social sciences

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Semiconductors at the Intersection of Geoeconomics, Technonationalism, and Global Value Chains

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Abstract: This study provides a historical and contemporary analysis of the United States' strategies in the global semiconductor industry, framed within Joseph Nye's three-dimensional chessboard analysis. This study examines the strategic responses of the United States from the 1980s to the present, connecting these shifts to changes in international politics and geoeconomic alliances. It scrutinizes how the U.S. utilized its unipolar power to respond to Japan's growing semiconductor industry influence in the 1980s and its adoption of free-market principles during the globalization era of the 1990s and 2000s. It further discusses how these multilateral shifts have led to a resurgence of technonationalism in the late 2010s, responding to asymmetric interdependence in the global value chain of the semiconductor industry. This research contributes to the comprehension of the dynamics of the industry within international politics and suggests insights into the ongoing Sino–American competition and strategic realignment in the sector.

Keywords: global value chain (GVC); semiconductor industry; technonationalism; geoeconomics; globalization

Citation: Park, Seohee. 2023. Semiconductors at the Intersection of Geoeconomics, Technonationalism, and Global Value Chains. *Social Sciences* 12: 466. https://doi.org/10.3390/socsci12080466

Academic Editor: Nigel Parton

Received: 30 June 2023
Revised: 17 August 2023
Accepted: 18 August 2023
Published: 21 August 2023

1. Introduction

As the semiconductor, a silicon-based substance, has emerged as a symbol of national power since the late 2010s amid the intensifying hegemonic competition between Washington and Beijing, the U.S. government has taken a more proactive role in the industry. Semiconductors are integral to a wide range of commercial electronic devices and defense systems. Their influence extends beyond shaping modern lifestyles to significantly impacting international politics and the global economy. Developing cutting-edge semiconductor products and establishing resilient supply chains has become a vital interest for national security, leading to fierce competition among states in the industry's global value chain (GVC) for industrial dominance.

Historically, the competition in the semiconductor industry shifted from American and Japanese companies in the 1980s to Korean and Taiwanese firms in the 1990s and 2000s. The invention of the transistor revolutionized electronic engineering by replacing vacuum tubes: the significantly smaller, more reliable, and more energy-efficient transistors set the foundation for the age of modern computers and digital technologies. This invention marked the victory of the United States in the Cold War technological race against the Soviet Union. Facing the unipolar moment after the collapse of the communist Eastern bloc, Washington has utilized its semiconductor technological advantage in order to maintain its international political and economic leadership. As a result, the semiconductor industry becomes an arena where geopolitical and geoeconomic power dynamics play out, reinforcing Washington's pre-eminence on the international political scene. However, the Japanese chipmakers' catch-up in the global market share during the 1980s and the expanding influence of Northeast Asian firms since the 1990s have challenged American dominance in the global chip market.

This research investigates the shifting dynamics of global power and competition in the semiconductor industry from the 1980s to the present, focusing mainly on the strategic

approach adopted by the United States. In order to provide a comprehensive understanding, this paper employs Joseph Nye's three-dimensional chessboard analysis. This model illustrates the interaction of different types of power in international relations across three key dimensions and characters: unilateral military power, multilateral economic power, and transnational relations, including states and non-state actors. This study traces the changes in the United States' semiconductor industry strategy beginning in the 1980s. At this time, the U.S. leveraged its unipolar power to confront increasing economic challenges and competition from Japan. Then, the analysis proceeds to the globalization era in the 1990s and 2000s, when Washington endorsed free-market principles to foster economic interdependence and multilateral interactions through the widespread GVC. This shift laid the groundwork for the resurgence of technonationalism in the 2010s and onward, an era characterized by complicated transnational relations. This study further illuminates how the United States launched technonationalistic initiatives, like the Chip 4 Alliance and the CHIPS and Science Act. These initiatives aim to balance enhancing the domestic chip industry in the United States and maintaining the interests of its Northeast Asian allies. The findings provide insights into the changing power dynamics in international politics and industrial competition in an increasingly interconnected global commerce symbolized as the GVC.

2. Theoretical Framework

This section introduces the core theoretical concepts that guide the analysis in this research: Joseph Nye's three-dimensional chessboard analysis, technonationalism, geoeconomics, and the GVC. These concepts will be used to frame the understanding of the changes in the American semiconductor industry from the 1980s to the present day.

2.1. Joseph Nye's Three-Dimensional Chessboard Analysis

Putting emphasis on how power is exercised, the focus will be on the shifts in the strategic approach of the United States, ranging from leveraging unipolar dominance to adopting collaborative multilateralism and engaging in transnational relations with non-state actors under technonationalism within the GVC. Thus, the analysis aims to highlight the nature of American strategies, describing its shifts over time between protectionism, cooperation, and technonationalism.

Nye's three-dimensional chessboard analysis serves as the primary framework for understanding international power dynamics. This analogy reflects global power distribution in a complex chess game, where the complexity extends beyond a flat surface into a three-dimensional space (Nye 2003, p. 39). Each "board" in this framework represents a different type of power, shaping how states interact and assert influence on the international political scene.

The top tier of the chessboard is the exercise of unilateral power, usually characterized by the United States' dominance in military power since the end of the Cold War. In unipolarity, Washington often finds itself needing to exercise unilateralism (Nye 2003, p. 140). Representing traditional hard power, the states are the dominant actors in this tier. Through utilizing military power and a conventional military alliance along with economic power, they seek national interests and strategic objectives, focusing on territorial integrity, political independence, and overall national security.

The second tier of the board represents the exercise of multilateral economic power. This dimension presents a multipolarity with several major players, such as the United States, the European Union, Japan, multinational corporates (MNCs), and the rising BRICS states. No state can operate as a hegemon, so each must engage with other entities. The key players in this tier are significant national and regional economies, and their participation influences the global economy. Hence, states leverage their economic power to achieve geopolitical ends, employing economic sanctions, trade agreements, foreign aid, and currency manipulation (Hirschman 1980).

The bottom tier represents complex transnational relations. In Nye's analysis, the third board involves soft power, where non-state actors substantially influence topics, such as terrorism, environmental degradation, and non-proliferation of mass destruction weapons. On this tier, power is diffused among state and non-state actors, such as international organizations, non-governmental organizations, MNCs, and even individuals or networks of individuals. The third tier is the critical dimension, where technonationalism plays a significant role as states face the challenges and opportunities posed by the growing power of non-state actors. Especially, global high-tech giants possess a massive influence on the economy and society (Wolf and Terrell 2016; Diesen 2021).

Power in the global context is not exercised through a single dimension alone. Rather, it is an interaction between these three dimensions shaping the strategic approaches of actors within international relations. From the first tier to the second, there is a shift from unilateral dominance to a multipolar framework. From the second to the third tier, the dynamic evolves further, blurring the traditional power structures, as non-state actors become increasingly influential. In this way, power shifts from being solely in the hands of states to a more dispersed structure, creating a complex interconnectivity of relations. As observed from this perspective, the shifts of the U.S. strategies in the semiconductor industry from a more traditional state-centric approach to a more intertwined network of states with different competitive edges and strategic interests underline this complexity. Therefore, demonstrating how these three dimensions are interrelated is critical to analyze international power dynamics and national strategies within significant industries like semiconductors, as a resource of state power in the 21st century.

2.2. Technonationalism as a Strategic Industry Approach

Technonationalism refers to the proactive engagement of states in high-tech industries to support domestic companies, enable them to have or maintain a dominant position in the GVC, and utilize their global market power as a mechanism for diplomatic power projection. This mercantile-inspired behavior ties a state's technological capabilities to its security, prosperity, and stability (Capri 2019). It underlines the utilization of influence over the GVC, obtained through technological advancement, to further national strategic agendas. Technonationalism, first coined by Robert Reich in 1987, refers to states viewing technological prowess as integral to national security and economic stability. This perspective often promotes domestic technological development to enhance geopolitical standing. Over time, in response to shifting international dynamics, the approach has evolved from a traditional focus on "catch-up" strategies to proactive "first-mover" strategies, as illustrated by China's active push for its technologies in international standards (Kim et al. 2020).

Technonationalism has highlighted different roles of states in the changing international economy: as a protector of domestic industries from foreign competition through trade barriers and subsidies (Fransman 1995; Ostry and Nelson 1995; Nelson and Wright 1992; Tyson 1991, 1993), as a facilitator of the innovative domestic environment (Nakayama 2012; Kohno 1995; Yamada 2000; Meyer 2004; Edgerton 2007) while pursuing the benefits of an integrated global market (Strange 1996), and as a tactician of fostering national strategic interests leveraging domestic high-tech industrial capabilities and home-grown firms' global market power (Evans 2020; Farrell and Newman 2014; J. L. Schoff 2022). Technonationalism, a strategic state approach, positions domestic high-tech industry competitiveness as critical to national power, blending economic advantage, military power, and technological capacity into "national interests" (Evans 2020). From this perspective, states encourage their domestic high-tech firms to strengthen industrial prowess and establish a balance of dependence with other states, fostering technological self-sufficiency and advocating the securitization of economic policy (Capri 2019; Luo 2021; Manning 2019; Schoff 2020; Schoff and Mori 2020).

2.3. Geoeconomics

Geoeconomics involves economic instruments to achieve geopolitical ends (Luttwak 1990). This perspective sees economic interdependence as a prospective chokepoint to be exploited (Mastanduno 2021). In contrast to the liberalist perspective arguing economic interdependence as a critical factor in maintaining international peace and prosperity (Doyle 2005; Gartzke 2007; Gartzke and Li 2003; Oneal and Russet 1997; Maoz and Russett 1992; Oneal and Russett 1999), the asymmetric interdependency serves as a source of bargaining power in geoeconomics, where the risk of defection underpins the unlikelihood of cooperation between interdependence states (Scholvin and Wigell 2018, p. 75; Suzuki 1994). It implicates a shift in the focus of state security from military prowess to global market power, viewing states as economic actors driving the international economy (Cowen and Smith 2009). This view expands the concept of security and actors in international relations beyond traditional nation-states (Babic et al. 2017; Babić et al. 2022). Thus, states continue leveraging their global market position to secure their strategic interests (Vihma 2018). They advance and protect their national interests by deploying economic instruments to create favorable geopolitical results (Blackwill and Harris 2016).

As a result, modern international politics is shaped by states employing technonationalism as a part of the geoeconomic strategy, balancing strategic technological advancement with geopolitical considerations. As states have promoted technonationalistic initiatives, geoeconomics reflects the notion of the "weaponized interdependence" suggested by Blackwill and Harris (2016). The blend of geoeconomics and technonationalism is vital to understand international relations nowadays. Thus, technonationalistic conflicts are witnessed mainly in the Sino–American rivalry, and global market distortion is prospective.

2.4. Global Value Chains

Global commodity chains (GCC), global production networks (GNP), or global value chains (GVC) are similar concepts to understand and analyze the high interdependence of the global economy[1]. These concepts are characterized by the fragmentation of labor based on comparative advantages in each state or region determined by the allocation and flow of financial, material, and human resources (Gereffi and Korzeniewicz 1993). The role of state actors in the GVCs has been understood in terms of the facilitation, regulation, and distribution of such resources within the national economic sphere until recent years (Mayer and Phillips 2017). However, states "upgrade" their position by moving to higher-value activities in the GVCs (Humphrey and Schmitz 2002). Upgrading often implies a higher position in the GVCs and potential economic and social gains, but its actual outcomes are influenced by many other factors, including firms' business strategies and industrial policies.

States proactively intervene in the GVC, using economic and political tools to manipulate the structure and shift power dynamics with technonationalistic and geoeconomic initiatives. Such interventions include measures to promote domestic industries, protect strategic sectors, influence the direction of technological innovation, and mitigate vulnerabilities in key supply chains. Hence, states can change the balance of power, shift the tendency of international trade, and create new aspects of the global economy. Technonationalism and geoeconomics are the fundamental drivers of shaping the individual states and the dynamics of the GVC as well.

3. American Power and the Semiconductor Industry in the 1980s

In the post-war period, the United States dominated international politics and economy. Despite the Soviet Union's effort for power balance, American industrial productivity remained unchallenged until the 1970s. However, the United States experienced a relative decline in its economic power due to Western Europe's recovery led by the Marshall Plan and the emergence of Newly Industrialized Economies (NIE) in East Asia. Moreover, the 1973 Oil Shock caused economic recessions in the 1980s (Kagan 2012). The trade deficit increased from 0.7% of the GDP in 1977 to 3.1% in 1987 (World Bank 2023). Such

macroeconomic crises in the early and mid-1980s caused fear among Americans that the United States' position as the global superpower was threatened. Jagdish Bhagwati (1988) explained the situation in two terms: Double Squeeze and Diminished Giant.

The rise of NIE's labor-intensive industries and Western Europe and Japan's capital and technology-intensive industries further challenged the U.S.'s competitiveness. In order to mitigate the declined competitiveness, the Plaza Accord was signed in 1985, aiming to devalue the U.S. dollar against other currencies to reduce the American federal deficit. This move symbolized state intervention in foreign currency markets to adjust the trade deficit artificially (Funabashi 1989). U.S. President Ronald Reagan asserted that his administration would take more aggressive trade practices, especially targeting Japan. The Accord was a signal flare of state intervention in the foreign currency market to adjust the trade deficit artificially and address the American will to further engage in the market. Based on comparative advantages, free trade was criticized, primarily by developing nations, who argued that such a system favors countries with already established manufacturing sectors (Irwin 2017). Historically, Australia and Latin American countries have implemented protectionist policies to stimulate domestic industries. However, the failure of Latin America's import substitution industrialization policy and the success of NIEs suggested that an export-oriented trade system could be more effective (Baer 1972).

Moreover, protecting specific industries until their maturity has proven effective for longer-term growth in the domestic economy, adding complexity to the theory of comparative advantage. Consequently, states with high-tech capabilities, natural resources, or the historical coincidence of starting "first" can leverage these comparative advantages. Therefore, lagging economies can justify their protectionist policies. By the 1980s, with increasing criticism of free trade, protectionist views were gaining traction in the United States. Despite President Reagan's statements about protecting free trade, Washington's policy began leaning toward protectionism. With the "relative" decline in the American economy and growing conflicts with emerging economies, trade barriers and domestic companies' support became political imperatives (Krugman 1987).

Along with the concerns about its decline in economic power, Japan's industrial success, particularly in the high-tech sectors in the 1980s, was perceived as a rival to American economic dominance by scholars two-fold. The first sought to understand Japan's growth model, predominantly attributing its success to bureaucratic leadership. Japan's Ministry of International Trade and Industry (MITI) was recognized as a pilot agency that shaped national interests and drove successful industrialization (Vogel 1979; Johnson 1982; Okimoto 1989; Anchordoguy 1989). The second perspective warned of a declining American industrial competitiveness, advocating for protectionist measures and strategic trade policies to safeguard domestic high-tech industries (Tyson 1991; Prestowitz 1988; Tyson 1993). The rise of Japan in the 1980s highlighted keywords, such as "protectionism", "national competitiveness", "industrial policy", and "state intervention". While these discussions mirrored the current discourse surrounding China's rise in the 2000s, shaping Washington's strategic approach to maintaining its global economic supremacy, it is crucial to understand the influence of historical narratives on how the United States saw Japan in the 1980s. In the context of the chip industry, Washington is embarking on a path to regain control over cutting-edge technologies and high-tech sectors and aiming for self-sufficiency. Such a trend has a historical parallel with the interaction with Japan in the 1980s (Vekasi 2019). The global realignment and creation of new approaches to advance strategic interests, values, and politics indicate that historical relations are likely to play a key role in shaping present policies.

These theoretical shifts among American economists in the late 1970s and the 1980s advocated state intervention and protectionism in response to imperfections in market competition and served as a backdrop for macroeconomic challenges in the 1980s. Particularly in the high-tech sectors, fixed costs and research and development (R&D) investments function as barriers to market entry. Thus, the strategic trade policy justified a protectionist stance for domestic high-tech industries and state intervention for the potential spillover

benefits to other sectors and overall economic growth (Grossman and Richardson 1985; Eaton and Grossman 1986; Dixit and Grossman 1986; Spencer 2004; P. Krugman 1994, 1983; Dosi et al. 1990; Tyson 1993). It was against the intellectual environment that Washington confronted its industrial decline, the rise of Japanese high-tech firms, and an escalating trade deficit. These trends elicited worries about diminishing state power. Martin Felstein refuted the idea of a loss of competitiveness as the root of the trade deficits, pointing instead to changes in capital flows (Council of Economic Advisers 1983). At the same time, Japan's increasingly dominant role in the global semiconductor market and the existence of the Keiretsu system—a network of interlinked corporates with shared business connections and shareholdings—posed challenges, fueling concerns about an uneven playing ground (Lawrence 1991). Such a change in academia resulted in the Plaza Accord in 1985, Article 301 of the Trade Act of 1974, and the establishment of the World Trade Organization in 1995.

Establishing the Semiconductor Industry Association (SIA) in 1977 exemplified the responses to these economic concerns. The SIA lobbied Washington to rectify perceived unfair practices by Tokyo. Academic and industrial efforts to address the importance of the high-tech industry for the national economy and security converged in the 1986 U.S.–Japan Semiconductor Agreement[2] and the Reagan administration's active intervention in the proposed acquisition of Fairchild Semiconductor, by a Japanese chipmaker, Fujitsu Ltd., in 1987[3]. Also, a significant milestone in U.S. semiconductor history was the establishment of SEMATECH in 1987, which comprised 14 leading U.S. semiconductor producers and received USD870 million from the U.S. Congress through the Defense Advanced Research Projects Agency (DARPA) (Congressional Research Service 2020). The 1980s marked a significant shift in U.S. trade policy toward Japan, underlining a rising technonationalist sentiment (Reich 1987) and demonstrating the perceived threats to American high-tech supremacy.

To summarize, during the 1980s, the United States adhered to the principles of neoliberalism under the political leadership of President Ronald Reagan, endorsing the belief in free-market economic systems. In this context, the U.S. domestic chip industry was largely driven by market forces. However, its international strategy deviated from these free-market principles, opting for interventionist and protectionist approaches prioritizing national security and technological leadership. This divergence points out the strategic value of the semiconductor industry held for the United States and the role of this industry amplified as a backbone of a rapidly digitalizing global economy in the era of globalization.

4. The Globalization Era: Embracing Free-Market Principles in the 1990s and the 2000s

In the 1990s, the U.S. policy focus shifted from industrial to science, promoting collaboration between the government, private firms, and academia rather than solely fostering strong domestic manufacturing capabilities (Williams and Khan 2021). As a result, the American semiconductor industry pivoted toward more knowledge-intensive activities, such as chip design, electronic design automation (EDA), software, equipment, and chemical materials. Simultaneously, the U.S. renegotiated its semiconductor trade agreements with Japan to recapture the market share in commodity and design-intensive chips. This negotiation resulted in the 1991 renewal of the agreement due to ongoing U.S. dissatisfaction with Japan's market penetration level (Yoshimatsu 1998, p. 223). Shortly after the renewal, Japan's banking sector collapsed, putting the country into the "Lost Decade" of the 1990s. While Tokyo experienced an economic downturn, Washington established the Semiconductor Research Corporation along with the previously established SEMATECH, enabling the SIA to influence policymaking significantly. In the mid-1990s, the Clinton administration further sought to move beyond bilateral agreements and eliminate import quotas on Japan, focusing on fostering a more open, competitive global market for the semiconductor industry. The 1996 U.S.–Japan semiconductor agreement signaled a commitment to a multilateral approach embracing the newly established World Trade Organization's norms of supporting free-market principles (Flamm 1996; Helm 1996). The U.S. semiconductor industry embraced this period of change by transitioning to a flexible

fabless/foundry business model, as exemplified by new fabless players, such as Qualcomm and Xilinx. These companies started outsourcing chip manufacturing to foundry players such as Taiwan Semiconductor Manufacturing Company (TSMC), focusing on intellectual properties and chip design. Maintaining a thirty percent annual growth propelled by the Windows-PC boom, the American semiconductor industry surpassed Japanese chip makers (Perrone 2016). This growth coincided with vertical specialization, which resulted in the fragmentation of the supply chain on a global scale. The production processes distributed across multiple countries marked the emergence of the GVC in the semiconductor industry. This new production paradigm is primarily facilitated by dominant leading firms in the industry that strategically outsourced various production segments to different locations based on comparative advantages. The cost-efficient way of production taps into specialized resources and exploits differences in labor costs and domestic regulations (Mayer and Phillips 2017). It enables companies to respond more flexibly to market demands and adapt to innovative technologies rapidly.

Under President Bill Clinton, the U.S. technology policy marked a transformative era in the relationship between the government and high-tech business actors. Based on state–business cooperation, the collaborative efforts in the semiconductor industry were evident for both defense and civilian applications. The shift from a predominantly military-focused R&D to an inclusive civilian emphasis demonstrated that the Clinton administration was committed to technological advancement as an economic powerhouse, diversifying tech initiatives for the digital age (Markoff 1993). Nonetheless, with the successful policy shift to a more market-oriented one in the 1990s, the American industry faced substantial challenges in the 2000s as the consequences of the 1990s science-policy strategies began to surface. Eliminating redundant capital and labor for cost efficiency and maximized shareholder returns increased industrial fragility. This fragility became evident with the Dot Com crash in the early 2000s, which exposed weaknesses in the ecosystem established through consolidation and vertical specialization. Champion firms that significantly dominated the competitive landscape only possessed the capacity to form stable supply chains narrowly focused on their specific requirements. Consequently, the industry became more vulnerable to disruptions when there were substantial shifts in the broader economic context, such as changes in market demand, significant technological advancements, policy changes, or fluctuations in global trade patterns (Williams and Khan 2021). Such fragile supply chains were optimized for short-term profitability and eliminating redundancy in the sector but not for the economy's long-term needs. Another significant point of the 2000s is that the industry experienced significant changes in its landscape. With East Asia emerging as a dominant player in the manufacturing of logic and memory chips, the balance of power in the global semiconductor market began to shift. While the U.S. government emphasized the market principles for the chip industry, South Korean and Taiwanese semiconductor firms focused on technological innovation backed by government support (Mark and Roberts 2023). This shift also coincided with the rapid development and expansion of China's semiconductor industry. Throughout the 2000s, the gross output of the Chinese chip industry increased by 24% as the profit ratio went up from 17.7 million CNY in 2000 to 1 32.7 million CNY in 2010 (Kong et al. 2016). This development marked Beijing's assertive entrance into the global semiconductor industry and further intensified the competition.

The embrace of free-market principles in the 1990s and the 2000s, marked by a laissez-faire policy direction or a free-market principle based on reducing government intervention and focusing on global production and self-regulation, showed its limitations. Despite maintaining an edge in high-value-added activities, the U.S. began losing ground in other segments, such as memory chips to South Korean firms and non-memory chip fabrication capabilities to Taiwanese companies. American companies' share in global semiconductor fabrication capacity fell from 40% in 1990 to 13% in 2015 and 11% in 2019 (Congressional Research Service 2020). This decline highlighted the urgent need to reassess the strategy and policies guiding the American semiconductor industry, particularly given the increasing competition from East Asia.

5. Return of Technonationalism: A Geoeconomic Perspective in the 2010s

In the context of the United States and its strategies to counter the rise of China in the high-tech domain, the resurgence of technonationalism cannot be fully understood without comprehending the shift in its paradigm. Initially, technonationalism shed light on domestic technological development utilizing domestic industrial policies (single-state focus), primarily achieved through government intervention and policies to strengthen domestic technological capabilities, industrial competitiveness, and self-sufficiency in high-tech sectors. Nevertheless, the dynamics of global competition for technological supremacy and the high interdependence on the GVC have changed the way of promotion and the nature of technonationalism. As states grapple with the escalating high-tech race, they increasingly leverage their high-tech capabilities for geopolitical ends involving domestic high-tech firms. Thus, the contemporary paradigm of technonationalism frames that state power is derived from domestic high-tech market power, exploiting potential technological asymmetry to advance state power in international politics. This geoeconomic perspective that employs economic resources to exert influence and achieve geopolitical objectives views technonationalism as a strategy to engage with the GVC (Park 2023). In this context, states seek a balance between national strategic interests and those of international partners. This approach acknowledges the broader implications of collective actions on international politics.

The return of technonationalism in the United States was triggered by the rising global competition in the semiconductor industry since the late 2010s. Chinese semiconductor firms and the government's intensive investment in the industry, such as the Made in China 2025 (MIC 2025) initiative, have spurred significant technological advancements, prompting Washington to re-evaluate its stance on technological sovereignty and security (McBride and Chatzky 2019). Starting from imposing tariffs on Chinese goods and blocking several Chinese-backed acquisitions of high-tech firms, such as Huawei and ZTE, in 2018 under the Trump administration (Kang and Sanger 2019), the Biden administration has reinforced its global leadership and technological dominance by responding with internal and external balance strategies.

Firstly, the resurgence of technonationalism has led to a dominant approach in governing science and technology since the late 2010s in the United States, particularly in the semiconductor approach. In response to China's increasing prowess in the high-tech sectors, the U.S. Congress enacted the CHIPS and Science Act, as a part of an internal balancing effort. A combination of two bipartisan bills—the Endless Frontier Act and Creating Helpful Incentives to Produce Semiconductors (CHIPS) for America—is another measure that the United States has taken to initiate support for its domestic semiconductor industry, especially for the chip fabrication segment. The Act intends to bring semiconductor manufacturing capabilities back to the U.S., enhance domestic R&D, and ensure a stable supply of semiconductors to reduce the vulnerability to geopolitical tensions or global health crises, like COVID-19 (Arcuri 2022). Under this Act, the U.S. government incentivizes foreign chipmakers, such as Samsung Electronics and TSMC, to invest in the United States, marking a significant effort to create a diverse domestic semiconductor ecosystem (Brown 2022; Maister 2020; Yu and Cheng 2022). As a result, both companies have announced sizeable investments to build chip manufacturing facilities in Arizona (TSMC's new lines) and Texas (Samsung's additional American factories), further strengthening the country's domestic chip manufacturing capabilities by reshoring (Brown 2022; Cheng and Li 2021; John Liu and Mozur 2023).

Secondly, as an external balancing strategy, Washington has sought to counter Beijing's influence by enlisting the support of like-minded democracies, particularly Japan, South Korea, Taiwan, and the Netherlands, holding critical positions in the semiconductor GVC. One of the fundamental approaches in the U.S. technonationalism is the formation of the Chip 4 Alliance with its Northeast Asian allies. This quasi-alliance aims to counter China's increasing influence and technological catch-up in the global semiconductor industry and other related high-tech sectors. Each alliance member has been assigned specific roles

corresponding to their strengths, with the United States leading chip design, I.P., and core technologies; South Korea focusing on memory chip production; Taiwan being responsible for non-memory chip production with its foundry market share; and Japan dealing with chemical materials, chip fabrication equipment, and parts (Cadence 2022). The alliance is not just about alignment in technology and production roles. It also incorporates a concerted approach to the GVC of the semiconductor industry, recognizing the importance of supply chain diversification, intellectual property rights protection, and a chokepoint strategy to control the export of advanced semiconductor products and chip manufacturing equipment for higher nodes. In October 2022, the Biden administration urged Japan and the Netherlands to collaborate in preventing the transfer of advanced chip technology to China (Allen and Benson 2023). As Japan's Tokyo Electron and the Netherlands' ASML hold a tight grip on the global advanced semiconductor manufacturing equipment market, their compliance with export controls is critical for the effectiveness of Washington's to counter Beijing. The integration of the unique position of ASML's lithography exemplifies the interconnected nature of the global chip industry and reveals a chokepoint in the GVC. The very fact that a single firm's monopoly, such as ASML's control over the most advanced extreme ultraviolet (EUV) lithography tools, illustrates that controlling specific technology can influence the entire global production and distribution of advanced semiconductors (Miller 2022, pp. 181–87). It further highlights the importance of the multi-concerted effort and coordination of diverse geoeconomic interests among like-minded nations. However, the alliance's success hinges on the member states' willingness to commit to the collective goals and Washington's ability to coordinate their interests while mitigating competition (Davis et al. 2022). ASML's case demonstrates that global dynamics can be shaped by single chokepoints, and it is critical to maintain equilibrium in the broader technology and security landscape. Ensuring this balance is crucial for the alliance and partnership to remain effective in achieving their shared policy objectives.

6. Discussion

In the era of technonationalism where highlighting technological self-sufficiency is pivotal to high-tech strategies, understanding the shifts in the dynamics of American power in the semiconductor industry provides critical insights. These shifts align with the tiers of Nye's three-dimensional chessboard framework, offering a perspective to understand potential strategic actions. Moreover, this analysis is crucial in grasping the implications of Washington's attempts for decoupling China from the GVC of the semiconductor industry and other critical sectors as well. Putting emphasis on how the United States has projected its state power, unilaterally, multilaterally, or trans-nationally engaging with state and non-state actors, as depicted in Nye's framework, this paper employs a historical approach to analyze the change in the American semiconductor industrial policies across different eras since the 1980s onward.

The 1980s corresponds to a unilateral distribution of power on the first and second tiers of Nye's analysis, characterized by the military and economic dominance of the U.S. During this period, Washington perceived a relative decline in power as Tokyo emerged as a critical competitor in the semiconductor industry. In order to address these concerns, the U.S. government resorted to strategic interventions, such as the 1985 Plaza Accord, the 1987 U.S.—Japan Semiconductor Agreement, and the denial of the Fujitsu–Fairchild acquisition deal. These measures aimed to open the Japanese market to American firms and retain American dominance within the industry. Such interventions illustrate the use of traditional hard power tools in the 1980s, reminiscent of a dominant power exercising unilateral action in a unipolarity. The U.S. government's proactive involvement in the high-tech industry during this era established the foundation for an increasingly interlinked and interdependent global economy, setting the stage for the second tier.

The globalization era (1990s–2000s) aligns with the second tier, where economic power takes center stage in multipolarity. During this era, the United States transitioned from direct government engagement in the high-tech sector to championing free-market princi-

ples, embracing globalization. This strategic shift was symbolized in companies' pursuit of new business models with a core focus on global cost competitiveness. The promotion of laissez-faire economics by the U.S. government resulted in the widespread GVC, creating a more interdependent global economy, further accentuating the multipolarity of this second tier. As economic activities spread globally, the power dynamics in the international economy have shifted. Multinational corporations acquired more prominent roles in shaping economic policies and influencing global commerce, raising concerns about the decline in state power (Sachs 2020; Weiss 2000; Pirie 2013). This intricate web of economic activities across national borders has created a system where the impacts of decisions taken in one state or region could reverberate globally, affecting industries and economies far beyond their immediate locality. This transition particularly influenced the semiconductor industry, as production processes were split across borders, and states started specializing in specific aspects of the GVC. The dependencies created by the GVC further underlined the need for cooperative engagement among the major players and set the stage for the complex geoeconomic considerations that characterize the third tier of Nye's model.

The contemporary era aligns with the bottom tier of the chessboard, drawing attention to the complexity of transnational relations, where power is dispersed among various state and non-state actors. In response to the security concerns arising from the rivalry with China, the United States calls for a resurgence of technonationalism, shifting its paradigm of collective promotion with like-minded nations for geoeconomic ends. Initiatives such as the Chip 4 Alliance and the CHIPS and Science Act underline this resurrection, illustrating an understanding of the necessity to balance strengthening domestic capabilities with maintaining international partnerships. In the semiconductor industry, Washington is currently charting a course to reclaim its dominance over cutting-edge technologies and vital high-tech sectors, aiming for self-sufficiency. Responding to globalization and interdependencies developed in the second tier, U.S. policymakers have recognized the importance of high-tech industries, especially the semiconductor industry and its role in retaining national security and economic competitiveness. This strategic response reflects the complex geoeconomics that stems from the dispersion of the GVC, as well as corresponding dependencies and vulnerabilities. The emphasis on technonationalism in this era also showcases a response to the increased influence of non-state actors, the high-tech giants operating in the oligarchical global high-tech market. Thus, the return of technonationalism in Washington's engagement in the semiconductor industry is both a result of and response to the dynamics between state power and business power internationally and domestically, embodying the complex contemporary high-tech industry and its weight in international politics.

The lessons learned from this analysis provide insights into the ongoing competition in the semiconductor industry. The current situation in the semiconductor industry sharply contrasts with the dynamics in the 1980s, when the United States could leverage its unilateral influence over the global high-tech industry to advance its interests. Fast forward to the present, the industry has grown significantly and diversified in previous decades, with the South Korean and Taiwanese industries being technologically advanced and capable of large-scale production. Meanwhile, China serves both as a key market for semiconductors and as a manufacturing base. Furthermore, with the Dutch company ASML occupying a unique niche within the GVC, the United States can no longer solely rely on unilateral tactics, calling for the necessity of a multilateral approach in the semiconductor and other high-tech geoeconomic strategies. Reflecting on the U.S.–Japan trade tensions in the 1980s, there are salient lessons to be drawn: the contemporary semiconductor landscape is shaped not only by technological advancements but also by geoeconomic factors to advance national interests, supply–demand dynamics, and prospective security risks (KPMG 2023).

Washington's efforts to limit Beijing's access to the semiconductor GVC have faced challenges. The United States has initiated the Chip 4 Alliance, assigning specific roles to each member state based on competitive edges in each segment of the semiconductor industry, and finding cohesion with its Northeast Asian partners is still a controversial topic.

The CHIPS and Science Act itself is already contradicting such a collective promotion of technonationalism, as the bill intends to strengthen the domestic semiconductor fabrication capability within the United States. Also, Tokyo's endeavor to host TSMC in Kumamoto and establish Rapidus with the government's financial and political support represents the strategic importance of nurturing domestic manufacturing capabilities (Hirosawa 2022; Nagaho 2023). The South Korean National Assembly passed the "K-Chips Act", increasing tax credits for chipmakers' investment in manufacturing facilities to boost the country's semiconductor industry (Lee and Shim 2023). Furthermore, Taiwanese chip industry leaders, such as K.S. Pua, CEO of Phison Electronics, and Tsai Ming-Kai, Chairman of MediaTek, called on government support for the chip design sector to maintain Taiwan's technological competitiveness amid the rising global competition. They urge Taipei for a holistic industrial policy including the entire chip ecosystem (Li 2023; Jay Liu and Lin 2023). Therefore, the divergence in strategic approaches of Northeast Asian allies addresses varying national interests.

The recent decision in June 2023 by the United States to allow South Korean and Taiwanese semiconductor firms, such as Samsung Electronics, SK Hynix, and TSMC, to continue their operations in China highlighted the ever-changing dynamics of the global semiconductor industry and its geopolitical implications (Hayashi 2023). Such a policy amendment of Washington potentially undermines its export control measures aimed at Beijing and testifies to the complications of attempting to technologically isolate China from the GVC of high-tech industries. Moreover, the highly interconnected nature of the semiconductor industry makes the United States enforce its export controls on its Northeast Asian allies. Primarily, this interconnectivity is evident as Korean and Taiwanese companies have invested in China. Such restrictions on their operations potentially induce detrimental economic consequences. With China, being a big export market, Seoul and Taipei may prioritize their economic relations over the objectives of Washington's initiative. Also, the United States has been pressuring manufacturing to curb their operation in China through incentives, which have been met with resistance from Korean and Taiwanese companies. This tension could lead to some firms forgoing U.S. federal government aid, demonstrating the limits of using financial support to shape business entities' behavior in the face of economic interdependency (Hayashi 2023).

The resurgence of technonationalism in U.S. semiconductor policy comes with its own set of problems. Firstly, the global high-tech market has thrived on collaborative efforts with MNCs benefiting from cross-border innovations throughout history. The new stance risks isolating the United States from global technological advancements, potentially hindering the very competitiveness it aims to protect. Secondly, the resurrection of technonationalism in Washington's policy necessitates a critical evaluation. Does this shift toward protectionism stem from genuine security concerns or is it driven by aspirations of economic supremacy? The essence of this shift lies in the intertwining of business interests with the state's strategic agenda—economic securitization. A profound grasp of the power dynamics between the state and business is imperative. Without this consideration, technonationalistic approaches might merely seem to be business manipulating state power for global commerce, cloaked under the guise of national security interests.

7. Concluding Remarks

This research has explored the changes in the strategies of the United States in the global semiconductor industry, guided by the metaphor of Joseph Nye's three-dimensional chessboard analysis. Across the decades, from the 1980s to the current era, Washington's strategic decisions have shaped the power distribution in international politics, geoeconomic alliances, and transnational relations, including both state and non-state actors. Exhibiting its unipolar power to respond to the rise of Japan in the semiconductor industry by leveraging traditional tools of hard power, the United States established strategic governmental interventions to secure its technological dominance in the 1980s. This period set an interlinkage to globalization and economic interdependence in the 1990s and 2000s,

representing a pivot in American strategy toward a more multilateral approach, embracing free-market principles. The escalating economic interdependence characterized by the emergence of the GVC underlines the multipolar power distribution in the international economy. In this multipolarity, technonationalism has resurrected as a strategic response to asymmetric interdependence, where states disproportionately depend on others for critical technologies. Technonationalism in the contemporary era represents a shift in perspective acknowledging the strategic importance of the high-tech industry for national security and economic stability, yet questioning the instrumentalization of the state's security concerns for advancing business interests.

These findings illustrate a complex interaction of high-tech strategies for geopolitical considerations. They mirror the constantly transforming nature of technonationalism from a developmentalism-oriented industrial policy promoted by a single state to a security-oriented geoeconomic strategy promoted by a group of like-minded states. Thus, the strategic balancing between retaining domestic industrial prowess and coordinating global partnerships is required for promoting national interests in the high-tech sector. Such concluding remarks call for further research into a broader area of asymmetric interdependence, addressing potential technological bottlenecks. Also, the emerging role of non-state actors, such as MNCs, within the global tech landscape influences state actors' technonationalistic strategies and reshapes geoeconomic dynamics. By expanding the focus beyond semiconductors to other critical high-tech sectors, such as electric vehicles, batteries, and artificial intelligence, future research could examine unique challenges and opportunities for the state's geoeconomic strategies. Each sector embodies technological advancements and represents strategic interests in terms of energy sustainability, transportation, logistics, and cognitive computation. Such an expansion of scope might help to understand holistic technonationalistic initiatives in an increasingly interconnected global high-tech landscape.

Funding: This research was funded by The Kurata Grants of the Hitachi Global Foundation, grant number 1475.

Data Availability Statement: The research data supporting the reported results in this article are available as open access.

Acknowledgments: The author would like to thank the Hitachi Global Foundation for the grants, GSICS's faculty and office staff for various support throughout my PhD study, especially my supervisor Ryo Ikea, vice-supervisor Jeongsoo Yu, and the department secretary Rika Hasebe. My gratitude extends to Yoichiro Sato and Hidetaka Yoshimatsu at Ritsumeikan Asia Pacific University for valuable feedback and insights. I cannot forget to thank the anonymous reviewers who provided me with constructive feedback to improve the paper.

Conflicts of Interest: The author declares no conflict of interest.

Notes

1 Gary Gereffi, leading scholar in the GVC studies, and other scholars have developed a framework of "global commodity chains" since the 1990s to analyze the shifted paradigm in the globalization of commerce and the increasing interconnectivity of the international trade environment. Similar terms, such as global production network and global supply chains, describe the production system relying on the geographical division of labor. Nonetheless, the term "global value chain" is more widely used nowadays in international business literature, due to its comprehensive nature including both primary and support activities that are outsourced and offshored, providing a more holistic view of global business operation (Gereffi et al. 2005; Gereffi 1996, 2014).

2 According to Hidetaka Yoshimatsu (1998), the Arrangement consisted of two parts. The first part is about boosting the sales of foreign semiconductors in the Japanese market, and the second part is about the suspension "dumping" of Japanese chip manufacturers in the U.S. market.

3 The U.S. government under the the Reagan administration intervened to block the Fujitsu–Fairchild deal in 1987. The Central Intelligence Agency, the Department of Commerce, and the Department of Defense urged the White House to scrutinize the deal, fearing potential implications for national security and the risk of a critical technology transfer to Japan (Sanger 1987; Reich 1987). This intervention implied Washington's willingness to shield domestic high-tech industries from international competition, denouncing a free-market approach.

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