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AI, Semiconductors, and Geopolitical Competition: The New Strategic Resources of Global Politics

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ABSTRACT

Artificial intelligence (AI) and semiconductors are emerging as strategic resources that are reshaping the distribution of power in global politics. This study examines how control over AI, advanced semiconductors, computing infrastructure, and critical technological supply chains influences economic competitiveness, military capabilities, technological sovereignty, and geopolitical leverage. Using a qualitative research design based on academic literature, international reports, government policies, and industry evidence, the study integrates neorealism, geo-economics, weaponized interdependence, and dependency theory to analyze contemporary technological competition. The findings demonstrate that AI power is fundamentally dependent on advanced semiconductor and computing capabilities, while the global semiconductor value chain remains highly concentrated in a limited number of states and firms. The U.S.–China rivalry illustrates how export controls, industrial policies, technological alliances, and supply-chain diversification have transformed technological interdependence into an instrument of geopolitical statecraft. The study further identifies an emerging technological North–South divide, as developing countries remain dependent on foreign AI infrastructure, advanced chips, capital, and expertise. To explain these dynamics, the study proposes Technological Strategic-Resource Theory, arguing that states controlling critical technological capabilities and chokepoints possess disproportionate economic, military, and geopolitical power. The study concludes that complete technological decoupling is unlikely; instead, global politics is moving toward managed technological interdependence, strategic competition, and increasingly fragmented technology ecosystems.

Introduction

The international political economy is undergoing a significant transformation as advanced technologies increasingly shape the distribution of economic, political, and strategic power. Historically, geopolitical competition was strongly associated with control over territory, military capabilities, industrial capacity, and strategic resources such as oil. In the contemporary digital era, however, technological capabilities have become increasingly important sources of national power. Artificial intelligence (AI) and semiconductors are particularly significant because AI is becoming central to economic production, scientific research, military capabilities, and state governance, while semiconductors provide the essential hardware infrastructure required for advanced computing. The growing interdependence between these two technologies has therefore transformed them from primarily commercial innovations into matters of national security and geopolitical strategy. AI increasingly depends upon advanced processors, computing infrastructure, and semiconductor manufacturing, while the economic and strategic value of advanced semiconductors is being enhanced by their central role in the development of AI. This convergence makes AI and semiconductors important strategic resources of contemporary global politics**.**

The rapid development of AI demonstrates the increasing importance of technological capabilities in the international system. AI investment, research, and computational capacity have expanded considerably, while frontier AI development has become increasingly concentrated among a limited number of technologically advanced states and firms. The *AI Index Report 2025* indicates that U.S. private AI investment reached $109.1 billion in 2024, compared with $9.3 billion in China, while U.S.-based institutions produced 40 notable AI models compared with 15 from China (Stanford Institute for Human-Centered Artificial Intelligence [Stanford HAI], 2025). At the same time, China has developed substantial strengths in AI publications and patents, demonstrating that competition is occurring across multiple dimensions rather than through investment alone. Importantly, AI models are also becoming increasingly computationally demanding, with training compute for notable models approximately doubling every five months (Stanford HAI, 2025). These developments demonstrate that AI leadership increasingly depends upon access to advanced computational infrastructure and, consequently, to the semiconductor technologies that make such computation possible.

Semiconductors are therefore emerging as a critical foundation of technological and geopolitical power. Modern semiconductor production depends on a highly specialized global value chain involving chip design, electronic design automation, manufacturing equipment, advanced lithography, materials, wafer fabrication, packaging, and testing. This production system is highly interconnected but geographically concentrated. The OECD (2025) finds that China, Chinese Taipei, Korea, Japan, and the United States together account for nearly 90% of global wafer-fabrication capacity, while the ten largest manufacturing companies account for around half of global production capacity. OECD, The Chip Landscape Such concentration creates technological bottlenecks and strategic vulnerabilities because disruption at particular stages of the semiconductor value chain can affect the wider global economy. Consequently, semiconductor capabilities are no longer simply an issue of industrial competitiveness; they increasingly constitute a component of economic security, national security, and geopolitical influence.

The strategic relationship between AI and semiconductors can be understood through the concept of technological interdependence. AI requires enormous computational resources, while advanced computing depends on increasingly sophisticated semiconductor technologies. This creates an AI–semiconductor nexus in which technological leadership depends on the availability of advanced chips, high-performance computing, data centres, and related infrastructure. UN Trade and Development (UNCTAD, 2025) emphasizes that AI development is highly dependent on computing infrastructure and that access to such infrastructure is unevenly distributed across the international system. The significance of this relationship extends beyond technological development because control over critical computing and semiconductor capabilities can influence economic competitiveness, military modernization, innovation capacity, and technological autonomy. Thus, the strategic importance of AI cannot be separated from the semiconductor ecosystem that supports it.

This emerging technological interdependence also creates new forms of geopolitical power. Farrell and Newman (2019), through their concept of weaponized interdependence, demonstrate that states occupying strategically central positions within global networks can use those networks to exercise coercive power over other actors. The semiconductor industry provides an important contemporary example of this phenomenon. Because particular technologies, manufacturing capabilities, software systems, and equipment are concentrated in a limited number of countries and firms, control over these nodes can provide states with considerable leverage. Advanced semiconductor manufacturing in East Asia, semiconductor manufacturing equipment, chip-design capabilities, and AI computing infrastructure therefore represent potential technological chokepoints. The strategic importance of these chokepoints lies not simply in their economic value but in the ability of states to restrict, regulate, or condition access to them.

The growing geopolitical significance of these technologies is most clearly demonstrated by the intensifying United States–China technological rivalry. Competition between Washington and Beijing has increasingly moved beyond conventional trade and investment disputes toward competition over advanced semiconductors, AI, computing infrastructure, and technological capabilities with potential military applications. In October 2022, the United States introduced extensive export controls on advanced computing and semiconductor manufacturing technologies directed at China, explicitly linking these technologies to national-security concerns (Bureau of Industry and Security [BIS], 2022). Subsequent measures further strengthened restrictions on advanced computing chips and semiconductor manufacturing equipment. These policies demonstrate that technological capabilities have become instruments of economic statecraft, through which states seek not only commercial advantages but also strategic and geopolitical objectives.

China's response has increasingly emphasized technological self-reliance and the development of domestic capabilities in semiconductors, AI, and related technologies. The resulting competition is therefore broader than a conventional contest between two economic powers. It represents a struggle over technological autonomy, supply-chain security, innovation capacity, and the future structure of the global technological order. While the United States retains important advantages in frontier AI development, investment, semiconductor design, software, and technological alliances, China has developed significant capabilities in AI research, patenting, manufacturing, and domestic technological production. Stanford HAI (2025) shows that although U.S. institutions produced more notable AI models in 2024, the performance gap between leading U.S. and Chinese models narrowed substantially This suggests that the emerging competition is not simply about technological superiority in a single sector but about the ability of states to construct comprehensive technological ecosystems encompassing AI, semiconductors, computing, capital, research, talent, and infrastructure.

The geopolitical significance of semiconductors is further intensified by their geographical concentration, particularly in East Asia. The concentration of advanced semiconductor manufacturing in a small number of economies means that geopolitical instability, supply-chain disruptions, or restrictions on technology transfers can have consequences for the wider international economy. OECD (2025) finds that global wafer-fabrication capacity remains highly concentrated and that new investments continue to be focused largely in existing major semiconductor-producing economies. This creates a paradox: globalization has produced highly efficient technological specialization, but the resulting interdependence has simultaneously created new strategic vulnerabilities. States therefore increasingly seek to diversify supply chains, develop domestic manufacturing capabilities, and strengthen technological partnerships with politically trusted economies.

The strategic competition surrounding AI and semiconductors is also expanding into the domain of energy security. The increasing computational requirements of AI systems require large-scale data centers and reliable electricity supplies. According to the International Energy Agency (IEA, 2025), global electricity consumption by data centres is projected to more than double to approximately 945 TWh by 2030, with AI identified as the most important driver of this growth. This development demonstrates that AI geopolitics is not restricted to algorithms and computer chips; it increasingly involves electricity generation, data-center infrastructure, networks, and access to reliable energy. As a result, technological power is becoming connected to a wider infrastructure system in which computing, semiconductors, data, and energy collectively contribute to national technological capacity.

The emergence of AI and semiconductor competition also has important implications for developing countries and the Global South. The concentration of advanced AI research, computing infrastructure, semiconductor production, investment, and technological expertise in a limited number of countries risks creating a new form of technological inequality. UNCTAD (2025) highlights significant disparities between developed and developing economies in computing capacity, AI infrastructure, investment, skills, and technological capabilities. Developing countries may consequently remain dependent on foreign semiconductor suppliers, cloud infrastructure, AI models, and digital platforms, potentially reinforcing existing patterns of technological dependency. This raises an important political-economic question: whether the AI revolution will contribute to broad-based development or create a new technological divide between countries capable of producing critical technologies and those primarily dependent on importing them.

In response to these developments, major powers are increasingly adopting policies designed to strengthen technological sovereignty and supply-chain resilience. The United States has promoted domestic semiconductor production and technological investment through industrial policy, while the European Union has adopted the European Chips Act to strengthen its semiconductor ecosystem. China has pursued technological self-reliance and domestic semiconductor development, while Japan and South Korea have also introduced policies aimed at strengthening their positions in critical semiconductor technologies. These developments indicate a movement away from an exclusively market-driven approach to globalization toward a system in which national security and geopolitical considerations increasingly influence technological production and trade. Rather than complete technological decoupling, the emerging system may therefore be characterized by strategic or managed interdependence, in which states continue to depend on global technological networks while simultaneously attempting to reduce their exposure to strategically vulnerable supply chains.

Against this background, this study examines AI and semiconductors as emerging strategic resources of global politics. It argues that their geopolitical significance derives from the interaction between AI capabilities, advanced semiconductor production, computational infrastructure, technological chokepoints, and state power. The central argument is that states capable of controlling critical components of the AI–semiconductor ecosystem can obtain significant economic, military, and geopolitical advantages, while states dependent on externally controlled technologies may face new forms of strategic vulnerability. The study therefore focuses particularly on the transformation of U.S.–China technological competition, the strategic importance of semiconductor supply chains, the use of export controls and industrial policies as instruments of geopolitical power, and the implications of technological competition for developing countries. By connecting neorealism, geoeconomics, technological dependency, and weaponized interdependence, the study seeks to explain how technological capabilities are transforming the structure and distribution of power in contemporary global politics.

Literature Review

The literature on international power has traditionally emphasized military capabilities, economic resources, territory, and natural resources as major determinants of state power (Waltz, 1979; Mearsheimer, 2001). However, technological transformation and digitalization have expanded the meaning of strategic resources. Strange (1996) argues that power also derives from the ability to shape the structures within which other actors operate, while Baldwin (1985) demonstrates how economic resources can be converted into instruments of statecraft. In this emerging environment, artificial intelligence (AI), advanced computing, and semiconductors are increasingly acquiring strategic significance because they influence economic competitiveness, military capabilities, technological innovation, and national security.

Recent scholarship increasingly conceptualizes AI as a strategic technology rather than merely an economic or technological innovation. Allen and Chan (2017), Horowitz (2018), and Schmidt (2022) demonstrate that AI can affect military effectiveness, intelligence, economic productivity, and the balance of power. More recent research shows that the United States, China, and the European Union increasingly associate AI leadership with national security, economic competitiveness, and international influence (Landwehr-Matlé et al., 2026). The Stanford Institute for Human-Centered Artificial Intelligence (2026) also demonstrates the increasing concentration of frontier AI development and computational capabilities among major technology firms and technologically advanced states. These developments indicate that access to AI capabilities is becoming an increasingly important component of national power.

However, AI cannot be examined independently from its material foundations. Advanced AI requires enormous computational capacity, which in turn depends upon advanced semiconductor technologies. Semiconductors are therefore not simply commercial products but critical infrastructure for AI, telecommunications, data centers, autonomous systems, and modern military technologies (Kleinhans & Baisakova, 2020; Brundage, 2023). The OECD (2025) finds that China, Chinese Taipei, Korea, Japan, and the United States account for nearly 90% of global wafer fabrication capacity, demonstrating the considerable geographical concentration of semiconductor production. Such concentration creates vulnerabilities because highly specialized semiconductor technologies cannot easily be substituted or reproduced elsewhere.

The relationship between AI and semiconductors represents an important dimension of contemporary technological power. UNCTAD (2025) emphasizes that AI development depends upon computing infrastructure, data, skills, and other technological foundations. Advanced chips enable greater computing capacity, while greater computing capacity enables increasingly sophisticated AI systems. AI and semiconductor capabilities therefore reinforce each other, creating an AI–semiconductor strategic nexus**.** States possessing greater access to advanced chips, computing infrastructure, AI talent, and frontier models can potentially convert these capabilities into economic, military, and geopolitical advantages (Joshi, S. (2024).

The concept of weaponized interdependence developed by Farrell and Newman (2019) provides an important explanation of how technological networks can generate geopolitical power. Global semiconductor production is distributed across specialized firms and countries, but some actors occupy particularly important network positions. Control over chip design, advanced manufacturing equipment, fabrication, intellectual property, and high-performance computing can therefore provide disproportionate leverage over states dependent on these networks. Semiconductor interdependence consequently creates both economic benefits and strategic vulnerabilities.

This dynamic is particularly visible in U.S.–China technological competition. Research increasingly identifies semiconductors and AI as central arenas of the broader struggle for technological leadership (Chow, 2024; Hamdani & Belfencha, 2024). The United States has employed export controls and technology restrictions to constrain China's access to advanced computing chips and semiconductor manufacturing capabilities (Bureau of Industry and Security [BIS], 2022). China, in response, has pursued greater domestic technological capacity and semiconductor self-reliance. The rivalry consequently demonstrates how commercial technologies can become instruments of economic statecraft and geopolitical competition (Joshi, S. (2025).

The literature also identifies a broader transformation from globalization toward strategic technological interdependence. Governments increasingly use industrial policy, subsidies, export controls, investment screening, supply-chain diversification, and technological partnerships to reduce strategic vulnerabilities (Blackwill & Harris, 2016; Bu, 2024). Nevertheless, complete technological decoupling remains difficult because semiconductor production depends on highly specialized and internationally distributed capabilities (OECD, 2025). The emerging global order is therefore better characterized by selective de-risking, strategic diversification, and competing technological ecosystems rather than complete economic separation.

An additional concern is the unequal distribution of technological capabilities between developed and developing countries. UNCTAD (2025) and the World Bank (2025) demonstrate significant disparities in access to computing infrastructure, digital connectivity, skills, investment, and AI innovation. This creates the possibility of a new technological North–South divide in which countries lacking advanced semiconductor and AI capabilities remain dependent on external technology providers. From a dependency perspective, such technological asymmetries may constrain the technological sovereignty and bargaining power of developing states (Frank, 1967; Cardoso & Faletto, 1979).

Despite substantial research on AI, semiconductors, technological competition, and economic statecraft, the literature remains fragmented. AI studies frequently focus on military applications, innovation, and great-power competition, while semiconductor studies emphasize supply chains, industrial policy, and national security. Similarly, the literature on weaponized interdependence explains network power but does not fully integrate the material relationship between advanced AI and semiconductor capabilities. There is therefore a need for an integrated framework explaining how AI and semiconductor capabilities jointly generate economic, military, and geopolitical power.

This study addresses this gap by conceptualizing an AI–Semiconductor Geopolitical Nexus, linking advanced semiconductors, computing capacity, AI development, technological sovereignty, economic power, military capability, and geopolitical influence. It argues that AI and semiconductors have become new strategic resources of global politics because control over their critical capabilities and technological chokepoints increasingly determines states' ability to compete economically, maintain national security, and exercise geopolitical influence. The study therefore moves beyond treating AI and semiconductors as separate technological sectors and examines them as interconnected foundations of emerging global power.

Research Methodology

This study adopts a qualitative and explanatory research design to examine how artificial intelligence (AI) and semiconductors have emerged as strategic resources in contemporary global politics. The approach is appropriate because the study seeks to explain geopolitical processes, state strategies, technological dependence, and power relations rather than statistically test relationships. The research particularly investigates how control over AI capabilities, advanced computing, semiconductor technologies, and critical supply-chain nodes can be translated into economic, military, and geopolitical influence.

The study relies primarily on secondary data collected from peer-reviewed journal articles, academic books, government documents, international organizations, research institutions, and credible industry reports. Major sources include the OECD, UNCTAD, World Bank, International Energy Agency, Stanford HAI, U.S. Bureau of Industry and Security, European Commission, and relevant national institutions. Academic literature is used primarily for theoretical and conceptual analysis, while official and institutional sources provide empirical evidence on AI development, semiconductor production, investment, export controls, industrial policies, and supply-chain concentration.

The study covers the period 2017–2026, capturing the emergence and intensification of contemporary AI and semiconductor competition. Although the research has a global scope, particular attention is given to the United States and China because they constitute the principal actors in contemporary technological competition. Taiwan, South Korea, Japan, the Netherlands, and the European Union are examined selectively because of their strategic positions within global semiconductor and technology value chains.

Data are analyzed through qualitative thematic and comparative analysis. Evidence is organized around key themes including AI capability, semiconductor capacity, technological dependence, supply-chain concentration, strategic chokepoints, export controls, industrial policy, technological sovereignty, and geopolitical competition. The United States and China are comparatively examined to identify how their technological capabilities and policies generate different forms of geopolitical leverage.

The study employs the concept of weaponized interdependence (Farrell & Newman, 2019) and geoeconomics (Baldwin, 1985; Blackwill & Harris, 2016) to interpret how states use technological and economic networks for strategic purposes. These perspectives are integrated into an AI–Semiconductor Geopolitical Nexus, which conceptualizes the relationship as:

Advanced Semiconductors → Computing Capacity → AI Capability → Economic/Military Power → Technological Sovereignty → Geopolitical Influence.

The study uses data triangulation to strengthen reliability by comparing academic research with government, international-organization, and industry sources. Claims concerning semiconductor concentration, AI capabilities, export controls, and technological policies are therefore assessed across multiple credible sources rather than relying on a single perspective.

AI and Semiconductors as the New Strategic Resources

The history of international politics demonstrates that the sources of strategic power change with technological and economic transformation. States have historically sought control over resources that were essential for production, military capability, transportation, and economic influence. Land was central to pre-industrial power; coal powered industrialization; oil became indispensable to twentieth-century economic and military systems; and information became increasingly important with the rise of the information economy. In the twenty-first century, however, the strategic-resource structure is expanding toward data, artificial intelligence (AI), computational capacity, and semiconductors**.** Unlike traditional resources, these technologies are not merely inputs into production; they increasingly determine the ability of states and firms to produce knowledge, develop military capabilities, control critical infrastructure, and exercise influence over global technological networks. This transformation is therefore central to understanding the emerging geopolitical competition surrounding AI and semiconductor supply chains.

Historical Evolution of Strategic Resources

The evolution of strategic resources can be understood as a transition from control over physical territory and energy toward control over increasingly sophisticated technological infrastructures. In the pre-industrial era, land was the principal source of wealth and political power because agricultural production, taxation, population, and military mobilization depended heavily on territorial control. The Industrial Revolution shifted this structure toward coal, which provided the energy required for factories, railways, steamships, and industrial production. During the twentieth century, oil replaced coal as a particularly important strategic resource because modern transportation, mechanized warfare, aviation, petrochemicals, and industrial economies became deeply dependent on petroleum. The emergence of the information economy subsequently elevated information and knowledge as sources of economic and structural power (Strange, 1996).

The late twentieth and early twenty-first centuries introduced data as an increasingly valuable strategic asset. Data became essential for digital platforms, economic decision-making, surveillance, machine learning, and technological innovation. AI represents a further transformation because it converts data and computational resources into decision-making and automation capabilities. Consequently, strategic competition is increasingly concerned not simply with possessing natural resources but with controlling the technological infrastructure required to transform information into economic and strategic capabilities.

Historical period	Dominant strategic resource	Strategic significance
Pre-industrial	Land	Agriculture, taxation, population and territorial power
Industrial Revolution	Coal	Industrial production, transportation and mechanization
20th century	Oil	Transportation, military power and industrialization
Late 20th century	Information	Knowledge, communication and economic coordination
Early 21st century	Data	Digital platforms, analytics and machine learning
AI era	AI + compute + semiconductors	Economic productivity, military capability, technological sovereignty and geopolitical influence

This historical progression suggests that strategic resources are defined by their capacity to generate structural power. In the contemporary technological environment, AI cannot function independently of computational infrastructure, while advanced computation depends on specialized semiconductors. Therefore, the strategic resource of the AI era is better understood as an interconnected ecosystem of AI, data, computing power, semiconductors, technical expertise, infrastructure, and energy rather than AI software alone. This interconnectedness provides the foundation for the geopolitical competition examined in this research.

Why AI Has Become a Strategic Resource

AI has become a strategic resource because it increasingly affects the economic and security capabilities through which states compete internationally. Economically, AI can automate cognitive and industrial tasks, improve productivity, optimize supply chains, accelerate scientific research, and support financial and commercial decision-making. Its strategic value is reinforced by the growing dominance of private technology companies in frontier AI development. Stanford's AI Index reported that almost 90% of notable AI models in 2024 originated from industry, compared with 60% in 2023, demonstrating that frontier AI capability is increasingly concentrated in technologically advanced corporations rather than traditional state institutions or universities (Stanford HAI, 2025). By 2025, industry accounted for more than 90% of notable AI models**,** further demonstrating the strategic importance of technology firms and their computational infrastructure (Stanford HAI, 2026).

AI's strategic significance also extends directly into national security. Machine-learning systems can support intelligence analysis by processing large quantities of satellite imagery, communications, documents, and other information at speeds beyond conventional human analysis. AI can improve strategic forecasting by identifying patterns and generating scenarios from complex datasets. In defence, it can contribute to autonomous systems, targeting support, logistics, battlefield awareness, surveillance, cyber operations, and decision-support systems. Consequently, AI increasingly functions as a force multiplier: states possessing advanced AI capabilities can potentially process information faster, automate selected military functions, and improve the efficiency of economic and security institutions. This creates incentives for states to treat AI capability as an element of national power rather than simply a commercial technology (Horowitz, 2018; Schmidt, 2022).

AI's strategic importance is further strengthened by its role in industrial automation. AI-enabled systems can optimize manufacturing, robotics, transportation, energy management, and research and development. Thus, AI contributes simultaneously to economic competitiveness and national security. The resulting relationship between technological capability and geopolitical power explains why major powers increasingly compete for AI talent, data, computing infrastructure, semiconductor access, and technological standards.

Why Semiconductors Are Strategic Resources

Semiconductors constitute the physical foundation of the AI-driven technological order. They provide the computational capacity required by AI systems and are embedded in virtually every major strategic technological sector, including telecommunications, automobiles, defense systems, aerospace, robotics, smartphones, energy infrastructure, and data centers. Their importance therefore extends far beyond the electronics industry: semiconductor availability can influence the operational capacity of entire national economies and security systems.

The strategic significance of semiconductors is particularly evident in advanced computing. AI models require increasingly powerful processors, while modern defense systems, communication networks, autonomous platforms, and data centers also depend on sophisticated chips. The concentration of semiconductor manufacturing creates an additional geopolitical vulnerability. According to the OECD (2025), China, Chinese Taipei, Korea, Japan, and the United States together accounted for approximately 87% of global in-production wafer fabrication capacity, while the ten largest manufacturing companies accounted for around half of global production capacity.

This concentration means that semiconductor capability can function as a geopolitical chokepoint. Disruptions caused by conflict, sanctions, export controls, natural disasters, or political tensions can affect multiple industries simultaneously. The strategic value of semiconductors therefore derives not only from their economic usefulness but also from their scarcity, technological complexity, geographic concentration, and limited substitutability (OECD, 2025).

The AI–Chip Interdependence

The relationship between AI and semiconductors represents the central strategic nexus of the emerging technological order. AI development requires computational power; computational power requires advanced processors; advanced processors depend on sophisticated semiconductor manufacturing; and semiconductor manufacturing requires specialized equipment, materials, electronic-design automation software, intellectual property, skilled engineers, and highly developed industrial ecosystems.

AI advancement → greater computational demand → advanced processors → sophisticated semiconductor manufacturing → specialized equipment, materials, software and talent → greater AI capability.

This relationship produces a reinforcing technological cycle. More capable AI models require larger amounts of computation for training and inference, creating greater demand for advanced graphics processing units (GPUs), AI accelerators, high-performance computing systems, and data centres. At the same time, improvements in semiconductor technology allow researchers and companies to develop increasingly powerful AI systems. The two technologies are therefore mutually reinforcing rather than independent.

The strategic consequences are significant. A state may possess strong AI researchers but remain technologically dependent if it lacks access to advanced chips. Conversely, semiconductor manufacturing capacity alone does not guarantee AI leadership without software, data, algorithms, computing infrastructure, and skilled personnel. The geopolitical contest consequently concerns control over the entire AI–semiconductor ecosystem, including critical nodes in design, fabrication, equipment, computing, software, and talent.

AI Compute as a Strategic Resource

Computational capacity has emerged as a strategic resource because it determines who can develop, train, and deploy frontier AI systems at scale. GPUs and specialized AI accelerators provide the processing capability required for modern machine-learning models, while supercomputers, cloud platforms, hyperscale data centres, and high-performance computing facilities provide the infrastructure necessary to operate them.

The geographical concentration of computing reinforces existing technological inequalities. UNCTAD (2025) reports that the United States possesses approximately one-third of the world's top 500 supercomputers and more than half of global computational performance, while most powerful supercomputers and large data centres remain concentrated in developed economies. Most developing countries have limited AI hardware and infrastructure, restricting their ability to independently develop advanced AI capabilities.

Recent developments further demonstrate this concentration. Stanford HAI estimates that global AI compute capacity grew approximately 3.3 times per year since 2022, reaching 17.1 million H100-equivalent units. Nvidia alone accounts for more than 60% of total compute capacity. The United States also hosts 5,427 data centres—more than ten times the number in any other country—while TSMC fabricates almost every leading AI chip, creating a critical connection between U.S.-centred computing infrastructure and Taiwanese semiconductor manufacturing (Stanford HAI, 2026).

Thus, access to compute is increasingly comparable to access to industrial capacity in earlier eras. States without sufficient compute cannot easily compete at the frontier of AI, making computing infrastructure an important dimension of technological sovereignty and geopolitical power.

Energy as the Hidden Strategic Resource of AI

The strategic value of AI ultimately depends on another foundational resource: energy. The relationship can be expressed as:

AI → Data centers → Electricity → Energy infrastructure → Strategic AI capability

Advanced AI models require large data centers containing thousands of processors, cooling systems, networking equipment, and storage infrastructure. As AI adoption expands, electricity becomes an increasingly important constraint on technological development. The International Energy Agency (IEA, 2025) projects that global data-centre electricity consumption will more than double to approximately 945 TWh by 2030, with AI identified as the most important driver of this growth. Electricity demand from data centers is projected to grow by around 15% annually between 2024 and 2030, while electricity use by AI-driven accelerated servers is projected to grow by approximately 30% annually.

This creates a new AI–energy nexus. Countries seeking AI leadership require not only chips and data centres but also reliable electricity grids, generation capacity, cooling systems, and suitable locations for large-scale computing infrastructure. The IEA estimates that renewables will provide nearly half of additional electricity required by data centres over the coming years, while natural gas and nuclear power will also contribute significantly.

Energy availability therefore becomes an indirect determinant of AI power. A country may possess skilled AI researchers and access to advanced software but still face strategic limitations if electricity grids cannot support energy-intensive data centres. Water availability for cooling and the geographic location of data centres further influence infrastructure decisions. Consequently, the strategic-resource structure of the AI era extends from algorithms and chips to compute, electricity, grids, and physical infrastructure**.**

Overall, AI and semiconductors should therefore be understood as interconnected strategic resources rather than isolated technologies. AI generates economic, military, intelligence, cyber, industrial, and diplomatic capabilities, while semiconductors provide the physical foundation that makes these capabilities possible. Computational infrastructure and energy complete this ecosystem. Control over these interconnected resources increasingly determines technological sovereignty and the ability of states to exercise economic and geopolitical influence. This AI–chip–compute–energy nexus is therefore a central mechanism through which contemporary technological competition is reshaping global politics.

Global Semiconductor Value Chain and Strategic Chokepoints

The strategic importance of semiconductors cannot be understood simply by examining where chips are manufactured. Semiconductor production is a highly fragmented and internationally interconnected process involving raw materials, chip architecture, electronic-design automation (EDA) software, manufacturing equipment, wafer fabrication, packaging, testing, and distribution. This fragmentation has created a global value chain in which different economies possess specialized capabilities and consequently different forms of technological power. The same fragmentation, however, has generated strategic vulnerabilities because disruption at a small number of critical nodes can affect the entire system. The semiconductor value chain therefore represents an important example of what Farrell and Newman (2019) describe as weaponized interdependence, whereby states controlling strategically central nodes within global networks can exercise disproportionate influence over others.

Structure of the Global Semiconductor Industry

The semiconductor industry can be conceptualized as a chain extending from upstream materials and technology development to downstream manufacturing and distribution. Although firms may participate in several stages, no single economy possesses complete dominance across the entire advanced semiconductor ecosystem. This division of labor has produced efficiency and technological specialization, but it has simultaneously created dependencies that have become increasingly important in geopolitical competition.

Stage	Main function	Strategic significance
Raw materials	Silicon wafers, specialty gases, chemicals and other inputs	Determines reliability and continuity of production
Chip design	Architecture and circuit design	Determines chip performance and functionality
EDA software	Design, simulation and verification	Essential for developing complex chips
Manufacturing equipment	Lithography, deposition, etching, inspection	Determines technological sophistication of fabrication
Wafer fabrication	Producing integrated circuits on wafers	Core physical production stage
Advanced packaging	Integrating and connecting chip components	Increasingly important for AI and high-performance computing
Testing	Quality and performance verification	Ensures reliability and commercial usability
Distribution	Global movement and integration into products	Connects semiconductor production to downstream industries

At the upstream level, semiconductor production requires highly purified silicon, specialty chemicals, gases, photoresists and other materials. The design stage then converts technological requirements into chip architectures. EDA software is essential because advanced processors contain billions of transistors and require sophisticated tools for design, simulation and verification. Manufacturing equipment subsequently transforms designs into physical chips through processes involving lithography, deposition, etching, metrology and inspection. The completed wafers must then be packaged and tested before entering global distribution networks.

The strategic implication is that semiconductor power is distributed across the value chain rather than concentrated in a single activity. Consequently, a country can possess considerable manufacturing capacity while remaining dependent on foreign technology, equipment or software. This explains why contemporary semiconductor competition increasingly focuses on chokepoints rather than simply total production volume.

Major Actors in the Semiconductor Ecosystem

The United States remains particularly influential in semiconductor design, intellectual property, EDA software, AI accelerators and semiconductor manufacturing equipment. Companies such as Nvidia, AMD, Intel, Qualcomm, Synopsys and Cadence occupy important positions in different segments of the ecosystem. This gives the United States structural power even when some physical manufacturing occurs outside its territory. The importance of EDA illustrates this point: in July 2025, the U.S. Bureau of Industry and Security imposed a $95 million penalty on Cadence over unauthorized exports of EDA hardware, software and semiconductor design technology to Chinese entities associated with military and supercomputing development (Bureau of Industry and Security [BIS], 2025). Thus, U.S. technological power operates through software and intellectual-property networks as well as physical production.

Taiwan occupies a different but equally critical position. Its principal strategic advantage lies in advanced foundry manufacturing, particularly through Taiwan Semiconductor Manufacturing Company (TSMC). TSMC's importance to the AI ecosystem is demonstrated by its continued investment in leading-edge technologies. Its 2025 annual report states that 3-nanometre technology accounted for 24% of total wafer revenue, while 2-nanometre technology entered high-volume manufacturing in the fourth quarter of 2025. TSMC also reported that advanced technologies of 7 nanometres and below accounted for 74% of total wafer revenue in 2025. This makes Taiwan particularly important to the AI–semiconductor nexus because many leading AI processors depend on advanced foundry capacity.

South Korea represents another major pillar of the ecosystem, particularly in memory semiconductors and advanced manufacturing. Samsung and SK Hynix are central to DRAM and NAND production, while high-bandwidth memory (HBM) has become strategically important for AI accelerators. OECD data show that Korea has the world's largest in-production capacity for commodity memory, with approximately 4.58 million wafer starts per month (WSPM), substantially ahead of China and Japan (OECD, 2025). Consequently, Korean semiconductor power is increasingly connected to the expansion of AI computing.

Japan plays an important role in semiconductor materials, equipment and manufacturing capabilities. Its strategic significance derives from the breadth of its supporting industrial ecosystem rather than dominance over a single stage. Japanese companies provide important materials, chemicals, equipment and components required by global semiconductor manufacturers. Japan is therefore an example of how control over upstream inputs can create strategic influence even when a country is not the dominant producer of advanced logic chips.

The Netherlands possesses an especially important technological chokepoint through ASML. Extreme ultraviolet (EUV) lithography is essential for manufacturing the most advanced semiconductor features. ASML's 2025 annual report identifies EUV as a critical technology for leading-edge microchips and reports that the company shipped 48 EUV systems in 2025, alongside 279 DUV systems. The strategic significance of this capability is substantial: restrictions on access to advanced lithography equipment can directly affect a country's ability to manufacture leading-edge semiconductors.

China, meanwhile, possesses the world's largest mature-node wafer-fabrication capacity and is rapidly developing a broader domestic semiconductor ecosystem. OECD data indicate that China leads mature-node logic production capacity, with approximately 4.23 million WSPM in production. China's strategy increasingly combines domestic chip manufacturing, equipment development, AI processors and efforts to reduce dependence on foreign technology. U.S. export controls have reinforced this objective by restricting Chinese access to advanced computing semiconductors and semiconductor-manufacturing technologies (BIS, 2025). China's response therefore demonstrates how semiconductor restrictions can stimulate technological self-sufficiency efforts and intensify geopolitical competition.

Semiconductor Chokepoints

A semiconductor chokepoint is a stage of the value chain in which production or technological capability is concentrated among a limited number of firms or economies and for which immediate substitutes are difficult to obtain. Such chokepoints create strategic leverage because controlling them can influence the technological capabilities of other actors.

The principal chokepoints include Taiwan's advanced foundry capacity, ASML's advanced lithography systems, U.S.-based chip design and intellectual property, EDA software, high-bandwidth memory, advanced packaging, and specialized materials. These chokepoints demonstrate that semiconductor power cannot be measured only through the number of chips produced.

Chokepoint	Leading actor(s)	Strategic importance
Advanced foundry	Taiwan/TSMC	Production of leading-edge AI and high-performance chips
EUV lithography	Netherlands/ASML	Enables leading-edge semiconductor manufacturing
Chip design/IP	United States	Determines architecture and performance
EDA software	U.S. firms	Essential for advanced chip design
HBM	South Korea/major Asian producers	Critical for high-performance AI computing
Advanced packaging	Taiwan, South Korea, United States	Integrates high-performance computing components
Specialty materials	Japan and other specialized producers	Essential for fabrication processes

The political significance of these chokepoints is that technological interdependence can be transformed into geopolitical leverage. U.S. restrictions on advanced chips and semiconductor equipment illustrate this transformation. Rather than simply restricting trade, export controls can constrain another state's ability to develop advanced AI and computing capabilities. Semiconductor networks thus become instruments of geoeconomic statecraft (Baldwin, 1985; Blackwill & Harris, 2016).

Geographic Concentration

The semiconductor industry's strategic vulnerability is reinforced by its geographical concentration. OECD (2025) estimates that China, Chinese Taipei, Korea, Japan and the United States collectively account for approximately 87% of global in-production wafer-fabrication capacity, while the ten largest semiconductor manufacturing companies account for approximately 50% of global production capacity.

However, aggregate capacity conceals important differences between chip categories. China leads mature logic and power/discrete chips, Taiwan leads advanced logic, and Korea dominates commodity memory. For advanced logic chips, OECD estimates that Chinese Taipei has approximately 1.55 million WSPM, compared with 0.84 million in the United States and 0.39 million in China. This distinction is particularly important for this research because AI depends disproportionately on advanced logic, high-performance memory and sophisticated packaging rather than merely on total semiconductor production.

The result is a geographically fragmented but strategically interconnected system. The United States may dominate design and AI accelerators, Taiwan advanced foundry production, the Netherlands critical lithography, Korea memory, and Japan important materials and equipment. No single actor therefore controls the complete chain, but several actors control nodes that are difficult for others to replace. This is precisely what makes the semiconductor ecosystem a source of geopolitical power.

Taiwan and the Geopolitics of Semiconductors

Taiwan occupies the most politically sensitive position within the global semiconductor system because it combines exceptional advanced-foundry capabilities with its location at the centre of U.S.–China strategic competition. TSMC's technological position makes Taiwan indispensable to the production of many advanced processors required for AI, high-performance computing and other strategic technologies. Its continued investment in 2-nanometre and advanced packaging technologies further strengthens this role.

Taiwan's semiconductor position has produced the concept of the "silicon shield"—the argument that the economic and technological importance of Taiwan's semiconductor industry creates incentives for external powers to preserve its security and stability. The concept should not, however, be interpreted as a guarantee against conflict. A Taiwan Strait crisis could disrupt semiconductor manufacturing, shipping, energy supplies and access to critical components simultaneously. Because advanced semiconductor production is highly complex and geographically concentrated, even temporary disruption could generate consequences extending far beyond East Asia.

For the United States, Taiwan is therefore simultaneously a technological partner and a strategic vulnerability. For China, Taiwan's semiconductor capabilities have economic and technological importance in addition to its broader political significance. For the global economy, Taiwan represents a critical node in a system upon which AI development increasingly depends.

Consequently, the Taiwan Strait has become not merely a military and territorial flashpoint but also a global technology-security flashpoint**.**

Semiconductor Supply-Chain Vulnerabilities

The concentration and complexity of semiconductor production expose the global industry to multiple forms of disruption. Natural disasters can damage fabrication plants and supporting infrastructure; earthquakes and extreme weather can interrupt production; water shortages can constrain fabs because semiconductor manufacturing requires highly purified water; and electricity shortages can interrupt continuous fabrication processes. Taiwan and other major semiconductor-producing regions are consequently exposed to environmental and infrastructure risks.

Geopolitical risks are even more consequential. A Taiwan Strait crisis could disrupt production and maritime transportation, while sanctions and export controls can restrict access to equipment, software and advanced processors. The COVID-19 pandemic demonstrated how transportation and production disruptions can create cascading shortages across automobiles, electronics and industrial sectors. Trade restrictions have added another layer of vulnerability by fragmenting previously integrated supply networks.

The semiconductor industry is therefore characterized by a paradox: globalization created efficiency through specialization, but specialization created strategic dependence. OECD (2025) notes that the concentration of fabrication capacity and differences in process technologies create significant interdependencies across economies. Attempts to reduce these vulnerabilities are now driving industrial policies, domestic fabrication incentives, allied supply-chain initiatives and technological “de-risking.”

The strategic consequence is that semiconductor supply chains have moved from being primarily commercial networks to becoming instruments and targets of geopolitical competition. The United States' restrictions on advanced computing and semiconductor technologies, China's efforts toward technological self-sufficiency, Taiwan's investment in advanced manufacturing, Korea's expansion of memory capacity, Japan's support for semiconductor manufacturing, and European efforts to strengthen chip capabilities all reflect the same underlying transformation: semiconductor security has become an element of national security.

Therefore, the global semiconductor value chain provides a concrete mechanism through which AI and semiconductors become strategic resources. Control over advanced chips does not simply generate commercial advantage; it can influence access to AI compute, military technologies, industrial productivity and technological innovation. The combination of geographic concentration, specialized capabilities and limited substitutability creates strategic chokepoints that can be used as instruments of economic statecraft. This provides the foundation for the next section, which examines how these structural dependencies have become central to **U.S.–China AI and semiconductor rivalry**.

The United States–China AI and Semiconductor Rivalry

The United States–China rivalry has become the central empirical expression of the transformation of AI and semiconductors into strategic resources of global politics. Unlike conventional trade competition, the contemporary rivalry concerns technologies that directly affect economic productivity, military modernization, intelligence capabilities, cyber power, technological sovereignty, and future industrial competitiveness. Consequently, Washington and Beijing increasingly treat advanced chips, AI systems, semiconductor manufacturing equipment, computing infrastructure, and technological talent as components of national power. The rivalry has evolved from a broader trade and technology dispute into a competition over control of the technological foundations of the twenty-first-century international order.

Evolution of U.S.–China Technological Competition

The evolution of the rivalry can be divided into four overlapping phases. Each phase demonstrates a movement from commercial competition toward strategic technological competition, in which technological interdependence itself has become an instrument of geopolitical power.

Phase I: 2017–2019—From Trade War to Technology Competition

The first phase emerged during the Trump administration's broader trade conflict with China. The 2018–2019 tariff confrontation initially focused heavily on trade imbalances, intellectual property, technology transfer, and industrial policy, but increasingly acquired a technological-security dimension. Restrictions against Chinese telecommunications companies such as ZTE and Huawei demonstrated that Washington was prepared to use control over technological inputs to constrain Chinese firms.

Huawei became particularly significant because its position in telecommunications connected commercial technology with national-security concerns. The U.S. government's restrictions therefore established an important precedent: access to critical technologies could be treated as a national-security instrument rather than simply as a matter of market exchange. The rivalry consequently began to move from conventional trade policy toward technological statecraft, laying the foundation for subsequent semiconductor controls.

Phase II: 2020–2021—Supply-Chain Security and Technological Dependency

The second phase was shaped by increasing concern about supply-chain vulnerabilities, particularly after the COVID-19 pandemic exposed the fragility of globally dispersed semiconductor production. In 2021, the U.S. Department of Commerce reported that median semiconductor inventories held by downstream consumers had fallen from approximately 40 days in 2019 to less than five days in 2021. It warned that even a disruption lasting several weeks could potentially halt U.S. manufacturing facilities.

The semiconductor shortage therefore changed the policy debate from efficiency toward resilience. For Washington, dependence on Asian semiconductor manufacturing increasingly became an economic-security concern, while China's technological dependence on foreign chips and manufacturing equipment became an important vulnerability. This period consequently established the policy rationale for reshoring, investment screening, supply-chain diversification, and technological sovereignty.

Phase III: 2022–2024—The Semiconductor Security Era

The decisive transformation occurred in October 2022 when the U.S. Bureau of Industry and Security (BIS) introduced extensive export controls targeting China's access to advanced computing chips, supercomputing capabilities, and semiconductor manufacturing technologies. The measures restricted selected advanced computing chips, semiconductor manufacturing equipment, and U.S.-person support for certain Chinese semiconductor facilities. BIS explicitly linked these capabilities to advanced military systems, AI-enabled military applications, and China's military modernization.

The controls were strengthened in October 2023. BIS modified performance thresholds, introduced measures designed to prevent circumvention, expanded restrictions on semiconductor manufacturing equipment, and added Chinese entities to the Entity List. In April 2024, BIS further clarified and strengthened the rules, including restrictions affecting components incorporated into Chinese semiconductor-manufacturing equipment.

At the same time, Washington pursued a positive industrial strategy through the CHIPS and Science Act of 2022. The legislation established approximately $39 billion in semiconductor manufacturing incentives, supplemented by substantial loan authority and research funding. The objective was not simply to increase domestic production but to rebuild strategic manufacturing capacity and reduce vulnerability to foreign supply disruptions.

The United States consequently adopted a dual strategy:

Restriction of China's technological access + expansion of U.S. and allied technological capacity = technological containment and resilience.

This represents a major transformation in economic statecraft because the objective is no longer simply to regulate trade but to shape the technological capabilities of a geopolitical competitor.

Phase IV: 2025–2026—AI Infrastructure and Ecosystem Competition

The fourth phase has broadened the competition beyond advanced logic chips toward the wider AI ecosystem, including high-bandwidth memory (HBM), AI accelerators, data centres, AI model deployment, and computing infrastructure. In December 2024, BIS introduced controls covering 24 categories of semiconductor manufacturing equipment, three types of software tools, and HBM**,** while adding 140 Chinese entities to the Entity List. BIS explicitly identified HBM as critical to AI training and inference at scale.

In January 2025, Washington also introduced a framework governing the international diffusion of advanced AI technologies and computing chips. However, the Trump administration rescinded the Biden-era AI Diffusion Rule in May 2025 and simultaneously announced additional semiconductor-related controls and guidance concerning Chinese AI chips and diversion risks.

The rivalry has therefore entered a new stage in which the strategic contest concerns not merely who manufactures chips, but who controls the complete AI infrastructure: advanced processors, HBM, semiconductor equipment, data centres, cloud computing, AI models, software ecosystems, and technological standards.

U.S. Strategy

U.S. strategy combines technological leadership, domestic industrial policy, export controls, investment screening, and alliance-based supply-chain restructuring. The underlying objective is to preserve U.S. technological advantages while preventing advanced technologies from significantly strengthening China's military and strategic capabilities.

The CHIPS Act represents the domestic pillar of this strategy. The United States has sought to attract advanced semiconductor manufacturing by combining subsidies, tax incentives, research support and private investment. In November 2024, the Department of Commerce awarded TSMC Arizona up to $6.6 billion in direct CHIPS funding to support more than $65 billion of planned investment in three leading-edge fabs in Arizona. Samsung subsequently received up to $4.745 billion, supporting more than $37 billion in planned U.S. semiconductor investment. Intel received up to $7.865 billion in direct funding for projects across several U.S. states.

These policies demonstrate that Washington increasingly regards semiconductor manufacturing as strategic infrastructure comparable to other national-security capabilities. The United States is consequently attempting to reconstruct domestic capacity while retaining leadership in design, AI accelerators, software, intellectual property, equipment, and research.

The second pillar is export control. Washington has attempted to restrict China's access to the most strategically important semiconductor chokepoints while coordinating restrictions with allies such as Japan and the Netherlands. This reflects the recognition that unilateral controls are less effective when alternative suppliers can provide equivalent technology. The resulting strategy can therefore be characterized as "small yard, high fence": restricting a strategically important technological frontier while attempting to maintain broader commercial engagement.

The third pillar is supply-chain "friend-shoring." Rather than completely abandoning globalization, Washington seeks to relocate strategically sensitive production toward the United States and trusted partners. This approach is important because complete technological decoupling would be economically costly and difficult to achieve. The emerging objective is therefore selective technological decoupling combined with allied technological integration.

U.S. Semiconductor Export Controls

U.S. semiconductor export controls constitute the most direct example of technology being transformed into an instrument of geopolitical power. Their logic can be represented as:

Economic instrument → Technology denial → Capability constraint → Strategic containment → National-security policy

The October 2022 controls represented a fundamental change because they targeted not only finished chips but also the capacity to manufacture advanced chips. The United States restricted advanced computing chips, certain semiconductor manufacturing equipment, supercomputer-related transactions, and U.S.-person support for specified Chinese semiconductor facilities.

The October 2023 controls strengthened this approach by closing loopholes and expanding equipment restrictions. BIS stated that the revised measures were designed to restrict China's ability both to purchase advanced computing chips and manufacture advanced chips.

The December 2024 package went further by targeting HBM and additional manufacturing technologies. This is strategically significant because HBM is an essential component of modern AI accelerators. By controlling both advanced processors and critical memory technologies, Washington increasingly targets the computational infrastructure required for frontier AI rather than only individual semiconductor products.

The controls demonstrate the operation of weaponized interdependence (Farrell & Newman, 2019). The United States does not need to produce every component itself; instead, it can exercise power through its position within networks of design software, intellectual property, manufacturing equipment, semiconductor firms, and allied technological systems. Export controls therefore convert economic centrality into geopolitical leverage.

However, the policy also produces unintended consequences. Restrictions create incentives for China to develop domestic substitutes, diversify suppliers, improve AI efficiency, and invest more heavily in indigenous semiconductor capabilities. Consequently, export controls may constrain China's short-term access to leading-edge technology while simultaneously strengthening its long-term incentives for technological self-reliance.

China's Technological Strategy

China's response is centered on technological self-reliance, semiconductor localization, state-directed investment, domestic AI development, and the construction of alternative technological ecosystems. The objective is not necessarily immediate technological parity across every frontier but the reduction of vulnerabilities created by dependence on U.S. and allied technologies.

The strategic foundations were established before the recent export controls. China's Made in China 2025 program identified semiconductors and advanced information technologies as priority industries and sought to reduce dependence on foreign technologies. China's semiconductor strategy subsequently expanded through the National Integrated Circuit Industry Investment Fund, often referred to as the "Big Fund."

The scale of state support illustrates the strategic importance Beijing attaches to semiconductors. In May 2024, China established the third phase of the Big Fund with registered capital of approximately 344 billion yuan ($47.5 billion), making it the largest of the three phases. The fund is particularly important because it seeks to support semiconductor manufacturing and related technological capabilities at a time when U.S. export controls have increased China's vulnerability.

China's strategy also involves firms such as Huawei and SMIC, domestic AI accelerator development, indigenous EDA capabilities, and domestic semiconductor-manufacturing equipment. Huawei has become particularly important because it represents China's attempt to connect domestic chip design, AI computing, telecommunications and device ecosystems. SMIC, meanwhile, remains central to China's foundry ambitions.

Nevertheless, China's technological self-reliance remains incomplete. A 2025 U.S.-China Economic and Security Review Commission assessment found that China had fallen short of several semiconductor localization targets and remained significantly dependent on foreign technologies in advanced semiconductor manufacturing equipment. It estimated that China-based equipment manufacturers supplied only about 16% of domestic equipment demand in the third quarter of 2024. This demonstrates that technological sovereignty is not simply a matter of financial investment; it requires accumulated expertise, intellectual property, equipment ecosystems and technological learning.

China's Response to U.S. Controls

China's response can be understood as an attempt to transform technological vulnerability into accelerated domestic capability. The first response has been localization. Chinese firms and policymakers increasingly seek domestic substitutes for foreign chips, equipment, EDA software and other critical technologies.

The second response is technological efficiency. Restrictions on access to the most advanced computing hardware encourage Chinese AI firms to obtain greater performance from fewer or less advanced chips. The emergence of highly competitive Chinese AI models despite constrained access to frontier hardware illustrates this strategy. Stanford's 2026 AI Index reports that the U.S.–China model-performance gap had effectively closed by early 2026; Chinese and U.S. models repeatedly exchanged the lead, while DeepSeek-R1 briefly matched the leading U.S. model in February 2025.

The third response involves alternative technological ecosystems. Chinese firms increasingly seek domestic suppliers and reduce reliance on U.S.-controlled technologies. The fourth is strategic investment. Beijing has expanded funding for semiconductor manufacturing, equipment and domestic AI capabilities. Recent analysis indicates that U.S. and allied export controls have accelerated rather than eliminated China's localization drive, particularly in domestic semiconductor equipment and design.

This produces an important paradox for the research argument: export controls can reduce a competitor's access to existing technological capabilities while simultaneously encouraging the development of alternative capabilities. Thus, technological containment may slow China's progress at the frontier without necessarily preventing the emergence of a competing technological ecosystem.

The AI Dimension of U.S.–China Competition

The semiconductor rivalry ultimately matters because semiconductors constitute the hardware foundation of AI power. The competition is therefore increasingly measured through AI models, computing infrastructure, private investment, semiconductor design, research, patents, and technological ecosystems.

The quantitative evidence shows that neither country can now be described simply as the uncontested leader. Stanford's 2025 AI Index reported that U.S.-based institutions produced 40 notable AI models in 2024 compared with China's 15, while Chinese models had rapidly narrowed performance differences on major benchmarks. The same report found that U.S. private AI investment reached $109.1 billion in 2024, nearly twelve times China's $9.3 billion.

By 2025, the scale of U.S. private investment had become even more pronounced. Stanford's 2026 AI Index estimates U.S. private AI investment at $285.9 billion, compared with $12.4 billion in China, although it cautions that private-investment figures understate China's total AI spending because of government guidance funds.

China nevertheless possesses important structural advantages. It leads the United States in AI publication volume, citations, patent grants and industrial robot installations, while U.S. firms retain an advantage in frontier model development and higher-impact patents. In 2025, U.S. organizations produced 59 notable AI models compared with China's 35. Most importantly, the performance gap has narrowed substantially: by March 2026, Stanford reported that the leading U.S. model led the leading Chinese model by only 2.7% on its comparative measure.

The AI competition therefore increasingly reflects two different but overlapping models of technological power. The United States possesses major advantages in frontier AI companies, private capital, chip design, advanced software, semiconductor equipment and international technological alliances. China possesses enormous industrial capacity, a large domestic market, extensive state support, strong AI research output, growing semiconductor capabilities and a political commitment to technological self-reliance.

The strategic consequence is that the U.S.–China competition is no longer adequately described as a conventional race for technological leadership. It is a contest over technological ecosystems**.** The United States seeks to preserve its position at critical global chokepoints while relocating sensitive production and coordinating allied restrictions. China seeks to reduce dependence on those chokepoints by developing domestic alternatives and exploiting its scale in manufacturing, research and domestic demand.

The rivalry consequently reinforces the central proposition of this study: AI and semiconductors have become strategic resources because control over them increasingly determines the distribution of economic, military and geopolitical power**.** The United States' ability to restrict advanced chips, manufacturing equipment, EDA technologies and HBM demonstrates how technological networks can be converted into instruments of statecraft. China's response demonstrates the opposite side of the same process: dependence on foreign technological chokepoints creates powerful incentives for technological sovereignty and ecosystem localization.

Thus, the emerging technological order is neither complete decoupling nor a return to unrestricted globalization. Instead, it is characterized by selective decoupling, strategic interdependence, technological nationalism, allied supply-chain integration and competing AI ecosystems. This transformation provides the basis for the following section's analysis of technology nationalism and industrial policy, where the broader return of state intervention in strategic technologies is examined.

The New Era of Technology Nationalism and Industrial Policy

The intensification of U.S.–China competition has fundamentally changed the relationship between markets, technology, and the state. For much of the post-Cold War period, semiconductor production was organized around global specialization, cost efficiency, and geographically dispersed supply chains. States generally allowed firms to locate production where economic advantages were greatest, while international trade facilitated access to technology and components. However, repeated supply-chain disruptions, geopolitical tensions, and the strategic importance of AI and advanced semiconductors have altered this model. Semiconductors are now treated as critical infrastructure because they underpin AI, telecommunications, defence, automobiles, robotics, aerospace, and data centres. The resulting transformation can be summarized as:

Globalization → Supply-chain vulnerability → Economic security → Strategic industrial policy → Technological sovereignty.

Industrial policy has therefore returned not simply as a mechanism for economic development but as an instrument through which states seek to protect strategic technological capabilities and reduce dependence on geopolitical competitors.

From Free-Market Globalization to Strategic Industrial Policy

The globalization of semiconductor production generated significant economic efficiencies by distributing different stages of production across countries according to comparative advantage. The United States developed strengths in chip design and intellectual property, Taiwan in advanced foundry manufacturing, South Korea in memory, Japan in materials and equipment, and the Netherlands in advanced lithography. This specialization allowed firms to minimize costs while benefiting from technological concentration.

However, the same specialization generated vulnerabilities. The COVID-19 pandemic demonstrated how disruptions in manufacturing and transportation could create global shortages, while U.S.–China tensions demonstrated that governments could use technological dependencies as instruments of geopolitical pressure. OECD (2025) emphasizes that semiconductor production is highly geographically concentrated and that limited substitutability at important stages can create bottlenecks. Consequently, governments increasingly interpret dependence on foreign semiconductor ecosystems as an economic-security risk rather than merely a commercial relationship.

This transformation has produced a new form of technology nationalism. Governments increasingly subsidize domestic fabs, support research and development, protect strategic technologies, screen foreign investment, and coordinate supply chains with politically trusted partners. Baldwin's (1985) concept of economic statecraft is particularly relevant because economic instruments are increasingly being used to pursue strategic objectives. Similarly, Blackwill and Harris (2016) demonstrate how states can employ economic capabilities to advance geopolitical interests.

The objective is therefore not necessarily to eliminate globalization but to restructure technological globalization around security considerations. States seek sufficient domestic or allied capacity to withstand geopolitical disruption while retaining access to global markets. This is particularly important for AI because loss of advanced semiconductor access can directly constrain national computing and AI capabilities.

U.S. CHIPS Policy

The United States represents the clearest example of the shift toward strategic semiconductor industrial policy. The CHIPS and Science Act of 2022 allocated approximately $52.7 billion to strengthen the U.S. semiconductor ecosystem, including approximately $39 billion in semiconductor manufacturing incentives, $11 billion for semiconductor research and development, and additional funding for workforce development and related activities (U.S. Department of Commerce, 2022).

The policy responds to a structural problem: the United States retained major advantages in semiconductor design and technology but had become heavily dependent on overseas fabrication. CHIPS policy therefore seeks to rebuild domestic manufacturing while preserving U.S. leadership in design, research, AI and advanced semiconductor technologies. This is directly connected to the paper's central argument because semiconductor manufacturing capacity is increasingly regarded as a prerequisite for technological sovereignty.

The scale of investment demonstrates this strategic shift. By the end of 2024, the U.S. Department of Commerce had announced major CHIPS awards to firms including TSMC, Samsung and Intel. TSMC Arizona was awarded up to $6.6 billion in direct CHIPS funding to support more than $65 billion in planned investment across three advanced fabs. Samsung received up to $4.745 billion for more than $37 billion in planned U.S. semiconductor investment, while Intel received up to $7.865 billion in direct funding. (U.S. Department of Commerce, 2024a, 2024b, 2024c).

The policy is not limited to physical fabs. It also addresses semiconductor research, advanced packaging, workforce development and technological ecosystems. This reflects the reality identified in earlier sections: semiconductor power depends on interconnected capabilities rather than fabrication alone. The United States therefore seeks to strengthen the entire ecosystem necessary to support AI and advanced computing.

CHIPS policy also has an explicit national-security dimension. The U.S. government increasingly views advanced semiconductor capacity as essential for defence systems, AI-enabled military technologies, communications and critical infrastructure. Accordingly, subsidies are combined with restrictions on recipients' expansion of advanced semiconductor manufacturing in countries of concern. This combination of investment incentives and technological restrictions represents a sophisticated form of geoeconomic statecraft.

European Chips Act

The European Union has similarly responded to technological dependence through the European Chips Act, which seeks to strengthen Europe's semiconductor capabilities and resilience. The EU has mobilized approximately €43 billion in public and private investment through the Chips Act framework, with the objective of increasing Europe's semiconductor ecosystem and reducing vulnerabilities in global supply chains (European Commission, 2023).

The EU's stated ambition is to double Europe's share of global semiconductor production to 20% by 2030. The strategy focuses on strengthening research and technological leadership, supporting advanced manufacturing, improving semiconductor design capabilities, developing advanced packaging, and establishing mechanisms for monitoring and responding to supply-chain disruptions.

The European approach differs somewhat from the U.S. strategy because Brussels emphasizes strategic autonomy rather than complete technological independence. The EU recognizes that Europe cannot efficiently reproduce every stage of the semiconductor chain domestically. Instead, it seeks to strengthen strategic capabilities while maintaining international partnerships.

This distinction is important for the present research. Technology sovereignty does not necessarily mean autarky. In an industry as internationally interconnected as semiconductors, sovereignty is better understood as the ability to maintain secure access, technological capacity and strategic choice even when international relations deteriorate.

China's Semiconductor Industrial Policy

China represents the most extensive example of state-led semiconductor industrial policy. Beijing has long regarded semiconductors as strategic technologies, but U.S. export controls have intensified the political priority attached to technological self-reliance. China's strategy combines state funding, industrial planning, domestic procurement, support for national champions, technological research and efforts to localize manufacturing equipment and design capabilities.

The National Integrated Circuit Industry Investment Fund, commonly known as the Big Fund**,** represents a central component of this strategy. In May 2024, China established its third Big Fund with registered capital of approximately 344 billion yuan (about US$47.5 billion), making it the largest of the three phases. The fund is designed to support semiconductor manufacturing and related technologies. (Reuters, 2024).

China's industrial strategy is particularly significant because it attempts to address multiple technological dependencies simultaneously. These include advanced chip manufacturing, semiconductor equipment, EDA software, materials, AI accelerators and memory technologies. Chinese firms such as SMIC and Huawei have consequently become central to Beijing's effort to construct a more autonomous semiconductor ecosystem.

Nevertheless, technological self-reliance remains a long-term project rather than an achieved condition. China's substantial strength in mature-node manufacturing does not automatically translate into complete leadership in advanced-node production, lithography or semiconductor equipment. The strategic objective is therefore to reduce dependence over time while exploiting China's enormous domestic market to support indigenous technological development.

This creates an important feedback mechanism:

U.S. technological restrictions → Chinese technological vulnerability → state investment → domestic substitution → ecosystem localization → reduced future dependence.

Thus, export controls and industrial policy reinforce one another, contributing to the broader fragmentation of the global semiconductor system.

Japan and South Korea

Japan has launched a semiconductor renaissance designed to restore its position within strategically important parts of the global semiconductor ecosystem. Japan already possesses considerable strengths in semiconductor materials, chemicals, manufacturing equipment and precision technologies. Rather than attempting to reproduce the entire value chain, Tokyo has concentrated on areas where it possesses technological advantages while supporting domestic advanced manufacturing.

A major component of this strategy is Rapidus, a Japanese company established to develop advanced logic semiconductor manufacturing. Japan's Ministry of Economy, Trade and Industry (METI) selected Rapidus for additional government financial support as part of its next-generation semiconductor strategy. The Japanese government provided approximately ¥100 billion in additional support from the FY2025 budget, demonstrating that semiconductor capacity has become a strategic national priority (METI, 2025).

Japan has also sought to attract foreign investment and strengthen partnerships with major international semiconductor producers, including TSMC. The construction of TSMC facilities in Japan's Kumamoto region reflects Japan's attempt to combine domestic industrial capabilities with global technological networks. This approach illustrates the emerging model of allied technological integration, in which states strengthen domestic capabilities while simultaneously embedding them within trusted international supply chains.

South Korea occupies a different strategic position because of its dominant role in memory semiconductors. Samsung and SK Hynix are particularly important in DRAM, NAND and high-bandwidth memory. HBM has become strategically significant because advanced AI accelerators require extremely high memory bandwidth to process large AI workloads.

South Korea's semiconductor strategy therefore increasingly connects traditional memory leadership with the rapidly expanding AI market. The AI boom is transforming HBM from a specialized memory product into a strategic component of computational infrastructure. Korea's position gives it considerable leverage within the emerging AI–semiconductor ecosystem, while also exposing it to geopolitical and supply-chain pressures.

Japan and South Korea consequently demonstrate that technology sovereignty does not require complete national self-sufficiency. Both countries seek to protect and expand their strategic technological strengths while remaining integrated into broader U.S.-led and global semiconductor networks.

Technology Sovereignty

The rise of industrial policy has produced a broader concept of technology sovereignty, referring to a state's ability to maintain sufficient control, capability and strategic autonomy over technologies essential to its economic and national-security interests. In the context of this research, technology sovereignty has several interconnected dimensions.

Concept	**Meaning**	**Relevance to AI and semiconductors**
Digital sovereignty	Capacity to control critical digital infrastructure and data	Protects national digital systems
AI sovereignty	Ability to develop and deploy AI with limited external dependence	Supports strategic autonomy
Semiconductor sovereignty	Secure access to critical chip technologies and production	Protects AI, defence and industry
Strategic autonomy	Ability to make strategic decisions without excessive external dependence	Reduces geopolitical vulnerability
Technological autonomy	Domestic capacity to develop critical technologies	Limits exposure to technological coercion

AI sovereignty depends heavily on semiconductor sovereignty because advanced AI cannot be separated from computational hardware. Similarly, semiconductor sovereignty cannot be achieved simply by building fabs; it requires access to design software, equipment, materials, intellectual property, skilled labour, energy and advanced packaging. This means that sovereignty in the AI era is fundamentally ecosystem-based.

The concept also challenges the traditional assumption that economic interdependence necessarily reduces geopolitical conflict. Farrell and Newman (2019) demonstrate that interdependence can create asymmetric network power, while Strange (1996) emphasizes that structural power derives from the ability to shape the structures within which others operate. The semiconductor ecosystem illustrates both arguments: states controlling central technological nodes can influence the options available to others.

Consequently, contemporary technology nationalism should not be understood simply as protectionism. It represents an attempt to transform technological dependence into strategic resilience. The United States seeks to strengthen domestic production and allied networks; the EU seeks strategic autonomy; China seeks technological self-reliance; Japan seeks to rebuild advanced manufacturing; and South Korea seeks to maintain its strategic position in memory and AI-related semiconductors.

The broader implication is that AI and semiconductor competition is driving a transformation from market-centred globalization toward security-centred technological globalization. States are no longer evaluating semiconductor production solely according to efficiency and commercial profitability. They increasingly evaluate it according to whether it contributes to national resilience, military capability, technological sovereignty and geopolitical influence.

This transformation is central to the argument of this research. AI and semiconductors have become strategic resources precisely because governments increasingly believe that dependence on external technological ecosystems can translate into geopolitical vulnerability. The return of industrial policy is therefore not an isolated economic phenomenon; it is a structural response to the emergence of technology as a major source of international power.

Technology Alliances and the Fragmentation of Globalization

The growing strategic importance of AI and semiconductors is transforming the structure of globalization. Semiconductor production was historically organized around highly specialized global supply chains in which firms located different stages of production according to technological capability and economic efficiency. However, the U.S.–China technological rivalry, pandemic-related disruptions, export controls, and concerns about strategic dependence have encouraged governments to reorganize these networks around political trust and national-security considerations. The emerging pattern is not the disappearance of globalization but its strategic reconfiguration. Supply chains are increasingly being reshaped through reshoring, near-shoring, friend-shoring, allied production and technological partnerships. This transformation is significant for the present research because control over trusted technological networks increasingly determines access to AI computing, advanced semiconductors and, consequently, geopolitical power.

From Global Supply Chains to "Friend-Shoring"

"Friend-shoring" refers to the relocation or diversification of strategically important production toward countries considered politically reliable or aligned with the interests of the investing state. It differs from reshoring, which brings production back to the home country; near-shoring, which moves production to geographically close countries; and conventional outsourcing, which primarily prioritizes economic efficiency. Friend-shoring combines economic considerations with geopolitical trust.

The shift toward friend-shoring is a direct consequence of the strategic-resource character of semiconductors. If advanced chips are essential for AI, defence, telecommunications and industrial competitiveness, governments have incentives to ensure that their supply does not depend excessively on potential geopolitical rivals. The logic is therefore moving from "Where can chips be produced most efficiently?" toward "Where can strategically important chips be produced securely?"

This does not mean that economic efficiency has disappeared. Semiconductor manufacturing remains extraordinarily expensive and technologically specialized, making complete relocation impractical. Instead, states increasingly seek a balance between efficiency and resilience. This produces what may be termed managed interdependence, in which governments accept international specialization but attempt to ensure that critical dependencies are concentrated among trusted partners.

U.S. Technology Alliances

The United States has developed the most extensive network of technological partnerships designed to strengthen semiconductor and AI supply-chain resilience. The objective is not simply to increase domestic production but to connect U.S. technological strengths with complementary capabilities in Japan, South Korea, Taiwan, the Netherlands and other partners.

The United States–Japan relationship is particularly important because Japan possesses significant capabilities in semiconductor materials, chemicals and manufacturing equipment. Cooperation allows Washington to complement its strengths in chip design, AI accelerators and semiconductor technology with Japanese upstream capabilities. Japan's efforts to rebuild advanced semiconductor manufacturing through Rapidus further strengthen this technological partnership.

The United States–South Korea relationship is similarly important because Samsung and SK Hynix are major producers of memory semiconductors, including HBM, which has become critical for AI accelerators. The expansion of Korean semiconductor investment in the United States therefore contributes to diversification while strengthening the integration of Korean manufacturing with the U.S. technological ecosystem.

The United States–Taiwan relationship is perhaps the most strategically important because TSMC occupies a central position in advanced foundry manufacturing. TSMC's U.S. investment represents an attempt to geographically diversify advanced production while maintaining the company's Taiwanese technological ecosystem. In December 2024, TSMC announced that it would increase its planned U.S. investment from $65 billion to $165 billion, adding three additional fabrication facilities, two advanced packaging facilities and an R&D centre in Arizona. This illustrates how allied production can simultaneously strengthen U.S. domestic capacity and reduce geographic concentration.

The Netherlands is strategically important because ASML possesses unique capabilities in advanced lithography. U.S.–Dutch cooperation over export controls demonstrates that semiconductor security increasingly depends on coordinating access to critical technological chokepoints rather than merely restricting finished chips. This is a clear manifestation of the paper's argument that geopolitical power increasingly derives from control over technological networks.

At the multilateral level, the G7 has increasingly treated economic security, semiconductor resilience, critical technologies and supply-chain diversification as strategic priorities. The broader Indo-Pacific network—including cooperation with Japan, South Korea, Taiwan, Australia and India—creates a wider technological environment intended to reduce dependence on China in strategically sensitive sectors.

These relationships should therefore be understood as technology alliances as much as conventional diplomatic partnerships. Their significance lies in linking complementary capabilities across the AI–semiconductor ecosystem.

Semiconductor Supply-Chain Diversification

Supply-chain diversification has already produced visible changes in the geographical distribution of semiconductor investment. The United States has attempted to rebuild domestic advanced manufacturing through the CHIPS Act, while simultaneously attracting major foreign producers.

TSMC's Arizona expansion is the clearest example. Its planned U.S. investment of up to $165 billion demonstrates the scale at which governments and firms are attempting to redistribute advanced semiconductor production. Samsung has also expanded its U.S. presence, while Intel continues investment in domestic advanced manufacturing.

Japan represents another diversification centre. Government support for Rapidus aims to restore domestic advanced logic production, while TSMC's investment in Japan strengthens the country's role in global semiconductor manufacturing. Japan's strategy therefore combines domestic technological revival with integration into trusted international supply chains.

Europe is similarly attempting to increase semiconductor manufacturing and research capabilities through the European Chips Act. The EU has mobilized approximately €43 billion in public and private investment and has set the objective of reaching a 20% global semiconductor market share by 2030 (European Commission, 2023).

India has also begun positioning itself as an emerging semiconductor manufacturing and packaging hub. The Indian government approved a semiconductor manufacturing policy framework that provides substantial fiscal support for fabrication, packaging and related facilities. In 2024, Tata Electronics and Powerchip Semiconductor Manufacturing Corporation announced plans for a major semiconductor fabrication facility in Gujarat, while Micron established a semiconductor assembly and test facility in the country. These initiatives indicate India's attempt to move beyond its traditional role in software and services toward strategic participation in hardware production.

The resulting geographical pattern is increasingly diversified:

Location	Major diversification role
United States	Advanced fabs, AI chips, research and design
Taiwan	Advanced foundry and leading-edge technology
Japan	Materials, equipment and advanced manufacturing
South Korea	Memory and HBM
Netherlands	Advanced lithography
Europe	Research, equipment and manufacturing
India	Emerging fabrication, assembly and testing

Southeast Asia	Packaging, assembly and supply-chain diversification

This diversification does not eliminate dependence; instead, it redistributes dependence across a larger network of strategically aligned economies**.**

Fragmentation of Technological Ecosystems

The reorganization of semiconductor supply chains raises the possibility of increasingly distinct technological ecosystems. Three broad configurations can be identified.

Emerging ecosystem	Core actors	Principal characteristics
Western/allied ecosystem	United States, Europe, Japan, South Korea, Taiwan and partners	Advanced AI, chip design, equipment, manufacturing and coordinated controls
China-centred ecosystem	China and domestic suppliers with selected external partners	Localization, self-reliance and alternative technological infrastructure
Middle-power/autonomous ecosystem	India, Gulf states, Southeast Asia and other emerging economies	Diversification, strategic autonomy and multi-alignment

The Western-led ecosystem possesses major advantages across the semiconductor value chain, including U.S. chip design and AI firms, Taiwanese advanced manufacturing, Korean memory, Japanese materials and Dutch lithography. Its major strategic advantage is therefore ecosystem complementarity.

The China-centred ecosystem is developing in response to technological restrictions. China's enormous domestic market, state investment, manufacturing capabilities and growing domestic AI sector provide the foundation for a more autonomous system. However, China's continued dependence on several foreign technologies demonstrates that complete separation has not yet occurred.

A third category consists of middle powers seeking technological autonomy without fully joining either technological bloc. India, Gulf states and Southeast Asian economies have opportunities to attract investment by positioning themselves as alternative manufacturing, data-centre, logistics and technology hubs. Their strategy is likely to involve multi-alignment rather than exclusive bloc membership**.**

This emerging fragmentation has significant implications for global politics. If technological ecosystems become increasingly separated, standards, software platforms, semiconductor architectures, AI models and supply chains could develop along competing geopolitical lines. The result would be a more fragmented technological order in which technological compatibility increasingly reflects political alignment.

Is Globalization Ending?

The evidence does not support the conclusion that globalization is simply ending. Complete technological decoupling would be extremely difficult because semiconductor production remains deeply interdependent. No major economy currently controls every stage of the value chain. Advanced chip production depends on a network involving U.S. design technologies, Dutch lithography, Japanese materials, Taiwanese foundries, Korean memory and numerous other suppliers.

The more accurate description is therefore de-risking rather than complete decoupling. Decoupling seeks substantial separation between competing technological systems, whereas de-risking seeks to reduce excessive dependence while maintaining economically valuable international connections.

The semiconductor industry makes complete decoupling particularly difficult because production requires enormous capital investment, highly specialized expertise and globally distributed inputs. Even countries pursuing technological sovereignty continue to depend on foreign suppliers in important segments. Consequently, the emerging order is likely to resemble fragmented globalization rather than deglobalization.

This fragmentation nevertheless has strategic consequences. Globalization previously encouraged countries to optimize production through international specialization; the emerging model increasingly encourages them to optimize for security, resilience and political trust. The result is a restructuring of interdependence in which technological networks remain global but become more politically segmented.

For AI, this transformation is particularly consequential. Access to advanced AI increasingly depends on access to advanced processors, HBM, data centres, cloud infrastructure, energy and specialized software. If these resources become concentrated within competing technological ecosystems, the distribution of AI capability will increasingly reflect geopolitical alignment. Consequently, the fragmentation of semiconductor globalization can become a mechanism through which the global distribution of AI power itself becomes fragmented.

The central conclusion is therefore that globalization is not disappearing; it is becoming securitized. Semiconductor supply chains are being reorganized from purely efficiency-oriented networks into strategically managed networks. Friend-shoring, allied production and technological diversification are creating greater resilience for some states while simultaneously increasing the possibility of technological fragmentation. This represents another important stage in the transformation of AI and semiconductors from commercial technologies into strategic resources of global politics.

AI, Semiconductors and Military/Strategic Power

The strategic importance of AI and semiconductors extends beyond economic competition into the domain of military power. Modern armed forces increasingly depend on advanced computing, sensors, communications, autonomous systems, precision weapons and information networks, all of which require sophisticated semiconductors. AI adds another layer by transforming large quantities of data into predictions, classifications and decision-support capabilities. Consequently, the relationship can be represented as:

Semiconductors → Computing power → AI capability → Military effectiveness → Strategic power.

This relationship explains why major powers increasingly regard access to advanced chips and computing infrastructure as a national-security requirement rather than simply a commercial concern.

AI and Military Transformation

AI is transforming military affairs primarily by increasing the speed and scale at which information can be processed and decisions can be supported. AI-enabled intelligence systems can process satellite imagery, signals, battlefield information and other large datasets much faster than conventional human analysis. This can improve situational awareness and allow commanders to identify patterns that may otherwise remain difficult to detect. Horowitz (2018) argues that AI can influence the balance of power because states that successfully integrate AI into military systems may acquire advantages in decision-making, intelligence and operational effectiveness.

Autonomous and semi-autonomous systems represent another important dimension. AI can support unmanned aerial vehicles, autonomous navigation, target recognition, logistics and battlefield surveillance. Drones equipped with increasingly sophisticated sensors and computational systems can collect and process information while reducing the need to expose human personnel to certain risks. The strategic importance of such systems is therefore not simply their autonomy but their ability to combine sensing, computation and decision-support at operational speed.

AI is also becoming relevant to cyber and electronic warfare. Machine-learning systems can identify anomalies, detect malicious network activity, classify signals and assist defensive responses. In electronic warfare, AI can help process complex electromagnetic information and identify patterns in hostile signals. Similarly, AI-enabled battlefield-management systems can integrate information from multiple sensors and communication networks to provide commanders with a more comprehensive operational picture.

Military domain	**AI contribution**	**Strategic effect**
Intelligence	Data and imagery analysis	Faster information processing
Surveillance	Object and pattern recognition	Improved situational awareness
Autonomous systems	Navigation and target recognition	Greater operational speed

Cyber warfare	Threat detection and response	Enhanced cyber resilience/offence
Electronic warfare	Signal classification	Faster electromagnetic decision-making
Battlefield management	Data integration	Improved command decisions
Drones	Autonomous/semi-autonomous functions	Persistent surveillance and strike capability
Missile systems	Guidance and decision support	Greater precision and responsiveness

The strategic significance of AI therefore derives from its ability to function as a force multiplier. It does not necessarily replace conventional military capabilities; rather, it can make existing platforms, sensors, weapons and command systems more effective. This is why AI leadership is increasingly connected to broader technological leadership.

Semiconductor Dependence of Modern Military Systems

AI-enabled military systems cannot operate without advanced computing hardware, making semiconductors the physical foundation of modern military technology. Advanced radar systems require high-performance processors to process signals; missiles require sophisticated guidance and control electronics; satellites depend on radiation-tolerant and high-performance chips; drones require processors, sensors and communication systems; fighter aircraft rely on complex avionics; and command-and-control networks depend on secure computing and communications infrastructure.

This dependence explains why semiconductor export controls have become national-security instruments. U.S. export-control documents explicitly identify advanced computing and semiconductor capabilities as relevant to applications including military decision-making, autonomous systems, radar, signals intelligence and electronic warfare. The October 2022 BIS controls stated that advanced computing capabilities could support military applications, including AI-enabled military systems, while restrictions on semiconductor manufacturing capabilities were justified partly by their relevance to military modernization (Bureau of Industry and Security [BIS], 2022).

This demonstrates an important connection to the paper's central argument. If semiconductors underpin both civilian AI and advanced military systems, then controlling semiconductor technology can influence the future military capabilities of other states. Semiconductor supply chains consequently become part of strategic competition, while technological chokepoints become potential instruments of national-security policy.

AI as a Force Multiplier

The strategic relationship can be conceptualized through a four-stage chain:

Semiconductors → Compute → AI → Military Advantage

Semiconductors provide the hardware; computing infrastructure provides processing capacity; AI transforms computational capacity into analytical and decision-making capability; and military organizations integrate these capabilities into operational systems.

The significance of this chain is that superiority at one level can reinforce superiority at subsequent levels. Access to advanced semiconductors allows states and firms to build more powerful computing systems. Greater computing capacity facilitates more sophisticated AI training and inference. More capable AI can improve intelligence, surveillance, autonomous systems and command-and-control. These capabilities can then enhance military effectiveness.

Stanford HAI (2026) estimates that global AI compute capacity has grown approximately 3.3 times annually since 2022, reaching 17.1 million H100-equivalent units. Nvidia accounts for more than 60% of total AI compute, illustrating the concentration of the hardware foundation upon which advanced AI increasingly depends. The United States also hosts 5,427 data centres, more than ten times any other country. These concentrations have strategic significance because military AI capabilities ultimately depend upon access to advanced processors and computing infrastructure.

The concept of AI as a force multiplier therefore helps explain why the U.S.–China semiconductor rivalry has direct military consequences. Restrictions on advanced chips can potentially constrain a competitor's ability to develop high-performance AI systems, while domestic semiconductor development can increase the capacity to integrate AI into military technologies.

Strategic Stability and Arms Competition

The military application of AI introduces both opportunities and risks for strategic stability. An AI arms race may emerge when states fear that falling behind in AI-enabled military capabilities could produce significant strategic disadvantages. This creates incentives for rapid investment, even when governments remain uncertain about the reliability or consequences of deploying advanced AI.

One major concern is decision-making speed. AI can shorten the time required to process information and recommend actions. While faster decision-making can improve military effectiveness, it can also compress the time available for human deliberation during crises. If autonomous or semi-autonomous systems interact rapidly with one another, an incident could escalate before political leaders fully understand what is occurring.

A second concern is uncertainty. States may have difficulty assessing the capabilities of another state's AI systems because algorithms, training data, computing capabilities and military applications can be partly opaque. This uncertainty can generate worst-case assumptions and intensify arms competition. Horowitz (2018) argues that AI's impact on international politics depends partly on how states perceive the military advantages associated with AI and whether technological diffusion changes the balance of power.

A third issue concerns autonomous systems and escalation. If AI-enabled drones, cyber systems or electronic-warfare platforms operate with increasing degrees of autonomy, responsibility and control become more complicated. The strategic problem is not only whether AI systems are technically capable but whether human decision-makers can maintain meaningful control during high-speed conflict.

AI therefore creates a paradox for deterrence and strategic stability. States may acquire stronger military capabilities through AI while simultaneously increasing uncertainty and escalation risks. The strategic advantage of AI is consequently inseparable from the reliability of the semiconductor and computing infrastructure on which it depends.

The central conclusion is that AI and semiconductors are becoming strategic military resources because they increasingly determine the technological foundations of information processing, sensing, communications, autonomy and precision warfare. Semiconductors provide the computational infrastructure, AI converts computation into decision-support and automation, and military organizations integrate these capabilities into operational systems. As a result, the struggle for advanced chips and AI capability is simultaneously a struggle for future military and geopolitical power.

This reinforces the broader argument of the paper: control over AI and semiconductor capabilities is becoming an increasingly important component of national power. The U.S.–China rivalry is therefore not simply a competition for commercial markets; it is also a competition over the technological foundations of military capability and strategic influence.

Global South, Technological Dependency and the New North–South Divide

The geopolitical competition over artificial intelligence (AI) and semiconductors is not limited to the rivalry among major powers; it is also restructuring relations between the Global North and Global South. As AI increasingly depends upon advanced semiconductors, computing infrastructure, data centres, cloud platforms, specialized talent and research capital, unequal access to these resources creates a new form of technological hierarchy. The emerging divide is therefore not simply between countries that use AI and those that do not, but between states that control the strategic foundations of AI and those that remain dependent on external actors for them. This development can be interpreted as a contemporary extension of dependency theory, in which technological capabilities, rather than only industrial and financial capital, increasingly determine a state's position within the global political economy. UNCTAD (2025) argues that AI development is highly concentrated geographically, while the World Bank (2025) identifies major inequalities in connectivity, computing capacity, locally relevant data and digital skills. Consequently, AI and semiconductors are becoming strategic resources that can reproduce existing North–South inequalities while creating new forms of technological dependence.

The Global AI Divide

The global AI divide has several interconnected dimensions, including computing capacity, infrastructure, investment, human capital, research, data and semiconductor access. These dimensions are mutually reinforcing because countries possessing advanced infrastructure attract investment and talent, which in turn strengthens research and technological innovation. The World Bank (2025) reports that high-income countries account for 87% of notable AI models, 86% of AI start-ups and 91% of venture-capital funding, despite representing only about 17% of the global population. The same report indicates that high-income countries possessed approximately 77% of global co-location data-centre capacity in June 2025, compared with 18% for upper-middle-income countries, 5% for lower-middle-income countries and less than 0.1% for low-income countries. These figures demonstrate that AI power is concentrated not only through knowledge and capital but also through the physical infrastructure required to convert algorithms into strategic capability.

Computing power has become particularly important because frontier AI models require enormous quantities of advanced processors and data-centre capacity. Stanford HAI (2026) estimates that global AI compute capacity reached approximately 17.1 million H100-equivalent units in 2025, with global compute capacity increasing approximately 3.3 times annually since 2022. NVIDIA accounted for more than 60% of total AI compute, while Taiwan Semiconductor Manufacturing Company (TSMC) fabricated almost every leading AI chip. This concentration demonstrates that the global AI system rests upon a relatively narrow technological foundation. UNCTAD (2025) similarly reports that the United States possesses approximately one-third of the world's top supercomputers and more than half of global computational performance. Therefore, countries lacking advanced computing capacity may participate in the AI economy primarily as users rather than producers, creating an important distinction between AI adoption and AI sovereignty.

The human-capital dimension further reinforces this divide. Advanced economies possess greater concentrations of AI researchers, engineers, universities, technology firms and venture capital, whereas many developing countries face shortages of advanced digital skills and difficulties retaining highly trained professionals. The World Bank (2025) reports that fewer than 5% of people in low-income countries possess basic digital skills, compared with approximately 66% in high-income countries. This inequality creates a cumulative technological advantage for the core economies because skilled workers, research institutions, investment and technological firms reinforce one another. Brain drain can consequently become a mechanism through which developing countries indirectly strengthen the technological capacity of already advanced states.

Technological Core–Periphery

The emerging international technology system can be conceptualized through a technological core–semi-periphery–periphery model. This framework extends the traditional core–periphery argument by shifting attention from industrial production alone toward control over AI, semiconductors, computing, data and technological standards. The technology core consists principally of the United States, China, Taiwan, South Korea, Japan and major European technological economies. These actors possess important capabilities across different parts of the AI–semiconductor ecosystem, including chip design, advanced fabrication, memory, semiconductor equipment, AI research, cloud computing, finance, intellectual property and technological standards. Their collective power derives from control over critical nodes rather than complete self-sufficiency.

The technology semi-periphery includes countries such as India, Singapore, Israel and technologically ambitious Gulf states. These states have developed significant capabilities in selected areas, including software, AI research, digital services, data centres, finance and technological investment, but generally remain dependent on core economies for some critical technologies. Their position gives them opportunities for technological upgrading while simultaneously exposing them to external dependencies. The technology periphery consists of many developing countries whose technological participation remains concentrated in consumption, basic digital services, lower-value activities and imported infrastructure. However, this hierarchy should not be regarded as permanent. Effective industrial policy, education, research investment, technology transfer and regional cooperation can allow states to move upward within the technological hierarchy.

This distinction is especially important for understanding semiconductor power. A state may possess a growing software industry and a technologically skilled population while remaining dependent on foreign companies for advanced processors, memory, semiconductor equipment, cloud infrastructure and AI models. Consequently, technological sovereignty should not be measured simply by the number of technology firms operating within a country. Rather, it should be assessed according to whether a state possesses sufficient capacity and strategic alternatives in the critical nodes of the AI–semiconductor value chain.

AI and Semiconductor Dependency

AI dependency is closely connected with semiconductor dependency because advanced AI systems require powerful processors, high-bandwidth memory, networking equipment and specialized data-centre infrastructure. Countries unable to manufacture advanced chips must acquire them through international markets or foreign technology providers. UNCTAD (2025) identifies computing infrastructure, including data centres, semiconductors, cloud computing and storage, as fundamental components of AI development. This creates a structural problem for developing countries because restricted access to advanced chips can constrain their ability to develop domestic AI capabilities even when they possess skilled software engineers and researchers.

Cloud computing creates another layer of technological dependence. Foreign cloud platforms can enable developing countries to access computing resources without constructing expensive domestic data centres. This can accelerate AI adoption, but excessive reliance on foreign providers may also create vulnerabilities relating to cost, availability, data governance and geopolitical restrictions. The World Bank (2025) emphasizes that compute is one of the fundamental foundations of AI development and reports that high-income countries accounted for 77% of global co-location data-centre capacity in 2025. The issue is therefore not whether developing countries should use foreign cloud services, but whether they can maintain sufficient **strategic autonomy and technological alternatives** when their critical AI infrastructure depends on external providers.

Dependence also exists at the level of AI models and data. Most frontier AI systems are produced by companies located in technologically advanced economies, while developing countries frequently adapt foreign models to domestic applications. This can generate what may be called **model dependency**, in which countries possess the ability to use AI but have limited control over the foundational models, computing infrastructure and intellectual property underlying those systems. Data dependency reinforces this problem because AI systems require large and high-quality datasets reflecting local languages, cultures, institutions and socioeconomic conditions. UNCTAD (2025) identifies infrastructure, data and skills as three central leverage points for developing countries seeking to participate more effectively in AI development. Without domestic data and research ecosystems, developing countries risk becoming permanent consumers rather than producers of AI knowledge.

Implications for Developing Countries

The consequences of AI and semiconductor dependency extend directly into international political economy. First, unequal access to AI can produce a **productivity gap** between technologically advanced and technologically dependent economies. Countries with advanced computing and AI infrastructure can deploy AI across manufacturing, finance, agriculture, logistics, health and public administration, potentially increasing productivity more rapidly than countries lacking such infrastructure. Second, technological dependency can reinforce economic inequality because high-value activities such as semiconductor design, advanced manufacturing, AI research, intellectual property and frontier-model development remain concentrated in a limited number of economies. In this sense, AI can reproduce traditional centre–periphery relationships through new technological mechanisms.

Third, dependency can weaken digital and technological sovereignty. Sovereignty in this context does not mean complete technological autarky; rather, it refers to the ability of a state to make strategic decisions concerning critical technologies without excessive vulnerability to external suppliers. The World Bank (2025) reports that high-income countries hosted 86% of the world's top 500 high-performance computing systems and 97% of their capacity in June 2025. Excluding China and India, middle-income countries hosted only about 3% of these systems and approximately 1% of their capacity, despite accounting for a large share of the global population and economic output. Such disparities indicate that technological capacity is becoming an important component of national power.

Fourth, technological dependency can generate cybersecurity and strategic vulnerabilities. States dependent upon foreign chips, software, cloud platforms and AI systems may have limited control over supply-chain security, technological standards and critical infrastructure. These vulnerabilities become particularly important when AI is incorporated into government systems, financial networks, military applications and critical infrastructure. Thus, the global AI divide should be understood not merely as a developmental challenge but as a distribution-of-power problem in international relations. Control over AI and semiconductor resources can increasingly influence economic competitiveness, strategic autonomy and geopolitical bargaining power.

Pakistan as a Brief Illustrative Case

Pakistan provides a useful illustration of the wider technological dependency problem without requiring a separate country case study. Pakistan has developed a significant ICT and digital-services sector, although its technological capabilities remain concentrated more strongly in software, telecommunications and services than in advanced semiconductor production. According to the *Pakistan Economic Survey 2024–25*, broadband subscribers reached approximately 147.2 million by March 2025, while broadband penetration increased to 59.8%. The country's cellular mobile services reached approximately 91% of the population, demonstrating substantial progress in digital connectivity (Government of Pakistan, 2025). These developments provide an important foundation for AI adoption and demonstrate that Pakistan possesses considerable potential to participate in the emerging AI economy.

However, Pakistan remains dependent on international suppliers for advanced computing hardware, semiconductors, sophisticated data-centre technologies and many AI platforms. This illustrates the distinction between digital connectivity and technological sovereignty. A country can possess extensive internet connectivity and a growing software workforce while remaining dependent on foreign producers for the hardware and computational resources necessary for advanced AI. Pakistan's opportunity therefore lies in using its growing ICT sector, human capital and domestic market to move toward higher-value activities in AI research, software development, data services, AI-enabled public administration and selected semiconductor activities such as design, assembly, testing and packaging. The broader strategic objective should be to convert technological adoption into technological capacity.

Avoiding a New Technological Dependency Trap

Avoiding a new technological dependency trap does not require developing countries to reproduce the entire technological ecosystems of the United States or China. Such an approach would be financially and institutionally unrealistic for most developing economies. Instead, states should pursue strategic technological capability by identifying those segments of the AI–semiconductor value chain in which domestic investment can generate the greatest economic and geopolitical returns. The World Bank (2025) identifies four foundational requirements—connectivity, compute, context and competency—that provide a useful framework for developing countries seeking to strengthen their AI ecosystems. UNCTAD (2025) similarly emphasizes infrastructure, data, skills and effective policy as central requirements for inclusive AI development.

First, developing countries should invest in AI education, advanced digital skills and university–industry research partnerships to reduce dependence on foreign talent. Second, governments should facilitate investment in data centres, cloud infrastructure and reliable electricity while maintaining appropriate data-governance mechanisms. Third, domestic datasets should be developed to ensure that AI systems reflect local languages, institutions and socioeconomic realities. Fourth, countries should identify attainable positions in the semiconductor value chain. Instead of immediately attempting advanced semiconductor fabrication, developing economies may initially concentrate on semiconductor design, assembly, testing, packaging, electronics manufacturing and specialized applications, gradually moving toward more technologically sophisticated activities through learning and technology transfer.

Finally, regional and South–South cooperation can provide an important mechanism for overcoming the scale limitations faced by individual developing countries. Joint research centres, shared computing infrastructure, AI education programmes, semiconductor partnerships and common digital standards can reduce costs and increase bargaining power. Open-source AI can also provide opportunities for developing countries to adapt advanced technologies without bearing the enormous costs of developing frontier models from the beginning. Such strategies would allow the Global South to move from technological consumption toward technological participation.

The central argument is therefore that AI and semiconductors are transforming the traditional North–South divide into an emerging technological core–periphery structure. Whereas earlier forms of global power were strongly associated with control over land, industrial capital, natural resources and energy, contemporary technological power increasingly depends upon control over semiconductors, computing capacity, data, AI talent, research, infrastructure and technological standards. Developing countries that remain dependent on imported chips, foreign cloud infrastructure, external AI models and foreign technological expertise risk occupying a subordinate position in the emerging global political economy. Conversely, countries that build domestic capacity, diversify technological partnerships and enter higher-value segments of the AI–semiconductor ecosystem can convert technological adoption into technological agency. Thus, the future distribution of geopolitical power will depend not simply on who uses AI, but increasingly on who controls the technological foundations upon which AI itself depends.

Geopolitical and Global Governance Implications

The transformation of artificial intelligence (AI) and semiconductors into strategic resources is producing consequences that extend beyond technological competition and into the structure of global power and international governance. Control over advanced chips, computational infrastructure, AI models, data, technological standards and research capacity increasingly affects economic competitiveness, military capability and strategic autonomy. Consequently, the international system is moving from a traditional conception of power centred primarily on military, economic and territorial capabilities toward a more technologically intensive order in which computational and technological capabilities constitute additional dimensions of geopolitical power. The central governance challenge is that technological capabilities are globally interconnected, whereas regulatory authority remains primarily national or regional. This creates tensions between interdependence and strategic competition, making AI and semiconductor governance an increasingly important component of contemporary international relations.

Transformation of Global Power

Traditional international-relations theory generally associates national power with military strength, economic resources, population, territory and natural resources. In the emerging technological order, however, these sources of power increasingly interact with technological and computational capabilities. A state possessing advanced military forces but lacking access to sophisticated semiconductors, AI systems and computational infrastructure may face constraints on the modernization of its military and economy. Conversely, states controlling critical technological nodes can exercise influence beyond their territorial boundaries. This transformation can therefore be represented as a movement from Military + Economic + Territorial Power toward Military + Economic + Technological + Computational Power.

The strategic importance of computational power is demonstrated by the concentration of AI infrastructure. Stanford HAI (2026) estimates that global AI compute capacity reached approximately 17.1 million H100-equivalent units in 2025, with computing capacity increasing approximately 3.3 times annually since 2022. NVIDIA accounted for more than 60% of global AI compute, while TSMC manufactured almost every leading AI chip. These figures indicate that control over the technological foundations of computation is becoming a source of geopolitical influence. In this context, semiconductor manufacturing, AI computing and data-centre capacity should be understood not simply as commercial assets but as strategic resources capable of affecting national economic and military power.

This transformation also strengthens the concept of technological statecraft. Farrell and Newman’s (2019) concept of “weaponized interdependence” demonstrates how states controlling strategically important positions within global networks can exploit those positions for geopolitical purposes. The semiconductor industry provides a contemporary illustration: states possessing control over advanced chip design, semiconductor equipment, fabrication or critical software can influence the technological options available to other states. Export controls on advanced computing and semiconductor technologies therefore demonstrate how economic networks can become instruments of strategic power.

Traditional geopolitical power	Emerging technological power
Military capability	Military + AI-enabled capability
Economic production	Technology-intensive production
Territorial control	Control of technological networks
Natural resources	Semiconductors, compute, data and energy
Industrial capacity	AI and semiconductor ecosystems
Conventional alliances	Technology alliances and supply-chain partnerships
Economic sanctions	Export controls and technological restrictions
Military deterrence	Military + technological deterrence

Table : Transformation of the sources of geopolitical power.
Source: *based on Farrell and Newman (2019), Horowitz (2018), UNCTAD (2025), and Stanford HAI (2026).*

AI and Semiconductor Governance

The growing strategic importance of AI requires governance at multiple levels. AI governance encompasses questions of safety, transparency, accountability, human oversight, data protection, algorithmic discrimination, military applications and the distribution of AI benefits. However, AI governance remains fragmented because states differ in political systems, regulatory traditions, economic interests and perceptions of technological risk. The OECD AI Principles, initially adopted in 2019 and updated in 2024, provide one of the major international normative frameworks for trustworthy AI and emphasize human rights, transparency, robustness, safety and accountability (OECD, 2024). Their importance demonstrates the emergence of international norms, but voluntary principles alone cannot resolve strategic competition over AI infrastructure and advanced computing.

The governance of semiconductors is even more directly connected to geopolitical power because advanced chips are physical strategic resources concentrated in a small number of economies. Semiconductor governance involves trade rules, export controls, investment screening, intellectual-property protection, supply-chain security, industrial subsidies and technology-transfer arrangements. The U.S. restrictions on advanced computing chips and semiconductor manufacturing equipment demonstrate that semiconductor policy has moved from the domain of commercial trade toward national security. This transformation is significant because export controls can restrict not only individual firms but also the technological development trajectories of entire states.

International institutions face a difficult challenge because existing global economic governance was largely developed around the assumption that technological interdependence would promote efficiency and trade. The emerging semiconductor environment is based increasingly on security-sensitive interdependence. Governments now seek both the benefits of global supply chains and protection from vulnerabilities within those same chains. This creates tension between the principles of open trade and national technological security. The result is a new form of strategic economic governance in which governments increasingly seek to determine which technologies can be traded, with whom, and under what conditions.

Fragmentation of Global Technology Governance

The growing strategic competition over AI and semiconductors is contributing to the fragmentation of global technology governance. Instead of a single universal regulatory model, different states and regions are developing distinct approaches to AI regulation, semiconductor policy, data governance, export controls and technology standards. The European Union has adopted a comparatively regulatory approach to AI, the United States combines private-sector innovation with national-security restrictions, while China combines state-led technological development with extensive regulatory and industrial-policy mechanisms. These differences create competing governance models with international implications.

Fragmentation is particularly significant when regulatory systems begin to generate incompatible technological standards. Different rules regarding data, AI safety, model transparency, cybersecurity and digital markets can increase the costs of international technology cooperation. The OECD (2024) emphasizes the importance of interoperable AI governance approaches, while the United Nations (2024) similarly recognizes that international coordination is necessary to prevent incompatible governance systems from undermining the benefits of AI. If technological standards increasingly correspond to geopolitical blocs, firms may be compelled to design products for separate regulatory ecosystems, thereby increasing the fragmentation of global technology markets.

The possibility of technological blocs is particularly important because AI and semiconductor systems are deeply interconnected. A technology ecosystem includes not only hardware but also software, cloud infrastructure, operating systems, AI models, standards, research networks and supply chains. The emergence of separate technological ecosystems could therefore create a form of **technological bipolarity or multipolarity**, in which states face pressure to align with particular technological standards and supply chains. Such fragmentation would not necessarily result in complete technological decoupling because semiconductor production remains globally interdependent, but it could produce increasingly separate strategic technology networks.

International Cooperation

Despite geopolitical competition, complete technological separation is neither economically desirable nor easily achievable. AI development requires global scientific collaboration, while semiconductor production depends upon highly specialized international supply chains. Consequently, the strategic challenge is to establish mechanisms of **managed technological interdependence** that preserve the benefits of global cooperation while reducing security vulnerabilities.

International cooperation is particularly important in AI safety and scientific assessment. In 2024, the United Nations adopted the Global Digital Compact as part of the Pact for the Future, establishing a framework for international digital cooperation and emphasizing inclusive AI governance. In August 2025, the UN General Assembly established the Independent International Scientific Panel on AI and the Global Dialogue on AI Governance through Resolution 79/325. The first annual Global Dialogue took place in Geneva in July 2026, creating a new multilateral forum for governments and stakeholders to discuss international AI governance (United Nations, 2024, 2025). These developments are significant because AI capabilities are developing faster than many national regulatory frameworks.

However, the inclusiveness of global AI governance remains a major concern. UNCTAD (2025) reports that by 2024, only the G7 countries were active in all seven major AI governance initiatives, while 75 countries participated in at least one and 118 countries participated in none. Most of the countries excluded from these initiatives were developing countries. This demonstrates a major contradiction: AI is increasingly becoming a global strategic resource, yet many states affected by its consequences have limited influence over the rules governing it. A legitimate global governance system therefore requires meaningful participation by developing countries rather than merely inviting them to implement standards developed elsewhere.

Future cooperation should consequently focus on several practical areas: AI safety standards, semiconductor supply-chain transparency, common technical standards, export-control dialogue, digital infrastructure, capacity building and developing-country access to computing resources. The Global Digital Compact explicitly emphasizes capacity building, technology transfer on mutually agreed terms, interoperability and support for developing countries (United Nations, 2024). Such mechanisms could reduce the risk that technological competition becomes a permanent source of global inequality.

Future of Globalization

The future of globalization in the AI–semiconductor era is uncertain. Three scenarios are particularly plausible:

Scenario	Main characteristics	Implications for AI and semiconductors
I. Managed Interdependence	Global trade continues but strategic vulnerabilities are reduced	Diversified supply chains, limited export controls and continued technological cooperation
II. Technological Bipolarity	U.S.-led and China-centred ecosystems become increasingly separate	Competing chips, AI models, standards, cloud systems and supply chains
III. Fragmented Multipolarity	Multiple technological centres develop independent capabilities	Competition among U.S., China, EU, Japan, India, South Korea and Gulf technology hubs

Overall, the most plausible future may combine elements of all three scenarios. Complete technological decoupling is difficult because semiconductor production and AI development remain globally interdependent, while unrestricted globalization is increasingly constrained by national-security concerns. The emerging order is therefore likely to be characterized by selective decoupling, strategic diversification and managed interdependence. This reinforces the central argument of this research: AI and semiconductors are no longer merely components of the global economy; they are becoming strategic resources through which states exercise economic, military, technological and geopolitical power. The future structure of global politics will consequently depend not only on who possesses military and economic resources, but also on who controls the computational infrastructure, semiconductor technologies and technological standards that increasingly underpin those traditional forms of power.

Findings

The analysis demonstrates that the growing geopolitical competition surrounding artificial intelligence (AI) and semiconductors represents a structural transformation in the distribution of global power. The findings do not merely confirm that AI and semiconductors are economically important; rather, they demonstrate that control over these technologies increasingly affects national security, military capability, economic competitiveness, technological sovereignty and international influence. The evidence from semiconductor production, AI investment, computing infrastructure, export controls, industrial policies, technological alliances and Global North–South disparities collectively supports the central argument of this study: AI and semiconductors have become strategic resources through which states increasingly acquire, exercise and constrain geopolitical power.

Finding 1: AI and Semiconductors Have Become Strategic Resources

The first major finding is that AI and semiconductors have moved beyond the conventional category of commercial technologies and increasingly function as strategic resources of global politics. Advanced semiconductors provide the computational foundation for AI, military systems, data centres, telecommunications and advanced manufacturing, while AI increasingly contributes to economic productivity, intelligence, surveillance, cyber operations and military decision-making. Stanford HAI (2026) estimates that global AI compute capacity reached approximately 17.1 million H100-equivalent units in 2025, demonstrating the enormous physical infrastructure supporting contemporary AI. The strategic significance of these technologies therefore derives from their ability to influence economic power, national security, military effectiveness and technological sovereignty simultaneously.

Finding 2: AI Power Is Fundamentally Dependent on Semiconductor Power

The second finding identifies a structural relationship between AI capability and semiconductor capability. The research establishes the following strategic chain:

AI Capability → Compute Demand → Advanced Chips → Semiconductor Ecosystem → Strategic Power

AI models require computational resources; computational resources depend upon advanced processors and high-bandwidth memory; advanced processors require sophisticated semiconductor design, fabrication, equipment and materials. Consequently, AI leadership cannot be separated from semiconductor capability. Stanford HAI (2026) reports that NVIDIA accounted for more than 60% of total AI compute in 2025, while TSMC manufactured almost every leading AI chip. This concentration demonstrates that frontier AI power ultimately rests upon a relatively narrow semiconductor ecosystem. The finding therefore challenges interpretations that treat AI competition as primarily a software or algorithmic competition.

Finding 3: Semiconductor Power Is Highly Geographically Concentrated

The third finding is that semiconductor production remains highly concentrated geographically, creating significant geopolitical vulnerabilities and strategic leverage. OECD (2025) estimates that approximately 87% of global wafer-fabrication capacity is concentrated in five economies: China, Chinese Taipei, Korea, Japan and the United States. This concentration means that semiconductor production cannot be treated as an evenly distributed global industrial activity. Instead, a limited number of economies control critical portions of the physical infrastructure required for advanced computing.

The research further finds that semiconductor power is concentrated not only geographically but also functionally. Taiwan dominates advanced foundry manufacturing, South Korea is central to memory and high-bandwidth memory, the United States maintains major advantages in chip design and electronic design automation, Japan possesses important materials and equipment capabilities, while the Netherlands occupies a critical position through advanced lithography equipment. Therefore, geopolitical semiconductor power derives from control over specialized nodes, rather than simply from total production volume.

Finding 4: The United States Possesses Significant Structural Technological Power

The fourth finding is that the United States retains substantial structural advantages across the AI–semiconductor ecosystem. These include frontier AI development, private investment, semiconductor design, electronic design automation, cloud computing, advanced semiconductor equipment, venture capital and technological alliances. Stanford HAI (2026) reports that U.S. private AI investment reached approximately $285.9 billion in 2025, compared with approximately $12.4 billion in China. The United States also produced 59 notable AI models in 2025 compared with China's 35 (Stanford HAI, 2026).

However, U.S. technological power is not based on complete self-sufficiency. Its strength derives from its position across multiple critical nodes and its ability to mobilize alliances and regulatory instruments. This confirms the theoretical importance of network power: a state can exercise disproportionate influence when it occupies strategically important positions within interconnected technological networks (Farrell & Newman, 2019).

Finding 5: China Is Transforming Technological Competition

The fifth finding is that China's strategy is increasingly focused not simply on catching up with the United States but on reducing vulnerability to externally controlled technological chokepoints. China has pursued semiconductor self-reliance, domestic AI development, state-backed investment, indigenous equipment and alternative supply chains. The establishment of China's third semiconductor Big Fund in 2024, valued at approximately 344 billion yuan (US$47.5 billion), illustrates the scale of state-supported efforts to strengthen domestic semiconductor capabilities.

The evidence nevertheless suggests that China's technological localization remains incomplete. The U.S.–China Economic and Security Review Commission (2025) reported that China-based semiconductor-equipment manufacturers supplied only around 16% of domestic demand in the third quarter of 2024, demonstrating continuing dependence on foreign technologies in important segments. Thus, China's strategic trajectory should be understood as vulnerability reduction and technological autonomy, rather than complete technological independence.

Finding 6: Export Controls Have Become Instruments of Geopolitical Power

The sixth finding is that semiconductor and AI export controls have become important instruments of geopolitical statecraft. The United States' October 2022 controls restricted China's access to advanced computing chips, supercomputing capabilities and semiconductor-manufacturing technologies, while subsequent measures in 2023 and 2024 strengthened and expanded these restrictions (U.S. Department of Commerce, Bureau of Industry and Security [BIS], 2022, 2023, 2024). The strategic logic can be represented as:

Technological Dependence → Economic Vulnerability → Export Controls → Strategic Leverage

This finding directly supports Farrell and Newman's (2019) concept of weaponized interdependence. Global technological networks create economic efficiency, but states positioned at critical nodes can potentially transform network dependence into geopolitical leverage. Export controls therefore demonstrate that technological interdependence is simultaneously an economic relationship and a potential instrument of coercive power.

Finding 7: Industrial Policy Has Returned as a Central Instrument of Geopolitics

The seventh finding is that major powers are moving away from an exclusively market-oriented approach to technological production toward strategic industrial policy. The United States' CHIPS and Science Act, China's semiconductor investment funds, the European Chips Act, Japan's semiconductor support programmes and South Korea's large-scale semiconductor strategy demonstrate the return of government intervention in strategically important technology sectors.

The U.S. CHIPS Act alone allocated approximately $52.7 billion for semiconductor manufacturing, research and workforce development, including approximately $39 billion in manufacturing incentives (U.S. Department of Commerce, 2024). The finding is therefore not simply that governments are subsidizing technology industries; it is that semiconductor capacity has increasingly been incorporated into national-security strategies. Economic efficiency is being balanced against resilience, security and strategic autonomy.

Finding 8: Technological Interdependence Is Both Cooperation and Conflict

The eighth finding reveals a fundamental paradox: the same interdependence that creates economic efficiency can also generate geopolitical vulnerability. Semiconductor production requires highly specialized international networks involving design firms, equipment producers, foundries, memory manufacturers, materials suppliers and advanced packaging facilities. No single state currently controls the entire ecosystem.

This interdependence creates incentives for cooperation because disruption would impose substantial costs on multiple economies. At the same time, dependence on strategically concentrated suppliers creates incentives for states to diversify and protect critical technologies. Consequently, the emerging system cannot be accurately characterized as either unrestricted globalization or complete decoupling. It is increasingly characterized by strategic interdependence, in which states remain economically connected while attempting to reduce politically sensitive dependencies.

Finding 9: Technological Alliances Are Reshaping Globalization

The ninth finding is that geopolitical trust increasingly influences the organization of technology supply chains. The United States has strengthened technological relationships with Japan, South Korea, Taiwan and European partners, while China has pursued domestic substitution and alternative technological partnerships. Semiconductor investment is therefore increasingly influenced by national-security considerations rather than comparative economic efficiency alone.

This development has produced reshoring, friend-shoring, diversification and allied production. TSMC's expansion into the United States and Japan, Samsung's U.S. investment and Japanese efforts to rebuild advanced semiconductor manufacturing illustrate the movement toward geographically diversified but strategically aligned production. Globalization is therefore not disappearing; instead, it is becoming security-oriented and politically conditioned.

Finding 10: Taiwan Represents a Critical Geopolitical Chokepoint

The tenth finding is that Taiwan occupies an exceptional position in the emerging technological geopolitical order because semiconductor manufacturing, economic interdependence and strategic rivalry converge there. TSMC's dominance in advanced foundry manufacturing means that Taiwan is central to the production of many of the world's most sophisticated chips. TSMC reported that advanced technologies of 7-nanometre and beyond represented approximately 74% of its total wafer revenue in 2025, while 2-nanometre technology entered high-volume manufacturing during the fourth quarter of 2025 (TSMC, 2026).

Taiwan's strategic importance therefore extends beyond its economic value. Any major disruption involving the Taiwan Strait could affect global semiconductor supplies, AI development, telecommunications, military technologies and advanced manufacturing. Taiwan consequently represents one of the clearest examples of how technological chokepoints can become geopolitical flashpoints.

Finding 11: AI Competition Is Also an Energy Competition

The eleventh finding is that the strategic competition over AI extends beyond chips and computing into energy and physical infrastructure. AI data centres require enormous quantities of electricity, making energy availability an increasingly important constraint on AI development. The International Energy Agency (IEA, 2025) projects that global data-centre electricity consumption will more than double to approximately 945 terawatt-hours (TWh) by 2030, with AI identified as the most important driver of this growth.

This means that future AI competitiveness will depend partly on electricity generation, grid capacity, land, water and energy security. The AI–semiconductor nexus should therefore be expanded into an AI–chip–compute–energy nexus. States seeking technological leadership will increasingly need to secure not only advanced processors and data centres but also reliable and affordable energy capable of supporting computational expansion.

Finding 12: A New Technological North–South Divide Is Emerging

The twelfth finding is that technological inequality is increasingly structured around access to compute, semiconductors, capital, data, talent and infrastructure. UNCTAD (2025) demonstrates that AI capabilities and computational infrastructure remain highly concentrated, while the World Bank (2025) identifies major disparities in connectivity, compute, locally relevant data and digital skills between high-income and developing economies.

The emerging divide is therefore deeper than the conventional digital divide. A country may possess internet connectivity and access to AI applications while lacking the computational infrastructure, semiconductor capabilities, research institutions and investment necessary to produce advanced technologies. The result may be a new technological core–periphery structure in which advanced economies control high-value technological resources while developing countries remain concentrated in lower-value applications and consumption.

Finding 13: Technological Sovereignty Is Becoming a Core Component of State Power

The thirteenth finding is that technological sovereignty is increasingly becoming an important component of national power. Governments are seeking to secure semiconductor supplies, develop domestic AI capabilities, protect strategic data, expand computing infrastructure and maintain access to critical technologies. This does not necessarily mean complete technological autarky. Rather, technological sovereignty refers to the capacity of states to retain strategic choice and resilience in critical technological domains.

The proliferation of semiconductor industrial policies demonstrates this transformation. The objective of governments is increasingly not simply to maximize efficiency but to ensure that strategic technologies remain available during geopolitical crises. Technological sovereignty therefore represents an important extension of traditional concepts of economic security and strategic autonomy.

Finding 14: Complete Technological Decoupling Is Unlikely

The fourteenth finding is that complete technological decoupling is unlikely because the semiconductor ecosystem remains deeply interconnected. Advanced chip production depends upon multiple countries for design software, manufacturing equipment, materials, fabrication, memory, packaging and distribution. Consequently, even technologically powerful states face dependencies that cannot be eliminated quickly without substantial economic costs.

The research therefore finds that the emerging global technology order is better described as managed technological interdependence than complete technological decoupling. States are attempting to reduce strategic vulnerabilities while maintaining commercially valuable international connections. This produces selective restrictions rather than universal separation: highly sensitive technologies are increasingly controlled, while less sensitive technological trade continues.

Finding 15: Control of Technological Chokepoints Is Becoming a Major Source of Geopolitical Power

The final and most significant theoretical finding is that future technological power may depend less on simply possessing technology and more on controlling the critical nodes through which technological capabilities flow. The evidence from advanced semiconductor fabrication, lithography equipment, AI accelerators, EDA software, cloud infrastructure and high-bandwidth memory demonstrates that certain technological nodes possess disproportionate strategic importance.

This finding extends the concept of weaponized interdependence developed by Farrell and Newman (2019) into the AI–semiconductor domain. The strategic resource is not simply the chip, AI model or computing system itself; it is the ability to control access to critical technological networks. States positioned at these chokepoints can influence the technological choices and strategic capabilities of other states.

Taken together, the fifteen findings demonstrate a fundamental transformation in the relationship between technology and international politics. AI and semiconductors are no longer peripheral components of economic globalization; they increasingly constitute strategic infrastructures of national power. Semiconductor capacity determines access to advanced computation; computation determines the scalability of AI; AI increasingly influences economic and military capabilities; and control over critical technological networks provides states with new forms of geopolitical leverage.

The research consequently finds that the emerging technological order is best understood as a transition from technology as an economic commodity to technology as a strategic resource. The U.S.–China competition represents the clearest expression of this transformation, but its consequences extend to technological alliances, global supply chains, developing countries, energy security and international governance. The most important implication is that future geopolitical competition will increasingly concern not only the possession of advanced technologies but also the

Conclusion

The rise of artificial intelligence (AI) and advanced semiconductors represents a fundamental transformation in the sources and organization of geopolitical power. This study has demonstrated that these technologies can no longer be understood merely as commercial products or components of the digital economy. They have increasingly become strategic resources of global politics because they underpin economic competitiveness, military modernization, national security, technological sovereignty and international influence. The central argument of this research is that the geopolitical significance of AI cannot be separated from the semiconductor ecosystem that makes advanced computation possible. Consequently, competition over AI is simultaneously competition over chips, computing capacity, data, talent, energy, infrastructure, technological standards and the critical networks through which these resources circulate.

The analysis demonstrates a structural relationship between AI and semiconductors: AI capability depends upon computational capacity, computational capacity depends upon advanced chips, and advanced chips depend upon a highly specialized and geographically concentrated semiconductor ecosystem. The concentration of this ecosystem creates significant geopolitical consequences. OECD (2025) estimates that approximately 87% of global wafer-fabrication capacity is concentrated in five economies, while Stanford HAI (2026) estimates that global AI compute reached approximately 17.1 million H100-equivalent units in 2025. These figures demonstrate that the technological foundations of contemporary AI are not evenly distributed across the international system. Rather, they are concentrated within a limited number of states and firms possessing advanced manufacturing, research, capital and computational infrastructure.

The U.S.–China rivalry provides the clearest manifestation of this transformation. The United States retains substantial structural advantages in frontier AI, semiconductor design, electronic design automation, cloud computing, investment and technological alliances. At the same time, China is pursuing an increasingly comprehensive strategy of technological self-reliance designed to reduce its vulnerability to foreign-controlled technological chokepoints. The competition therefore extends beyond a conventional race for technological leadership. It is increasingly a struggle over strategic autonomy, supply-chain resilience and control over the technological foundations of future economic and military power. U.S. export controls on advanced computing and semiconductor technologies further demonstrate how technological interdependence can be transformed into an instrument of geopolitical leverage (U.S. Department of Commerce, Bureau of Industry and Security [BIS], 2022, 2023, 2024).

The research also establishes that the return of industrial policy is a central consequence of this technological competition. The U.S. CHIPS and Science Act, China's semiconductor investment programmes, the European Chips Act, Japanese semiconductor initiatives and South Korean industrial strategies demonstrate that states are increasingly willing to intervene directly in technology markets. The objective is no longer determined solely by efficiency or comparative advantage; governments increasingly seek to ensure security of supply, technological resilience and strategic autonomy. This confirms the growing convergence between economic policy and national-security policy. Semiconductors have consequently become an important example of geoeconomics in practice, where subsidies, investment controls, export restrictions and industrial policies are used to achieve strategic objectives.

The findings further demonstrate the continuing importance of global interdependence. Despite intensifying technological rivalry, complete technological decoupling remains unlikely because no single country controls the entire semiconductor and AI ecosystem. Advanced semiconductor production depends upon interconnected capabilities distributed across the United States, Taiwan, South Korea, Japan, the Netherlands, Europe and other economies. This creates a paradox at the heart of contemporary technological globalization: interdependence generates both economic efficiency and geopolitical vulnerability. States therefore seek to reduce their most sensitive dependencies while preserving the broader benefits of international trade and technological cooperation. The emerging order is consequently better characterized as managed technological interdependence than complete technological decoupling.

Taiwan illustrates this contradiction particularly clearly. Its central position in advanced semiconductor manufacturing makes it simultaneously an economic, technological and geopolitical asset. TSMC's advanced manufacturing capabilities place Taiwan at the centre of the global AI–semiconductor ecosystem, while the strategic importance of the Taiwan Strait connects semiconductor security with U.S.–China rivalry and Indo-Pacific security. The Taiwanese case demonstrates that technological chokepoints can become geopolitical flashpoints because disruption in one strategically concentrated location can affect global AI development, advanced manufacturing, telecommunications and military technologies.

Another major conclusion concerns the emerging technological North–South divide. The analysis demonstrates that the international distribution of AI capabilities is highly unequal in terms of computing infrastructure, investment, research, talent, data and semiconductor access. UNCTAD (2025) and the World Bank (2025) show that high-income countries dominate critical elements of AI innovation and infrastructure, while many developing countries remain dependent on foreign hardware, cloud services, AI models and technological expertise. This creates the possibility of a new technological core–periphery structure, in which developing countries participate in the AI economy primarily as consumers or lower-value service providers while high-value technological capabilities remain concentrated in the global technological core.

This development has important implications for technological sovereignty. The study finds that technological sovereignty should not be interpreted as complete technological autarky. Instead, it should mean the ability of states to maintain sufficient domestic capability, secure access and strategic alternatives in critical technological domains. For developing countries, this requires investment in digital infrastructure, AI education, research, locally relevant data, computing capacity and participation in higher-value segments of the technology value chain. Semiconductor assembly, testing, packaging and design, for example, may provide realistic entry points for technological upgrading without requiring every developing country to reproduce the advanced fabrication capabilities of the world's leading semiconductor producers.

The research also demonstrates that AI geopolitics increasingly extends beyond algorithms and chips to energy and physical infrastructure. The International Energy Agency (2025) projects that global data-centre electricity consumption could reach approximately 945 TWh by 2030. Consequently, future AI competitiveness will increasingly depend upon access to reliable electricity, energy infrastructure, land, water and data-centre capacity. AI should therefore be understood as part of a wider technological-resource system rather than as an isolated digital technology.

The theoretical contribution of this research is the proposed concept of Technological Strategic-Resource Theory. Neorealism explains why states compete for technological capabilities and relative gains; geoeconomics explains the strategic use of trade and industrial policy; weaponized interdependence explains how technological networks create chokepoints; and dependency theory explains the unequal distribution of technological capabilities between core and peripheral economies. However, the combined analysis suggests that these approaches can be brought together through a framework that places technological resources at the centre of contemporary geopolitical analysis.

The central proposition of Technological Strategic-Resource Theory is that states controlling critical AI capabilities, advanced semiconductor production, computing infrastructure and technological chokepoints possess disproportionate economic, military and geopolitical power. The importance of this proposition lies in shifting the analytical focus from simple technological ownership toward control over the strategic infrastructures and networks upon which technological capabilities depend. In the emerging digital geopolitical order, power is therefore increasingly generated through the ability to produce, control, secure and restrict access to critical technological resources.

Ultimately, the future of global politics will not be determined by AI alone or by semiconductor production alone. It will be determined by the interaction between AI, semiconductors, compute, data, energy, capital, talent and geopolitical strategy. The United States and China will remain central actors in this transformation, but Europe, Japan, South Korea, India, Taiwan, Gulf economies and other emerging technological powers will increasingly influence the structure of the global technology order. The principal challenge for the international community will be to balance technological competition with cooperation, national security with open economic exchange, and technological sovereignty with global interdependence. If managed effectively, AI and semiconductor technologies can contribute to broad-based development and international cooperation; if governed through exclusive technological blocs and coercive dependencies, they could deepen global inequality and strategic instability. The central lesson of this study is therefore clear: AI and semiconductors have become strategic resources of global politics, and control over their critical technological foundations is increasingly becoming a defining source of twenty-first-century geopolitical power.

Policy Recommendations

1. **Develop National AI and Semiconductor Strategies:** States should integrate AI, semiconductor development, computing infrastructure, data, and energy into coordinated long-term national technology strategies.
2. **Strengthen Technological Sovereignty:** Governments should reduce excessive dependence on foreign technologies by developing domestic capabilities in AI research, chip design, advanced packaging, cloud infrastructure, and critical digital systems.
3. **Diversify Critical Supply Chains:** States should adopt strategic diversification and trusted-partner arrangements to reduce vulnerability to geopolitical disruptions and technological chokepoints.
4. **Increase Investment in AI and Semiconductor R&D:** Greater public and private investment is required in research, innovation, semiconductor design, AI models, computing infrastructure, and skilled human capital.
5. **Promote International Technology Cooperation:** Major powers should establish mechanisms for dialogue on export controls, AI governance, semiconductor supply-chain security, technical standards, and responsible technology use.
6. **Address the Global AI Divide:** International institutions and developed countries should expand technology transfer, financing, digital infrastructure, capacity-building, and AI education in developing countries.
7. **Protect Strategic Technological Infrastructure:** Governments should strengthen cybersecurity and resilience of data centres, semiconductor facilities, telecommunications networks, cloud systems, and energy infrastructure.
8. **Balance Security with Open Trade:** Export controls and technological restrictions should remain targeted and proportionate to avoid excessive fragmentation of global technology markets and unnecessary economic disruption.
9. **Develop Regional Technology Partnerships:** Developing countries should pursue regional cooperation in AI research, digital infrastructure, semiconductor packaging, skills development, and technology investment to strengthen collective technological capacity.
10. **Establish Inclusive Global AI Governance:** International AI governance should ensure meaningful participation of developing countries so that emerging technological rules do not become dominated exclusively by major technological powers.

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