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# The Implications of US-China Strategic Competition on Global Supply Chain Stability: A Case Study of Semiconductors

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# تداعيات التنافس الاستراتيجي الأمريكي-الصيني على استقرار سلاسل التوريد العالمية: دراسة حالة صناعة أشباه الموصلات

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**الملخص**

تطور التنافس الاستراتيجي بين الولايات المتحدة وجمهورية الصين الشعبية ليتجاوز المجالات العسكرية والدبلوماسية التقليدية إلى صراع محتدم من أجل الهيمنة التكنولوجية. تدافع هذه الورقة عن أطروحة مفادها أن هذا التنافس يقوم بزعزعة استقرار سلاسل التوريد العالمية بشكل جوهري من خلال تسييس بنيتها الأساسية، محولاً إياها من شبكات قائمة على الكفاءة إلى أدوات للقوة الجيوسياسية. باستخدام صناعة أشباه الموصلات كدراسة حالة محورية، يوضح التحليل كيف تخلق السياسات مثل ضوابط التصدير والعقوبات ومبادرات الإنتاج المحلي هشاشة نظامية، وتقسم الأسواق إلى كتل متصارعة، وتُدخل قدراً كبيراً من عدم اليقين على الاقتصاد العالمي. تستخدم الورقة منهج التحليل النوعي للوثائق السياسية الأولية والبيانات الاقتصادية الثانوية لتتبع الآليات السببية لهذا الاختلال. وتخلص إلى أن تسليح الاعتماد المتبادل في قطاع التكنولوجيا يستلزم إعادة تقييم نماذج سلاسل التوريد التقليدية ويطرح تحديات عميقة للحوكمة الاقتصادية العالمية.

**الكلمات المفتاحية:** العلاقات الأمريكية-الصينية، التنافس الاستراتيجي، سلاسل التوريد العالمية، أشباه الموصلات، ضوابط التصدير، السياسة الاقتصادية، الانفصال الاقتصادي، السيادة التكنولوجية.

**Abstract**

The strategic competition between the United States and the People's Republic of China has evolved beyond traditional military and diplomatic realms into a fierce contest for technological supremacy. This paper argues that this competition fundamentally destabilizes global supply chains by politicizing their core architecture, transforming them from efficiency-driven networks into instruments of geopolitical power. Using the semiconductor industry as a critical case study, the analysis demonstrates how policies like export controls, sanctions, and

 

onshoring initiatives create systemic fragility, bifurcate markets, and introduce significant uncertainty into the global economy. The paper employs a qualitative analysis of primary policy documents and secondary economic data to trace the causal mechanisms of this disruption. It concludes that the weaponization of interdependence in the tech sector necessitates a re-evaluation of traditional supply chain models and presents profound challenges for global economic governance.

**Keywords:** US-China relations, strategic competition, global supply chains, semiconductors, export controls, economic statecraft, decoupling, technological sovereignty.

## 1. Introduction

For decades, the architecture of the global political economy has been predicated on a paradigm of neoliberal globalization, characterized by hyper-efficient, just-in-time (JIT) production systems orchestrated across intricate and expansive transnational supply networks. This model, underpinned by profound geographic specialization and a finely tuned international division of labor, has been widely credited with driving down production costs, accelerating the diffusion of innovation, and fueling unprecedented levels of global economic convergence and growth (Baldwin, 2016; Gereffi, 2018). However, this entrenched orthodoxy is presently undergoing a profound and structural reconfiguration. The primary catalyst for this systemic shift is the escalating strategic competition between the world's two preeminent powers, the United States and the People's Republic of China. This rivalry has transcended its status as a mere external variable influencing the international economic order; it has evolved into a central, deterministic force that is actively reshaping the foundational logic of global production and innovation (Farrell & Newman, 2019; Weiss, 2021). By systematically securitizing and politicizing global value chains (GVCs), this great power contest is converting them from arteries of commerce into primary arenas for geopolitical coercion and techno-nationalist ambition (Blackwill & Harris, 2016).

The semiconductor industry serves as the paradigmatic case of this critical juncture. Far from being a conventional consumer good, the advanced microchip has been aptly termed the "new oil" and the essential bedrock of economic competitiveness and military supremacy in the 21st century (Miller, 2022). It is a foundational, general-purpose technology that underpines advancements in artificial intelligence (AI), fifth-generation (5G) and sixth-generation (6G) telecommunications, quantum computing, and sophisticated defense systems. The extreme geographic concentration of this industry's capabilities—a hallmark of its erstwhile efficiency—has rendered it a critical node of systemic vulnerability. The dominance of Taiwan and South Korea in advanced logic chip fabrication, the Netherlands' monopoly on extreme ultraviolet (EUV) lithography equipment, and the United States' hegemony in electronic design automation (EDA) software and core intellectual property (IP) create a network ripe for "weaponized interdependence" (Farrell & Newman, 2019; Howell et al., 2023).

This paper proceeds from a central thesis: that the strategic competition between the U.S. and China has emerged as the principal driver of instability, fragmentation, and structural transformation within global semiconductor supply chains. We posit that state interventions, increasingly motivated by national security imperatives and techno-nationalist agendas rather than market efficiency, are generating systemic frictions, compelling costly redundancies, and exacerbating strategic vulnerabilities for all participants in the global economy. Through an escalating arsenal of policies—including stringent export controls, targeted sanctions, inbound investment screening, and massive domestic subsidy programs like the U.S. CHIPS and Science Act and China's "Big Fund"—the two superpowers are forcibly decoupling, "de-risking," and "friend-shoring" critical segments of production networks (European Commission, 2021; White House, 2022). This deliberate restructuring threatens to unwind the efficiency gains that have long defined GVCs and heightens the risk of a permanent bifurcation

 

into distinct, non-interoperable, and competing technological spheres (Hwang, Paik, & Lim, 2024; World Bank, 2023).

To interrogate this thesis, this paper employs an in-depth critical case study analysis of the global semiconductor industry. This sector is selected due to its unparalleled strategic significance, its acute exposure to geographic and technological chokepoints, and its position at the epicenter of the U.S.-China technological rivalry. The analysis will dissect the specific policy mechanisms employed by both nations and evaluate their tangible and prospective impacts on supply chain resilience, stability, and the global innovation ecosystem.

The paper is structured as follows. First, it reviews the evolution of scholarly literature on the convergence of geopolitics and global supply chain governance. Second, it constructs an integrated theoretical framework grounded in the concepts of "Economic Statecraft" (Baldwin, 1985) and "Weaponized Interdependence" (Farrell & Newman, 2019) to elucidate how states leverage network centrality as a tool of coercion. Third, it provides a detailed empirical analysis of the key U.S. and Chinese semiconductor policies and their consequential effects on supply chain integrity. Finally, the paper concludes by discussing the broader implications of this strategic contest for the stability of the global economic system, signaling a potential paradigm shift from a primary emphasis on "efficiency" to a new, contested prioritization of "resilience," "security," and "sovereignty" (Iansiti & Lakhani, 2020; Tapscott, 2021).

## 2. Literature Review

The scholarly discourse on Global Value Chains (GVCs) has undergone a significant evolution, mirroring the tectonic shifts in the global political economy itself. The foundational literature was dominated by economic sociology and international business perspectives that framed GVCs primarily as instruments for optimizing productive efficiency and facilitating economic upgrading for developing nations. Seminal works, such as Gereffi and Korzeniewicz's (1994) global commodity chains framework and the subsequent GVC governance model by Gereffi, Humphrey, and Sturgeon (2005), focused extensively on lead firm coordination, inter-firm dynamics, and the pursuit of cost reduction through geographic specialization and economies of scale. Within this paradigm, geopolitical risk was largely treated as an exogenous variable—an external shock to an otherwise rational, market-driven system—rather than an inherent and endogenous feature of its very architecture (Dicken, 2015). This perspective, while invaluable for modeling operational efficiency, has proven increasingly anachronistic in explaining the current dynamics of strategic decoupling and the overt politicization of production networks.

In response to a world increasingly characterized by renewed great power competition, a burgeoning body of literature in International Political Economy (IPE) and strategic studies has emerged to critically interrogate the intersection of geopolitics and globalization. A pivotal contribution is the theory of "weaponized interdependence" advanced by Farrell and Newman (2019, 2021). They argue that the very density and centrality of the networks underpinning globalization create new, asymmetric forms of structural power. States that host and exercise jurisdiction over critical nodes within financial (e.g., SWIFT, the US dollar), informational (e.g., internet platforms), or technological (e.g., semiconductor design software) networks can weaponize this interdependence for coercive ends, effectively turning a system designed for openness and synergy into a tool for exclusion, enforcement, and geopolitical leverage. This coercive mechanism, they contend, creates a fundamental and inescapable "security-efficiency trade-off," a concept further elaborated by economists and policy analysts (Evenett, 2022; Crowley & Singer, 2022). This re-prioritization signifies a direct and radical challenge to the hyper-efficient, just-in-time model that defined the previous era of hyper-globalization.

This theoretical shift finds its most potent and critical empirical application in the semiconductor industry, which has become the central case study in the new geopolitics of technology. Miller's (2022) seminal work, *Chip War*, provides a comprehensive historical and

 

political account of the struggle for semiconductor supremacy, meticulously detailing the technological race and the escalating, tit-for-tat policies of the US and China. His work underscores the sector's quintessentially strategic nature, moving analysis beyond pure economics to the realm of high politics and national survival. Complementing this macro-level account, scholars like Lindsay (2020) offer a rigorous examination of the specific tool of export controls, analyzing their use as a modern, precise instrument of statecraft that can surgically sever an adversary's access to critical technologies and recalibrate global production maps.

On the side of the targeted actor, analyses of China's vulnerabilities and responses have become a key sub-field. Sacks (2021) provides a critical examination of the gaps within China's semiconductor value chain and its multi-faceted, state-coordinated responses to US technological containment, including the "Made in China 2025" initiative and subsequent plans. Further technical and economic depth is added by scholars like Fuller (2016), who has long examined the structure and inherent vulnerabilities of the global semiconductor supply chain, and Howell et al. (2023), who have attempted to quantify the immense costs—running into trillions of dollars—associated with decoupling and the pursuit of technological self-sufficiency.

This paper seeks to contribute to this robust and rapidly evolving literature by synthesizing these key concepts—weaponized interdependence, the security-efficiency trade-off, and the return of techno-nationalist industrial policy—into a focused, systematic analysis of supply chain stability. While existing studies excellently document the policies and the political struggle, this paper explicitly centers supply chain stability and integrity as its core dependent variable. It aims to systematically analyze how the specific instruments of strategic competition, derived from the theoretical frameworks above, directly propagate instability, foster fragmentation, and amplify systemic risk throughout the global semiconductor production network, thereby bridging a critical gap between high-level geopolitical theory and the operational realities of global production.

## 3. Theoretical Framework: The Convergence of Economic Statecraft and Weaponized Interdependence

To adequately analyze the transformation of the semiconductor supply chain, this paper employs an integrated theoretical framework that combines classic concepts of economic statecraft with contemporary theories of network power.

First, the US-China competition is fundamentally operationalized through Economic Statecraft, which David Baldwin (1985) defined as the use of economic resources as instruments of foreign policy. This framework moves beyond viewing trade and investment as merely commercial activities, recasting them as central arenas of strategic competition where economic power is leveraged to secure geopolitical ends. In the context of semiconductors, this encompasses not only punitive measures like sanctions but also positive inducements like subsidies, all aimed at shaping the technological landscape to favor national strategic interests.

Second, and more specifically, the theory of Weaponized Interdependence (Farrell & Newman, 2019) provides a powerful lens through which to view the mechanisms of contemporary economic statecraft. The theory posits that the structure of global economic networks—characterized by hubs, chokepoints, and a reliance on common standards—concentrates power in the hands of states that control these critical nodes. Under conditions of strategic rivalry, these states can "weaponize" their jurisdictional authority over these nodes to monitor, constrain, or coerce adversarial actors. The US campaign against Huawei, which leveraged control over EDA software, core IP, and manufacturing equipment, is a textbook example of this dynamic. It demonstrates how interdependence, once a source of mutual gain, can be reconfigured into a vulnerability to be exploited (Farrell & Newman, 2021). This creates a pernicious feedback loop: actions taken under this logic incentivize targets to develop their

 

own chokepoints or achieve self-sufficiency, further accelerating the fragmentation of the global network.

## 4. Case Study: The Structural Decoupling of the Global Semiconductor Value Chain

The global semiconductor value chain represents arguably the most complex, capital-intensive, and geographically dispersed system of production in human history, embodying the zenith of economic globalization. This intricate process involves a highly specialized international division of labor: design software (U.S.-dominated, e.g., Synopsys, Cadence), integrated circuit design (U.S., UK), core intellectual property (UK, via Arm Holdings), advanced manufacturing equipment (Netherlands' ASML with its EUV monopoly, U.S.'s Applied Materials, Japan's Tokyo Electron), and high-end fabrication (concentrated in Taiwan's TSMC and South Korea's Samsung) before final assembly, packaging, and testing (often located in China and Southeast Asia) (Linden et al., 2021; Miller, 2022). This dispersion was long hailed as the pinnacle of hyper-efficiency and comparative advantage. However, from a geopolitical perspective, this very structure has been reconfigured from a source of collective strength into a critical systemic vulnerability, exposing the entire network to coercion and disruption originating from strategic competition (Farrell & Newman, 2019).

### 4.1 US Policy Arsenal: From Punitive Controls to Positive Industrial Policy

The United States has systematically deployed its jurisdictional, market, and technological power in an escalating campaign to curb China's technological ascent.

1. **Entity List and Targeted Export Controls:** The addition of Huawei (2019) and subsequently Semiconductor Manufacturing International Corporation (SMIC) to the U.S. Department of Commerce's Entity List were pivotal actions. These measures, under the Export Administration Regulations (EAR), required U.S. and often non-U.S. firms utilizing a *de minimis* level of U.S. technology to obtain a license for exports, effectively severing these Chinese champions from advanced semiconductors, design software, and manufacturing tools (Lindsay, 2020). This was a clear demonstration of "weaponized interdependence," forcing a stark choice upon global firms and initiating the bifurcation of market access.
2. **The October 2022 Sweeping Restrictions:** This represented a dramatic and strategic escalation from entity-specific targeting to a sector-wide technological embargo. The Biden administration expanded controls to restrict China's access to entire categories of technology. The new rules targeted not only advanced AI chips but also the specific tools, components, and even U.S. person expertise required to manufacture logic chips at the 14/16 nanometer node and beyond. The extensive use of the Foreign Direct Product Rule extended the jurisdictional reach of these controls, aiming to create a high-tech cordon sanitaire around China's advanced semiconductor industry (U.S. Department of Commerce, 2022; Chen, 2023).
3. **The CHIPS and Science Act (2022):** This act, providing over $52 billion in subsidies and a significant investment tax credit for domestic semiconductor manufacturing and R&D, signifies a monumental shift towards a neo-industrial policy. Its explicit goals are too "onshore" and "friendshore" critical segments of the supply chain, reduce dependency on geopolitically volatile regions, and bolster U.S. "technological sovereignty" and supply chain resilience (White House, 2022). It explicitly includes "guardrails" to prevent recipients from expanding advanced chip production in "countries of concern," namely China.

### 4.2 China's Counter-Strategy: Pursuing Strategic Autonomy (zili gengsheng)

Confronted with technological containment, China's response has been characterized by a whole-of-state mobilization focused on import substitution and self-reliance, albeit with mixed results.

 

1. **Industrial Policy and National Plans:** The "Made in China 2025" initiative was a foundational policy that explicitly targeted 70% self-sufficiency in core technologies like semiconductors by 2025. While this goal has proven unattainable—highlighting the immense difficulties of achieving technological parity in a sector with such high barriers to entry—it has nonetheless channeled hundreds of billions of dollars into the sector through state-guided investment (Kennedy, 2021). Subsequent plans have continued this strategic focus.
2. **Financial Mobilization: The "Big Fund":** The National Integrated Circuit Industry Investment Fund ("The Big Fund") is the financial engine of China's state-capitalist approach. Its successive phases have mobilized tens of billions of dollars into domestic chip companies, financing acquisitions, R&D, and the construction of new fabrication facilities (fabs) to build out domestic production capacity, particularly for mature nodes (Sacks, 2021).
3. **Asymmetric Countermeasures and Resource Statecraft:** China has begun to leverage its own positions of market power in critical raw materials. The implementation of export controls on gallium and germanium (August 2023) and later on rare earth processing technologies, which are essential for semiconductors, EVs, and defense applications, served as a strategic signal. This move demonstrated Beijing's capacity for retaliatory economic statecraft and its willingness to weaponize its dominance in key resource markets (Sacks, 2023; Wong & Zhai, 2023).

### 4.3 Implications for Supply Chain Stability and Resilience

The synergistic effect of these adversarial policies has direct and profound destabilizing consequences for the global supply chain:

1. **Accelerated Bifurcation and "Innovation Decoupling":** The supply chain is actively splintering into two parallel, less efficient systems: one centered on U.S. and allied technology (a " techno-democratic bloc") and another oriented around Chinese technological autonomy. This process forces multinational corporations to maintain duplicate supply chains and R&D efforts, a phenomenon termed the "innovation decoupling penalty," which risks slowing the aggregate pace of global technological advancement by fragmenting the global innovation commons (Muro, 2022; Weber & Shaikh, 2023).
2. **The Acute Security-Efficiency Trade-off and Rising Systemic Costs:** The pursuit of resilience through "friendshoring" and onshoring introduces costly redundancies and inflates production expenses. Building parallel, geographically diversified supply chains sacrifices the economies of scale that drove down costs for decades, potentially fueling sector-specific inflationary pressures and diverting capital from frontier innovation to costly duplication (Howell et al., 2023; World Bank, 2023).
3. **Strategic Dilemmas for "Middle Powers" and Corporate Actors:** The geopolitical contest places pivotal entities like South Korea, Taiwan, the Netherlands, and corporations like TSMC and ASML in an acutely challenging position. They possess immense structural power derived from their control of chokepoints, yet their economic sovereignty is constrained by the coercive pressure of competing superpowers, forcing them into complex hedging strategies that themselves introduce new uncertainties (Grunberg, 2023; Kastner et al., 2023).

## 5. Discussion

This inquiry has posited that the architecture of global semiconductor supply chains is undergoing a fundamental reconfiguration, driven not by market forces but by the tectonic pressures of U.S.-China strategic competition. The preceding analysis substantiates this thesis with compelling evidence, demonstrating that the actions of both powers are systematically dismantling the hyper-efficient, globally integrated model that characterized the late 20th and early 21st centuries. The semiconductor industry, as the critical case study, reveals a

 

paradigmatic shift in the very logic of global production: the primacy of market efficiency and comparative advantage is being systematically supplanted by the imperatives of national security, technological sovereignty, and techno-nationalist ambition (Baldwin, 2022; Weiss, 2021). The policy instruments deployed—from the strategic weaponization of technological chokepoints (Farrell & Newman, 2019) to the implementation of massive, state-directed subsidy programs—are not peripheral adjustments but rather foundational forces actively forging a new, fragmented structure for the global economy (Weber & Shaikh, 2023).

The consequences of this deliberate fragmentation are profound and multifaceted, presenting a series of destabilizing trade-offs. Firstly, the pursuit of resilience through "friendshoring" and redundant capacity building introduces significant systemic inefficiencies. The economies of scale that drove decades of cost reduction and rapid innovation are being sacrificed at the altar of security, leading to inflated production costs, duplicated capital expenditure, and ultimately, higher prices for downstream industries and consumers (Howell et al., 2023; World Bank, 2023). Secondly, this process creates a paradoxical reconfiguration of risk rather than its elimination. While the goal is to reduce dependency on geopolitical adversaries, the re-concentration of specific capabilities within new, politically aligned blocs may simply create novel, albeit different, single points of failure. The resilience of a diversified but less economically robust "techno-democratic" bloc remains untested against future shocks, be they geopolitical, natural, or economic (Hwang, Paik, & Lim, 2024).

Furthermore, the analysis reveals a critical strategic dilemma at the heart of the current U.S. approach. The demonstrated efficacy of "weaponized interdependence"—exemplified by the stringent export controls on advanced chips and manufacturing equipment—constitutes a potent tactical victory (Farrell & Newman, 2021). However, this short-term coercive power carries profound long-term costs. By demonstrating the vulnerability of deep interdependence, the United States has inadvertently accelerated the very trend it seeks to manage: it has provided an incontrovertible rationale for China and other nations to pursue technological autarky with renewed vigor. This has catalyzed asymmetric retaliatory measures, such as China's controls on critical raw materials like gallium and germanium, and has ignited a global race for technological sovereignty that actively undermines the open, interconnected, and innovation-friendly ecosystem from which American technological leadership originally emerged (Sacks, 2023; Hoekman & Sabel, 2023).

The implications of this microcosmic study extend far beyond the semiconductor sector, pointing to a macroscopic transformation in the ontology of globalization itself. The era of what might be termed "naïve hyper-globalization"—predicated on the belief in the inherent apolitical nature of commerce—is conclusively over. It is yielding to an era of "managed globalization" or "geoeconomic fragmentation," where states explicitly subordinate market logic to strategic objectives (Iansiti & Lakhani, 2020; Tapscott, 2021). This new paradigm is defined by the prioritization of resilience, security, and sovereign control over pure cost-optimization. This reordering presents an existential challenge to the post-Cold War liberal institutionalist order. Multilateral institutions, most notably the World Trade Organization (WTO), were architected for a world moving towards deeper integration and are fundamentally ill-equipped to adjudicate disputes born of weaponized interdependence or to mitigate the centrifugal forces of overt geoeconomic conflict (Hoekman & Sabel, 2023). The core principles of non-discrimination and rules-based dispute resolution are being systematically eroded by the new reality of bloc-based, power-driven competition.

This research, therefore, delineates several critical avenues for future scholarly inquiry. First, there is an urgent need to rigorously model and quantify the "innovation decoupling penalty." While competition can spur innovation, the fragmentation of global research communities, the duplication of monumental R&D efforts, and the erection of barriers to the cross-border flow of talent and ideas risk creating a substantial drag on the aggregate pace of

 

global technological advancement (Muro, 2022). Disentangling the innovative effects of competition from the stifling effects of fragmentation is a paramount task for economists and political scientists. Second, the strategic agency of corporate entities and "middle powers" (e.g., South Korea, Taiwan, the Netherlands, and key firms like ASML and TSMC) demands closer examination. These actors, who control critical chokepoints, are not merely passive subjects of superpower competition but active agents navigating this bifurcated landscape. Their hedging strategies, lobbying efforts, and role in potentially forming new minilateral governance structures or technical standards-setting bodies will be crucial in shaping the ultimate contours of the fragmented order (Grunberg, 2023; Kastner et al., 2023).

## 6. Conclusion

In conclusion, the global semiconductor supply chain serves as both a stark portent and an essential laboratory for understanding the emergence of a new, less stable global economic order. The transition from an efficiency-centric to a resilience- and security-centric paradigm is not a neutral technical adjustment; it is a deeply political, fraught, and costly process. The trade-offs it entails—between efficiency and security, between interdependence and sovereignty, between global innovation and national technological leadership—will define the trajectory of the global economy, the direction of technological progress, and the distribution of geopolitical power for decades to come. The age of the globally integrated chip has passed, and the world is now grappling with the complex and uncertain birth pangs of its successor.

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