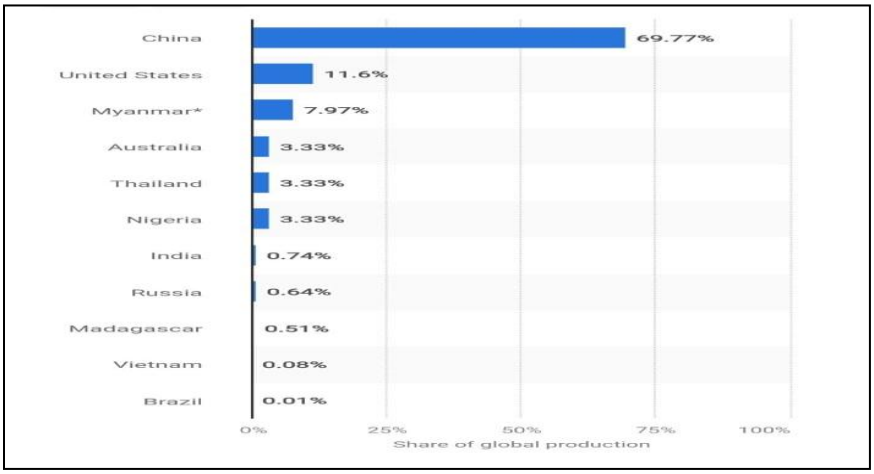

Figure 5: Rare Earths: Production Share by Country 2024
Source: Madhumitha Jaganmohan, "Distribution of Rare Earths Production Worldwide as of 2024, by Country," Statista, February 25, 2025.

China's largest, rare earths production firm is the China Rare Earth Group Co., Ltd. which is a combination of three state-owned mega firms that include, China Southern Rare Earth Group Co. Ltd., Chinalco Rare Earth and Metals Co., and China Minmetals Rare Earth Co. This firm is responsible for 60-70% of rare earths production and contributes approximately 30-40% of CRM to global supply networks.[77]

The US, on the other hand, holds 11.6% of rare earth reserves.[78] California's Mountain Pass Mine is the only plant in the US that is accountable for the extraction of rare earth minerals, but it lacks refining and processing apparatus. This technological gap compels the US to export its extracted minerals to China for further processing and refinement.[79] In 2024, more than 70% of its rare earth imports were sourced from China, which reflects a high level of economic dependency.[80] The West, for a long time, did not venture into the processing and refinement of these rare earth minerals because they produce radioactive waste and toxins. To address this issue,

[77] Qian Zhou and Sofia Brooke, "China Merges Three Rare Earths State-Owned Entities to Increase Pricing Power and Efficiency," *China Briefing*, January 12, 2022, https://www.china-briefing.com/news/china-merges-three-rare-earths-state-owned-entities-to-increase-pricing-power-and-efficiency
[78] Jaganmohan "Distribution of rare earths production worldwide as of 2024, by country."
[79] Funk, Josh. "The US Has a Single Rare Earths Mine. Chinese Export Limits Are Energizing a Push for More." *AP News*, April 18, 2025, https://apnews.com/article/rare-earths-trump-tariffs-china-trade-war-effd6a7ec64b5830df9d3c76ab9b607a
[80] Richter, Felix. "The U.S. Relies Heavily on Rare Earth Imports From China." *Statista*, April 14, 2025, https://www.statista.com/chart/34301/us-rare-earth-imports/

China has maintained a significant edge by incorporating environmental safety measures in rare earths. In October 2024, it launched the world's largest rare earths refining plant, named 'Northern Rare Earths Green Smelting Upgrade and Transformation Project' in Baotou. This facility has been regarded as a 'Quality Powerhouse Enterprise' because of its environmental stewardship approach in regard to rare earths' processing and refinement.[81]

As contemporary geopolitics are marked by the technological contest between the US and China, heavy reliance on the rival state generates vulnerabilities and economic risks.[82] Following the US' export restrictions on semiconductor chips, China strategically responded by restricting the supply of rare earth minerals, which represents a form of resource nationalism, where the critical resources are used as a tool for geopolitical leverage in order to advance national interest against perceived vulnerabilities.[83]

Implications for the Global Techno-political Order

The emergence of China as a systematic tech rival poses an enduring challenge to the long-standing leadership of the US in the high-tech sector.[84] This contestation is fundamentally geopolitical and has the potential to redefine the prevailing techno-political order.[85] Escalating technological frictions between the two major powers underscore the probability of decoupling efforts, particularly in critical security areas.[86] Given the scale of economic interdependence between the US and China, absolute

[81] "World's Largest Rare-Earth Raw Material Production Base Now Operational in North China." *Global Times*, October 16, 2024, https://www.globaltimes.cn/page/202410/1321307

[82] Jackson, Lewis, Amy Lv, Eric Onstad, and Ernest Scheyder. "China Hits Back at US Tariffs With Export Controls on Key Rare Earths." *Reuters*, April 5, 2025, https://www.reuters.com/world/china-hits-back-us-tariffs-with-rare-earth-export-controls-2025-04-04/

[83] Darabshaw, Sohrab. "Is China Using Rare Earths as Its Most Powerful Trade Weapon Yet?" *MetalMiner*, April 22, 2025, https://agmetalminer.com/2025/04/22/china-rare-earths-trade-weapon/.

[84] Brown, Michael. "U.S.–China Competition: The Battle for Global Technological Leadership." *Council on Global Competition and Innovation*, May 1, 2025, https://cgci.org/resources/u-s-china-competition-the-battle-for-global-technological-leadership/

[85] Hooper, Drew. "Semiconductors & Geopolitics: Overview of Semiconductors Industry & US–China Geopolitics." *Hooper Consulting*, October 19, 2023, https://hooperco.org/semiconductors-and-geopolitics

[86] Lardy, Nicholas. "Is US–China Decoupling Heading in a Dangerous Direction?" *East Asia Forum*, July 7, 2023, https://www.eastasiaforum.org/2023/07/07/is-us-china-decoupling-heading-in-a-dangerous-direction/

decoupling marked by complete economic severance seems to be unrealistic and practically unfeasible.[87]

According to assessments by the International Monetary Fund (IMF), the combined economies of the US and China comprise 43% of the global GDP and nearly half of global production capacity.[88] Moreover, both countries continue to rank among each other's largest trading partners, reflecting deep and enduring interdependence.[89] Given these realities, absolute decoupling would have far-reaching implications[90] including disruptions of the supply chains and increased possibilities of sparking a global economic recession due to their major contribution to worldwide production outputs.[91]

Recognizing the risks associated with absolute decoupling, the US and China are navigating the tech-based rivalry by pursuing a targeted decoupling approach, which entails a selective and focused disengagement in sectoral domains like foundational and dual-use technologies.[92] As emphasized by the US Secretary of the Treasury, Janet Yellen, the US does not seek broad economic disengagement but instead aims to pursue an approach that safeguards its national security interests. Hence, the present strategy avoids severance with China across the entire economic spectrum, instead seeking limited decoupling in critical techno-security infrastructure.[93]

US-China decoupling carries significant implications as it paves the way for the fragmentation of the global technological landscape.[94] This development is giving rise to the creation of two alternative and competing

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[87] Ren, Yuxiang, and Wang Weimin. "U.S. Decoupling from China: Strategic Logic, Trend, and Measures." *The Frontiers of Society, Science and Technology* 4, no. 12 (2022): 47–54, https://doi.org/10.25236/FSST.2022.041206

[88] Rao, Pallavi. "The $115 Trillion World Economy in One Chart." *Visual Capitalist*, December 19, 2024, https://www.visualcapitalist.com/the-115-trillion-world-economy-in-one-chart/

[89] "The U.S.-China Trade Relationship." *Council on Foreign Relations*, October 31, 2025, https://www.cfr.org/backgrounder/contentious-us-china-trade-relationship

[90] Park, Yong. "US–China Strategic Competition Amidst the Paradox of Decoupling." *International Journal for Social Science Studies* 12, no. 1 (2023): 4, https://doi.org/10.11114/ijsss.v12i1.6377

[91] Feingold, Spencer, and Lea Weibel. "How Might Economic Decoupling or De-risking Impact the Global Economy." *World Economic Forum*, June 27, 2023, https://www.weforum.org/agenda/2023/06/global-economic-decoupling-derisking-experts-explain/

[92] Hwang, Tim, and Emily Weinstein. "Decoupling in Strategic Technologies." *Center for Security and Emerging Technology*, July 2022, https://cset.georgetown.edu/publication/decoupling-in-strategic-technologies/

[93] United States, Department of the Treasury. *Remarks by Secretary of the Treasury Janet L. Yellen on the U.S.–China Economic Relationship*. Washington, DC: Department of the Treasury, 2023.

[94] Herrero, Alicia. "US–China Tech Bifurcation." *Bruegel*, May 10, 2023, https://www.bruegel.org/podcast/us-china-tech-bifurcation

technological spheres of influence led by the US and China separately.[95] The US promotes a democratic and rule-based technological ecosystem by seeking allied cooperation.[96] China, on the other hand, advocates for an all-Chinese-centred technological regime through indigenous production and self-sufficiency.[97] This bifurcation poses serious challenges for third-world countries, which are compelled to navigate competing standards and strategic alignments amidst intensifying geopolitical rivalry marked by technological contestations.[98] Maintaining strategic autonomy and multi-alignment for middle and emerging powers is also likely to become difficult as they face mounting pressure to choose sides amongst competing technological blocs. The tech-bifurcation also risks adversely impacting global innovation ecosystems, thereby deepening inequalities between technologically advanced and lagging states, and reshaping the global order along competing technological, economic, and strategic lines.

Conclusion

The growing friction between the US and China is reshaping the technological order of the twenty-first century. This rivalry, at its core, is geopolitical in nature as both states are strengthening their assets and making efforts to reduce reliance on foreign sources. Following the US' tech containment strategy, China, driven by its innovation imperative, has intensified efforts at bolstering indigenous semiconductor production. It is investing in the production of domestic semiconductor chips through state-led initiatives. It also maintains a strategic leverage in terms of its control over the processing of rare earth elements. In addition, both states are undergoing targeted decoupling, notably in sectoral domains such as application-specific semiconductor technology through export restrictions. The ramifications associated with decoupling are profound because the technological bifurcation could lead to strategic vulnerabilities and compel nations to navigate value chain dependencies under heightened pressures.

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[95] Taneja, Hemant, and Fareed Zakaria. "AI and the New Digital Cold War." *Harvard Business Review*, September 6, 2023, https://hbr.org/2023/09/ai-and-the-new-digital-cold-war/

[96] Jain, Ash, and Matthew Kroenig. "Toward a Democratic Technology Alliance: An Innovation Edge That Favors Freedom." *Atlantic Council*, June 13, 2022, https://www.atlanticcouncil.org/in-depth-research-reports/report/toward-a-democratic-technology-alliance-an-innovation-edge-that-favors-freedom/

[97] Woods, Dwayne. "The Silicon Sword Hanging Over China's Head." *Journal of Chinese Political Science*, March 5, 2024, https://doi.org/10.1007/s11366-024-09883-5

[98] Moseley, Lauren. "Promoting Semiconductor 'Friend-Shoring': The Role of Indo-Pacific Allies and Partners in Supply Chain Resilience," *Center for Strategic and International Studies*, April 20, 2023, https://www.csis.org/programs/asia-program/promoting-semiconductor-friend-shoring-role-indo-pacific-allies-and-partners