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Article

Geopolitics and geospatial strategies: The rise of regulatory supply chain controls for semiconductor GPN in Japan, South Korea and Taiwan

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Geopolitics and geospatial strategies: the rise of regulatory supply chain controls for semiconductor GPN in Japan, South Korea and Taiwan

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Abstract: In this article, we present an analysis of how East Asian states (specifically, Japan, South Korea and Taiwan) are adapting to the emerging geopolitical contexts of the ‘great powers competition’ between the United States and China. To the extent that the previous literature on GPN/GVC governance included the state as one of the extra-firm actors, geopolitics has not been explicitly dealt with in its role in shaping GPN/GVC governance. We build on the existing research on GPN/GVC governance and propose a shift in perspective, from one of cost-driven to diplomacy-driven governance. Taking the case of the semiconductor industry, we conduct an analysis of native language sources and examine how regulatory supply chain controls are shaping East Asian industrial and trade policies. Specifically, we focus on how East Asian states are negotiating their dependence on the world’s two largest markets, the United States and China, and developing new policy strategies in order to navigate the dual hegemony. The analysis reveals that, while varying strategies are adopted, multilateral alliances of the states are gaining prominence in GPN/GVC governance. We conclude that a more state-centric analysis of GPN/GVC is in order.

Keywords: role of the state; semiconductor industry; global supply chain; East Asia

1 Introduction

Global production networks/global value chains (henceforth, GPN/GVC) in East Asia have been integral to the post-World War II economic globalization (Brown et al. 2005;

Yeung 2022). However, the recent rise in regulatory supply chain controls, much of it attributed to the tensions between the two ‘great powers’ and their hegemonic actions (Parnreiter 2018), challenges the basic geographical assumptions of firm-centric, cost-driven GPN/GVC governance. In this article, we examine how geopolitics is altering the role of the state in the GPN/GVC governance. We take the cases of three East Asian states – Japan, South Korea and Taiwan – as they navigate the rise of regulatory supply chain controls over the semiconductor industry. As societies with strong traditions of state-driven, interventionist approach, one that combines industrial policy and strategic trade policy, the East Asian states serve as useful case examples of GPN/GVC governance that demonstrate a unique ideological hybridity of state capitalism, operating under liberal international order. As we shall show, evidence from these East Asian ‘middle powers’ reveals that power asymmetries between countries are far more complex and layered than what is being characterized in the great-powers competition between China and the U.S.

Semiconductors are the 4th most traded product in the world after crude oil, motor vehicles/parts and refined oil, and their supply chains have disproportionate geopolitical significance as they constitutes upstream segments of multiple industrial sectors – including mobile phones, IT infrastructure, PCs, industrial equipment, consumer electronics, automobiles, and military applications. Today, three quarters of global chip manufacturing capacity is located in East Asia, and 40 % of the global logic chip production is located in Taiwan alone.¹ Japan was the first to challenge the U.S. dominance in the 1980s; subsequently, South Korea and Taiwan emerged as centers of manufacturing in

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¹ On the one hand, given the complexity of production that requires over 50 sophisticated specialized equipment as well as specialized materials and chemicals, no single firm or nation monopolizes the entire supply chain of the global semiconductor industry. On the other hand, while a supply chain paralysis can be caused by a single point of failure, which may be caused by natural disasters, cyberattacks, infrastructure failures or sanctions, East Asia serve as significant choke points for this industry.

memory and logic chips, respectively. The concentration of manufacturing in East Asia involves both front-end (wafer fabrication) and back-end (assembly, packaging and testing) stages, with a recent growth in Southeast Asia (Malaysia, Vietnam and the Philippines). The U.S. continues to play a significant role in the industry, by taking the lion's share of the industry's value-added; as much as half of the value added of the semiconductor supply chain is in the stage before manufacturing – the design stage – and nearly three quarters of design in this industry still takes place in the U.S.²

Since the U.S. and China constitute a half of the global semiconductor market, the use of regulatory supply chain controls – as one manifestation of the growing U.S.–China tensions – has significant impacts on the East Asian economies. The three East Asian states examined in this article very much fall under the economic sphere around China, and yet they are among the strongest U.S. military allies as well as the members of the “Chips 4 Alliance”, a proposed working group led by the U.S., which is aimed at cooperating on the semiconductor supply chain regulatory controls in the name of security interests.

Our central research question for this article is as follows; how do contemporary states navigate the complexities of geopolitics in governing GVC/GPN? To better understand how East Asian states are responding to new geopolitical tensions, we will first demonstrate how state capitalism, rooted in the developmental state, is being reinvigorated in East Asian states in the context of the emerging ‘economy-security nexus’ (Pempel 2013), whereby international security concerns increasingly dictate the economy (Altenburg and Leininger 2008). We then discuss the need for a conceptual shift in GPN/GVC research as geopolitical pressures result in economic coercions. By examining industrial and trade policies of East Asian states over the semiconductor industry, we show how states re-constitute national priorities, how they re-align diplomatic strategies, and how they justify policy directives.

2 Geopolitics and the role of the state in East Asia

The question of the role of geopolitics in altering GVC/GPN governance is inherently geo-specific. In the case of East

Asian states, geopolitics has been entangled with the role of the state in a particular manner in the post-World War II period, which serves as a crucial context to interpret the present. First and foremost, the legacy of highly interventionist ‘developmental state’ (Amsden 1992; Johnson 1982; Wang 2022) has been attributed as one of the key factors of post-World War II economic growth in East Asia. Even though the developmental state in principle contradicts the prevailing liberal orthodoxy of the U.S., the developmental state has not only co-existed in the liberal international order, but also thrived because of it, by leveraging global trade liberalization and encouraging export-led industrialization (Wade 2007).

The demise of the developmental state model is principally attributed to the rise of multinational firms and their increasingly globalized GPN/GVC, allegedly diminishing the power of the state (Campbell and Pedersen 2001). The developmental state has also come to be seen as increasingly ineffective in ‘picking winners’ to spur innovation and entrepreneurship (Wong 2011). Yet, it is crucial to take into account the particular geopolitical context in East Asia, under which the highly interventionist states were enabled under the liberal international order; the U.S. geopolitical security interests in the region ensured the Anglo-American-centric globalization benefitted Japan, South Korea and Taiwan in building strong economies (Van Wolferen 1986). It could be argued that, in spite of the contradictions that state capitalism brings to the liberal international order, the East Asian developmental state was tolerated to co-exist as long as it supported the U.S. national security interests. By contrast, the Chinese variety of ‘new state capitalism’, in which the state serves as the promoter, supervisor and owner of capital (Alami et al. 2022), is treated with a significantly greater suspicion, leading some to claim that ‘the openness has become a liability for liberal market economies’, as the illiberal states’ can operate freely ‘in the universalist institutions of the liberal international order’ while simultaneously ‘constructing an ecosystem of alternative ordering institutions’ (Cooley and Nexon 2022, p. 109).

Geopolitics is therefore altering how state interventions are situated, interpreted, and justified. In the U.S., Biden Administration’s Innovation and Competition Act (2021) is broadly understood as a shift from one under the Washington consensus to another which formally embraces national industrial policy. Yet, it is important to acknowledge that some industrial sectors have never been free of state support, and this is particularly the case for the semiconductor industry. At the height of Japan–U.S. trade friction, the U.S. government established a joint government-industry R & D consortium SEMATECH, emulating the model

² The U.S. dominates in EDA & Core IP segment (74 %) as well as LOGIC segments (67 %), whereas South Korea dominates in memory production (59 %), and China (38 %) and Taiwan (27 %) dominate in assembly, packaging and testing. The U.S. (41 %) and Japan (32 %) dominate in equipment manufacturing (Varas et al. 2021).

of Japan's R&D facility that developed super LSI chips in the 1970s. Various other countries also established state-sponsored R&D facilities, including Belgium, France and Singapore, just to name a few.

To justify state interventions, national security has been invoked to prevent economic competition against those perceived to drive cost advantages of competitors and create unequal playing-fields, which, in turn, threatens the model of open, liberalized economies. Decades before the U.S. sanctions against Huawei (2019), the U.S. imposed a number of sanctions against Japan's semiconductor industry, starting with voluntary import restrictions in 1982, followed by a series of dumping judgments by International Trade Commission (ITC) in 1985. The Plaza Accord (1985) dramatically raised production costs in Japan, and the US–Japan Semiconductor Agreement (1986) introduced a price floor for the Japanese-made chips, and simultaneously required increasing consumption of foreign-made chips in Japan (Kuwata 1990). The Japanese government negotiated the Agreement to cease a decade later, during which Intel (USA) recovered its leadership position on PC processors. The U.S. Congressional Budget Office stated at the time that “the concern of military planners is that deterioration of U.S. semiconductor producers could soon lead either to dependence on foreign sources for components for sophisticated weapons systems, or to a decline in the technological base needed to develop and use these components” (Dallmeyer 1988).

The developmental state model today is facing a shifting geopolitical environment, from one that supported economic growth in East Asia to one that increasingly prioritizes the U.S. security interests. As we shall demonstrate in the subsequent sections, East Asian states are called on to balance the U.S. security interests with their own national economic interests. As such, the varying strategies of East Asian states reflect their need to perform ‘balancing acts’ and ‘dual-footing.’ In the following section, we narrow the scope of geopolitics to focus specifically on its impacts on GPN/GVC governance, by taking the case of the regulatory supply chain controls, which, as a form of economic coercions driven by national security interests, are increasingly shaping the geo-spatial strategies of East Asian states.

3 From firm-centric to state-centric GPN/GVC governance

Since the 1990s, various forms of economic coercions – such as trade sanctions, tariff barriers, and regulatory supply chain controls – have been deployed by states to intervene

in the geography of international trade. Particularly under the context of increasingly densely networked global supply chain, regulatory supply chain controls have emerged as a powerful geo-political instrument. Regulatory supply chain controls combine bilateral and multilateral alliances to promote international trade, while sanctioning against economic competitors.

To date, geopolitics has not been central to the global supply chain analysis, however. The literatures on supply chain management (SCM), GPN and GVC all emphasize global inter-connectedness through analyses of industrial or commodity chains/networks. Since the focus on SCM literature has been on the profitability and performance of global economic activities, it is by nature firm-centric. Similarly, the GVC literature, with its theoretical underpinning of the world systems theory, focuses on the asymmetrical power between the lead firms and their suppliers (Gereffi et al. 2005) with the state serving primarily as a passive actor (Mayer and Phillips 2017).

The literature on GPN provides a conceptual foundation to analyze geographic interactions among global lead firms, institutions, and embedded regional assets (Henderson et al. 2002). With its major focus on “strategic coupling,” the firm-region nexus serves as an essential institutional context for GPN/GVC (Coe and Yeung 2015). However, its emphasis on the ‘cost-capability structure’ suggests that the paradigm is inherently firm-centric (Horner 2017; Lim 2018; McGregor and Coe 2023), and firm strategies – in deploying regional assets (e.g., technical labor force) – continue to be the primary concern. Yeung for example (2022, p. 3) conceded that (geo)politics, economies, and space are increasingly mutually constituted in the global economy in the 2020s, and the existing approaches “can be inadequate because of their relative neglect of the state and its variable geopolitical interventions.”

With the rise of regulatory supply chain controls, the state plays a far greater role than previously conceptualized in GPN/GVC governance literature. For one, an exclusive focus on firm strategies – without counting state support – would not accurately reflect the true ‘cost-capability structure’ calculations. Even if private investment dwarfs state support, state support provides a catalytic role in the cost capability structure in the long run. For another, cost parameters expand beyond what has long been primarily labor cost-driven analysis of offshoring, to one that incorporates geopolitical risks. The increasing role of the government incentives elevates the role of the state in GPN/GVC governance, and challenges the prevailing firm-centric view in understanding the geography of global supply chain.

We therefore contend that it is vital to develop a new paradigm that shifts GPN/GVC governance from one that is conceptualized primarily cost-driven to another that incorporates security, risks, and diplomacy. With the supply chain being weaponized by the state (Farrell and Newman, 2019), geography of production is driven by multi-lateral state strategies. Both coupling and decoupling are being coerced by states through formations of geopolitical alliances, which involves redirecting offshoring, promoting on/reshoring, and negotiating for friend shoring. Friend-shoring in particular is an instrument of long-term, multilateral alliance-building, with which the states and firms negotiate and ensure access to crucial manufacturing materials and equipment. As such, alliance-driven GVC governance (see Birch 2008) needs to be reconceptualized from a firm-centric to state-centric paradigm.

Under the multi-lateral state strategy-driven GPN/GVC, decoupling gains an entirely new meaning. Previously, both ‘strategic coupling’ (Yeung 2016) and decoupling have been the aspects of ‘firm-region nexus’ (MacKinnon 2012), whereby firm assets and regional assets (such as technological clusters and labor availability) are strategically paired/unpaired, with the regions serving as extra-firm agents. Today, decoupling has become synonymous to state strategies at the national level involving trade sanctions, with a goal of not only reducing dependency on the global supply chain, but also undermining competitors from gaining global market share. For example, China began the mandate in the early 2000s to decouple from the U.S. firms and develop domestic capability to reduce its dependence in military equipment production (Miller 2023). Concepts such as ‘geopolitical decoupling’ as a result of the hot war in Ukraine (Pavlínek 2023) and ‘defensive decoupling’ which prepares an economy for potential geopolitical conflicts (Ando et al., 2024) place the state at the center of GVC/GPN governance.

Decoupling today involves geo-spatial strategies, including disengagement (divestment of offshoring), re-shoring or friend-shoring; both reshoring and friend-shoring may satisfy security interests of the state but may contradict economic interests of firms particularly in the short run, thus requiring significant state support, intensive public-private collaborations, as well as multilateral negotiations. Due to the cost and complexities of making decoupling a reality, compounded by diplomatic challenges over the narrative, the language of ‘decoupling’ in the U.S. has shifted to ‘de-risking’ (Farrell and Newman 2023), which signals an intention to stall technological development of the competitor, and reduce ‘undue dependence’ on countries that may exercise retaliations.

Previously, de-risking has been treated with a firm-centric perspective in the GPN/GVC literature, with primary

focus on business risk reductions. Both “geopolitical risks” and “regulatory risks” are regarded as exogenous factors (Coe and Yeung 2015), and so as “policy risks” (quota, sanctions, tariffs, and other regulatory controls) in the supply chain management literature (Manuj et al. 2014). Since costs and capabilities are shaped by locations that are increasingly determined by geopolitical considerations and diplomatic alliances, policy debates around de-risking also require a reconceptualization of risks that goes beyond business risk reduction (including those through subsidy).

As we shall show in the subsequent section, East Asian states with integrated GPN/GVC linkages to the Chinese economy but fall under the U.S. military umbrella face complex challenges in balancing economic and security interests. As the two great powers seek to achieve ‘asymmetric interdependence’ (Ernst 2021), the U.S.-driven regulatory supply chain controls are resulting in ‘coercive coupling/decoupling’, whereby East Asian states are being subject to align their regulatory supply chain controls with that of the U.S. security interests. Coercive coupling may take the form of technological alliances combined with decoupling from firms in the non-aligned states, and/or specific geo-spatial strategies (e.g., on/re-shoring and friend-shoring) that ensure supply chain risks are minimized from the U.S. perspective. In response, the East Asian states are re-articulating their own economy-security nexus by signaling strong alliance with the U.S. while minimizing the cost of decoupling from China in varying manner, resulting in complex diplomatic negotiations over terms of trade and their own geospatial strategies.

4 Methodology

The methodology adopted in this paper involves conducting native-language survey of media reports (economic and industry journals/magazines/newspapers), government documents, and academic literature available in Japanese, Korean and Mandarin (see Appendix) and covers the developments with emphasis on the last 5 years (2019–2023). By combining the native language proficiency of the authors, we focused on materials on the political, economic and geographic strategies as being articulated by the state and reported domestically. Due to the challenges in conducting multilingual discourse analysis, for which the methodology is hardly established (see, for example, Taylor and del Fante 2020), we conducted case studies of three East Asian states, by systematically analyzing the above mentioned materials on the discourse around the semiconductor industry. First, we identified reporting or analysis of the semiconductor industry by major sources, and conducted

snowballed searches beyond the major sources. We then searched for statements that illustrated how the states and major firms articulated their positions in economic and/or security terms. More specifically, we identified sources that discuss how regulatory supply chain controls by the great powers are shaping East Asian industrial and trade policies, and what strategies are being deployed to manage their own regulatory supply chain controls that maintain compatibility with those by the great powers. All translations from the original languages to English have been performed by the authors.

This methodology was used as a way to overcome the constraints of English language media analysis on East Asian states. Such analysis is fundamentally limited in scope, as it would inherently involve bias in interpreting and representing issues as articulated by Fairclough (2009). Language has long been understood as a political weapon (Dunmire 2012), and discourse over policy issues are inherently political. In conducting this research, authors observed that while the English language media may provide a summary of key points, they often did not capture the diversity of views represented in each of our respective countries. Furthermore, as we shall demonstrate, the domestic media sources communicate a significantly more palpable sense of dilemma for East Asian states, whose economic-security nexus are distinct from that dictated by the U.S.

5 Geospatial strategies of the East Asian states

In the following section we demonstrate how the Japanese, South Korean and Taiwanese states adapt their geospatial strategies, re-articulate their own economy-security nexus, and use diplomatic strategies in the era of weaponized interdependence. Their state actions would have considerable economic impacts on Asia and beyond, and may become the basis for a significant reformulation of the geography and governance of the global supply chain. The case studies also demonstrate the complexities of coercive coupling/decoupling, particularly in instances where the U.S. security interests do not align with domestic priorities of East Asian states. Most of all, it showcases the challenges of GVC/GPN governance which is increasingly multi-state alliance based.

5.1 Japan

Subsequently to the U.S. sanctions that began in the 1980s, Japan's global share of the semiconductor chip production

declined from over 50 % in 1988 to 10 % by 2019 (Nikkei BP Special 2023). Industry insiders in Japan commented, “we were beaten by the U.S. to a total surrender” and fumed over the weakness of the Japanese government's negotiation position, with some even pondering “are we a truly independent state? What kind of business is possible when prices are determined by a foreign government?” (Tanaka and Narabe 2024). The loss of Japan's competitiveness is not attributed exclusively to the U.S. sanctions, however. While the Japanese media blamed poor diplomacy, stating that the government “compromised too quickly” (Toyo Keizai 2012) and “succumbed to the pressure from the U.S.” (Tanaka and Narabe 2024), industry insiders placed blame on both state and firm strategies. On the first, the government failed in making swift changes to the taxation system to encourage capital investments (Inoue 2012). Subsequent several state-sponsored projects, such as Semiconductor Industry Research Institute Japan (SIRIJ) (1994), Elpida Memory Inc. (1999), Asuka (2001), Halca (2001), as well as ASPLA (2001), never achieved success. SIRIJ deliberately avoided to use the term “strategy” in its name to avert drawing concerns from the U.S. government (Narabe 2024). On the second, Japan's chipmakers, with their origin as a division within vertically integrated electronics conglomerates, primarily served their own internal demand, did not cooperate fully in the state-sponsored projects nor shift their operations to broader industry trends (such as shifting from DRAM chips to small-lot, logic LSI chips (Nikkei Electronics 2008)), and failed to compete against the business model based on the division of labor between fabless design firms and contract foundries. The loss of strong domestic customers in personal computers and smartphones also contributed to their demise.

Today, Japan is invoking its own ‘national security’ to re-jumpstart the industry (Nohara 2023). Prime Minister Kishida's opening speech at SEMICON JAPAN 2022 stated “Semiconductors are key technologies that are important for digitization, decarbonization, and economic security, and the government will device an aggressive plan for investment expansion” (Murao 2022), and pledged 2 trillion yen (USD\$13 billion) with a goal of tripling domestic sales by 2030. These efforts would have been highly controversial as a source of ‘unfair competition’ at the height of the U.S.-Japan competition. The Japanese government also articulated Semiconductor/Digital Industry Strategy (June 2021) to build manufacturing capacity for IoT applications, and to strengthen technological foundations for the next generation semiconductors. Its primary strategy is to: 1) on-/re-shore manufacturing and R&D, including inward friend-shoring (promoting inward foreign direct investment), 2)

maintain strong alliance with the U.S., and 3) develop its own multi-lateral diplomacy to support the industry.

First, the state has provided subsidies to build TSMC (Taiwan) plants in Kumamoto, and established Rapidus, a joint public-private venture (2022) with a goal of manufacturing highly advanced 2 nano logic semiconductors with cooperation with IBM. The revised national strategy (2023) includes capacity building for AI-semiconductor chip development, designed to satisfy domestic demand in the automobile sector and data centers. In total, over USD\$1 trillion will be allocated over 10 years through both public and private investments. It is unlikely, however, that the full reshoring of previously offshored operations will ever take place due to both talent and cost constraints (Kamakura 2022). With respect to friend-shoring, since TSMC's Kumamoto plants are not designated to produce the cutting-edge semiconductor chips, they are rumored to be economically viable for TSMC only after state subsidy and Sony's multi-year commitment to purchase their chips.

Second, upon the request of the US government, Japan followed the U.S. sanctions against China and imposed export control for 23 items to take effect in July 2023. Since China's share of Japan's export is considerable (at 29 % of total semiconductor equipment exports), regulatory controls would negative impact the Japanese economy and force a further reconfiguration. Aside from the US-orchestrated trade restrictions, however, Japan has not articulated a specific policy for China, except for officially ending Official Development Assistance (ODA) that began in 1972. Therefore, Japan's official position has been somewhat opaque, emphasizing the 'balancing act' and alliances with 'like-minded countries' until the Biden-Kishida joint statement in April 2024, in which Japan reaffirmed its alliance with the U.S. With the concerns that the U.S. interest in Asia remains 'episodic' (Fiori and Passeri 2015), the joint statement is intended not only to ensure the continued U.S. engagement but also to guard against tendencies toward U.S. isolationism as a result of rising populism.

Third, Japan's economic diplomacy took a turn to leading multilateral negotiations such as the Quad (Japan–Australia–India–US alliance). Japan's policy strategy does not aim at localizing end-to-end supply chain, as acknowledged by Prime Minister Kishida who, instead, emphasized the importance of strengthening global alliances (Murao 2022). A parliamentarian also echoed the need to "... learn from the mistakes of past in attempting to internalize production. An international alliance that takes advantage of partners' strengths is the key." Samsung's plan to open a R&D facility in Yokohama for prototype development

and collaborative research with Japanese firms reflects this strategy.

In sum, Japan's strategy is to cultivate new opportunities to regain industrial leadership through reviving state subsidy, which has long been de-emphasized as a result of U.S.-Japan tensions since the 1980s. Geopolitical matters are also spoken more saliently – a Japanese parliamentarian expressed strong concerns for "an unlikely security event surrounding Taiwan" which would result in "a closure of Taiwan Straights and stoppage of three quarters of global semiconductor supply." As such, "international alliance must take place with partners who share common values, such as the U.S. and the EU, and not China" (Murao 2022). Simultaneously, it was stated that "given new technologies such as 3D chips and chiplets in integrated circuits, this means that the start-line of competition is being redrawn. We should absolutely not squander this opportunity."

5.2 South Korea

South Korea's semiconductor industry achieved a 18 % global market share in 2020 (Park 2022). The industry has grown around memory chips, led by integrated device manufacturers (IDMs) such as Samsung Electronics and SK Hynix, which have half of the global market share of NAND flash memory chips and 70 % of the global market share of DRAM memory chips (Stangarone 2023). Semiconductors are among the most important exports; it accounted for 16 % of total exports in 2023 (Ministry of Trade, Industry, and Energy, Republic of Korea, 2024). The 'K-Semiconductor Strategy to Realize a Comprehensive Semiconductor Powerhouse' was announced in 2021, which also refers to semiconductors as 'the backbone of our economy' and describes them as the 'rice (foundation) of all industries' as well as 'a strategic weapon.'

In South Korea, the sense of crisis was already palpable prior to the U.S.–China conflict, due to the on-going tensions with Japan. Japan sanctioned against South Korea in 2019 by removing South Korea from its favored nation status, thereby impacting Japan's exports of three chemicals necessary for semiconductor manufacturing.³ This prompted the South Korean government to identify structural weaknesses, and implement new policies to stabilize the supply chain (Lim and Cho 2023; Song 2022). Compounded by the pandemic, the supply chain crisis has led the government to

³ Japan attributed its action to regulatory deficiencies in South Korea, while South Korea viewed this as a retaliation against a court ruling in 2018 which required Japanese firms to compensate for forced labor during World War II.

recognize semiconductors in the context of its own national security. President Yoon (2023a) stated, “the semiconductor industry is the foundation of the economy ... and a national security asset. ... Competitor countries are using all means, including export regulations, subsidies, and tax credits, to threaten and destroy our industry.” Yoon also likened the fight for semiconductors as a war, stating “semiconductor competition is a risky, industrial war ... an all-out national war. The public and private sectors must work together as a team to overcome this challenge” (President Yoon Seok-yeol 2023b).

To maintain its global market share, South Korea is adopting two major strategies: 1) on-shoring – establishing a semiconductor ecosystem inside South Korea and 2) deploying pragmatic diplomacy. The government identified South Korea’s competitive weaknesses (including logic semiconductors, materials and components, design and packaging), and enacted ‘The National High-Tech Strategic Industry Act’ in 2022 (Moon Administration), allowing the government to provide funding for the creation of specialized complexes, infrastructure development, and R & D support (Park 2022).⁴ This was followed in 2023 by the National Assembly passing the ‘K-Chips Act’ (Yoon Administration) which included a revision to the ‘Restriction of Special Taxation Act’, allowing significant increases of tax credits for facility investments.

The government also announced support for a new ‘K-Belt’ (Moon administration) followed by ‘Mega Cluster’ (Yoon administration) that encompass building of the world’s largest cluster with end-to-end supply chains. As a specialized industrial complex that link materials and equipment, these spatial strategies involve a high-tech equipment joint venture, a high-tech packaging platform, and an establishment of a ‘fabless valley’. Within 2 months of taking office, the Yoon Administration announced the ‘Strategy to Achieve a Semiconductor Superpower by combining the capabilities of the public and private sectors’ with the goal of expanding logic semiconductors production, and building an ecosystem of materials and components production to achieve 50 % self-sufficiency by 2030. In January 2024, the government announced the ‘Semiconductor Mega Cluster Creation Plan.’ Under this plan, the government plans to create the world’s largest semiconductor cluster (21 million m²) in the southern Gyeonggi region by fostering private investment worth 622 trillion won by 2047. In parallel with the government’s plan, more than five semiconductor factories are planned to be built by 2042, including Samsung’s

300 trillion won (USD\$228 billion) investment over the next 20 years to build a logic chip cluster in Yongin near Seoul. SK Hynix also plans to invest 120 trillion won in Yongin to build four factories. SK Chairman Choi Tae-won stated, “The Yongin Cluster is the most planned and strategically pursued project in the history of SK Hynix” (SKhynix 2023).

Both Samsung and SK Hynix employ re-shoring strategy by taking part in the development of the Mega Cluster and investing in a local R & D-manufacturing complex (Park 2023). They also employ friend-shoring, although some plans predate the U.S.–China conflict escalation. In addition to a plant in Austin, Texas, Samsung is already investing USD\$17 billion for a new plant being built in Taylor, Texas (Lee and Do 2023). Samsung’s long-term goal is to build up to nine new plants in the U.S., and SK Hynix also plans to establish a back-end processing plant in the U.S.

The U.S. sanctions against China are making significant impacts on the South Korea’s semiconductor industry, as the major portions of its capacity has been offshored to China (Yoon 2023).⁵ China constituted a half of South Korea’s semiconductor exports in 2023 (Jung 2024),⁶ the highest share among the trading partners including Chip 4 Alliance countries and the EU. The Democratic Party (the opposition party) urged the Yoon administration to “step forward and persuade the U.S.” against the U.S. sanctions on made-in-China semiconductor chips, stating, “if this continues, the enormous amount of our investments in China could turn into a pile of scrap metal. Our semiconductor industry is caught in the hegemonic war between the U.S. and China ... our industry is a ‘the shrimp’s back about to explode in the fight among whales’ (a collateral damage). We cannot just sit back and watch these companies take a massive hit.” In response, the People Power Party (the ruling party) is exercising ‘pragmatic diplomacy’ through leveraging its technological capabilities (Park 2022; Yoon 2023). Rather than choosing sides, the party will “protect our national interests in the semiconductor hegemony war,” given its “direct link to national security” and “leverage this strategic asset in diplomacy and ensure maintaining a significant lead over our competitors.”

With China expressing concerns over South Korea’s participation in the Chip 4 Alliance (Choi 2022; Kim 2022), ‘pragmatic diplomacy’ is intended to appease both China

⁴ Unlike the case of Taiwan, regime changes are anticipated to have few impacts on these policies, as the two major parties are in opposition with respect to their policy on Japan, not China and the U.S.

⁵ Samsung produces 39 % of its NAND chips at its plant in Xi’an, and SK Hynix produces half of its DRAM chips and 20 % of its NAND chips at its plants in Wuxi and Dalian (Lee and Do 2023).

⁶ China’s share of South Korea’s semiconductor exports was 36 %, and Hong Kong’s share was 14 %. Since most exports to Hong Kong are re-exported to China, in total, half of South Korea’s semiconductor exports in 2023 has gone to China (Jung 2024).

and the U.S. The Ministry of Foreign Affairs for example justified attendance at the Chip 4 Alliance plenary session in February 2023 as to conduct a review of the premise of the alliance and its value based on national interests, rather than to discuss export controls with allies (Seong and Jo 2023), and emphasized that it is not intended to exclude China but rather to ensure the industry's supply chain stability through accessing technologies and equipment from the U.S. (Lee and Choi 2022). South Korea is also seeking other alliances to stabilize the supply chain; it sponsored a Korea–Netherlands summit in December 2023 in which a semiconductor alliance was announced with joint statements by President Yoon and Dutch Prime Minister Rutte (Ko 2023). The ‘Semiconductor Mega Cluster Creation Plan’ is also a plan to stabilize the supply chain by establishing a cooperation system with the US, Japan, Netherlands (EU), and UK through summit diplomacy, mentioning those countries as a semiconductor alliance.

Pragmatic diplomacy with the U.S. has resulted in initially one-year, and subsequently an indefinite waiver on South Korea's major manufacturing plants in October 2023, by designating Samsung and SK Hynix as Validated End-User (VEU) which allow imports of U.S.-made equipment in their factories in China. A Samsung official was quoted by stating, “through close consultations between governments of each country, much of the uncertainty about the Chinese production line has been resolved,” and a SK Hynix official also stated, “we are deeply grateful for the efforts of the Korean and U.S. governments” (Park and Lee 2023).

5.3 Taiwan

Taiwan's semiconductor industry has 22 % global market share (2021 data) (NDC 2023a). Specialized in manufacturing, Taiwanese firms are leaders in IC design (19 %, especially MediaTek), chip foundry (63 %, especially TSMC), and IC assembly and testing (56 %, especially ASE Group) (NDC 2023a). The Taiwanese semiconductor industry emerged with a combined outcome of its industrial policy (Amsden and Chu 2003) and technological learning that took place in the Taiwan–U.S. relationship since the 1980s (Hsu 2017; Hsu and Saxenian 2000). Most notably, Taiwan Semiconductor Manufacturing Company (TSMC) developed a new business model as a contract foundry, which, along with the emergence of smart phones, created the division of labor between manufacturing and fabless design firms (e.g., Apple, Qualcomm, Nvidia and Advanced Micro Devices [AMD]). Subsequently, Taiwanese firms gained global market share not only by maintaining its relationship with Silicon Valley but also by establishing new factories in China, forming the US–Taiwan–China semiconductor networks

(Poon et al. 2006). However, the emerging geopolitical risks including US–China trade war and supply chain disruptions caused by COVID-19 pandemic have prompted Taiwanese firms to adjust their strategies.

Today, the Taiwanese semiconductor industry adopts a combination of reshoring, offshoring and friend-shoring strategies. The government is initiating industrial upgrading strategies to attract reshoring, directing firms to focus on high value-added production, and promoting R & D to nurture talent in its innovation clusters (CTCI 2021). It is also recruiting foreign materials and equipment suppliers to open facilities in Taiwan (CNA 2023a; MOEA 2023). The “Three Major Programs for Investing in Taiwan” on strategic industries (smart technologies, 5G and AIoT) attracted 1,244 firms with a total investment of USD \$59 billion (2022). The government also sponsors R & D in advanced semiconductors; “Ångström semiconductor initiative” supports detection technology, new materials, and sub-nanometer semiconductor components and wafers (NDC 2023b). It should be noted, however, that unlike the case of Japan and South Korea, Taiwan's reshoring strategy involves a risk in itself in the event of military actions by China.

Similar to South Korea, the semiconductor industry is increasingly viewed as a leverage for Taiwan's national security. The term “silicon shield” originated in the media in 2001, whereby the presence of TSMC was thought to effectively mobilize the U.S.-led UN troops the way oil supply for Kuwait allegedly did in 1990. A more commonly used local term is “the guardian mountain,” originally referring to Taiwan's central mountain range that protects cities from typhoon winds and rain (Luo 2021). Today, Taiwan's semiconductor industry is viewed to serve as a double-shield for Taiwan's security, first by ensuring the interests of the U.S. and its allies in protecting the supply chain, and second by deterring China's military aggression through China's dependence on Taiwan's semiconductors.

From this perspective, both offshoring and outward friend-shoring contradict Taiwan's interests, as they move the industry away from Taiwan. Offshoring, however, is integral to Taiwan's semiconductor industry for reasons beyond ensuring access to low cost labor. Because Taiwan is excluded from international organizations and regional agreements such as Regional Comprehensive Economic Partnership (RCEP), their unrecognized status precludes Taiwan from signing multilateral trade agreements. In such context, offshoring is a strategy to circumvent higher tariff barriers faced by Taiwanese firms vis-à-vis their competitors. In part prompted by a series of economic sanctions China initiated on Taiwan after the 2016 election victory by pro-independence Democratic Progressive Party, the

government developed “New Southbound Policy” to redirect offshoring to South and Southeast Asia, and facilitate developing electronics clusters abroad, supported by the New Southbound Office (MOEA 2019; NDC 2023a).

Outward friend-shoring also contradicts the double-shield rationale played by the semiconductor industry in Taiwan. Recent announcements of new TSMC plants in Japan (Kumamoto), Germany (Saxony) and the U.S. (Arizona) could lead to “de-Taiwanize” or “unarm” Taiwan at the expense of de-risking supply chain disruptions (Powers-Riggs 2023), and thereby disincentivize the U.S. and its allies to protect Taiwan (Nei 2023). In addition, concerns are raised as to whether geopolitics-induced geographical locations may jeopardize TSMC’s technological leadership to its competitor Intel (Luo 2022).

Proponents of friend-shoring argue that a stronger political-economic alliance between Taiwan and the U.S. would function to deter China from forcefully annexing Taiwan through military actions. Taiwanese President Tsai Ing-wen stated that friend-shoring would make both supply chain and Taiwan–US relationship more resilient (CNA 2023b), which, in turn, makes Taiwan indispensable to the rest of the world. Mark Liu, the CEO of TSMC, also stated that “(TSMC) depends on the real-time connection with the outside world, with Europe, Japan, the US ... and it’s everybody’s effort ... So if you take it over by force, you can no longer make it operable...” (CNN 2022).

In spite of increasing calls in politics and social movements over the past decade for ‘de-China-ization,’ operations in China continue to remain integral to Taiwanese firms’ offshoring strategies. While recognizing a degree of geopolitical risk, offshoring in China is one of Taiwan’s security strategies with a rationale that economic interdependence would avert military aggression. Moreover, some Taiwanese firms are behaving opportunistically; testing and production support firms in particular are actively seeking new market opportunities outside the list of U.S. sanctioned products in China by leveraging the vacuum created by divesting foreign competitors and benefitting from Chinese subsidies, in areas such as the mature process chips production (CTCI 2021). Automotive electronics is another opportunity that falls outside the U.S. sanctions, for which TSMC is seeking to supply with its recent establishment of a plant in China (Gloria 2021). These firms have been subject to scrutiny by the U.S. media, however; Bloomberg (2023) accused them of sanction-busting, and the CEO was forced to defend its position in a CNN interview by stating “*we only work with consumers ... not military entities...*” (CNN 2022).

Similar to the case of South Korea, Taiwan’s TSMC is in negotiation with the U.S. government to receive a

waiver for their operations in China. Furthermore, Taiwan is seeking additional bilateral agreements with countries to compensate for its unrecognized status. The recent agreement, “Taiwan–U.S. 21st Century Trade Initiative” between Taiwan and the Biden Administration is more substantive than the Indo-Pacific Economic Framework, which Taiwan is unable to join (NDC 2023c). This initiative may function as a demonstration effect for other bilateral, longer-term trade agreements that are resistant to potential policy changes as a result of regime changes in Taiwan. With the recent victory of DPP notwithstanding, given its inability to secure the majority in the parliament, and the continued pro-China stance of Kuomintang Party (currently in opposition), regime changes in Taiwan may play a significant role in the future of Taiwan, and consequently, the semiconductor industry.

6 Discussion and conclusion

Table 1 summarizes how geopolitics is altering the role of the state over GVC/GPN governance in the East Asian states. The variations in geospatial and geopolitical strategies across the three states can be explained by the varying specialization/competitive strengths as well as perceived weaknesses of the respective semiconductor industry, varying status of their political and economic relationships to China (e.g., dependence on China’s market, and offshored facilities in China), as well as their relationships to the U.S.

Three salient points emerge based on the analysis of the responses by the East Asian states. First, it highlights the centrality of geospatial strategies in their industrial policy. While varying in degrees of urgency, the East Asian states all recognize that their engagement in the global semiconductor industry is at its one of the most crucial turning points of the post-World War II era. As such, these states are reassessing their own geospatial strategies, and combining redirected offshoring, on-/re-shoring, and friend-shoring to satisfy both its economic and security concerns, while carefully choosing the nature and the degree of alignment with the U.S. security interests. While the Japanese government largely views the current situation as an opportunity to formally and explicitly re-implement industrial policy and re-invigorate its innovative capabilities, South Korea and Taiwan prioritize protecting their global market shares, minimizing exposures to economic risks, and leveraging their positions of strengths to negotiate with the U.S., which involves conceding to friendshoring and gaining waivers for their operations in China.

Second, it points to the multilateral nature of their geopolitical strategies. The analysis demonstrates distinct

Table 1: Geospatial and geopolitical strategies for the semiconductor industry: Japan, South Korea and Taiwan.

	Japan	South Korea	Taiwan
Specialization/competitive strength	Chemicals, equipment	Memory chip, DRAM	Logic chip and packing
Economic-security risks	– Diminishing domestic market – Export restrictions (imposed by both U.S. and Japan) – Reliance on China market – Conflicts in Taiwan Strait	– Export restriction (both U.S. and Japan) – Reliance on China (offshored production facilities) – Weak domestic ecosystem – Weakness in logic chips	– Military threats from China – Reliance on China (offshored production facilities) – Loss in manufacturing leadership – Weakness in materials and equipment – De-Taiwanization (both foreign and domestic)
National goals	– Rebuild the industry – Ensure economic security – Strengthen alliances with ‘like-minded’ countries	– Localize supply chain by building mega-clusters – Achieve self-sufficiency – Stabilize semiconductor supply chain	– Maintain leadership in manufacturing – Strengthen ‘resilient partnerships’ – Secure domestic semiconductor ecosystem
Geospatial strategies	– Inward friend-shoring: Subsidize TSMC’s construction costs in Kumamoto. – Support innovation (Rapidus to develop 2 nm chip through a joint public-private venture)	– On/Reshoring: “Mega-cluster”: creation of specialized industrial complexes – Ecosystem development: “Strategy to Achieve a Semiconductor Superpower” – Support innovation: tax credits for investments “K-Chips Act”	– On/Reshoring: “Three Major Programs for Investing in Taiwan” – Offshoring: “New Southern Policy” to redirect offshoring away from China – Support innovation “Ångström semiconductor initiative”: public funded R & D project
Geopolitical strategies	– Maintain close alliance with the U.S. – Multi-lateral diplomacy (QUAD)	– Outward friend-shoring – “Pragmatic diplomacy” and maintain neutrality	– Outward friend-shoring – Strengthen partnerships with allies: trade agreements

Source: compiled by authors.

economy-security nexus for each of the East Asian states. Firms in East Asia are not only collaborators and suppliers, but also competitors to the U.S. firms as well as with each other. Japan’s recent sanction against South Korea (2019) is one such example, and the recent efforts by the U.S. to improve Japan–South Korea relations are motivated, in part, to minimize discord in the U.S.-led multilateral alliances over regulatory supply chain controls. As such, Japan, South Korea, and Taiwan can be better characterized as competitors each seeking their own interests, rather than coherent collaborators of the U.S. alliance.

Third, the multilateral nature of geopolitics involves, on the one hand, economic coercions through various instruments, but on the other, concessions and compromises to maintain the very alliances on which economic coercions are based. The U.S. issuing indefinite waivers to aspects of South Korean and Taiwanese investments in China is one such example, potentially undermining the intended effects of the regulatory supply chain controls. Given unilateral sanctions are often ineffective in maintaining alliances, multi-territorial industry policy must take into account

diplomatic negotiations over incentives for allies, not solely by the national security interests of the great powers.

Based on our findings, we suggest two avenues of research that carry important theoretical implications moving forward. First, the frameworks of GPN/GVC governance is fundamentally built on a model of global economic integration. With regulatory supply chain controls, trade policies are moving toward trading blocs at best, deglobalization (Bello 2013) at worst. Nevertheless, given the central role the state plays in implementing sanctions and exercising economic coercions, it is unlikely that even deglobalization would weaken the future role of the state in GPN/GVC governance. Therefore, it is imperative to examine how GPN/GVC governance becomes transformed by state actions under new geopolitical contexts, and how the nature of coercive coupling/decoupling and de-risking would change over time. Second, it is worth examining to what extent the developmental state model in East Asia would be resurrected or renewed under the new geopolitical contexts. While the case of East Asian states presented in this article may represent a more extreme case of geo-political

challenges facing one of the most strategic industries, the new geopolitics may induce a greater number of states to adopt geospatial industrial policy in one form or another. For example, countries which are traditionally weakly aligned with the U.S. are leveraging their status to benefit from trading blocs (such as the EU or USMCA) and China's Belt and Road Initiative (BRI) simultaneously in some cases. It would therefore be important to continue analyzing the endurance, resurrection, or modification to the model of the developmental state, and to what extent they would challenge, maintain, or modify the liberal international order.

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Appendix

List of native language sources researched:

Japan:

Newspapers:

Asahi Newspaper
Nippon Keizai Newspaper

Industry magazines:

Diamond
E.E. Times
Impress Watch
Keieisha Connect
Keizaikai
Nikkei Compass
Nikkei Electronics
Nikkei BP
President
Tech+
Toyo Keizai

Government:

Ministry of Economy, Technology and Industry (METI) website
Japan External Trade Organization (JETRO)

Industry Associations, Institutes, Consultancy:

Institute of Electrical Engineers of Japan
Japan Institute of International Affairs
Japan Machinery Federation
Keizaikai
Nippon Express (NX) Research Institute

Other media:

Nippon Hoso Kyokai

Scholarly Journals and Reports:

Crisis & Risk Management Society of Japan
Hannan University Ronshu
Japan Advanced Institute of Science and Technology
Kansai University Industry Seminar
Japan Society for Research Policy and Innovation Management
Japan Society of International Economics
Keizai Rongi
Manufacturing Management Research Center,
University of Tokyo
Ryutsu University

South Korea:

Newspapers:

Hankyoreh
The Chosun Daily
The Dong-A Ilbo
The Hankook Ilbo
The JoongAng
The Kukmin Daily
The Kyunghyang Shinmun
The Munhwa Ilbo
The Segye Times
The Seoul Shinmun

Government:

Ministry of Economy and Finance
Ministry of Science and ICT
Ministry of Trade, Industry and Energy
National Assembly Future Institute
National Assembly Library
Office of the President Republic of Korea
Republic of Korea Policy Briefing
The National Assembly of the Republic of Korea

Industry Associations, Institutes, Consultancy:

Hyundai Research Institute
Korea International Trade Association (KITA)
Korean Institute for Industrial Economics & Trade
The Federation of Korean Industries

Other media:

Big Kinds
Research Information Sharing Service (RISS)

Scholarly Journals and Reports:

JPI Policy Forum
National Strategy
Sungkyun China Brief
The Korean Journal of Political Science
The Journal of Humanities and Social Sciences 21

Company websites:

Samsung Global Newsroom
SK Hynix Newsroom

Taiwan:Newspapers:

Central News Agency (CNA)
United Daily News (UDN)
Global Views Monthly
Common Wealth Magazine
The Reporter
The News Lens
Business Next
The Storm Media
BBC Chinese
Nikkei Asia
Yahoo News

Government:

National Development Council (NDC)
National Science and Technology Council (NSTC)
Ministry of Economic Affairs (MOEA)
Institute for National Defense and Security Research
Industrial Technology Research Institute

Industrial Magazine:

Economic Daily News
IEK Net, Industry, Science and Technology
International Strategy Center (ISTI)
Taiwan Banker

Industry Associations, Institutes, Consultancies:

Taiwan Semiconductor Industrial Association (TSIA)
Chinese Technology Consultants Inc Foundation (CTCI)

National Policy Foundation

Chinese National Federation of Industries
Chung-Hua Institution Economic Research
Industrial Value Chain Information Platform
NARLabs, Science & Technology Policy Research and
Information Center
Straits Exchange Foundation

Other media:

Formosa TV (Youtube Channel)
Statista

Company websites:

Taiwan Semiconductor Manufacturing Company
(TSMC)
MediaTek
ASE Group
United Microelectronics Corporation (UMC)
PwC Taiwan

Scholarly Journals and Reports:

National Digital Library of Thesis and Dissertation in
Taiwan
Taiwan Citation Index – Humanity and Social Sciences
(TCIHSS)
Airiti Library

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