[After Trump Series 2] Prospects for U.S.-South Korea Cooperation in an Era of U.S.-China Strategic Competition

US-China Technology Rivalry and Implication for US-Korean Technology Cooperation

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US-China Technology Rivalry

Amid the recent trade conflict between the US and China in the Trump administration, high-tech such as semiconductors, 5G, and AI have been at the center. China has been challenging the US's advantage in the high-tech sector, and the US has tried to deter it in various ways of trade sanctions, export controls, investment regulations, restrictions on the exchange of researchers, and intellectual property lawsuits. Semiconductor, 5G, and AI are known to be the main tools driving a new economic paradigm related to the fourth industrial revolution, and these technologies are expected to be the keys for economic competitiveness in the 21st century. In addition, these technologies are typical dual-use technologies that can determine the performance of various advanced weapons.

The United States has been leading the development and use of PC, Internet, mobile, and other ICTs. and has maintained technological superiority since the acceleration of ICT revolution. Ever since China announced 'Made in China 2025(MIC 2025)' in 2015, China's technological advancement and challenge began to draw attention. The goals of MIC 2025 include increasing the Chinese-domestic content of core components up to 40 percent by 2020 and 70 percent by 2025. The plan focuses on high-tech fields including pharmaceutical, automotive, aerospace, semiconductor, and robotics manufacturing, most of which are currently dominated by non-Chinese companies. Aiming to self-sufficiency and global competency of Chinese manufacturers, Chinese government has expressed its strong will to secure its position as the world's best manufacturing powerhouse by 2045.

Concerning over China's practices of technology transfer, huge amount of subsidies to high-tech sectors and military implication of advanced manufacturing base, Trump administration made the US Trade Representative (USTR) to investigate on Chinese practices. The result of this investigation was that China has sought to access the crown jewels of American technology and intellectual property in an illegal way and has caught up some emerging high-technology industries that would drive future economic growth and advancements in the defense industry. With the growing perception of China's challenge as a threat to national security as well as an economic aggression in USA, many laws such as 'Export Control Reform Act (ECRA), 'Foreign Investment Risk Review Modernization Act (FIRRMA)' were enacted, the trials of M&A on US high-tech companies by Chinese capitals have been refused, and import bans to Chinese firms have been reinforced during the last four years of Trump Administration.

The US strategies responding to China's technological rise could be broadly summarized into three categories. At first, the US has been trying to put Chinese firms under pressure by mobilizing a variety of means such as regulations on M&A, export restrictions and intellectual property lawsuits. Secondly, the US has been strengthening the domestic technological innovation, especially for the manufacturing base. For example, 'Chips for America Act,' and 'The Endless Frontier Act' are soon to be initiated to support the U.S. semiconductor manufacturing base and upgrade overall innovation capacities. Thirdly, the US has been set to form a technology alliance with other countries against China under the concept of the Economic Prosperity Network. A couple of versions of a technology innovation alliance have been proposed in order to unite countries that could play a complementary role in technology innovation with the US, such as India, Europe, Japan, Australia, Israel and etc.

The US government's hard push has seemed to be a significant blow to the technological innovation that the Chinese government has been ambitiously promoting. For example, the goal announced in MIC 2025, that is, the semiconductor self-sufficiency rate of 70% by 2025, has become impossible to achieve. Huawei as well as the Chinese memory firms and foundries have faced a great challenge when they could not get a supply of EDA, FPGA software and equipment from the US and other countries due to the US sanctions. Despite these difficulties, the willingness of the Chinese government and firms to upgrade technology base and increase R&D investment has not abated, but rather been strengthened. We could expect that the US and China will continue

to compete over core technologies and data, as seen in the cases of Huawei and Tiktok.

Up until now the vision of fourth Industrial Revolution has been shared by the US and China, and the global supply chain for it has been so far integrated within the complex network across the national boundaries. However, as the strategic competition between the US and China has intensified and the competition for high techs has escalated, there has been growing signs of balkanization of internet as well as decoupling of global supply chain in high-tech industries. The possibility of separating the internet platform has become more apparent as the Chinese internet platforms companies such as Baidu, Alibaba and Tencent are competing against the US-led platforms such as Google, Amazon, Facebook, etc. In the semiconductor sector, there have been growing signs of decoupling of the global semiconductor supply chain as the US government has restricted domestic and foreign firms' export of chips, software, and equipment to Chinese semiconductor firms.

The strategic competitive landscape will not easily subside even after the US presidential election in November. It is difficult to expect a dramatic compromise of technology rivalry between the two countries. However, there is still room for careful attempts to manage and institutionalize the conflicts while reducing the costs and damages to both US and China. The US should acknowledge that no such actions could completely stop the Chinese efforts of the technological innovation and narrow the focus on apparent illegal technology takeovers or clear infringements of core interests of USA. It could be broadly accepted in the international community only when those measures are based upon the WTO trade norms or export control regimes and taken in a way that respects market principle. In the long run, it is necessary to accept that a certain amount of US technology leakage to China is inevitable, so US should strengthen the competitiveness of US technology base. China also needs to see its own technology innovation from a long-term perspective, refrain from aggressive challenges and illegal technology takeovers that could stimulate the US more than necessary, and acknowledge that the US technology and market are critical to the continuous growth of Chinese economy. In addition, intellectual property system in China and government subsidies for the domestic firms should be reorganized in accordance with international standards, and this could also enhance the reputation of China as a nation that complies with international rules and norms.

In other words, the US and China should conform to multilateral norms and respect market

principles, trying to institutionalize management of conflicts to avoid extreme confrontation. Competition between the two countries would be inevitable in the high-tech sectors, but at the same time, it must be acknowledged that the two countries have formed a deep interdependence within the global value chain over the decades, which has been the source of economic prosperity and technology innovation to the both countries. If this interdependent relationship is broken abruptly and completely, although some degree of decoupling in critical and strategic areas seems to be necessary and desirable, the entire world economy as well as both countries should suffer and pay enormous costs. Economic measures against other countries should be carried out transparently in accordance with international norms only when there is a clear reason to seriously undermine market principles or pose a direct threat to national security. In addition, the two countries need to refrain from creating an overheated environment of competition and devise the ways to manage conflicts. Above all, having a shared sense of responsibility for recovering the global economy and avoiding so called innovation winter which reduces productivity and shrinks innovative activities, the US and China should make an effort to keep the global technological innovation system open and make up an environment where all countries compete fairly.

Implication for US-Korea Technology Cooperation

The US-China technology rivalry and the decoupling of the US-China in the global ICT supply chain have been causing great challenges to many countries, including Korea, which have gotten entangled within complex and mutually interdependent global economic network. In this highly integrated global economy, a country would have difficulty in restricting economic and technological relationships on the national security grounds. While many countries share some of the US's concerns regarding China, most of them also want to maintain proper relations with China as well as the US and avoid having to choose one of them. In the Biden administration, the pressures against China are expected to continue, maybe, in a somewhat relaxed form, and the formation of a technology alliance in line with the grand multilateral strategy against China could be discussed in detail.

The U.S. attempt to form a technology alliance against China would narrow down the options for Korea, giving a very important implication to the future US-Korea relations and technical cooperation. The various versions of the technology alliance are now being presented by US gov-

ernment and think tanks reports. For instance, the US government has launched 'The Clean Network' program, addressing the threat to data privacy, security, human rights and aiming to exclude products made by Chinese companies from the US and other countries' 5G networks, mobile applications, app stores, and cloud computing. The State Department has even published a list of the countries and the firms that have agreed not to use Huawei equipment. LG U+, one of three major telecom service firms in Korea, has been using Huawei equipment, while the US has continuously demanded to stop. LG U+ has started buying LTE equipment from Huawei since 2013 and it has been now estimated that 30 percent of the Korean mobile carrier's LTE equipment is from Huawei. Despite the pressure from the US, it is not easy for LG U+ to disconnect from Huawei as its LTE service has a high compatibility with the 5G equipment supplied by Huawei.

In the case of the global semiconductor supply chain, the US has a clear technological dominance in design, software, and equipment, so Korean semiconductor firms have no other choice than to use U.S. semiconductor equipment or software and comply with its request. At the same time, however, China has been a major market accounting for almost the half of Korean semiconductor exports. The shrinking of the Chinese market will inevitably bring about a contraction of the Korean semiconductor industry. Samsung and SK Hynix have been placed in a complicated situation due to the US sanctions, which ban supplying semiconductors made with American equipment or software to Huawei without prior approval from Washington. They have halted their semiconductor shipments to Huawei, which has been one of Samsung's five largest customers. Meanwhile, Korean manufacturers of memory chips and smartphone parts are on alert because they would face difficulties in taking orders from Huawei if the Chinese firm cuts production. Huawei is a rival of Korean chipmakers and smartphone manufacturers, but Huawei is also a large importer of Korean products as it purchases more than 8 billion US dollar worth of Korean chips annually. LG U+, Samsung, SK Hynix and other Korean companies doing business with the Chinese companies are expected to bear heavy costs and losses in replacing existing Chinese suppliers or markets in the short term. Over the long term, however, it could serve as an opportunity for the Korean firms to replace Chinese firms and expand its market share and secure new clients. In order to take advantage of this situation, Korean firms should accelerate innovation by widening the technological gap with Chinese competitors and, from a perspective of Korea, this is the reason that US-Korea technology cooperation need to be advanced further.

At this time when Korean companies are being pressured by US-China decoupling, discussions are now taking place in the US on forming a more long-term and full-fledged technology alliance against China. Some argue that a technical alliance should be established, suggesting for like-minded nations to come together to form a Global Strategic Supply Chain Alliance (GSSCA) that could address security needs with respect to critical strategic items such as semiconductor, rare earth metals, active pharmaceutical ingredients. GSSCA wants to organize certain key industries to develop supply chains within the alliance excluding from non-member states. Meanwhile, there are a few technical alliance proposals that more explicitly suggest the fields and participating countries. For example, a recent NSCAI interim report suggested a very specific proposal to strengthen technical alliances with India and Europe and other countries regarding AI. The other report argues that, when China has been leveraging its formidable scale in terms of R&D expenditures, data sets, scientists and engineers, venture capital, the only way for the United States is to make a concerted effort to step up engagement with allies and form an alliance innovation base with Japan, Australia, Israel, and Norway. The mechanisms for innovation with allies include technology scouting programs, multilateral cooperative frameworks, rapid innovation initiatives, and bilateral projects.

The fact is that none of the current technology alliance proposals in the United States mentions Korea as one of the key countries to join the technology alliance, while Korean companies and governments has been taking a confused position between the United States and China. It seems that we stand at an important turning point for the future of US-Korea relationship and S&T cooperation and it is necessary to think over the meaning and direction of US-Korea S&T cooperation.

Whether in the form of an alliance or in any other ways, the US and Korea should move forward on technology cooperation at various levels. As is known well, the S&T cooperation with the US has played an important role in Korea's economic growth and technology innovation. KIST's establishment in 1966 assisted by the Johnson Administration was considered as the beginning of Korea's modern science. KIST, as the first comprehensive R&D institute in Korea, had become an important center of economic and technological development, supporting private firms as it had developed technologies and transferred them to the industrial sector. Korean companies have been strengthening their technological innovation capabilities by moving from labor-inten-

sive sectors to technology-intensive sectors within the global value chain, where technology transfer from American companies has been crucial. For instance, the history of the Korean semiconductor industry started with the foreign direct investment of US firms such as Fairchild and Motorola in the 1960s, which were increasingly investing in low-wage countries, especially in South-East Asia, in order to reduce their production costs. Korea benefited from this trend and made its very first start as a simple assembly site for the US companies within a hierarchical international division of labor. Motorola assembled the transistors and then later simple integrated circuits for consumer electronics in Korea. Thanks to the proper mix of the early US investment, government support, and Cheabols' continuous strategic initiative in Korea, the Korean semiconductor industry has attained an important growth momentum and achieved an impressive world market success in the limited segment of DRAMs. Currently, Korea and the US are forming a proper division of labor in the global semiconductor supply chain, and the various ways of cooperation should be explored for the further development of the industry in both countries.

On the government level, Korea and the US have made commitments to build a cooperative relationship in S&T that serves both political and scientific goals. The Joint Science and Technology Committee Meeting between Korea and US has been held since the Agreement Relating to Scientific and Technological Cooperation Between Korea and US took effect in 1993. This Meeting has provided an opportunity for both countries to improve mutual understanding on current S&T policies and discuss ways to expand cooperation. The committee has not been held in the Trump administration since its ninth meeting in 2016, but it needs to be re-established to recognize the importance of US-Korea S&T cooperation and to discover new agenda. International S&T cooperation takes many forms and governments have only a limited ability to direct the flow and direction of scientific research and technology innovation. However, it is for sure that the opportunities for enhancing the S&T relationship at the policy level do exist. Governments have an influence over large-scale mega-science projects in the fields of energy, environment, bio, ICT, and etc. The governments in Korea and the US may discuss whether they could jointly consider such projects.

On the other hand, defense R&D has occupied a fairly big portion of national R&D in both US and Korea, which are each other's' largest arms trade partner, as the issue of defense technology cooperation has covered weapons acquisition, technology transfers, and strategic technology protection. The two countries have talked collaboratively on the defense technology through the

Defense Technology & Security Consultative Mechanism (DTSCM) and the Defense Technology Strategy & Cooperation Group (DTSCG). Korea and the US could develop military technology cooperation further in the areas of military application of emerging state of the art technologies related to the Fourth Industrial Revolution and the other defense innovation and reform programs.

The most important part of US-Korea S&T cooperation has been the exchange of students, scientists, engineers, and researchers. In particular, the Korean scientists and engineers trained at American universities or working at US companies has contributed to strengthen technological innovation in Korea and the United States. While attempting bilateral cooperation within policy programs may also be effective, it seems that the most robust cooperation could grow from the bottom up; exchange of graduate students, researchers, and entrepreneurs in various fields of science and engineering linking with one another and identifying common interest and concern. It is recommended that exchanges of personnel at the levels of universities, businesses and public research institutes should be promoted and an environment for expanding the exchange need to be provided. All of these efforts could naturally lead Korea to deepen technology cooperation with the United States, which may not necessarily exclude the Chinese market. It is my opinion that US-Korea technology cooperation had better proceed under an open innovation environment and it is neither possible nor desirable for both the US and Korea to completely turn away the Chinese market. We need to flesh out a way of further S&T cooperation for the continuous growth of both the US and Korean economies.

Korea has upgraded its technological innovation capacity through various cooperation with the US at the levels of the government and the private sector and has been successfully transformed to one of the most innovative nations. Now, all of the US-China technology competition, the COVID-19, and the Fourth Industrial Revolution have posing great challenges to the economic growth and technological innovation in Korea, and the US Korea S&T cooperation could contribute to overcome these challenges and create a win-win structure. The US-Korea technical cooperation would not only make the continued economic growth and technological innovation of the two countries possible, but, for sure, consolidate US-Korea alliance and be beneficial for security in East Asia.

References

Capri, Alex. 2020. “Semiconductors at the Heart of the US-China Tech War.” The Hinrich Foundation.

Eznell, Stephen. 2020. “An Allied Approach to Semiconductor Leadership.” ITIF.

Houser, Kimberly. 2020. “The Innovation Winter Is Coming: How the U.S.-China Trade War Endangers the World.” *San Diego Law Review* 57(3).

Kliman, Daniel, Ben FitzGerald, Kristine Lee and Joshua Fitt. 2020. “Forging an Alliance Innovation Base.” CNAS.

Lewis, James. 2019. “China’s Pursuit of Semiconductor Independence.” Washington DC: CSIS.

Murphy, Paul and Paul Sullivan. 2020. “Formation of a Global Strategic Supply Chain Alliance (GSSCA): A New Strategic Multilateralism.” Global America Business Institute.

NSCAI. 2020. *National Security Commission on Artificial Intelligence's 2020 Interim Report and Third Quarter Recommendations*.

Park, JoonSoo. 2019. On Ways of the ROK-U.S. Defense Technology Cooperation along the Alliance Development. KIDA

President’s Council of Advisors on Science and Technology (PCAST). 2017. “Report to the President: Ensuring Long-Term U.S. Leadership in Semiconductors.”

Saif M. Khan and Carrick Flynn. 2020. “Maintaining China's Dependence on Democracies for the Advanced Computer Chips.” Brookings

SIA(Semiconductor Industry Association). 2020. *2020 State of the U.S. Semiconductor Industry.*

_____. 2020. “Strengthening the U.S. Semiconductor Industrial Base.”

_____. 2019. “Winning the Future: A Blueprint for Sustained U.S. Leadership in Semiconductor Technology.”

_____. 2016. *Beyond Borders: The Global Semiconductor Value Chain.*

USTR(Office of the U.S. Trade Representative). 2018. “Findings of the Investigation into China’s Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974.”

Varas, Antonio and Raj Varadarajan. 2020. “How Restrictions to Trade With China Could End U.S. Leadership in Semiconductors.” Boston Consulting Group.

VerWey, John. 2019. “Chinese Semiconductor Industrial Policy: Past and Present.” *Journal of International Commerce and Economics.*

Wagner, Caroline S., Anny Wong, Sungho Lee, and Irene T. Brahmakulam. 2003. *Phase Transition in Korea-U.S. Science and Technology Relations*. Rand.

Weiss, Linda. 2014. *America Inc.? Innovation and Enterprise in the National Security State.* Cornell University Press.

White House. 2018. "How China's Economic Aggression Threatens the Technologies and Intellectual Property of the United States and the World." Office of Trade & Manufacturing Policy Report.

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Knowledge-net for a Better World

Date of Issue: 7 December 2020
US-China Technology Rivalry and Implication for US-Korean Technology Cooperation
ISBN 979-11-6617-068-3 95340

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