

## 9 US-China Supply Chain Competition and Korea's Economic Security Diplomacy

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### Abstract

With the official launch of the Indo-Pacific Economic Framework (IPEF) led by the US, the US-China supply chain competition has accelerated. While guarding our national interests and taking leadership in the agenda through establishing trade norms via participation in the framework from the early stage, we also need to enhance cooperation with China based on separately established trade norms and technical standards. South Korea should strive to achieve supply chain balance to reduce its market burden and trade dependency on China by actively participating in open governance in the early stage. Furthermore, for the economic security diplomacy and economic statecraft of middle powers such as South Korea, it is important to actively develop diverse roles of the government that can support private companies' activities and market functions in the domestic and global markets and deploy different comprehensive and composite diplomacy strategies for different industries, countries, and camps. To be specific, first, South Korea needs diplomacy to achieve technology independence and develop alternative sources of imports or to secure and stockpile strategic materials. In particular, it is urgent to pursue diplomacy for the "Korean industry-academia-research cooperation model (K-model) for the front-end process of Korean semiconductors" to achieve technology independence. Second, the government should play an active role in diplomacy for talent-nurturing to foster strategic industries and enhance innovative capabilities. We also need to improve innovation capabilities and nurture talents through the "re-shoring policy" and "friend-shoring diplomacy" in areas where the Republic of Korea (ROK) has weaknesses, including the back-end process and design of semiconductors. Third, with comprehensive and composite diplomacy

differentiated by industry, country, and camp in the semiconductor and battery businesses, it is necessary to employ “bridging diplomacy,” “solidarity diplomacy,” and “value diplomacy.” Lastly, it is not desirable to link the economy and security with all countries, industries, and value chains. In other words, conflicts should be resolved and a peaceful economy should be created through the flexible application of economic security diplomacy.

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## US-China Supply Chain Competition

On May 26, 2022, US Secretary of State Antony J. Blinken gave a speech about the Biden administration's China policy at George Washingtons University. In his remarks, Secretary Blinken expressed his view that China has both the intent and the economic, diplomatic, military, and technological power to reshape the international order thanks to the stability and opportunity that the international order provides. Secretary Blinken pointed out that China is undermining international laws and agreements rather than reinforcing them, and that the US would shape the "strategic environment" to prevent China's aggressive action, which constitutes the most serious challenge to the international order in the long term.

In other words, Secretary Blinken stressed that, instead of relying solely on China to change its trajectory, the US would reshape the strategic environment around China for the advancement of a free and inclusive international system. He proposed the US's China policy's keywords as "investment, alignment, and competition." Among them, investment by the US in competitiveness, innovation, and democracy and stronger alignment with allies and partner countries are most relevant to South Korea.

At the ROK-US summit on May 21, 2022, South Korea officialized its joining of the Indo-Pacific Economic Framework (IPEF). The four major areas of IPEF are trade; supply chain; clean energy, decarbonization, and infrastructure; and taxation and anti-corruption. There are concerns that supply chain cooperation with the US may trigger economic retaliation by China. However, it would be difficult for China to preemptively retaliate only against South Korea among the 14 or more countries participating in IPEF. Moreover, since 80% of South Korea's exports to China and 64% of its imports from China are intermediate goods, any control on the export of intermediate goods would damage both countries. Since the ROK's reliance on China in terms of industrial raw materials stands at 33.4% as of 2020, which is higher than the G7 average, a

raw material export ban could deal a significant blow to South Korea.

South Korea should reinforce its cooperation with China based on separately established trade norms and technical standards while also protecting its national interests and preempting the agenda by participating in IPEF from the early stage. According to the research published by the World Trade Organization in 2021, there were 391 Technical Barriers to Trade (TBT) cases from the US, 126 from China, and 117 from South Korea. Through cooperation with IPEF and China, South Korea should contribute to removing such barriers.

As shown with the launch of IPEF and the Quad statement, the global supply chain is being divided into one that shares the norm of liberal values led by the US and one oriented around the norm of authoritarian values led by China. 5G, semiconductor, battery, and rare-earth elements are the representative industries in which the supply chain is being reshaped due to the strategic technology competition between the US and China. The US published supply chain reports on the four strategic sectors of semiconductors, batteries, pharmaceuticals, and rare-earth elements in June 2021. The US also released a report on the status of the supply chain in six industries of logistics and transportation, food and agricultural products, semiconductor, healthcare, rare-earth elements and battery in February 2022. In addition, China expressed its commitment to self-rehabilitation and self-reliance in the semiconductor industry through its 14<sup>th</sup> 5-year plan announced at the National People's Congress and Chinese People's Political Consultative Conference in March 2021. In May 2022, the Chinese Communist Party issued an order that all computers relying on foreign semiconductors used by the central or local governments and state-owned enterprises should be replaced with those made in China until 2024. In the same month, China's major system semiconductor producer Zhaoxin launched its CPU-embedded mainboard in Russia, which was under economic sanctions imposed by western countries. However, China's self-sufficiency rate in semiconductors stands at less than 15% as of 2021. China is also expected to accelerate its efforts to participate in the

Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) to reinforce the Regional Comprehensive Economic Partnership (RCEP) led by China in an effort to counter the US-led IPEF and to gain competitive edge against the US in market areas not addressed by IPEF. It is also expected to expand the network it can lead in the global supply chain by leveraging One Belt One Road project while expediting the conclusion for free trade agreements with South Korea and Japan, and cooperating with BRICS.

In 2021, US-China semiconductor trade volume stood at USD 17 billion, which means that China is the second largest semiconductor importer for the US following ASEAN (USD 30 billion). Meanwhile, South Korea-China semiconductor trade volume stands at USD 81 billion, which is China's third-largest next to China-Taiwan (USD 120 billion) and China-ASEAN (USD 90 billion). If the US restructures the semiconductor supply chain to exclude China completely, it will deal a major blow not only to South Korea, which is highly reliant on China in the semiconductor export market, but also to Taiwan, ASEAN, Japan, and the US itself. Therefore, South Korea should make efforts to achieve supply chain balance by reducing its semiconductor market burden and trade dependency on China by actively participating in open governance early on.

### South Korea's Economic Security Diplomacy Challenges: Economic Statecraft and Comprehensive and Composite Diplomacy as a Middle Power

The issue of economic security has recently emerged in South Korea due to the South Korea-Japan conflicts over history, Japan's export control of semiconductors against South Korea in 2019, and the South Korea-China crisis over the shortage of urea solution in 2021. To go back further, China's retaliatory moves against South Korea's THAAD deployment fall in the realm of economic security issue. Therefore, other than the urea solution crisis caused

by supply chain disruption, economic security can be characterized as the efforts to achieve country's own diplomatic goals by pressuring a competitor country or counterpart country through weaponizing economic reliance. In particular, the key factors in South Korea's economic security are technology sovereignty and supply chain stability to preemptively respond to such economic oppression. To secure technology sovereignty and realize supply chain stability, "economic security diplomacy" is required, and for the means of such diplomacy, sophisticated "economic statecraft" should be designed.

It is important for the economic statecraft of middle powers like South Korea to actively develop diverse roles of the government to underpin the activities of private companies and market functions, both domestically and globally, and to deploy comprehensive and composite diplomacy differentiated by industry, country, and camp. Specifically, I would like to propose the following three types of roles and diplomacy of the government.

## **(1) Diplomacy for Technology Independence or the Development of Alternative**

### **Sources of Imports and the Securing and Stockpiling of Strategic Materials**

The first is diplomacy for technology independence or the development of alternative sources of imports and the securing and stockpiling of strategic materials. Technology independence through technology transfer and cooperation is needed in areas where South Korea has a low level of technology self-reliance, including high value-added materials such as semiconductor equipment. While the capabilities of South Korea's businesses are important, government subsidies and diplomatic support for technology cooperation (transfer) are vital. In particular, cooperation with Taiwan is needed for advanced semiconductors of the ultra-fine process of sub-1 nano angstrom (0.1 nm). And diplomacy for cooperation with Japan is required for the semiconductor material, parts, and equipment. Japan relocated its manufacturing bases and R&D centers to South Korea as it transferred to the

Korean semiconductor ecosystem after its businesses suffered damages due to reduced exports and increased costs after the restrictions on Korean semiconductor trade and technology in 2019. Leveraging this as an opportunity, the South Korean government should actively attract more investment from leading Japanese semiconductor businesses.

In other words, South Korea should follow the steps of the US's reshoring and friend-shoring policies so that South Korea can attract domestic investment from companies based in advanced countries that share their values and norms and utilize the investment for South Korea's industry-university-research institution cooperation and the nurturing of local talents. Specifically, the US is granting benefits to US companies that jointly develop technological intellectual property (IP) in quantum information and communications technology (ICT,) which is the next-generation semiconductor standards, through industry-university cooperation. The ROK government should also offer diverse benefits to encourage South Korean and foreign businesses to pursue the joint development of such technology IP through industry-academia cooperation with universities at home and abroad.

While South Korea is leading the market with the world's best technology in memory semiconductors, it lags behind countries such as the US (design: Intel, Nvidia, and Qualcomm) and Taiwan (manufacturing: TSMC) in system semiconductors. Even in the memory area, China, Europe, and Japan are quickly catching up with South Korea. Against this backdrop, the ROK needs to maintain a super-gap strategy through Samsung's GAA (Gate-All-Around)-based 2 nm process manufacturing and build capabilities to develop equipment for the front-end process, in which South Korea is behind other countries. Moreover, together with IPEF participants, a multilateral cooperation system for semiconductors should be established based on design (US); memory semiconductor design and manufacturing (South Korea); materials, components, and manufacturing equipment (Japan); and back-end process (Malaysia).



The South Korean government should support S&S Tech, a Korean company, to reduce reliance on Japan and achieve self-reliance through cooperation with Hoya and Shin-Etsu Chemical, two Japanese players that are leading in photomask manufacturing, among the materials players. In addition, South Korea should pursue self-reliance in manufacturing photomask writers through cooperation with and investment attraction from NuFlare of Japan and IMS of Austria.

The EUV exposure device essential to the fine front-end process for sub-7 nm semiconductors is exclusively produced by ASML – a super contractor – of the Netherlands. It is expected to produce 51 units this year, of which 18 units are secured by TSMC and 22 units by Samsung. Intel of the US has already signed a contract to introduce ‘High Numerical Aperture (High NA) EUV,’ which is a next-generation EUV exposure device of ASML. It is urgent for Samsung to introduce next-generation devices of ASML to stay ahead of the US and Taiwan.

Meanwhile, ASML Korea announced an investment plan of KRW 240 billion to construct a semiconductor complex that includes a DUV (deep ultraviolet)/EUV training center and remanufacturing facilities in Dongtan and to support the materials, components, and equipment localization of the Korean semiconductor industry. Other local governments and universities in South Korea should also follow the cooperation case of ASML and Dongtan to develop the “K-model for the industry-university-research institution cooperation of the semiconductor front-end.” Moreover, the South Korean government also needs to reinforce diplomacy with ASML and the Netherlands’ government to attract more active investment and facilitate technology cooperation.

On the other hand, for general purpose materials, including urea solution and rare earth elements, the diversification of imports is absolutely necessary, including leveraging India as alternative source for import of rare earth elements to overcome the heavy reliance on certain countries such as China. As the domestic production or import diversification of all items may incur



enormous costs, South Korea should focus on the most vulnerable industries and items to explore response strategies.

South Korea relies on China for 80% of the 288 key import items, including graphite, lithium, and nickel for EV batteries. Against this backdrop, the South Korean government should carry out diplomacy to secure and stockpile strategic materials through institutions, such as the Korea International Trade Association, diplomatic offices overseas, and the Korea Trade-Investment Promotion Agency so that the ROK can reduce its reliance on China. In particular, until South Korea can secure supply replacement through RCEP and CPTPP, it should maintain its cooperative relationship with China for key battery materials, including lithium, and tungsten oxide, which is a semiconductor material with 94.7% reliance on China. To secure and stockpile strategic materials, South Korea may form a consortium with Chinese companies to enter a third country. For example, LG is establishing a batch production system for EV batteries in Indonesia through a consortium joined by China's Huayou and CATL. LG Chem plans to construct the largest cathode material plant in the country, producing 60,000 tons per year, in Gumi, Gyeongsangbuk-do Province, together with China's largest cobalt producer Huayou Cobalt. POSCO Chemical is also operating a manufacturing subsidiary for cathode material (Zhejiang POSCO-HUAYOU New Energy) and precursor (Zhejiang HUAYOU-POSCO New Energy).

## **(2) Diplomacy and Talent-Nurturing Policy to Foster Strategic Industries and Enhance Innovative Capabilities**

Second, the government should strengthen its roles in diplomacy and talent-nurturing to foster strategic industries and enhance innovative capabilities. It needs to reinforce cooperation with the US to have a competitive advantage against China in high value-added areas, including semiconductors and batteries, and pursue fostering strategic industries,

enhancing innovative capabilities, and nurturing talent through foreign investment attraction and domestic industry-university-research institution cooperation. In particular, South Korea should be prepared for possible issues with certain manufacturing sites by diversifying manufacturing bases in South Korea and abroad. It should use Southeast Asian countries with high demand for semiconductors, including Vietnam, Malaysia, and Thailand as bases for semiconductor R&D centers or manufacturing sites. Also, it should diversify its production sites to include India and Australia, which are emerging as alternative suppliers for semiconductor materials and production. It is also necessary to pursue M&As to reinforce innovative capabilities and secure key strategic technologies in strategic industries.

Specifically, the back-end process is as important as the semiconductor front-end process explored above, as it is the back-end process that covers the stage of manufacturing foundry system semiconductors into final products. For example, more foundry system semiconductor production is required to resolve the disruption in automotive production caused by the shortage of automotive semiconductors, and more back-end process players should be there to support such efforts under the small-batch production system of foundries. The size of the packaging and test players (OSAT), which constitute the semiconductor back-end process, was around USD 57.5 billion (KRW 71 trillion) in 2019 but is expected to grow to USD 82.3 billion (KRW 101.7 trillion) in 2026.

Korean fabless (a designer of semiconductor) companies mainly rely on Taiwanese and Chinese players for packaging and testing, which entails concerns over the possible loss of opportunity to preempt the market and technology leakage. To resolve such issues, the reinforcement of packaging technology, development of additive technology, including 3D packaging, and strong investment and support at the national level to nurture talents are required. In addition, the government's diplomacy to pursue technology transfer and cooperation or M&As with companies in leading countries, including Taiwan and the Netherlands, is desperately needed. The ROK government

should spare no effort for a full range of investment and diplomatic support so that Korean back-end process players, such as Tesna, which was acquired by Doosan, Hana Micron, SFA Semicon, Nepes, and overseas back-end process players can actively pursue industry-university-research institution cooperation and nurture working-level talents in the semiconductor back-end process.

As for M&As, given that South Korea does not have sufficient talents for fabless players, which are essential for the small-batch production system, South Korea can pursue M&As with foreign fabless companies. The government can support cooperation with overseas companies through establishing public fabrication facilities (FABs). In particular, the government should create an environment where Indian fabless players specialized in AI chip design can be incorporated into South Korea's fabless ecosystem. We need a diplomacy that leverages diverse support from the government to attract talents to South Korea's industry-university cooperation projects and traditional leading global semiconductor players, including Intel of the US and ARM of the UK; automotive semiconductor leaders, such as NXP of the Netherlands and Infineon of Germany; fabless players; and IP R&D centers.

### (3) Comprehensive and Composite Diplomacy Differentiated by Industry, Country, and Camp: Bridging Diplomacy, Solidarity Diplomacy, and Value Diplomacy

Third, the economic security of South Korea has moved beyond an issue of diplomacy and alliance into a realm of values. Therefore, as a middle power aiming to become a global pivot state, South Korea requires composite economic security diplomacy differentiated as bridging diplomacy, solidarity diplomacy, and value diplomacy by industry, country, and camp. In other words, South Korea should deploy comprehensive and composite diplomacy in which it pursues bridging diplomacy for the battery "industry"; solidarity diplomacy with "countries" that share similar interests and values such as democracy, human rights, and the environmental concerns; and value

diplomacy where South Korea shares the values of freedom and human rights in the democracy camp led by the US and the values of peace and prosperity in the authoritarian camp led by China. What is important in such diplomacy is that South Korea should aim to contribute to shaping the global standards of advanced industries' technology.

The bridging diplomacy by industry between the US and China can be pursued in the EV and battery industries. While the global EV market is growing 20% per year, Germany recorded the highest exports in 2021 (export value of around USD 15.5 billion) followed by Belgium (USD 9.8 billion), China (USD 8.1 billion), South Korea (USD 5.6 billion), and the US (USD 4.6 billion). China accounts for almost half of the EV battery market with 48.7%. The three major South Korean battery makers are chasing China with 30.4% of market share. In particular, since China has an absolute advantage in the battery material and refinery market, South Korea should pursue bridging diplomacy to make efforts to secure raw materials for batteries while also cooperating with China on batteries and reinforcing cooperation to rebuild the battery supply chain with the US. In other words, instead of unconditionally excluding China to cooperate with the US in rebuilding the battery supply chain, South Korea should aim to reduce its dependency on China.

Meanwhile, in order to prevent the leakage of manufacturing technology for advanced semiconductors, South Korea should align its export control system and regulations at a similar level with those of the US, Japan, and the EU, which share democratic values and have a similar technology level with South Korea. Moreover, it is important to pursue solidarity diplomacy for RE100 (which uses renewable energy 100%) with the countries sharing environmental values as South Korea. While the new and renewable energy produced in South Korea in 2021 was only 43,000 GWh or 7.5% of the nation's total power production, Samsung Electronics alone consumes 23,000 GWh, or slightly more than half of South Korea's renewable power, in its global operation. In particular, with the rising call by global investment companies and major

companies to apply RE100 in the semiconductor industry, which is South Korea's major industry, purchasing Renewable Energy Certificates (REC) from domestic companies alone will not keep up with such demands. Therefore, solidarity diplomacy should be pursued with the US, Japan, and the EU, under which South Korea is allowed to reach a Power Purchase Agreement (PPA) with new overseas renewable players. Furthermore, South Korea should serve as a buffer in the US-China competition through solidarity diplomacy with other middle powers, including ASEAN, India, Japan, Australia, Germany, France, and Canada, which share similar interests and have the similar national power to diversify supply chains and shape technical norms.

Lastly, South Korea can deploy economic security diplomacy by promoting democracy, freedom, and human rights with the US. The ROK can also foster peace and prosperity on the Korean Peninsula with China in the form of value diplomacy. Democracy and human rights and peace and prosperity are compatible values and ideologies. As such, South Korea should seek economic security diplomacy with a focus on compatibility and cooperation instead of collision and conflict while bearing in mind that South Korea cherishes versatile values. For example, the Uyghur Forced Labor Prevention Act, enacted on June 21 this year in the US, is expected to ban the import of polysilicon, which is a raw material used for solar panels, produced in Xinjiang. As 45% of global polysilicon production takes place in Xinjiang, the enactment of the Act can serve as a major opportunity for OCI, a South Korean company. During President Biden's visit to South Korea, he chose the ROK as a solar partner, and Hanwha Solutions, OCI, and other relevant companies participated in the business roundtable with President Biden. The case of solar power generation is a representative one that uncovers the new business opportunities created through value alliance.

## Implications for the Korean Peninsula: Creating a Peace Economy through the Flexible Application of Economic Security Diplomacy

On May 26, 2022, the UN Security Council was set to vote on a resolution for tougher sanctions on North Korea but failed to do so due to China and Russia's veto power as permanent members. It marked the first time that a vote on a resolution for sanctions on North Korea failed at the Council. China and Russia condemned the additional sanctions on North Korea with the view that they are inefficient and have negative effects and blamed the US for the recent provocation by North Korea, saying that the US did not respond to North Korea's positive and preemptive measures.

The New Cold War framework of South Korea-US-Japan on the one hand and North Korea-China-Russia on the other hand revealed by North Korea's nuclear issue is expanding to political security, military diplomacy, emerging security, and economic security. Due to the Russia-Ukraine war, China is purchasing Russian oil and gas at a low price, and Russia is continuing the war while sustaining the national economy through energy sales. India, which is a member of QUAD, also continues to purchase Russian oil at low prices instead of joining the West in imposing sanctions on Russia. Furthermore, while North Korea-China health and infectious disease prevention cooperation is growing stronger, North Korea refuses to accept vaccine support from South Korea and the US.

Under such circumstances, it is important to firmly establish South Korea's roles. If starting from the close ties between the economy and security, it is difficult to resolve the inter-Korean relations and South Korea-China issues that are closely related to the peace and prosperity of the Korean Peninsula. In other words, such an approach is bound to move away from the diplomacy that sought a peace economy and created functionalism effects under the principle of the separation of economy and politics. While it is true that the functionalism approach, which assumes the expansion of exchanges in

economy and trade would lead to trickle-down effects on the areas of politics and military, has not worked recently, this does not mean that positive roles of functionalism and the peace economy should be ignored. The cross-strait relations between China and Taiwan are a case in point.

Lastly, it is not desirable to link the economy and security in all industries or across value chains in all countries. While economic security diplomacy should be reinforced with allies, including the US, Europe, and Japan, and countries that share the same values and norms, we need a differentiated approach based on the separation of economy and politics, the peace economy, and functionalism for certain industries and value chains with North Korea, China, and Russia. In other words, South Korea should resolve conflicts and create the peace economy by flexibly applying economic security diplomacy. For example, the ROK should pursue cooperation with North Korea on minerals for which South Korea relies heavily on China, with North Korea's denuclearization in the long term set as a precondition. North Korea has great potential with the world's 10<sup>th</sup>-largest reserves, or 2 million tons, of graphite, which is a key material in batteries, and the 2<sup>nd</sup>-largest reserves, or 48 million tons, of rare-earth elements. One of the representative cases is the pilot project of the Jeongchon graphite mine in 2003, which has made quite an achievement. It is possible to seek such pilot projects by reopening Gaeseong Industrial Complex. Economic cooperation between South Korea, North Korea, and China should also be strengthened in China's three northeastern provinces and the North Korea-China border areas by utilizing the values of peace and prosperity on the Korean Peninsula as a medium. At the same time, however, it is also necessary to outplay China's rapid catch-up by uniting with the US through economic security diplomacy in South Korea's major competitive industries, including semiconductor and EV. The US's strategy to reshape the supply chain and economic security strategy are focused on certain industries, including semiconductor and battery, and some value chains, including upstream and midstream. Therefore, instead of criticizing and reshaping the entire value chain across upstream, midstream, and downstream, it



is desirable to take the approach of separating the economy and politics and functionalism in other industries and downstream. Nevertheless, when the two approaches collide, South Korea will need to set its priorities based on its national interests and principles. However, South Korea does not need to voluntarily make such choices in areas where both approaches are permissible.

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