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Supply Chain Diversification and Industrial Policies to Strengthen Economic Security

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Supply Chain Diversification and Industrial Policies to Strengthen Economic Security*

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Abstract

Recently, global supply chains are often disrupted because of geopolitical factors, industrial policies induced by national security concerns, and economic coercion for political and security purposes. Under these circumstances, creating supply chain resilience and strengthening economic security are of great interest of researchers, policymakers, and business persons. This study overviews the growing literature, both theoretically and empirically, on supply chain resilience and industrial policies and provides policy implications from the perspective of Asia, particularly Japan. Major means to create supply chain resilience include diversification of partners across like-minded countries (friendshoring) and (re)location of production facilities in the domestic economy (onshoring). For effective friendshoring, policies should provide information on foreign risks and markets to the private sector. For effective onshoring, industrial policies should promote competition within, and openness of, and knowledge diffusion in the target industry. To further strengthen the effectiveness of these policies for supply chain resilience and economic security, multilateral cooperations among Asian countries are suggested.

Keywords: supply chain, resilience, economic security, industrial policy, economic coercion
JEL classification: F13, F51

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1 Introduction

In recent years, global connectivity through supply chains, including those within Asia and between Asia and other regions, has faced serious threats for several reasons. First, supply chains were disrupted due to natural disasters, such as the Great East Japan earthquake in 2011 and the COVID-19 pandemics during the period 2022-2022. Second, geopolitical factors, including the Russia-Ukraine war, and associated economic coercion, such as the export ban of rare earths by China against Japan in 2010, also shrank international trade and investment. Finally, protectionism policies and industrial policies to foster domestic industries and thus to strengthen national security, including raising tariffs on imports from all countries by President Trump of the United States (U.S.) in 2025, have become another crucial threat to global supply chains. Consistent with theoretical predictions that a small economic shock propagates through supply chains and is strongly amplified (Acemoglu, et al., 2012; Elliott, et al., 2022; Gabaix, 2011), we observed these supply chain disruptions resulted in substantial economic effects, as shown in detail later.

Accordingly, both academic researchers, policymakers, and business persons are quite concerned about the resilience of supply chains. In particular, because geopolitical factors and security-induced policies are major risks of supply chain disruptions, supply chain resilience is regarded as a central issue of economic security. Although economic security can be defined in various ways, this study follows the definitions by Bown (2024), "at a minimum, it involves a country getting the goods and services it needs when it needs them, at a reasonable price," and by the Liberal Democratic Party of Japan (2020), "ensuring the independence, survival and prosperity of our country from an economic perspective."

In order to ensure economic security and strengthen supply chain resilience, governments believe that more policy involvement in business activities is needed than ever before. For example, in Japan, a Cabinet Decision in 2022 states, "With regard to economic security, it is necessary for the government not to rely substantially on the market force and competition in the relationship between the public and private sectors and to be more involved in both public supports to and regulations" (Cabinet Office 2022). In conjunction with this, the Economic Security Promotion Act was enacted to provide subsidies to private companies in exchange for requiring them to report on procurement and inventory of critical products. In addition, large subsidies have been provided to the semiconductor industry. In the US, the CHIPS and Science Act and the Inflation Reduction Act provide subsidies for domestic production and research and development (R&D) of essential products such as semiconductors, renewable energy, and electric vehicles (EV). Europe has also enacted a similar European Chips Act (Todo, 2022).

In general, two major policy measures are utilized for supply chain resilience: diversification of supply chain partners to like-minded countries, or friendshoring, and (re)locating production facilities in the domestic economy, or onshoring, through protectionism industrial policies. This study aims at evaluating the recent policies for friendshoring and onshoring from the perspective of

Asia, in particular, Japan, based on the thick theoretical and empirical literature on supply chains, economic coercion, and protectionism and industrial policies induced by national security concerns.

The rest of the paper is organized as follows. The next section explains the theoretical and empirical literature on how supply chain resilience can be created. Section 3 focuses on the theory and empirics of economic coercion, whereas Section 4 provides policy implications to create supply chain resilience, particularly by diversifying supply chain partners across countries. Section 5 shows theory, empirics, and policy implications regarding protectionism and industrial policies for onshoring. Section 6 summarizes the paper and concludes.

2 Supply Chain Resilience

2.1 Theory of Formation and Resilience of Supply Chains

Many studies theoretically examine how supply chains are formed and can be resilient. Most of them assume non-market transactions in supply chains, leading to a conclusion that the market equilibrium is not socially optimal and thus that policy interventions can improve social welfare and supply chain resilience.

For example, Acemoglu and Tahbaz-Salehi (2024) analyze the equilibrium in a model that assumes non-market transactions between final-good firms and their suppliers. It is further assumed that creating a supply chain relationship is costly and that the relationship specificity leads to productivity gains, as observed in typical supply chain relationships among Japanese firms, known as *keiretsu* (Aoki, 1988). In this setting, firms paying a cost of creating a supply chain tie benefit other firms directly and indirectly connected through supply chains, without receiving any compensation from the other firms. As a result, because the benefits from creating supply chain ties are not fully internalized, relationships between suppliers and final-good firms in the equilibrium are constructed at a sub-optimal level. Acemoglu and Tahbaz-Salehi (2024) also find that supply chains in the equilibrium shrink as the cost of building supply chain ties increases, and at some point they shrink discontinuously. This result is interpreted as supply chains being vulnerable to large shocks.

Using a similar model with a cost of supply chain formation, Grossman, et al. (2024) further assume that while there is a risk of supply chain disruption, each firm can invest to mitigate the risk and strengthen supply chain resilience. In the equilibrium, because firms do not consider the social returns of their own investment for resilience, their investment and the number of suppliers (the degree of diversification) tend to be smaller than at the social optimum.

Similarly, Capponi, et al. (2024) assume that monopolistic suppliers invest in productive capacity to prepare for demand and supply shocks and find a sub-optimal level of investment in productive capacity. Then, supply chains are vulnerable to a large shock due to the sub-optimal level of investment. Subsidies for investment, provision of incentives for ordering in advance, supplier substitutability, and competition can mitigate supply chain inefficiencies and vulnerabilities.

To summarize these studies, supply chains are inefficient and vulnerable to shocks. Although these papers assume demand and supply shocks, supply chain disruptions related to economic security can also be considered as one such shock. Therefore, we can conclude that because the risk of supply chain disruptions related to economic security is increasing, the current situation theoretically requires more extensive policies.

Furthermore, these studies develop their theory as if the risk of supply chain disruption were completely predictable. In practice, the risk of supply chain disruptions, particularly those related to national security and geopolitical factors, such as politically motivated trade restrictions or reduction of bilateral economic relations due to conflicts, are difficult for private firms to accurately predict. This is in contrast to supply chain disruption risks stemming from natural disasters such as earthquakes and floods, which can be predicted to some extent based on scientific knowledge and past experiences.

If it is costly to gather information to predict them while that information spills over to other firms, firms are not willing to pay that cost to obtain the information (Rauch, 1999). In this case, there is a market failure other than the one contemplated in the above studies. Therefore, policy support is also needed for the government to collect such information on security risks and make it available to the private sector. This is similar to how information support to firms for exports can be justified because of search costs (Srhoj, et al., 2023).

Furthermore, because private firms are not well informed, the risk of supply chain disruptions may be underestimated due to myopia of managers (Ridge, et al., 2014) and status quo bias (Kahneman, et al., 1991). In such cases, there will be a larger difference in supply chain formation between the socially optimal equilibrium based on accurate risk assessment and the market equilibrium achieved under an underestimated risk on top of the market failure due to the network externality. Therefore, more extensive policies may be theoretically justified in the current situation where the risk of supply chain disruptions related to national security is rising. These points have not yet been sufficiently formalized in theoretical considerations, and further progress is expected.

2.2 Earlier Empirical Studies on Supply Chain Disruptions

Many earlier empirical studies on supply chain disruptions were motivated by the 2011 Great East Japan Earthquake (GEJE). This mega earthquake disrupted supply chains connected to the disaster areas and affected production activities in other areas of Japan and overseas, drawing attention to the propagation effect of economic shocks through supply chains.

A seminal econometric study by Carvalho, et al. (2021) using firm-level data analyze shock propagation of the economic shock by the GEJE within Japan, whereas Boehm, et al. (2019) examine its propagation to Japanese firms' foreign subsidiaries. Barrot and Sauvagnat (2016) investigate propagation of shocks from various natural disasters in the U.S. In addition, Kashiwagi, et al. (2021) use global supply chain data to analyze the international propagation of shocks from a disaster in

the U.S. These studies show that economic shocks propagate through supply chains and that their impact is substantial.

In addition to econometric studies, many others employ simulation approaches. For example, Inoue and Todo (2019) simulate an agent-based model (ABM) using large-scale firm-level data in Japan to reproduce the economic damage due to the GEJE propagating to various regions of Japan. As a result, they estimate that the production loss caused by the GEJE through supply chain disruptions is about 100 times larger than the direct production loss in the affected areas, confirming the substantial ripple effect.

Later studies examine supply chain disruptions due to the global pandemic of COVID-19 in 2020-2022 and associated lockdowns that reduced production in various countries and regions. For example, a strand of literature takes econometric approaches to estimate the effect of the COVID-19 on international trade (Ando and Hayakawa, 2021; Hayakawa and Mukunoki, 2020, 2021a, 2021b; Liu, et al., 2022). Others employ computational general equilibrium (CGE) models or ABM-based simulations to estimate the effect of COVID-19 on production (Bonadio, et al., 2021; Guan, et al., 2020; Inoue and Todo, 2020; McCann and Myers, 2020; McKibbin and Fernando, 2021).

Many of these studies also analyze how the propagation of economic shocks through supply chains is amplified or mitigated, finding that substitutability and diversity of supply chain partners are particularly important. For example, Barrot and Sauvagnat (2016) use the definition in Rauch (1999) to show that propagation is larger in industries where inputs are specific, or not standardized, a result also confirmed by Kashiwagi, et al. (2021).

Furthermore, Kashiwagi, et al. (2021) find that firms outside the U.S. are not indirectly affected by the disaster in the U.S. even if they are connected with firms in the affected region. Firms in the U.S. connected with firms in the affected region have a smaller impact if they are connected with overseas firms. These findings imply that internationalized firms have a wide variety of supply chain partners and can relatively easily find substitutes even if the production of one of their partners is reduced. In addition, according to ABM-based simulations in Inoue and Todo (2019), the more stringent the assumptions under which intermediate goods can be substituted, the larger the propagation effect.

Similar results are found in studies on the COVID-19. Ando and Hayakawa (2021) and Todo, et al. (2023) both find that sourcing intermediate goods from more diverse countries mitigated the impact of supply chain disruptions during the pandemic period of the COVID-19. These results indicate that diversifying and internationalizing transaction partners and strengthening their substitutability can help build supply chains that are resilient to supply and demand disruptions.

2.3 Empirical Studies on Supply Chain Disruptions due to Geopolitical Factors and Protectionism Policies

Recently, as cases of supply chain disruptions due to national security and geopolitical issues have risen, many studies examine the impact of geopolitical factors and protectionism policies on trade

and foreign direct investment (FDI). I first show some econometric works and then simulation studies using CGE models and ABMs.

Econometric studies

An econometric study by Crosignani, et al. (2024) examines the effect of restrictions on exporting from the U.S. to Chinese firms listed in the Entity List of the Bureau of Industry of the U.S., applying event study estimations with two-way fixed effects to firm-level data with supply chain information. They find that U.S. suppliers immediately terminated relationships with Chinese customers in the list and further were more likely to shrink ties with non-listed Chinese firms, indicating broader decoupling due to targeted export controls.

Hayakawa and Ito (2025) focus on the effect of the U.S. export restriction particularly on China's major high-tech firm, Huawei Technologies, and find its negative effect on exports of Huawei's prior suppliers in Japan to China. This finding suggests that the U.S. export restrictions on China affected not only exports from the U.S. but also exports from third countries to China. They further find that Japanese suppliers of Huawei increased their exports to non-China countries after the U.S. export restrictions, suggesting that firms respond to protectionism policies by diversification of trade partners.

Rather than focusing on a specific protectionism policy or geopolitical event, Aiyar, et al. (2024) estimate the effect of the geopolitical distance between two countries, based on voting patterns at the United National General Assembly, on their bilateral FDI. They find a negative effect particularly after 2018 when trade conflicts between the U.S. and China started, suggesting that geopolitical factors have become a major sources of shrinks of global supply chains.

Model-based simulation analysis

Many studies use CGE models of multi-country and multi-industry with production networks to estimate the economic effect of actual and hypothetical events of trade disruption. Among them, many take economic sanctions by Europe on Russia because of the Russia-Ukraine war and find a large negative effect on production in Russia magnified by the propagation through supply chains and a smaller and heterogeneous effect on other countries (Chepeliev, et al., 2022; Hosoe, 2023; Imbs and Pauwels, 2024; Mahlstein, et al., 2022).

Baqaee, et al. (2024) estimate the impact of a hypothetical trade disruption between the G7 and China on the German economy, using a CGE model of Baqaee and Farhi (2024). The results show that a sudden disruption would reduce Germany's gross national expenditure (GNE) by 4% in one year, while a gradual disruption over three years would reduce the decline to about 2% by restructuring supply chains. Note that the model of Baqaee and Farhi (2024) has also been used for other economic security issues, such as Russia's shutting off natural gas supplies to Germany in the wake of the Russian-Ukrainian war (Bachmann, et al., 2022; Moll, et al., 2023).

Inoue and Todo (2023) simulate the impact of trade disruptions, extending an ABM of Inoue and Todo (2019) that focuses on supply chains in Japan to incorporate firm-level trade. The results

show that if 80% of imports from China were disrupted for four weeks and two months, Japan's value-added production (GDP) during that period would decrease by about 8% and 40%, respectively. These results imply that the effect of import disruption is largely magnified through domestic supply chains.

In addition, Inoue and Todo (2023) experiment with different assumptions in terms of the difficulty in substitution of suppliers facing disruptions, although their benchmark model allow for substitution from existing suppliers and do not assume supply from new suppliers. It is found that simply allowing substitution with another supplier indirectly connected in the existing supply chain can considerably mitigate the impact of the disruption on GDP. These results again highlight the importance of substitutability for resilience.

Moll, et al. (2023) that analyze the impact of the disruption of natural gas supply disruption from Russia to Germany in 2022 show that a small difference in the elasticity of substitution of intermediate goods significantly affect the impact of the disruption. Thereby, they conclude that the reason why the German economy was not significantly affected (German GDP growth in 2022 was close to 2%) despite the actual disruption of natural gas supply from Russia in Germany was largely due to the fact that natural gas imports from Russia could be substituted for imports from the rest of the world.

More recently, several studies investigate the effect of tariffs imposed by President Trump of the U.S. in 2025 on the global production. For example, McKibbin, et al. (2025) predict the effect of the Trump tariffs which were announced from April 2 to May 10, 2025 and generally higher than actually implemented later. Using the G-Cubed economic model, a hybrid of dynamic stochastic general equilibrium (DSGE) models and CGE models developed by McKibbin and Wilcoxen (1999, 2013) and assume different scenarios depending on how other countries retaliate, they estimate that the U.S. GDP would decline by -0.03 to -2.1% from 2024 to 2026. In addition, GDP of China, Japan, and Indonesia, for example, would decline by -0.4 to -1.2%, +0.2 to -0.4%, and +0.09 to +0.28%, respectively. GDP of other countries may increase due to effects of trade diversion from exports from high-tariff countries, such as China, to low-tariff countries. Kumagai, et al. (2025) used the IDE-GSM (Institute of Developing Economy-Geographical Simulation Model) of Kumagai, et al. (2013) that incorporates geographic information affecting transport costs into a CGE model to examine the effect of Trump tariffs announced in April. They find a large negative effect on GDP of the U.S. (-5.2%) and countries that were to be imposed high tariffs and relied substantially on the U.S. in their exports, such as China (-1.9%) and Vietnam (-1.3%) and minor effects on other countries, such as Japan (+0.2%) and Indonesia (+0.0%), results consistent with McKibbin, et al. (2025). These results imply that supply chains relying substantially on a particular country are vulnerable to economic shocks originating from the country.

3 Economic Coercion

3.1 Theory of Economic Coercion

Another major issue related to economic security and supply chain resilience in recent years is economic coercion, which refers to a country's attempts to use its own economic resources, trade, investment, and other economic means to exert pressure on other countries and to influence their policy decisions. For example, China banned the export of rare earths to Japan in 2010 in response to the collision of Chinese fishing boats off the Senkaku Islands. In 2023, China banned the import of marine products from Japan in protest against the release of Advanced Liquid Processing System (ALPS) treated water by Japan. There have been many examples of such economic coercion by China in recent years, such as the restriction of imports of wine, barley, and other products from Australia in 2020 after it requested China to investigate the origin of COVID-19 (Adachi, et al., 2022; OECD, 2024; Zhang, 2024). The second Trump administration of the U.S. imposed high tariffs mostly to foster domestic manufacturing sectors but to achieve political aims in some cases, such as to stop India's energy imports from Russia and to retaliate over the prosecution of former Brazilian President Bolsonaro, a political ally of President Trump.

Recently, Clayton, et al. (2023, 2024, 2025a, 2025b) extensively examine economic coercion theoretically, using models with one hegemon (the U.S.) and other multiple countries. The model in Clayton, et al. (2024) assumes that firms in non-hegemonic countries utilize the hegemon's and domestic inputs (including financial services). The hegemon's inputs are more productive when more countries use them because of scale economies. The model further assumes economic coercion by the hegemon: the hegemon government requires foreign firms to make a transfer to the hegemon's consumers and to pay a higher price for the hegemon's inputs threatening to exclude the foreign firms from the hegemon's input network if they do not comply. Before the economic coercion, both hegemon and other countries can implement policies by subsidizing to domestic firms and imposing tariffs (price wedges) on other countries' inputs.

In the equilibrium, the hegemon uses its policies to make its financial network and supply chains more attractive so that foreign economies depend more on the hegemon and are more willing to comply with the coercion. In turn, foreign countries subsidize to and foster domestic firms and impose tariffs on the hegemon's inputs so that they do not need to rely on the hegemon. Because of anti-coercion policies of non-hegemon countries, the world is not fully integrated but fragmented. This equilibrium is not optimal because of scale economies in the financial network and supply chains. In addition, Clayton, et al. (2024) show that if the hegemon commits to limit its coercions through, for example, international organizations or rules, the hegemon can increase its power while other countries are more attracted to the hegemon's network and are better off.

Further, Clayton, et al. (2024) measure the geoeconomic power of the U.S. and China, two hegemons in practice, over each country, using the model and data on trade of goods and services. This essentially measures the maximum possible payment of each non-hegemon country to mitigate

the hegemon's cutting off exports of goods and services to the country. They find that the major source of the U.S. power is financial services whereas that of China is manufacturing.

The theoretical conclusions can explain the reality quite well. Examples of financial coercion by the U.S. that are consistent with the theory include financial sanctions on Iran and Russia and pressure on HSBC to reveal business transactions related to China's Huawei and its top executives (Clayton, et al., 2024). In addition to economic coercion restricting goods trade shown earlier, China improved the attractiveness of its supply chains, utilizing the Belt and Road Initiative (BRI) where China supported development of transport and digital infrastructure (Clayton, et al., 2023) and indeed promoted BRI countries' exports to and foreign direct investment (FDI) from China (Li and Todo, 2025; Todo, et al., 2025).

Using a theoretical framework of network science, Farrell and Newman (2019) argue that structures of economic networks are often asymmetric, with some hub countries connected with a far larger numbers of countries than others. This asymmetry creates weaponized interdependence in which the hub countries are able to coerce others. They suggest that to mitigate the coercion, non-hub countries should reduce exposure to the hubs, i.e., chokepoints in the network, and diversify partners. Cipriani, et al. (2023) also reach the same conclusion, using the case of the global financial network.

3.2 Empirical Studies on Economic Coercion

The theoretical studies in the previous subsection suggest that under the risk of economic coercion by hegemons, non-hegemon countries are incentivized to implement anti-coercion policies, including subsidies to domestic firms and reductions in reliance on hegemons in financial networks and supply chains.

Several recent studies confirm these theoretical implications, although most studies rely on qualitative studies of specific cases of economic coercion because of lack of a sufficiently large number of cases for quantitative econometric analysis. For example, Ferguson, et al. (2023) show that when China restricted imports from Australia during the COVID-19 pandemic in response to Australia's claim that China should investigate the source of COVID-19, Australia responded by diverting export destinations. Facing to China's export ban of rare earth metals, Japan diversified source countries (Mancheri, et al., 2019). Adachi, et al. (2022) observe that South Korea's Samsung Electronics did not necessarily suffer economic coercion from the Chinese government even when it treated Taiwan and Hong Kong as countries on its website in 2019. From this observation, Adachi, et al. (2022) claim that technological sophistication is a major factor that can curb economic coercion.

Liu and Yang (2025) is a recent attempt to investigate factors to avoid economic coercion quantitatively. Based on a theoretical model similar to Clayton, et al. (2024), Liu and Yang (2025) construct a measure of "international power" that captures the asymmetric import dependence between a pair of countries, averaged across sectors inversely weighted by each sector's trade elasticity. Then, using bilateral trade data and the Integrated Crisis Early Warning System (ICEWS)

dataset that is constructed by automatically scanning news articles around the world and can capture disputes and negotiations over trade, they find that the number of bilateral trade engagements shown in news articles is positively affected by power asymmetry between the two countries (i.e., the reliance of a country on the other). This result implies that reducing the reliance on a country and diversifying trade partners can lower the risk of economic coercion, which is consistent with the conclusion of Section 3.1. This conclusion contrasts with that from studies showing that a close economic relationship through trade and FDI is likely to reduce the risk of military conflicts (Hegre, et al., 2010; Schultz, 2015), possibly because these studies do not take into account the reliance on a hegemon.

4 Diversification of Supply Chains for Resilience and Anti-Economic Coercion

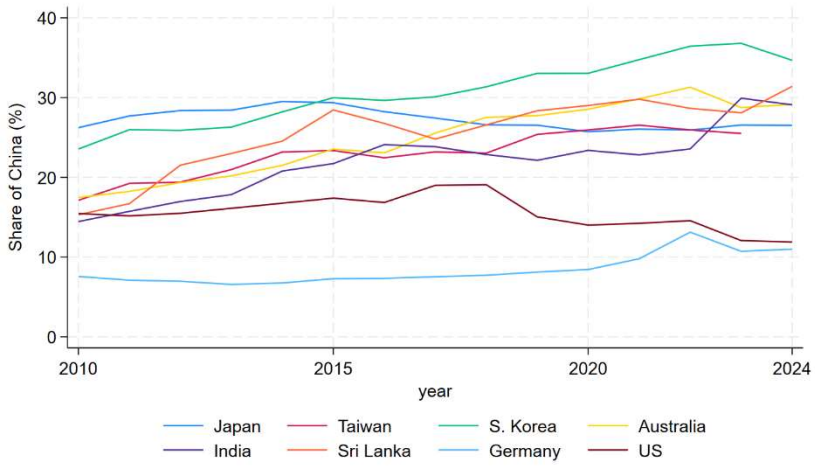
4.1 Ongoing Restructuring of Global Supply Chains

The theoretical and empirical studies in the previous subsections show a substantial propagation effect through supply chains and a crucial role of substitutability of partners in supply chain resilience. They further suggest diversification of supply chains for resilience and anti-coercion. Realizing these issues and facing the rise of geopolitical and protectionism risks of supply chain disruptions, firms in the world have started to reorganize their supply chain partners, as shown earlier (Ferguson, et al., 2023; Hayakawa and Ito, 2025; Mancheri, et al., 2019). Also, Alfaro and Chor (2023) document a reduction in U.S. sourcing from China and an increase in that from Vietnam and Mexico and in onshoring during the period 2017-2022.

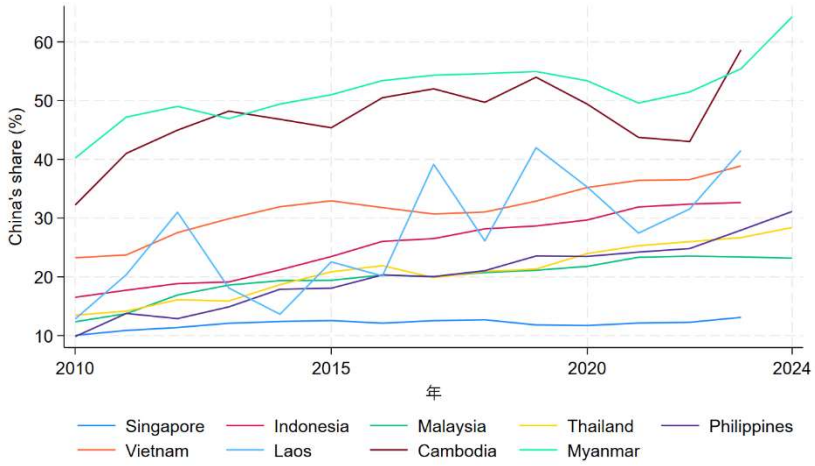
In Asia, heavy reliance on China in supply chains is a major source of risks of supply chain disruptions, as suggested by the economic coercion theory of Clayton, et al. (2024) and the network theory of Farrell and Newman (2019) (Section 2.4). However, supply chains in Asia have not been reorganized away from China. Figure 1 shows China's share in imports of intermediate products for East and South Asia (and the U.S. and Germany for comparison) in panel (A) and for Southeast Asia in (B). Although China's share for the U.S. drastically decreased from 20% in 2018, the beginning of the U.S.-China tariff war, to 12% in 2024, China's share after 2018 is increasing for most countries and remains stable but still high for the rest. No Asian country show a clear declining trend.

Figure 1: Chana's share in imports of intermediate products for selected countries

(A) East and South Asia



(B) Southeast Asia



Source: UN Comtrade.

Notes: Intermediate goods are defined by 22, 42, 53 of the Broad Economic Categories.

For Japan, ASEAN countries are major candidates for supply chain partners when reducing its reliance on China. However, Japan's FDI to ASEAN in the manufacturing sector has been also stagnant: 3.1 billion yen during the 3-year period 2017-2019 (before the COVID-19 pandemic) and 2.8 billion yen during the period 2022-2024. Japan's FDI to India, an alternative candidate, slightly increased from 0.88 billion yen in 2017-2019 to 1.05 billion yen in 2022-2024 (Bank of Japan, 2025). However, the amount of FDI to India is still small, compared with that to ASEAN. Moreover, the

share of China in imports of automobile parts to Japan increased from 35% in June, 2018 to 42% in June, 2025, while the increase in the share of ASEAN during the corresponding period was smaller, from 23% to 27% (UN Comtrade). Therefore, diversification of production facilities of Japanese firms to ASEAN and India away from China has been limited.

4.2 Obstacles of and Policies for Supply Chain Diversification

One major reason for the lack of sufficient diversification of supply chains of Asian countries is uncertainty of risks of supply chain disruptions due to geopolitical and protectionism factors, leading to a large gap between the market equilibrium and the social optimum, as discusses in Section 2.1. If the risks are clearly known to firms, they can use the risk information to determine how much to diversify their supply chains, at least to maximize their own long-term profits and to narrow the market-optimum gap. Therefore, the government should make efforts to collect information on national security risks and disclose this information to the private sector.

The Japanese government is making several efforts for this purpose. First, it is going to establish the Economic Security Center, a public thinktank to strengthen the capacity of economic intelligence. Second, it has constructed the Trusted Thinktank Network Strategic Dialogue among public and private thinktanks to share information about security risks for each country and disseminate the information to the private sector, particularly, small- and medium-sized enterprises (METI, 2025a).

Another factor that prevent supply chain diversification is initial costs involved in the diversification, such as those of gathering market information and building non-market relationships. Eaton, et al. (2021) utilize detailed data on exports from Colombia to the U.S. and demonstrate that the search costs of finding suitable sales partners and learning about the market are very high. Although Eaton, et al. (2021) analyze the costs associated with exporting, the costs of searching for suppliers would be similar. However, even if firms pay such costs to diversify their supply chains, the benefits will spill over to other firms through their supply chains. As a result, supply chain diversification will not reach the socially optimal level (Acemoglu and Tahbaz-Salehi, 2024).

Therefore, policy interventions, such as information and business matching support for supply chain diversification, can be justified. There is also much evidence, albeit with large heterogeneity, that policies, such as information support and subsidies for export promotion, are effective in practice (Srhoj, et al., 2023). It can thus be concluded that the same policy support is effective for their search, whether for suppliers or customers.

From Japan's perspectives, another important obstacle for supply chain diversification, particularly to the Global South, including Southeast and South Asian countries, is competition with China. China has developed transport, energy, and ICT (information and communication technologies) infrastructure in the Global South through Belt and Road Initiative (BRI). Accordingly, FDI from China to BRI countries and exports from BRI countries to China increased substantially (Li and Todo, 2025; Todo, et al., 2025). By contrast, the economic and political relationships

between Japan and BRI countries, measured by Japan's infrastructure projects in BRI countries and visits of political leaders of BRI countries to Japan, respectively, shrank (Nishitateno and Todo, 2025).

Therefore, Japan should support more infrastructure development, technical assistance and cooperation, and human capital development in the Global South through official development assistance (ODA) and other public finance measures through, for example, the Japan Bank for International Cooperation (JBIC) to strengthen the two parties. Japan's ODA is found to have a "vanguard effect," or its positive effect on FDI from Japan (Kimura and Todo, 2009). In addition, Japan's technical assistance, for example, in the foundry industry in Indonesia and in the coffee farming in Ethiopia, is found to help to expand Japanese firms' supply chains overseas (Takahashi and Todo, 2014; Todo, 2011). Therefore, it is concluded that such public support to the Global South can improve economic profits and resilience of Japan, creating a win-win situation with the Global South.

Another obstacle to expand supply chains between the Western countries, including Japan, and the Global South is that the Western countries often impose strict regulations on suppliers in the Global South regarding environment, human rights, and labor issues. For example, EU Deforestation Regulation will restrict imports of agricultural products, such as palm oil and coffee, unless exporters can verify these products are deforestation-free from 2026. The U.S. suspended Bangladesh's most-favored-nation (MFN) status to strengthen labor rights and factory safety in Bangladesh in 2013. These regulations might be too strict, provided the level of economic development in the Global South. Accordingly, the trade and FDI relationships between the Global South and the West are not growing, compared with those between the Global South and China that is less concerned about these issues (Dong, et al., 2022; Yang, 2022).

Therefore, to intensify economic ties with the Global South, Japan should take a more flexible approach to environment, human rights, and labor issues, bridging other Western countries and the Global South. In practice, the Japanese government has already taken this approach. Most notably, Japan has lead the Asia Zero Emission Community (AZEC), an international framework with most ASEAN members and Australia, that allows for multiple pathways to zero emission of global-warming gas. This direction of policy efforts should be strengthened further.

4.3 Multilateral Cooperation

In all policy measures above, international cooperations are quite important. In practice, policies to deal with lack of information about country risks and market information can be more effective if multiple countries cooperate and share their information. In addition, flexible approaches to the Global South regarding environment, human rights, and labor issues definitely require international cooperation, at least with the Global South and preferably with the U.S. and European countries. Such cooperation may be done in international frameworks, such as the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), Regional Comprehensive

Economic Partnership Agreement (RCEP), and Free and Open Indo-Pacific (FOIP). Infrastructure development in the Global South can also be done in a bilateral or multilateral framework. One example is cooperation among JBIC, U.S. International Development Finance Corporation, and the Export-Import Bank of Korea to promote projects for digital infrastructure in India, including 5G networks, Open RAN, and data centers (JBIC, 2024).

It should further be noted that international cooperation is crucial to deal with economic coercion. Clayton, et al. (2024) theoretically show that when non-hegemon countries implement anti-coercion policies individually, the world tends to be over-fragmented and inefficient. This result implies that non-hegemon countries should cooperate and keep economic relationships among them while reducing reliance on hegemons. In practice, cooperation among Asia-Pacific countries through, for example, CPTPP, RCEP, and FOIP can be effective to alleviate economic coercion by the two hegemons, China and the U.S.

5 Industrial Policy for Onshoring

In addition to international diversification of supply chain partners, another possible way to strengthen economic security and avoid economic coercion is to bring production sites and suppliers back to the domestic economy, or onshoring. Recently, many countries, including the U.S., China, Japan, and other developed and developing countries, are implementing industrial policies targeting specific industries to bring supply chains for critical products, such as semiconductors, into the domestic economy. This section evaluates these industrial policies based on theoretical and empirical findings.

5.1 Theory of Industrial Policy

It is theoretically clear that such industrial policies are effective for industrial development under certain conditions. Suppose that an industry has economies of scale, and that the larger the scale of production, the higher the production efficiency and productivity. If that industry in a particular country were not sufficiently large and were to trade freely, it would lose out to imports from other countries due to lack of international competitiveness. As a result, the industry in that country would not survive. In that case, if the government supports that domestic industry and foster it to a certain size by restricting imports, growth in productivity due to increasing returns to scale enables the industry to become internationally competitive and contribute to the country's economic growth (Harrison and Rodriguez-Clare, 2010; Juhász, et al., 2023).

This logic can be applied to the development of regional economies. It is well recognized that if firms in a specific industry are concentrated in a certain region, information and technology will be locally shared and spread among those firms. Moreover, human resources specific to that industry will be attracted to the region. Accordingly, such agglomeration of firms improves the production

efficiency and productivity of that region (Marshall, 1890). Therefore, it is possible to develop specific industries by attracting core firms in a certain region.

It has also been shown theoretically by Grossman, et al. (2023) explained in Section 2.1 that a policy of onshoring may also be effective in strengthening supply chains. They show that when price elasticity increases with prices, policies that discourage diversification of supply chain partners and promote onshoring enhance social welfare because of excessive diversification of supply chains in the market equilibrium. Clayton, et al. (2024) explained in detail in Section 3.1 also suggest that subsidizing to domestic firms can help reducing the risk of economic coercion.

In addition to onshoring, recent U.S. industrial policies aim at preventing, or sabotaging, improvements in productivity of high-tech industries by restricting their exports and technology transfer to China. Using a two-country trade model, Liu, et al. (2024) theoretically examine how sabotaging foreign (China's) productivity affect home (U.S.) real income. They find that partially sabotaging productivity of a foreign export sector to the extent where it still can export would lower home real income due to an increase in the price of imports to the home. However, comprehensive sabotaging that prevents exports of the foreign can improve home real income due to gains in the terms of trade. Using the World Input-Output Database, they further show that this non-monotonicity can be applied to the semiconductor industry, justifying the current U.S. policies against China.

However, while these conclusions are predicted in theory and in some empirical cases, they my not always work in practice. Governments do not always have the ability to select industries with economies of scale appropriately, and political pressure can lead to the policy selection of the wrong industries, firms, or regions, resulting in government failures where policies do not work effectively. It is also possible that policy support may stifle corporate ingenuity and make domestic business activities rather inefficient, resulting in a failure of industry development.

5.2 Empirical Studies on Industrial Policy

Empirically, the effect of policies that promote specific industries and regions are found to be quite mixed. For example, policies to attract large factories in the US are found to have had spillover effects that increased the productivity of firms in the surrounding area (Greenstone, et al., 2010). However, Okubo and Tomiura (2012) demonstrate that the subsidy policies implemented in Japan in the 1980s and 1990s to attract high-tech firms to regional economies, such as Technopolis and Zuno-Ricchi (brain-location in Japanese), attracted rather low productivity firms and had no effect on technology spillovers and regional development. By contrast, Nishimura and Okamuro (2011a, 2011b) find that the Industrial Cluster Policy in the 2000s and 2010s similar to Technopolis and Zuno-Ricchi was more successful in improving productivity and technological progress. They argue that this is mostly because the policy focuses on creating networks between firms in the region for information sharing, between firms in and outside the region for supply chain expansion, and between firms and universities for innovation.

China's recent industrial policy providing substantial subsidies to targeted industries, particularly ICT industries, has been paid attention by policymakers of the U.S., Europe, and Japan, resulting in a "subsidy race" among them. In practice, however, industrial policy in China has not always been successful. For example, a study using firm-level data covering large and medium-sized Chinese firms from 1998 to 2007 shows that subsidies to firms were effective in increasing productivity in industries where competition among firms was maintained (Aghion, et al., 2015). A more recent study using data on Chinese listed firms from 2007-2018 shows that subsidies are granted to rather less productive firms and have a positive effect on employment but a negative effect on productivity (Branstetter, et al., 2023).

However, there is a growing body of evidence that industrial policies have been effective (Juhász, et al., 2023; Lane, 2020) as a result of the use of advanced econometric methods that can more accurately identify causal relationships. For example, Lane (2025) shows through difference-in-differences (DID) estimations that industrial policies targeting the heavy and chemical industry in South Korea in the 1970s significantly increased its output, productivity, and exports, and that the effects extended to downstream industries through supply chains. Kalouptsidi (2018) demonstrates through structural estimation that China's shipbuilding industry overtook Japan and gained the top share of the global market due to subsidies granted in the late 2000s. Furthermore, Juhász (2018) uses the Napoleonic wars during the period 1803-1815 that disrupted trade with Britain in parts of France as a natural experiment. Juhász (2018) finds that the cotton spinning and weaving industry grew significantly because the trade disruption acted as infant industry protection, increasing the production capacity of cotton spinning and weaving machines. Moreover, this growth is found to have been sustained over the long term.

Goldberg, et al. (2024) examine the effect of industrial policy in the global semiconductor industry. They find substantial international productivity spillovers possibly due to knowledge transfer between fabless firms, such as Intel, and foundries, such as TSMC, FDI, and R&D collaborations. This finding implies that the effect of subsidies can be captured by foreign firms, and thus that the subsidy race where many countries, including the U.S., China, Japan, South Korea, Malaysia, and EU countries, are currently subsidizing to the semiconductor firms may improve welfare.

Another strand of literature related to that on industrial policy for economic security examines the effect of innovation policies motivated by national security, including defense R&D. For example, Gross and Sampat (2023) take substantial public investments in R&D by the U.S. government during World War II as a case of security-motivated innovation policy. Using data at the county-technology level, they find that units that received a lot of public investments by the policy produced 40-50% more patents by 1970, for 25 years after the war, than other units, implying that the policy created technology clusters in the long run. Their further analysis shows that while the policy jump-started technology clusters, the long-run effect mostly stemmed from self-sustaining agglomeration dynamics. Giorcelli (2019) finds that Cold War–motivated U.S. program that sent

Italian managers to U.S. firms and provided advanced machines improved firm productivity substantially and persistently. Moretti, et al. (2025) use panel data for OECD countries at the industry-country level and find that defense-related R&D crowds in private R&D in the corresponding country and other countries.

Three key factors of success in industrial policies arise from these studies. First, effective industrial policies are often associated with competition and openness. This implication is clearly found in the case of subsidies in China (Aghion, et al., 2015). Also, the successful industrial policy to the heavy and chemical industry in South Korea restricted imports but promoted exports, leading to competition in the world market (Lane, 2025). Second, creating economic networks and promoting knowledge spillovers are another key to the success in industry policies. Regional development programs in Japan were effective when policies focused on creating networks, rather than proving subsidies (Nishimura and Okamuro, 2011a, 2011b). International knowledge transfer was found in the recent subsidy race in the semiconductor industry, raising productivity globally (Goldberg, et al., 2024). Finally, effective industrial policies often target innovation. Creation of knowledge incurs externality through spillovers (Romer, 1990), and thus policy interventions are evidenced to promote innovation (Bloom, et al., 2019). This theoretical logic can be applied to industrial policies and empirically supported by the effect of defense R&D (Giorcelli, 2019; Gross and Sampat, 2023; Moretti, et al., 2025). Also, the effect of import reductions from the U.K. on the French cotton machinery industry was larger in regions where universities were located (Juhász, 2018).

These implications are consistent with a seminal work that reassess the effectiveness of industrial policy, Aiginger and Rodrik (2020). They advocate a contemporary conception and practice of industrial policy that establish "a sustained collaboration between the public and private sectors around issues of productivity and social goals," rather than traditional industrial policy characterized by "top-down policymaking, targeting pre-selected sectors, and employing a standard list of subsidies and incentives."

5.3 Evaluation of Current Japanese Industrial Policy

From the above perspectives, this subsection evaluates the Japanese government's ongoing industrial policy to the semiconductor industry and consider future challenges.

One notable policy is that the Japanese government has attracted a production plant of TSMC of Taiwan, the largest and most advanced semiconductor foundry in the world, to Kumamoto of the Kyushu island located in the western part of Japan with a subsidy of 476 billion yen by 2024. The subsidy may be expanded to 1.2 trillion yen in total (METI, 2025b). This policy follows the direction of successful industrial policies suggested in Section 5.2 in the following three ways and has the potential to succeed.

First, the attracted firm is a foreign firm with state-of-the-art technology. Empirical literature has found that high technologies of foreign-owned firms often spill over to and improve productivity

of domestically-owned firms in many countries, including Japan, the U.S., and Europe (Haskel, et al., 2007; Keller and Yeaple, 2009; Todo, 2006). However, despite of the fact that the amount of foreign direct investment (FDI) inflows to Japan relative to GDP has been the lowest among OECD countries (OECD Data Explorer), policies of Japan have failed to promote FDI with advanced technological capabilities.

Second, the Kyushu region, including Kumamoto, has already been an industrial cluster of the electrical and electronics equipment and automobile industries. Because TSMC's Kumamoto plant was established in such a clustered area, it has further attracted more new investments of semiconductor-related materials, manufacturing equipment, and user firms in the region (Nihon Keizai Shimbun, 2023). The reason why previous policies such as Technopolis and Zuno-Ricchi did not work was that they tried to attract high-productivity firms to regions without such an existing industrial cluster. In this respect, the attraction of TSMC to Kumamoto has been able to make good use of the economies of scale that the region originally possessed. As the agglomeration of firms increases and supply chains develop in Kyushu, their productivity is expected to increase through technology and knowledge spillovers through the regional supply chains. (Javorcik, 2004; Todo, et al., 2016). In addition, policies support knowledge networks between firms and universities in the region and between local firms and Taiwanese research institutions (METI, 2025c). This also promotes knowledge diffusion in the region.

Third, the policy of attracting TSMC's plant to Kyushu has been accompanied by another policy to attract its R&D center to Tsukuba near Tokyo where R&D centers and universities are clustered. As a result, joint research is being conducted not only between TSMC and Japanese firms and universities, but also with foreign companies such as Intel, IBM, and Samsung, based on the Advanced Semiconductor Manufacturing Technology Consortium at the National Institute of Advanced Industrial Science and Technology (AIST). Empirical studies using firm-level data for various countries show that productivity spillovers from FDI to local firms are particularly large when foreign firms conduct R&D in the host country (Todo, 2006; Todo, et al., 2011). It has also been demonstrated that international research collaboration improves firms' innovation capacity through technology and knowledge sharing (Iino, et al., 2021). Therefore, the effect of TSMC on Japanese firms through joint R&D in Tsukuba is expected to be significant.

Another major industrial policy being implemented to promote the semiconductor industry in Japan is the support to Rapidus, a newly established semiconductor firm which aims to manufacture next-generation semiconductors of 2nm or smaller, including a subsidy of about 1 trillion yen (until 2024). In addition, a new research organization for the development of these next-generation semiconductors, the Leading-Edge Semiconductor Technology Center (LSTC) was established by the government support (METI, 2025b).

One notable characteristic of this industrial policy to Rapidus is that it encourages R&D collaboration with NSTC (National Semiconductor Technology Center) and IBM in the U.S., IMEC (Interuniversity Microelectronics Centre) in Belgium, and Leti (Laboratoire d'électronique des

technologies de l'information) in France, and other leading overseas research institutions and firms. In particular, 150 engineers of Rapidus have been dispatched to an R&D center of IBM and engaged in joint research. This effort should have promoted knowledge spillovers from IBM to Rapidus (METI, 2025b), resulting in its prototyping of 2nm transistors in July, 2025, only three years after its establishment (Rapidus, 2025). This is consistent with the second and third key factors of successful industrial policies in Section 5.2.

In the context of Asia in general, such competitive and open industrial policies that promote knowledge diffusion among Asian countries should be conducted more. Fitzgerald, et al. (2021) find that international research collaborations within a region measured by co-authorships of academic papers have been more prominent than across regions. This fact may be because geographic constraints in research collaborations (Henderson, et al., 2005; Lin, et al., 2023). Indeed, intra-ASEAN research collaborations have been growing for the last two decades (Oldac and Yang, 2023). However, international collaborations of Asian countries are growing substantially slower than their overall academic publications (Fitzgerald, et al., 2021). The share of patents by international collaborations in total patents for Japan, South Korea, and China is 2.9%, 2.3%, and 4.7%, respectively, substantially lower than 13.1% of the U.S., 19.3% of Germany, and 25.3% of the U.K. Therefore, there is a large room for improving international research collaborations by open industrial policies.

6 Summary and Conclusion

Recently, global supply chains are often disrupted because of geopolitical factors, industrial policies induced by national security concerns, and economic coercion for political and security purposes. Under these circumstances, creating supply chain resilience and strengthening economic security are of great interest of researchers, policymakers, and business persons. This study overviews the growing literature, both theoretically and empirically, on supply chain resilience and industrial policies and provides policy implications from the perspective of Asia, particularly Japan. Major means to create supply chain resilience include diversification of partners across like-minded countries (friendshoring) and (re)location of production facilities in the domestic economy (onshoring). For effective friendshoring, policies should provide information on foreign risks and markets to the private sector. For effective onshoring, industrial policies should promote competition within, and openness of, and knowledge diffusion in the target industry. To further strengthen the effectiveness of these policies for supply chain resilience, multilateral cooperations among Asian countries are suggested.

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