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RESEARCH ARTICLE

Clashes of techno-statecraft: US-China technology rivalry and South Korea's strategy?

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Abstract
The current conflictual dynamics underlying high-tech rivalry between China and the United States and the management of collateral damages by middle-power countries emanate from the clashes of techno-statecraft. Each country's pursuit of technological superiority for its own prosperity, security, and prestige through deep and wide state intervention has aggravated the situation. Against this backdrop, our paper attempts to elucidate the dynamics of techno-statecraft of China, the United States, and South Korea. First, we examined the concept of techno-statecraft, which can be differentiated from that of economic statecraft, as an analytical framework of the paper. Second, we looked into China's technological challenge as shaped by its techno-statecraft. Third, we traced the American threat perception of China's technological rise and its techno-statecraft response. Fourth, the paper discussed the dilemmas Asian countries are currently facing and their choices through a case study of South Korea. Finally, it draws some theoretical, empirical, and policy implications.

Keywords: economics; economic security; US-China trade

Introduction

The US-China strategic rivalry has been intensifying in recent years. Geopolitics, geo-economics, technology, and values have emerged as four major battlegrounds, of which, as Secretary of State Tony Blinken aptly points out,[1] high technology rivalry has become its core. Technology is of paramount importance because of its multiplier effects on economic competitiveness, weapon development and national security, and even the preservation of democratic values.

The US-China rivalry on the technology front was inconceivable until very recently because American technological supremacy was undisputed. Since 2010, however, China has been catching up with the United States ferociously. Graduating from the status of a naive technology "imitator," it is competing with the United States in cutting-edge high technology such as 5G, space technology, and artificial intelligence (AI), threatening American economic prosperity and national security. This can be attributed partly to China's state-led promotion and acquisition of technology. The United States has responded to this through a mix of industrial policy, export controls, and cooperation with its allies. The rise of techno-statecraft characterizes the essence of the technology rivalry between the two giants.

The fierce technology rivalry has put middle-power countries in the Asia-Pacific in a difficult position. They are deeply integrated with the Chinese economy through trade, investments, supply chain networks, and technology cooperation. But the American government has been putting pressure on them to decouple from China in the areas of trade, investments, and technology, while fostering

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[1]Blinken (2022b).

closer cooperation with the United States. Meanwhile, Beijing warns that decoupling is not acceptable, and otherwise, reciprocal treatment would be followed. They are facing a serious "sandwich dilemma."

The current conflictual dynamics underlying high technology rivalry between China and the United States and the management of collateral damages by middle-power countries emanate from the clashes of techno-statecraft. Each country's pursuit of technological superiority for its own prosperity, security, and prestige through deep and wide state intervention has aggravated the situation. Against this backdrop, our paper attempts to elucidate the dynamics of techno-statecraft of China, the United States, and South Korea. First, we will examine the concept of techno-statecraft, which can be differentiated from that of economic statecraft, as an analytical framework for the paper. Second, we look into China's technological challenge as shaped by its techno-statecraft. Third, we will trace the American threat perception of China's technological rise and its techno-statecraft response. Fourth, the paper will discuss the dilemmas Asian countries are currently facing and their choices through a case study of South Korea. Finally, it draws some theoretical, empirical, and policy implications.

Techno-globalism, techno-nationalism, and arts of techno-statecraft

Since the Industrial Revolution, technology has been the key determinant of economic prosperity and national security. Starting with Great Britain, those countries enjoying superiority in technology were able to assure victory in war, facilitate colonial expansion, and foster economic development. The distribution of technology was uneven, with the rich becoming richer and the poor becoming poorer. Since World War II, the United States has enjoyed unprecedented supremacy in technology. American firms, academicians, and government agencies invented new technologies, which diffused globally through the mechanisms of multinational corporations and the product life cycle.[2] American inventors earned substantial royalties from their intellectual property rights, whereas latecomers simply imitated American technology without posing any discernible threats to the United States. Technological innovation and the creation of a cluster of technologies in major industries helped the United States achieve remarkable economic growth and hegemonic status in the international system,[3] enabling the diffusion of techno-globalism.

Boomerang effects soon followed. The outflow of American capital and technology justified through techno-globalism created a serious hollow out syndrome in the United States.[4] A major challenge came from Japan in the early 1980s. The US Congress and CIA published major reports warning impending danger of Japan's industrial competitiveness.[5] Japan's neo-mercantile policy, dense state-business policy networks, and process innovation-driven corporate strategy began to erode American industry's competitiveness, causing severe trade deficits. Especially worrisome for the US was that Japan was trumping the United States in such high technology sectors as semiconductors and automobiles. And Japanese firms were aggressive in acquiring cutting-edge American technology. For example, Japan's leading computer manufacturer, Fujitsu, attempted to acquire Fairchild, a major American semiconductor manufacturer, in 1987. The economic foundation of American security presented another challenge. The declining manufacturing sector, coupled with the erosion of industrial competitiveness, especially in the areas of cutting-edge technologies, brought about profound loopholes in the American security posture. It was more so because the American military-industrial complex, which was based on technology "spin-off" of the Cold War era, proved to be less efficient than Japan's version of a commercial industrial complex anchored in "spin-on" in the age of the diffusion of dual-use technology.[6]

Answer to these challenges came from the Berkeley Roundtable on the International Economy (BRIE). As early as 1982, BRIE urged the American government to undertake an active trade and industrial policy to cope with Japan's competitive challenges. Tyson and Zysman emphasized the need

[2]Vernon (1992).
[3]Drezner (2001); Modelski and Thompson (1996).
[4]Gilpin (1976).
[5]U.S. Congress Joint Economic Committee (1982); CIA (1982).
[6]Sandholtz et al. (1992).

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to "develop a national capacity to access sector weakness and formulate policies to combat foreign government influence on international trade as a whole."[7] For them, an industrial policy of Japanese style was the key to enhancing the international competitiveness of American industry. Researchers at BRIE further argued that high-tech industry is the basis for both economic and military security, and that the United States should reduce dependence on foreign suppliers for the components, materials, and equipment that American companies need in order to increase their productivity. It was also strongly recommended that the American government introduce a new institutional mechanism to transform the existing spin-off into a spin-on model that can maximize dual-use technology.[8] The Reagan and Bush administrations, which placed a greater emphasis on fair trade and subsequent policy measures, did not accommodate industrial policy based on active state intervention in markets.

Déjà vu? Ironically, the specter of aborted old ideas is being resurrected in the 21st century. This time, the target is China. Confronting China's technological challenges, the United States is adopting more aggressive trade, investment, and industrial policy, which Vinod K. Aggarwal and Andrew W. Reddie term "new economic statecraft."[9] It is new because such policy intervention goes beyond "the traditional focus on economic statecraft that utilizes economic tools such as sanctions for foreign and national security purposes."[10] Linda Weiss and Elizabeth Thurbon also noted the domestic dimension of economic statecraft, which focuses particularly on the state's techno-economic decisions that ensure its strategic positioning facing geoeconomic challenges.

In this paper, we propose the new concept of "techno-statecraft" rather than "economic statecraft," since the former reflects state intervention in technology policy more precisely. Techno-statecraft can be defined as the government's efforts to enhance national interests by promoting cutting-edge technology, while reducing foreign dependence, protecting indigenous critical technology, ensuring technology hegemony, and finally using technology tools to address specific foreign policy objectives.[11]

Techno-statecraft is composed of four components.[12] Its first component is the promotion of cutting-edge technology by the state to enhance competitiveness, while reducing foreign dependence on technology, parts and components, and materials. The government singles out specific technology sectors and protects them from foreign competition. Promotional policies include the strategic allocation of grants and R&D funds, tax incentives, the cultivation of human capital, and the active inducement of foreign direct investments.[13]

The second is state protection or the acquisition of critical technologies for national security.[14] There are several different ways to approach it. The government can regulate the outflow of critical technology through export control. It can also scrutinize counter-industrial espionage activities. Equally important is to deny the outflow of critical technologies to actual or potential enemies or competitors through multilateral collaboration. Meanwhile, the state can also actively involve itself in the acquisition of foreign technologies, either legally or illegally through industrial espionage.[15]

Third, it involves efforts to ensure or maintain technology hegemony by setting and even dominating technical standards in key critical technologies such as digital ones. International technical standards refer to the technical specification or process used to enhance the quality, safety, and interoperability of commodities and services. Technical standards with intellectual properties are important not only because they are vital to industrial competitiveness, but also because they shape overall norms, principles, and rules regarding the diffusion and operation of specific technologies. For this reason, technical standards have emerged as a new area of international contention, warranting government attention.[16]

[7]Tyson and Zysman (1982).
[8]Sandholtz et al. (1992).
[9]Aggarwal and Reddie (2022).
[10]Baldwin (2020).
[11]*Forbes* (2021).
[12]문정인 (2020:215-222).
[13]Tyson and Zysman (1983); Cohen and Zysman (1989).
[14]Rasser and Wolf (2022); Sandholtz et al. (1992); 北村滋 (2022); 國分俊史 (2020).
[15]Hou and Wang (2020); Glitz and Meyersson (2020).
[16]Lee (2022); Seaman (2020); Kinnwall (2019).

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Finally, techno-statecraft can be seen as an instrument to advance specific foreign policy goals through the manipulation of technology. Protection of privacy through the application of clean networks, preventing the outflow of critical technologies that can threaten human rights and democracy, and technology sharing with allies and partners for common security interests belong to this type of techno-statecraft.[17]

Techno-statecraft is a subset of new economic statecraft. As the importance of technology has grown over time, however, there is a need to differentiate the domain of technology from that of economy. Techno-statecraft is also different from techno-nationalism. Whereas the latter refers to a neo-mercantile tendency to maximize one country's national interests unilaterally, the former denotes the art of managing technology assets for the enhancement of national interests unilaterally and/or multilaterally. In this sense, techno-statecraft can be defined as a state's operational skills in managing technology for prosperity, security, and other national values.

The logic of techno-statecraft seems indispensable to understanding the dynamics of US-China technology rivalry and South Korea's coping mechanisms. Common to all these three countries is a growing reliance on techno-statecraft. It is the clashes of techno-statecraft that make the technology rivalry fiercer and even unruly.

China's technological rise and underlying techno-statecraft

Technological leapfrogging

After a relatively long period of self-reliant economic development, China decided to undergo opening and reform only 45 years ago. It was then a poor, developing socialist country. But its economic transformation since then has been profound. In less than 40 years, China has emerged as the second-largest economy, the number-one trading state, and the largest foreign reserve holder in the world.[18] In 2017, China exceeded the United States in GDP size measured by purchasing power parity, and its nominal GDP is also approaching that of the US China's sudden economic rise has alarmed the United States.[19]

Such economic transformation was facilitated by progress in technology. China has long been known as a world factory, taking advantage of cheap labor as well as "a kingdom of bogus products." Indeed, China has actively introduced and imitated foreign technology while lacking innovation and invention. As of 2020, however, China's technological landscape is totally different. Citing its technological leapfrogging, David Goldman, a longtime observer of the Chinese economy, argues that China will dominate the world not by military power but by technological power and that the world will be assimilated by China through its technology.[20] Robert Manning even compared China's technological rise to the Sputnik moment.[21] These claims are not groundless. Let us take some examples: In 5G, the apex of digital communication technology, Huawei's 5G technology surpassed the United States. Up until very recently, space technology was an American monopoly, but China is catching up by sending an unmanned spaceship to the moon and operating a space station. China's Beidou satellite navigation system is also challenging the US GPS system. China has also shown remarkable progress in quantum information and artificial intelligence (AI).[22]

Some other evidence also highlights China's technological rise. According to the World Bank database, the number of Chinese scientists' articles published in professional journals listed on SCI increased from 87,850 in 2003 to 669,744 in 2020, exceeding that of the United States (455,856). The number of international patent applications has also been remarkable. In 2000, China filed less than 1,000 international patent applications, but this number rose to 69,995 in 2022, which is far larger than the United States (58,716 cases) for the same year. More striking figures can be found in the number of

[17]Baldwin (2020); Blackwill and Harris (2016).
[18]Allison, Kiersznowski, and Fitzek (2022).
[19]Based on World Bank's World Development Indicators (WDI) data (Last access: 15 January 2024).
[20]Goldman (2020).
[21]Manning (2020).
[22]Allison et al. (2021).

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patent applications in ten cutting-edge technologies (AI, quantum computing, regenerative machines, blockchain, cyber security, virtual reality, lithium batteries, drones, and conducting polymers). According to Nikkei's annual survey on the ranking of patent applications in these technologies, China did not have any notable patent applications in 2000. Even in 2010, China ranked number one in only one area, drone technology, but in 2017, it ranked number one in all cutting-edge technologies except quantum computing.[23]

It is true that China still lags behind the United States in fundamental technology. As its competitive performance demonstrates, however, China has been quite successful in transforming imported technology into commercial and military applications.[24] Now, China is vigorously venturing into the new frontier of cutting-edge original technologies.

China's techno-statecraft

Promotion of Technology: What accounts for such an unprecedented technological transformation? Techno-statecraft has mattered and state promotion of technology has played a key role.

China's rise in science and technology was not a sudden occurrence. In November 1949, shortly after the establishment of the People's Republic of China, China launched the Chinese Academy of Science (CAS) with the primary focus of advancing science and technology, which shows how promptly China recognized the significance of science and technology. During its first stages, China expedited the progress of fundamental research, defense science, and aerospace technology with the aim of creating nuclear bombs, hydrogen bombs, and satellites (or intercontinental ballistic missiles) as part of the "Two Bombs, One Satellite" objective. Following China's reform and opening, science and technology have been recognized as crucial drivers of economic development, given the country's focus on economic construction. The current administration under Xi Jinping maintains a strong focus on science and technology, with the goal of establishing China as a global leader in innovation.[25]

In 2015, by benchmarking Germany's "Industry 4.0" strategy, the Chinese government announced the "Made in China 2025" initiative that aimed at emerging as "a strong manufacturing state" by integrating the traditional manufacturing sector with cutting-edge technologies.[26] The explicit goal was to increase domestic production of core parts and materials by 40 percent in 2020 and 70 percent by 2025, while simultaneously reducing reliance on foreign original technology and materials, particularly those from the United States and the EU. As with Japan and South Korea which went through assertive industrial policies in the 1970s, the Chinese government designated ten technologies (next generation IT, robotics, aerospace technology, marine equipment, etc.) as strategic sectors.[27] With the strong backing of party leadership, the Chinese government orchestrated bureaucratic agencies, private firms, and research institutions in a decisive manner.

China has chosen to embark on a "New Long March" rather than striking back with a short-sighted tit-for-tat strategy. It has been setting long-term aims and responding to US sanctions by upgrading institutional arrangements, enhancing industrial policies, and strengthening R&D investment.[28] China's R&D investments were also impressive. In 2000, US R&D investments were $330 billion, whereas China invested only $40 billion. But by 2020, China was nearly catching up with the United States by investing $564 billion per year. The United States spent $664 billion in that year. This was a result of the "Made in China 2025" initiative, which pledged to increase R&D expenditures seven percent per year until 2025. It is also interesting to note that in accordance with the 10 Year Action Plan for Basic Research, basic research accounted for eight percent of China's total R&D spending.[29]

[23]Nikkei Asia (2020).
[24]연원호 외 3인 (2020).
[25]Yeon (2020).
[26]Kennedy (2015).
[27]Wübbeke, et al. (2016).
[28]Yeon (2021).
[29]Sun and Cao (2021).

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Massive investment in human capital was another critical element. In 2000, the number of American R&D scientists and engineers was one million, whereas those in China were 650,000. But the number drastically changed in 2019. China's R&D personnel rose to 2.1 million surpassing 1.6 million in the United States. Noticeable is the assertive talent search by the Chinese government. The Chinese government launched the "Thousand Talent" program in December 2008, aiming to attract world-class scientists, primarily Chinese but also including 300 foreign scientists. The Chinese government distributed them to state R&D centers and university research institutes. And they played an essential role in creating new ventures. As the "Thousand Talent" program proved to be successful, the Chinese government initiated a "Ten Thousand Talent" program in 2012, which aimed to recruit ten thousand talented scientists, including 100 Nobel Laureates-class ones, by 2022.[30]

Finally, facing American pressures of decoupling and sanctions, the Chinese government adopted the 14th Five-Year Plan (2021-2025) and its Long-Range Objectives Through the Year 2035, which emphasized "dual circulation economic strategy" and "breakthroughs in core technologies." The new strategy favors domestic production and consumption over foreign trade and investment, while stressing the importance of indigenous core technologies (AI, quantum information and quantum computing, semiconductors, brain science, genomics and biotechnology, clinical medicine and health, deep space, deep earth, deep sea and polar research). The choice of those technologies clearly reflects concerns arising from American pressures and Covid-19.[31]

State-led Technology Acquisition and Protection: Unlike the United States, China paid less attention to the protection of high-tech. But it has been actively acquiring cutting-edge foreign technologies through licensing, mergers and acquisitions, and even theft and industrial espionage since 2020.[32] The Chinese government has shown keen interest in dual-use technology for military applications. Military-civil fusion technology has been a major target for legal and even illegal acquisitions. It is undeniable that China's technological leapfrogging was partly assisted by this state-led aggressive technology acquisition.

As US-China relations deteriorate and China's technological prowess grows, China has recently strengthened its efforts to prevent technology leakage in various ways by overhauling its legal system. Since December 2020, China has implemented the Export Control Law and strengthened the management of export licenses for dual-use items and military- and nuclear-related technologies. On April 22, 2022, it also issued the "Regulations on Export Control of Dual-Use Items," which consolidated the export control regulations for dual-use items that had been scattered across four administrative laws and regulations. Individual and comprehensive export licensing systems, target country risk classification, and end-user/use controls became more systematized.

Since January 2020, China has also established a foreign investment screening system through the implementation of the Foreign Investment Law. It was originally intended to grant "domestic treatment" to foreign investments, but foreign investments that affect or may affect the security of the country, were excluded, requiring a security review. Security reviews are mandated for those investments related to the defense industry, national defense, in the vicinity of military facilities. Investments that involve important information technology, financial services, and national security related core technologies are also subject to security review.

And as a response to foreign sanctions, China has enacted a series of laws and regulations since 2020. A representative measure is the Anti-Foreign Sanctions Law, which came into effect on June 8, 2021. It allows punitive countermeasures against a variety of people and actions that China considers to be detrimental to its interests. It specifically threatens to punish foreign organizations and people that uphold economic sanctions against China.[33]

The Chinese government also issued the Data Security Law in September 2021 and the Cybersecurity Law in June 2017. On May 21, 2023, it imposed sanctions on Micron Technology, a US memory

[30]동아사이언스 (17 September 2020).
[31]Yeon (2021); Sun and Cao (2023).
[32]The Policy Planning Staff, Office of the Secretary of State (2020).
[33]Yeon (2021).

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semiconductor company, based on the Cybersecurity Law. The Chinese government accused Micron's products of having serious hidden cybersecurity risks, posing a great risk to China's critical information infrastructure supply chain and compromising national security.

China implemented the revised Anti-Espionage Law on July 1, 2023. By broadly including documents, data, materials, and items related to national security and interests beyond the existing state secrets, the law aims to protect information critical to national security, including key technologies. Likewise, China has become increasingly assertive in its protection of key technologies, a mirror image of the US moves. But such measures have posed new grave threats to foreign companies doing business in China.

Setting Technical Standards: Another noticeable techno-statecraft approach is to secure an advantageous position in international technical standards. Simply put, China wants to increase standard essential patents (SEPs) in key high-tech items not only to minimize the burden of patent licensing fees but also to expand Chinese technical standards to other parts of the world through the Belt and Road Initiative.[34] After having paid billions of dollars to Qualcomm as patent licensing fees for 2G technology, a senior Huawei executive epitomizes the importance of technical standards in the following manner: "The third class firms make products; the second develop technology; the first set rules, that is, standards." Getting China's own technical standards with intellectual properties was seen as the surest way to self-reliance and/or hegemony in technology rivalry.[35]Against this backdrop, the Chinese government launched "China Standards 2035" with the goal of achieving 70 percent of international technical standards in key technology sectors by 2035. Five strategic technologies were singled out: 5G, AI, Internet of Things, smart cities, and space technology (Beidou satellite navigation).[36] The initiative has paid off. Huawei now accounts for one third of all SEPs in 5G and has become a de facto leader in mobile communication technology. At the same time, China has been assertive in undertaking leadership in the International Standardization Organization (ISO) although it lost its executive directorship to South Korea in 2022.

Techno-Statecraft: Finally, China's techno-statecraft has also demonstrated foreign and national security policy dimensions. Two aspects draw our attention. One is the government's efforts to secure dual-use technology for military purposes from abroad,[37] According to a recent study, the United States is the primary foreign source of patented Chinese military technology.[38] The other involves sharing its advanced technologies like 5G, GPS, CCTV, and facial technologies with developing countries for domestic political purposes, with the aim of encouraging them to rely on Chinese technology.[39] One can perceive it as China's attempt to assert its technological dominance.[40]

China's rise to technological competitiveness is not accidental, but a product of careful state orchestration of technology policy. China reveals techno-statecraft par excellence. The state's systematic promotion of technology, assertive legal and illegal state-led acquisition of cutting-edge foreign technology, a subtle approach to technological hegemony through diffusion of Chinese technical standards, and incremental utilization of technology for foreign and national security goals have significantly contributed to Beijing's advantageous position in technology rivalry with the United States.

US threat perception and techno-statecraft response

China's technology rise and US threat perception

In a speech on September 16, 2022, National Security Advisor Jake Sullivan underscored that the era of maintaining a certain gap with China is no longer acceptable, and he strongly insisted on widening the gap with China as much as possible in certain technologies, computing-related technologies, biotech,

[34]Lee (2022).
[35]Lee (2022); Seaman (2020).
[36]中共中央 国务院 (2021); Gargeyas and Pardhi (2022).
[37]Nouwens and Legarda (2018).
[38]Schmid and Edenfield (2023).
[39]*The New York Times* (24 April 2019).
[40]Russel and Berger (2020).

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and clean tech, which he called "force multipliers."[41] Moreover, in a lecture at CSIS in April 2023, US Treasury Secretary Janet Yellen declared that the US will not hesitate to defend its fundamental interests. She made it clear that although its targeted actions might have an economic impact, their main motivations are concerns for national security and principles. She emphasized that even if it meant putting aside its economic interests, the United States would not back down on these concerns.[42]

But early warnings about China's technological rise came from several sources. On February 21, 2019, the Task Force on American Innovation published a report warning that although the United States still maintains its global leadership in technology, China can easily catch up with unless the United States strengthens its competitiveness.[43] The Harvard Belfer Center cautioned that technology serves as the foundation of the strategic competition between the United States and China, predicting that China will surpass the United States in key high-tech sectors within the next decade.[44] Fear of China's technological catch-up constituted the first element of American threat perception.

More critical and immediate concerns came from China's unfair and illicit practices in acquiring American technology. The USTR's special report, "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," served as the backdrop for President Trump's issuance of an executive order in March 2018. The report presented four types of unfair and illicit practices: (1) forced technology transfer by the Chinese government; (2) discriminatory technology licensing; (3) aggressive acquisition of foreign high-tech companies by Chinese enterprises backed by the Chinese government; and (4) unauthorized hacking to get technology and trade secrets.[45] More threatening are China's illegal activities. In 2018 alone, the Trump administration published four noticeable reports on China's illegal activities. The US Department of National Intelligence scrutinized China's cyber and economic spy activities, whereas the White House also issued a report on China's economic invasion through thefts of American technology and intellectual property rights.[46] The Department of Justice presented detailed examples of China's industrial espionage. On July 7, 2020, FBI director Christopher Wray revealed that China's industrial spy activities had increased by 1,300 percent in the last ten years.[47] In 2015, the FBI already estimated that over 180,000 of China's industrial spies were engaging in activities to steal American cutting-edge military technology.[48]

Technical standards have also emerged as a major concern, which is well reflected in President Joe Biden's recent remarks: "the rules of the digital age should not be written by China and Russia."[49] For Americans, it is unthinkable that China accounts for 70 percent of the technical standards of such critical technologies as 5G, AI, and space technology by 2035. The White House unveiled the American government's national standards plan for critical and emerging technologies in May 2023 as a comprehensive strategy to counter China's growing influence in creating international technology standards. The United States realizes that China is actively attempting to sway the development of international standards, particularly for critical and emerging technology, in order to advance their military-industrial and autocratic goals, including obstructing the free flow of information and slowing innovation in other nations. The United States underlined that it would continue to support standards development that is governed by rules and driven by the private sector, and that it would supplement the inventive potential of the private sector with proactive government and economic policies, public participation, and investments in critical and emerging technologies.[50]

[41]Sullivan (16 September 2022).
[42]Yellen (20 April 2023).
[43]Task Force on American Innovation (2019).
[44]Allison et al. (2021).
[45]USTR (2018).
[46]National Counterintelligence and Security Center (2018); U.S. Department of Justice (2020).
[47]Wray (2020).
[48]Watkins (2015).
[49]Biden (2020).
[50]The White House (2023d).

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Americans also began to regard China's technological rise as a challenge to one of the key American foreign policy goals, namely the universal value of democracy and human rights. American congressional leaders and government officials accuse the Chinese government of utilizing cutting-edge technologies such as facial and voice recognition, 5G, digital payments, and commercial drones, which are legally or illegally acquired from the United States in monitoring and suppressing human rights and democracy movements in Xinjiang Uyghur, Hong Kong, and China. Equally important is that such repressive technology is being transferred to developing authoritarian states through the BRI networks.[51]

American threat perception of China's technological rise seems neither contrived nor fictional. The threats are real precisely because they seriously undermine American competitiveness, national security, hegemonic position, and foreign policy goals. The American government cannot stand idle.

American techno-statecraft responses

Enhancing Competitiveness: In May 2022, Secretary of State Antony J. Blinken identified "invest," "align," and "compete" as three crucial responses to China's technological challenge. "Investment" means enhancing the US capability for domestic production, whereas "alignment" centered on the US efforts to foster technological collaboration with its allies and partners. "Competition" can be understood as strengthening efforts to create an arena for fair competition by using various measures including export controls, import controls, and investment review policies.[52] In his recent speech at the Brookings Institution on April 27, 2023, US National Security Advisor Jake Sullivan proposed the idea of a New Washington Consensus highlighting the need for a new industrial policy. He argued that US policy must adapt to an evolving global landscape with many emerging challenges. He then identified investing in its economic and technological prowess, advocating for diversified and robust global supply chains, raising standards for labor, environment, trusted technology, and good governance, and utilizing capital to achieve public goods like climate and health as key industrial and innovation strategy.[53] This approach dovetails nicely with our concept of techno-statecraft, which has manifested in terms of state-led promotion of competitiveness, state protection of critical technologies through export control, and dense international collaboration for collective decoupling as well as joint promotion of mutually beneficial competitiveness.

Upon its inauguration, being keenly aware of China's technological challenge, in October 2018, the Trump administration announced "the Strategy for American Leadership in Advanced Manufacturing" that includes support for 270 R&D projects, leveraging $1 billion federal fund, inducement of $2 billion private investments, and training of 200,000 scientists and engineers. Special emphasis was given to 5G, AI, high-performance computers, advanced electrical engineering, and quantum computing.[54] It was a mirror image of China's "Made in 2025" initiative.

More dramatic was the passage of the CHIPS (the Creating Helpful Incentives to Produce Semiconductors) and Science Act. The United States used to be the pacesetter in the semiconductor industry and has been dominant in its entire supply chain ranging from R&D, design, equipment, and fabrication. In 1990, for example, the United States accounted for 37 percent of world semiconductor production. In 2019, however, American share went down to 12 percent, while outsourcing chip fabrication to South Korea and Taiwan, precipitating a serious hollow out effect in the United States. In order to manage the problem, while enhancing American competitiveness, the US Congress passed the CHIPS and Science Act, which President Biden signed on August 9, 2022. The Act secured $39 billion for chip production subsidies and $13.2 billion for R&D support. It also provides tax incentives for 25 percent of total investment expenses for semiconductor and equipment manufacturing. The Act also stipulates a guardrail clause in which those firms getting government support are not allowed to invest in high-level logic chip manufacturing in China. The goal of the Act, as Biden explicitly declared, is to

[51]Ford (2019).
[52]Yeon (2022a).
[53]Sullivan (27 April 2023).
[54]National Institute of Standards and Technology (2019).

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restore American leadership in manufacturing the most sophisticated chips that are vital to economic competitiveness and national security.[55] The Biden administration also implemented the Inflation Reduction Act (IRA) and the Bio Executive Order (E.O. 14081), both of which aim to enhance American industrial competitiveness. In particular, to remain the global leader in clean energy technology, manufacturing, and innovation, the Biden administration launched the IRA in 2022. In order to invest in cutting-edge clean energy technologies as well as accelerate the shift to a clean energy economy, it offers more than 20 new or updated tax incentives.[56]

The initiative paid off. Micron announced its plan to build a chip plant in New York by pouring $100 billion over the next 20 years, and the state of New York pledged to offer a tax incentive of $5.5 billion. IBM also announced that its Poughkeepsie R&D Center will invest $20 billion over the next 10 years in semiconductor chip manufacturing and related research. Intel has decided to build a new chip plant in Ohio with an investment of $20 billion. Such corporate decisions portend the renaissance of the American semiconductor industry, especially in the area of fabrication.[57] SIA projected that, owing to the CHIPS and Science Act, 35 American and foreign chip makers will be investing a total of $200 billion in 35 states for 23 new plants, 9 plant expansions, and the establishment of various equipment and material production plants. Such investments will require 277,000 semiconductor-related scientists, engineers, and technicians.[58]

Counter-Industrial Espionage, Export Control, and Decoupling: Protecting American technology is as important as promoting new technology and enhancing competitiveness. The US government took three distinct approaches to protecting American technology. The first is the strengthening of counter-industrial espionage. American intelligence and security agencies began to undertake surveillance on Chinese students, researchers, and businessmen residing in the United States. In certain cases, the United States did not allow joint research with China, while blocking the entry of Chinese research personnel. The US government sees that US private enterprises and universities are all being used to create the PLA's future military technologies under China's "civil-military fusion" strategy. The FBI and the Justice Department consider Chinese students in the United States, particularly those studying science, as possible national security risks. To counter China's efforts, the US government has tightened visa restrictions and strictly implemented deemed export regulations. In 2020, the visa cancelation could affect at least 3,000 Chinese students, according to some official estimates.[59] In addition, the US government defines "export" to include a release of technology or software to a foreign national and considers such release to be a "deemed export" to the home country of the foreign national. Accordingly, the US Department of Commerce requires "deemed export" licenses to universities, high technology research and development institutions, as well as the medical and computer sectors, in order to control Chinese students' access to particular technologies.

Second, extensive export control has been implemented. The Export Control Reform Act strictly limits the transfer of emerging and foundational technologies related to national security to China. Through interagency and multilateral export control processes, the US government has established 38 new export controls on emerging technologies since 2018, when the Department of Commerce received new authority to regulate emerging technologies under the Export Control Reform Act (ECRA).[60] Based on this list of technologies, the United States has also been using the Entity List as a means to control the export of American technology to China. "End-use" and "end-user" provisions as well as secondary sanctions have been very effective in limiting the transfer of technologies to Chinese firms, particularly those related to "Made in China 2025." Since the enactment of the ECRA, the US government has used the entity list more than 30 times against China, raising issues of harming American national security, repression of human rights in Xinjiang Uyghur, and military activities in

[55]Biden (9 August 2022).
[56]The White House (2023a).
[57]*CNBC* (6 October 2022).
[58]*The New York Times* (1 January 2023).
[59]*The New York Times* (3 December 2020).
[60]Mayer Brown LLP (2022).

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the South China Sea. However, the list of US export controls reveals a concentration solely on high-tech companies, a clear indication of the US policy goal.

The American government has undertaken much harsher measures on the semiconductor sector since it serves as the basis for all other advanced technologies.[61] A series of US measures were introduced to block exports of advanced chip manufacturing equipment and limit sales of certain semiconductors to China. Companies that manufacture products using those chips in China are now unable to import chips for that purpose and must relocate their production.[62] On October 7, 2022, the Department of Commerce's Bureau of Industry and Security (BIS) published a new rule banning or limiting the transfer of semiconductor-related technologies. They include leading-edge graphics processing units (GPUs), semiconductor manufacturing equipment that is specific to producing advanced node logic semiconductors, the support and tacit knowledge needed to produce and develop advanced logic and memory chips in China, any type of US-origin commodity, software, or technology to China for the development or production of any type of semiconductor production equipment, or related parts or components, and the shipment of foreign-made items made directly from US technology or software or produced with US equipment if destined for use in producing supercomputers in China or to any of 28 companies that have provided high-performance computing support for China's military.[63]

On December 16, 2022, the Biden administration extended its "entity list" to include another 36 Chinese companies, including YMTC (Yangtze Memory Technologies Co.) and SMEE (Shanghai Micro Electronics Equipment Group), which are the biggest NAND flash memory and semiconductor equipment manufacturing companies respectively. As Jon Bateman aptly puts it, "Although framed as a national security measure, the primary damage to China will be economic, on a scale well out of proportion to Washington's cited military and intelligence concerns."[64]

Finally, decoupling was not limited to exports, but extended to technology. The American government has been accelerating efforts to decouple China from global supply chains on two fronts. One is import restrictions on Chinese technology and decoupling of capital investment linkage, and the other is expelling Chinese firms from global digital networks.

As Section 889 of the 2019 Defense Authorization Act bans the importation of specific communication and video surveillance equipment and services from China, American government agencies are no longer allowed to procure equipment and services from Chinese high-tech manufacturers such as Huawei, ZTE, Hikvision, Dahua Technology, and Hytera.[65] The Department of Defense released its initial list of "Communist Chinese Military Companies" to Congress in June 2020 and has continued to update the list with additional entities to counter China's (PRC) Military-Civil Fusion development strategy.[66] On November 29, 2020, the Pentagon also blacklisted SMIC, CNOOC (China National Offshore Oil Corporation), CCTC (China Construction Technology Consulting Co.), CIECC (China International Engineering Consulting Corporation) and blocked their access to American infrastructure.[67]

On October 5, 2022, the Department of Defense once again updated the list and added thirteen firms, including DJI, which dominates more than 50 percent of the global market for commercial drones; BGI Genomics Co., a genetic testing company with a massive gene database and contracts to sequence DNA all over the world; CRRC Corp., a manufacturer of rail transit equipment; and Dahua Technology, a Hangzhou-based manufacturer of surveillance equipment, as "notable" additions to the blacklist.[68]

[61]Yeon (2022b).
[62]Bouffanais and Lim (2022).
[63]Rasser and Wolf (2022).
[64]Bateman (2022).
[65]Yeon (2020).
[66]U.S. Department of Defense (2021).
[67]Thomson Hine LLP (2020).
[68]U.S. Department of Defense (2022).

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The United States is limiting or banning Chinese firms' investments in, or their access to, American capital markets. For example, the Foreign Investment Risk Review Modernization Act, which was included in the 2019 Defense Authorization Act, virtually banned Chinese firms' mergers and acquisitions of American firms specializing in critical technologies. For fear of undermining national security, the White House prohibited American indirect investments in 68 Chinese firms allegedly associated with PLA.[69] Along with this, three Chinese mobile communication firms were expelled from the New York securities market for violating the privacy of American individuals.[70] Even in 2023, for the first time in history, the United States introduced an outbound investment screening mechanism against China through a presidential executive order.[71]

The United States has been attempting to decouple China from global digital networks. On August 20, 2020, Mike Pompeo, then Secretary of State, announced the "Clean Network" initiative and urged American allies and partners to work together to purify global digital networks involving carriers, apps, cloud, cable, and 5G path in order to prevent hostile actors' violations of privacy and commercial information.[72] Obviously, the initiative targeted Chinese firms by banning Chinese mobile communication firms' access to carriers, preventing the installation of American apps on Chinese smartphones, removing Tik Tok and WeChat from the American web store, banning the use of cloud systems provided by Chinese firms such as Alibaba, Baidu, Chine Mobile Com, and Ten Cent, blocking Chinese manipulation through undersea cable systems, and removing Huawei and ZTE equipment from 5G. The Biden government no longer uses the word "Clean Network," but the policy seems to be continuing. On April 28, 2022, the Biden administration released the Declaration for the Future of the Internet, a new worldwide alliance that establishes principles for nation-states' use of the internet. The White House has pitched the proclamation as an alternative to the digital authoritarianism.[73]

Concerns over human rights and international technical standards have also led to sanctions and restrictions on China. The Global Magnitsky Human Rights Accountability Act of 2016 authorizes the US government to sanction foreign government officials worldwide who are deemed to be human rights offenders, freeze their assets, and ban them from entering the United States. In addition to the well-known case of Xinjiang forced labor cotton, sanctions against AI companies, such as Hikvision and Dahua, have been reviewed.[74] And the American government has been trying to deter China from taking advantage in international standards in 5G technology and satellite navigation by fostering close cooperation with allies and partners. It is more so because China is using BRI as a critical tool for "asymmetric decoupling." It is asymmetrical in the sense that it reduces China's reliance on the rest of the world while increasing the world's reliance on China. It should be highlighted that growing ties between countries along the BRI corridors and China's economy increase reliance on Chinese goods, give China more input in creating global standards, and offer China an advantage in the global fight for digital innovation and technology standards.[75]

International Collaboration: Unlike the past, the United States can neither enhance its competitiveness nor assure export control and decoupling by itself. It requires close collaboration with allies and partners. That is why the United States has been proposing a number of multilateral cooperative mechanisms, such as the US-EU Trade and Technology Council (TTC), the trilateral security alliance between Australia, the U.K., and the United States (AUKUS), the Indo-Pacific Economic Framework (IPEF), the Americas Economic Partnership for Economic Prosperity (APEP), and the Partnership for Global Infrastructure and Investment (PGII), all launched in succession in 2022.[76]

[69]The White House (2021).
[70]*Reuters.* (6 January 2021).
[71]The White House (2023e).
[72]Pompeo (5 August 2020).
[73]The White House (2022).
[74]Rubio, Marco and August Pfluger (15 December 2022).
[75]Blinken (2022).
[76]Yeon (2022a).

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It is noteworthy that they serve as platforms for technological cooperation. The TTC has become a forum for the United States and European Union to coordinate approaches to key global trade, economic, and technology issues.[77] AUKUS is a new security partnership that will promote a free and open Indo-Pacific that is secure and stable. It will also promote deeper information sharing and technology sharing; and foster deeper integration of security and defense-related science, technology, industrial bases and supply chains.[78] IPEF is designed to strengthen ties with allies and partners and tackle 21st-century economic challenges in the Indo-Pacific region. It aims to accelerate the clean energy transition, implement tax fairness and fight corruption, set high standards for technology, and ensure more resilient supply chains for critical goods and inputs. APEP is a framework for cooperation across the "Americas" to foster regional competitiveness, resilience, shared prosperity, and inclusive and sustainable investment.[79] PGII is the flagship G7+ initiative for the advancement of strategic, values-driven and high standard infrastructure and investment in low- and middle-income countries.[80] Both APEP and PGII seek to build an environment of trust and confidence in the digital economy, and to advance secure and resilient digital infrastructure and platforms. The United States has also been utilizing the Group of 7 (G7) in enforcing multilateral export control over critical technologies. Owing to the American appeal, the G7 summit, which was held in Hiroshima in May 2023, decided to maintain proper control over a specific, constrained collection of sensitive technologies that are essential to national security or may jeopardize global peace and security. To achieve this, the G7 affirmed a commitment to ongoing cooperation on export restrictions, investment screening, and the development of global standards, particularly in the digital space.[81]

Let us take another example of international collaboration, the semiconductor sector. The semiconductor industry requires not only time (3-5 years to build a plant) but also substantial investment (a cost of $10-20 billion per plant). It is also essential to secure proper infrastructure, R&D environment, legal and institutional arrangements, and human capital. "To ensure a competitive, resilient, secure, and sustainable (CRSS) supply of semiconductors to meet the significant increase in global demand over the next decade," international collaboration is essential.[82] By proposing the 'FAB 4 (or widely known as Chip 4)' initiative, which includes the United States, Japan, South Korea, and Taiwan, the American government has actively sought its East Asian allies and partners to join its competitive efforts. It can be seen as a technological alliance to foster a harmonious division of labor between fabless-strong United States and fab-strong East Asian countries. They responded positively. Leading South Korean chip makers have decided to make huge investments in the US TSMC of Taiwan is also planning to invest $40 billion in the state of Arizona for building two foundry fabs. They were responding to Biden's call that the United States should no longer remain a hostage to chips anymore.[83] While promoting cooperation with East Asian countries, the Biden administration has also undertaken the North American semiconductor initiative that fosters close cooperation with Canada and Mexico to reduce dependence on Asia. The initiative aims to create "chip clusters" in North America, especially along the Mexican border, and enhance cooperation in critical technologies.[84]

Moreover, the American government has been seeking close cooperation with allies and partners in export control enforcement. In 2020, the United States was quite successful in banning semiconductor exports to Huawei through cooperation with Korea and Taiwan. Washington is now concerned about advanced chip manufacturing and is attempting to collaborate with the Netherlands and Japan, as Dutch lithography specialist ASML and Japan's Tokyo Electron Ltd. manufacture the necessary equipment to produce highly advanced chips. They have been under

[77]European Commission (2021).
[78]U.S. Department of Defense (2023).
[79]The White House (2023b).
[80]The White House (2023c).
[81]Ministry of Foreign Affairs of Japan (2023).
[82]Tyson and Zysman (2022).
[83]Biden (29 November 2022).
[84]*The Wall Street Journal* (10 January 2023).

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pressure to expand their export control list against China (ASML already stopped sending its most sophisticated machines[85] to China in 2019) and would be directly affected if their governments chose to comply with US controls. Based on recent bilateral negotiations, the Dutch and Japanese governments are likely to eventually join American export control efforts. Taiwan's Foxconn recently also sold out completely its stock worth of $780 million of Tsinghua Unigroup, a leading semiconductor conglomerate in China.[86] In addition, the US government is deliberating on a new and more effective multilateral export control framework with like-minded countries to replace the Wassenaar Arrangement, better integrate governmental action, and enable enterprises to manage investments and plan long-term operations.[87]

American techno-statecraft responses have ranged from promotion to protection and international collaboration. Its effectiveness is yet to be seen, but as in the case of semiconductors, the United States has been successful in putting pressure on China bilaterally and multilaterally.

US-China technology rivalry and Middle Powers' Sandwich Dilemma: The Case of South Korea

Sandwich dilemma

The United States still retains the upper hand in high technology rivalry with China, and it will take some time for China to catch up. Nevertheless, cutthroat competition will be unavoidable because of the structural struggle for technological supremacy that can determine the fate of prosperity and national security. Paradoxically, as American external pressure intensifies, China's self-reliant posture strengthens, bolstering its R&D efforts towards indigenizing advanced technology. The United States will perceive such a move as a direct threat to American supremacy. South Korea is located in the middle of a fierce technological rivalry between China and the United States.

Seoul's calculus of interests is complicated in dealing with the dilemma. It seems logical for South Korea to take sides with the United States precisely because of its technological superiority. Considering China's efforts to narrow its technology gap with South Korea inch by inch, Seoul can get the best benefits by joining the American move to slow China's rise. However, South Korea is heavily dependent on China, which is its largest trading partner, accounting for almost 25 percent of its total trade. When it comes to semiconductors, the situation is more delicate. China is the number-one market for South Korea's chip makers, with huge direct investments. Giving up the Chinese market in favor of a pro-American balancing approach is difficult because doing so is likely to result in significant short-term losses. It is ironic to note that South Korea's chip makers' investments in the United States stem from their gains in the Chinese market. Thus, China cannot be easily ignored. Equally critical is the US' growing reliance on techno-statecraft. While China is catching up, the United States uses source technology to pressure South Korea to comply with US policy. Accordingly, South Korea, as with other middle powers such as the EU and Japan, is also competing to secure strategic autonomy through technological superiority.

How can South Korea overcome this sandwich dilemma? South Korea has pursued three distinct techno-statecraft approaches: realignment of international collaboration, state promotion and protection of technology, and muddling through corporate strategy.

South Korea's techno-statecraft

Positional Realignment: Facing the sandwich dilemma, South Korea has been gradually realigning its international position. It is making a prudent bet on the United States by promoting bilateral technology cooperation as well as joining the US-led Chip 4 dialogue. In fear of China's economic retaliation, Seoul was initially hesitant to join the Chip 4 initiative. But on December 16, 2022, Lee Changyang, Minister of Industry, Trade, and Energy, said that "I do not see any reason not to join the

[85]Extreme ultraviolet (EUV) lithography machines.
[86]*South China Morning Post* (17 December 2022).
[87]Shivakumar, Wessner, and Tomoshige (2023).

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America-led Chip 4. We need to reflect our interests by joining it."[88] His logic is straightforward. South Korea is strong in memory chips, whereas Taiwan is strong in foundries. The United States is the leader in equipment technology, and Japan is advantageous in materials and parts. They are mutually complementary. Thus, South Korea has everything to gain from Chip 4's synergistic effects. Moreover, Chip 4 is primarily for cooperation in human resources training, technology development, and information exchange, which will not threaten China.

South Korea has also joined American efforts for export control of critical technology by complying with American demands. The American secondary sanction fundamentally limits South Korean firms' maneuvering scope. On the occasion of President Biden's visit to Seoul in May 2022, President Yoon also formally declared that South Korea will be forming an economic security alliance with the United States by jointly securing the global supply chain and enhancing bilateral cooperation in nuclear energy, space technology, and digital technology. Seoul has also decided to seek multilateral cooperation with the United States by participating in the Indo-Pacific Economic Framework, which focuses on digital technology, clean energy, and supply network security.

State Promotion and Protection: Since his inauguration, President Yoon Seok-yeol has been emphasizing the role of the government in protecting and promoting high technology in three ways. The first is the protection of the world's No. 1 technology that has already been industrialized. The second is to nurture and protect key technologies necessary for stabilizing Korea's supply chain. The third is the development of cutting-edge technologies that will determine Korea's future competitiveness.

To follow up Yoon's directives, the Ministry of Science, Technology, and ICT singled out 12 strategic technology sectors for industrial competitiveness in October 2022. They are semiconductor and display, secondary battery, AI, advanced mobility, next generation nuclear energy, advanced bio, aerospace and marine, hydrogen, cyber security, next generation communication, advanced robotics, and quantum.[89] In order to promote strategic technology, the government has allocated 25 trillion won for the next five years by increasing its annual R&D budget by more than 10 percent. For 2023, the government allocated 5.24 trillion won for R&D, and earmarked 1.43 trillion won for ICT.[90] Of these, four areas of ITC draw special attention. They are quantum computing, high-performance computers, semiconductor fab design, and super conductivity.[91]

The government also adopted a new private-public collaborative model by removing compartmentalization of R&D and increasing synergy among diverse technology sectors. The government is planning to increase the number of "National Technology Strategy Center" from four to seven. The government is planning to formulate a more flexible roadmap for strategic technology development.[92]

Realizing the urgency given its manpower shortage, the South Korean government is paying utmost attention to the cultivation of high-tech human resources. First, the Korean government intends to develop one million digital talents. It also attempts to cultivate key talents in new industries and new technologies with skills such as digital and AI in a timely way, as well as foster the establishment of a foundation for SW/AI and digital education in response to the 4th industrial revolution and digital transformation. Second, it plans to facilitate the cultivation of talents with core competencies by providing state's learning assistance and career management. It intends to modify the curriculum in order to develop all students into a talented workforce. The South Korean government plans to cultivate 150,000 semiconductor engineers over the next 10 years and 1000 quantum talents by 2030. Also, it advocates for the rearrangement and consolidation of primary and secondary education curricula focusing on future competencies such as creativity, digital literacy, and problem-solving abilities. Third, universities are encouraged to promote autonomous innovation and flexible system operation in

[88]*The Korea Herald* (18 December 2022).
[89]과학기술통신부 (2022a).
[90]과학기술정보통신부 (2023).
[91]과학기술정보통신부 (2022b).
[92]과학기술정보통신부 (2022a).

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response to the Fourth Industrial Revolution, to use university technology and resources to strengthen entrepreneurship education, and to build a startup ecosystem within universities, transforming universities into dynamic innovation hubs that lead the nation.[93]

Most recently, the South Korean government gave hefty tax incentives to chip makers by increasing tax reductions from 8 percent to 15 percent for facility investment for large- and middle-scale firms, while smaller firms get greater incentives from the current 16 percent to 25 percent reduction. In monetary terms, chip makers will be enjoying benefits of 3.65 trillion won in 2024, 1.37 trillion won in 2025, and 1.37 trillion won in 2026.[94] That is one of the highest tax breaks for the chip industry in the world.

Most noticeable is the presidential commitment to science and technology. President Yoon has set up a special task force team to deal with science and technology in the office of the president and has been directly involved in the coordination of science and technology policy, reminiscent of the Park Chung-hee era. Its outcome is yet to be seen, but judged on past experiences, presidential commitment usually makes big differences in policy formulation and implementation.

South Korea has also been paying a greater attention to the protection of technology by scrutinizing the Act on Prevention of Divulgence and Protection of Industrial Technology (the Industry Technology Protection Act) that was enacted in 2006 and amended in 2011. The Act identifies 75 national core technologies and regulates each technology's export as well as inbound and outbound investments.[95] The Special Act to Protect and Foster National High-Tech Strategic Industry (Strategic Industry Act) also became effective in August 2022, and aims to protect and foster technologies of national strategic importance ("national strategic technologies"). In particular, the Special Act emphasizes measures designed to secure a stable supply chain for items relating to national strategic technologies, as well as provide governmental support for and additional regulation of companies possessing national high technologies. The Strategic Industry Act specifically applies to strategic technologies, which are defined as those with significant effects on national and economic security (e.g., stabilization of the supply chain) as well as national exports and employment and which result in extensive ripple effects on relevant industries.

Muddling through: The Yoon government's pro-American balancing strategy notwithstanding, the private sector seems to be still interested in muddling through the US-China technology rivalry. Upon the request of President Biden, Samsung decided to invest $17 billion to build two foundry plants in Taylor, Texas and unveiled its plan to invest a total of $200 billion over the course of 20 years.[96] SK also announced a plan to invest a total of $30 billion to build advanced memory chip manufacturing plants, electric battery plants, semiconductor-related R&D activities, and bio facilities in the United States.[97] While Hyundai Motors has been building a plant for EVs in Georgia,[98] LG has decided to build an electric battery plant in Ohio in cooperation with Honda.[99]

All this indicates South Korean firms' tilt toward the United States, but this is not the end of the story. South Korea's semiconductor and automobile firms have grown owing to the Chinese market with huge investments in China. Samsung completed its NAND flash memory plant in Xian, accounting for 40 percent of its total production. SK Hynix's plant in Wuxi accounts for 50 percent of DRAM and its Dalian plant for 30 percent of its NAND flash memory production, respectively. China's share of South Korea's semiconductor chip exports grew from 3.2 percent in 2000 to 39.7 percent in 2021, whereas Hong Kong accounted for about 20 percent. Altogether, China and Hong Kong's share

[93]교육부 (2022).

[94]기획재정부 (2023).

[95]The act defines "national core technology" as industrial technology that has high technological and economic values in domestic and overseas markets, brings high growth potential to its related industries, and is feared as a technology that will exert a significantly adverse effect on national security and the development of the national economy in the event that it is divulged abroad.

[96]*Bloomberg* 21 July 2022.

[97]*Korea JoongAng Daily* 22 July 2022.

[98]*Reuters* 15 October 2022.

[99]*Reuters* 30 August 2022.

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reached almost 60 percent of South Korea's semiconductor exports. Automakers, especially Hyundai, face a similar challenge. Although their sales in China have rapidly declined in the past several years, the Chinese auto market, whose sales exceeded 23 million cars in 2022, is too big for South Korean firms to give it up. In addition, with the rapid development of advanced technologies in recent years, companies need to invest more heavily in R&D to remain competitive. In order to secure a steady flow of R&D funds, maintaining business in the huge Chinese market is important.

The US government's inconsistent and sometimes erratic economic security policies have been troubling South Korean firms. Both the CHIPS and Science Act and the IRA encourage foreign investments in the United States to build domestic production capabilities of key items for economic security purposes. But detailed guidelines for each bill, especially the CHIPS and Science Act, fundamentally delimit South Korean firms' business maneuverability through restrictions on their investments in semiconductor plants in China of no more than 10 percent per year, the return of profits to the American government of up to 75% of subsidies received, the submission of technical and accounting information to the US government, and the mandate of technological cooperation with the Pentagon on selected critical technologies. Investing in local communities, hiring socially disadvantageous groups, and even using US-made steel are additional requirements.[100] In brief, companies investing in the United States have been forced to play by the US government's revised rules on subsidies, and the South Korean government faces challenges in convincing domestic stakeholders that the United States is motivated by national security rather than self-enrichment.

Facing major challenges emanating from the technology rivalry between the two giants. Seoul's approach has been cautious and prudent. While having formally taken sides with the United States through the economic security alliance and the Chip 4 coalition, the South Korean government has allowed the private sector to explore options for muddle through. At the same time, the government has taken assertive techno-statecraft measures to protect South Korean high-techs and promote strategic technologies through massive R&D investments, human resources development, and hefty tax incentives. The Office of the President has become the commanding post of science and technology policy.

Conclusion and implications

A comparative examination of techno-statecraft practices by China, the United States, and South Korea reveals several interesting implications.

First, high technology competition between the United States and China is real and fierce, which narrows the scope of maneuver by middle powers such as South Korea. Seoul is inclined to take sides with the United States, but is fundamentally constrained by its heavy economic dependence on China.

Second, techno-statecraft is a common practice among the three countries under examination. Such practice brings the state back to defy the logic of globalization. All countries are inclined to seek the techno-statecraft approach in which the state promotes and protects high technology, while trying to maintain an advantageous position in setting technical standards. And most countries attempt to utilize technology as an instrument to advance their foreign policy and national security interests.

Third, clashes of techno-statecraft have become evident, reminiscent of the war of tariffs in the 1930s. The CHIPS and Science Act can be compared with the Smoot Hawley Act of 1930. It is more so because the technology rivalry between China and the United States is deepening the geopolitical divide. It is a bad omen for the future of world politics and economy precisely because of its negative outcomes. Such rivalry will not only reduce global welfare, but also increase the probability of major conflicts on a global scale.

Finally, inter-state collisions driven by techno-statecraft should be avoided. It is difficult to find domestic solutions to the dilemma of techno-statecraft because it is driven by domestic political pulses. Thus, solutions should be sought externally. Creating a new international governance system to deter the temptations of techno-statecraft, while promoting global cooperation, can be an option. While the

[100]The CHIPS Incentives Program 23 June 2023.

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current US-China strategic competition has paralyzed most multilateral frameworks, this still directs us to discuss techno-statecraft at international fora, such as deliberating a new "technology round" as part of the World Trade Organization (WTO).

References

Aggarwal, Vinod K. and Andrew W. Reddie. 2022. "The New Reality of Economic Statecraft." *Global Asia* 17:4. https://www.globalasia.org/v17no4/cover/the-new-reality-of-economic-statecraft_vinod-k-aggarwalandrew-w-reddie

Allison, Graham, Kevin Kylman, Karina Barbesino, and Hugo Yen. 2021. *The Great Tech Rivalry: China vs. the US*. Cambridge: Harvard Kennedy School. https://www.belfercenter.org/sites/default/files/GreatTechRivalry_ChinavsUS_211207.pdf

Allison, Graham, Nathalie Kiersznowski, and Charlotte Fitzek. 2022. *The Great Economic Rivalry: China vs. the US*. Harvard Kennedy School Belfer Center for Science and International Affairs paper, March. https://www.belfercenter.org/sites/default/files/files/publication/GreatEconomicRivalry_Final.pdf.

Baldwin, David A. 2020. *Economic Statecraft: New Edition*. Princeton University Press.

Bateman, Jon. 2022. "Biden Is Now All-In on Taking Out China." *Foreign Policy* 12 (2022). https://foreignpolicy.com/2022/10/12/biden-china-semiconductor-chips-exports-decouple/

Biden, Joseph R. 2020. "Why America Must Lead Again: Rescuing US Foreign Policy After Trump," Foreign Affairs, March/April 2020.

Biden, Joseph R. 2022. "Remarks by President Biden at Signing of H.R. 4346, "The CHIPS and Science Act of 2022." https://www.whitehouse.gov/briefing-room/speeches-remarks/2022/08/09/remarks-by-president-biden-at-signing-of-h-r-4346-the-chips-and-science-act-of-2022/

Biden, Joseph R. 2022. "Remarks by President Biden on Growing the Economy and Creating Good-Paying Jobs." https://www.whitehouse.gov/briefing-room/speeches-remarks/2022/11/29/remarks-by-president-biden-on-growing-the-economy-and-creating-good-paying-jobs/

Blackwill, Robert D., and Jennifer M. Harris. 2016. *War by Other Means: Geoeconomics and Statecraft*. Harvard University Press.

Blinken, Antony J. 2022a. "The Administration's Approach to the People's Republic of China." https://www.state.gov/the-administrations-approach-to-the-peoples-republic-of-china/

Blinken, Antony J. 2022b. "Remarks to the Press." https://www.state.gov/secretary-antony-blinken-remarks-to-the-press-3/

Bloomberg. 2022. "Samsung Eyes $200 Billion Expansion of Chip Plants in Texas." https://www.bloomberg.com/news/articles/2022-07-21/samsung-eyes-sweeping-expansion-of-chip-facilities-in-texas

Bouffanais, Roland and Sun Sun Lim. 2022. "Counting the Costs of US-China Technology Decoupling," Asia Global Online. https://www.asiaglobalonline.hku.hk/counting-costs-us-china-technology-decoupling

CIA. 1982. The Threat of Foreign Competition: US High-tech Industries and National Security Considerations. https://www.cia.gov/readingroom/document/cia-rdp85t00153r000300070005-7

CNBC. 2022. "Biden to tout IBM's plans to invest $20 billion in New York over the next decade." https://www.cnbc.com/2022/10/06/biden-to-tout-ibms-plans-to-invest-20-billion-in-new-york-over-the-next-decade.html

Cohen, Stephen S. and John Zysman. 1989. "Manufacturing matters: The myth of the post-industrial economy." *Computers in the Human Context: Information Technology, Productivity, and People*. MIT Press, 97–103.

Drezner Daniel. 2001. "State structure, technological leadership and the maintenance of hegemony." *Review of International Studies* 27.1, 3–25.

European Commission. 2021. "EU-US Trade and Technology Council." https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/stronger-europe-world/eu-us-trade-and-technology-council_en

Forbes. 2021. "The Era of 'Tech Diplomacy' Is Here." https://www.forbes.com/sites/mungchiang/2021/07/07/the-era-of-tech-diplomacy-is-here/?sh = 73cd69e67687

Ford, Christopher A. 2019. "Technology and Power in China's Geopolitical Ambition," https://www.uscc.gov/sites/default/files/Ford_USCC%20Testimony_Final.pdf

Gargeyas, Arjun and Megha Pardhi. 2022. "What's Behind China's New National Standardization Outline Document?" The Diplomat. 14 January 2022. https://thediplomat.com/2022/01/whats-behind-chinas-new-national-standardization-outline-document/

Gilpin, Robert. 1976. "The Political Economy of the Multinational Corporation: three contrasting perspectives." *American Political Science Review* 70.1, 184–191.

Glitz, Albrecht, and Erik Meyersson. 2020. "Industrial Espionage and Productivity." *American Economic Review* 110.4, 1055–1103.

Goldman, David. 2020. *You Will Be Assimilated: China's Plan to Sino-form the World*. New York: Post Hill Press.

Hou, Tie, and Victoria Wang. 2019. "Industrial Espionage–A Systematic Literature Review (SLR)." *Computers & Security* 98, 102019.

Kennedy, Scott. 2015. *Made in China 2025*. Center for Strategic and International Studies. https://www.csis.org/analysis/made-china-2025

Kinnwall, Adam. 2020. *Will China Dominate Technological Standard Setting?*. Oxford China International Consultancy.

Korea JoongAng Daily. 2022. "SK to up investments in the U.S. by $22 billion, Chey tells Biden." https://koreajoongangdaily.joins.com/2022/07/27/business/industry/Korea-SK-Joe-Biden/20220727180441529.html

https://doi.org/10.1017/bap.2024.26 Published online by Cambridge University Press

Lee, Heejin. 2022. "Big-Power Rivalry over Tech Standards and South Korea's Response," *Global Asia* 17:4. https://www.globalasia.org/v17no4/cover/big-power-rivalry-over-tech-standards-and-south-koreas-response_heejin-lee±

Manning, Robert. 2020. "The U.S. Finally Has a Sputnik Moment with China," *Foreign Policy*. https://foreignpolicy.com/2020/10/29/us-china-sputnik-moment-technology-competition-semiconductors/.

Mayer Brown LLP. 2022. "Commerce Department Conducting Outreach on New Export Control Regime Focused on China." https://www.mayerbrown.com/en/perspectives-events/publications/2022/08/commerce-department-conducting-outreach-on-new-export-control-regime-focused-on-china

Ministry of Foreign Affairs of Japan. 2023. "G7 Leaders' Statement on Economic Resilience and Economic Security." https://www.consilium.europa.eu/media/64501/g7-statement-on-economic-resilience-and-economic-security.pdf

Modelski, George and William Thompson. 1996. *Leading Sectors and World Powers: The Coevolution of Global Politics and Economics*. Columbia, SC: University of South Carolina Press.

National Counterintelligence and Security Center. 2018. "Foreign Economic Espionage in Cyberspace." https://www.dni.gov/files/NCSC/documents/news/20180724-economic-espionage-pub.pdf

National Institute of Standards and Technology. 2019. "Revitalizing American Leadership in Advanced Manufacturing" https://www.nist.gov/speech-testimony/revitalizing-american-leadership-advanced-manufacturing

Nikkei Asia. 2020. "Patent Wars in Digital Era." https://vdata.nikkei.com/en/newsgraphics/patent-wars/

Nouwens, Meia, and Helena Legarda. 2018. "China's pursuit of advanced dual-use technologies." https://www.iiss.org/research-paper//2018/12/emerging-technology-dominance

Pompeo, Michael. 2020. "Secretary Michael R. Pompeo At a Press Availability," https://2017-2021.state.gov/secretary-michael-r-pompeo-at-a-press-availability-10/index.html

Rasser, Martijn and Kevin Wolf. 2022. "The Right Time for Chip Export Controls." https://www.lawfareblog.com/right-time-chip-export-controls

Reuters. 2021. "NYSE to delist three Chinese telecoms in dizzying about-face." https://www.reuters.com/article/us-china-usa-telecom-idUSKBN29B1TR

Reuters. 2022. "Honda Motor, LG Energy to build $4.4 bln U.S. EV battery plant." https://www.reuters.com/business/autos-transportation/honda-motor-lg-energy-build-ev-battery-plant-ohio-nikkei-2022-08-29/

Reuters. 2022. "Hyundai to break ground on $5.5 billion Georgia plant this month." https://www.reuters.com/business/autos-transportation/hyundai-break-ground-55-billion-georgia-plant-this-month-2022-10-14/

Rubio, Marco and August Pfluger. 2022. "Rubio, Pfluger Introduce Bill to Force Sanction Reviews of Chinese Tech Companies Enabling Genocide." https://www.rubio.senate.gov/public/index.cfm/2022/12/rubio-pfluger-introduce-bill-to-force-sanction-reviews-of-chinese-tech-companies-enabling-genocide

Russel, Daniel R., and Blake H. Berger. 2020. Weaponizing the Belt and Road Initiative. Asia Society Policy Institute. https://asiasociety.org/policy-institute/weaponizing-belt-and-road-initiative

Sandholtz, Wayne, Michael Borrus, John Zysman, Jay Stowsky, Ken Conca, and Steven Vogel. 1992. *The Highest Stakes: The Economic Foundation of the Next Security System*. Oxford, USA: Oxford University Press.

Seaman, John. 2020. "China and the New Geopolitics of Technical Standardization." Notes de l'Ifri 34, 20-21. https://www.ifri.org/en/publications/notes-de-lifri/china-and-new-geopolitics-technical-standardization

Schmid, Jon and Nathaniel Edenfield, 2023. *Scientific and Technological Flows Between the United States and China*. Santa Monica, CA: RAND Corporation.

Shivakumar, Sujai, Charles Wessner, and Hideki Tomoshige. 2023. *Toward a New Multilateral Export Control Regime*. Center for Strategic and International Studies. https://www.csis.org/analysis/toward-new-multilateral-export-control-regime

South China Morning Post. 2022. "Apple supplier Foxconn to sell stake in embattled Chinese chip firm Tsinghua Unigroup." https://www.scmp.com/tech/big-tech/article/3203662/apple-supplier-foxconn-sell-stake-embattled-chinese-chip-firm-tsinghua-unigroup

Sullivan, Jake. 2022. "Remarks by National Security Advisor Jake Sullivan at the Special Competitive Studies Project Global Emerging Technologies Summit." https://www.whitehouse.gov/briefing-room/speeches-remarks/2022/09/16/remarks-by-national-security-advisor-jake-sullivan-at-the-special-competitive-studies-project-global-emerging-technologies-summit/

Sullivan, Jake. 2023. "Remarks by National Security Advisor Jake Sullivan on Renewing American Economic Leadership at the Brookings Institution." https://www.whitehouse.gov/briefing-room/speeches-remarks/2023/04/27/remarks-by-national-security-advisor-jake-sullivan-on-renewing-american-economic-leadership-at-the-brookings-institution/

Sun, Yutao, and Cong Cao. 2021. "China's plan to become a world-leading technology force." *East Asia Forum*, 8. https://www.eastasiaforum.org/2021/05/08/chinas-plan-to-become-a-world-leading-technology-force/

Sun, Yutao, and Cong Cao. 2023. *The Political Economy of Science, Technology, and Innovation in China: Policymaking, Funding, Talent, and Organization*. Cambridge University Press.

Task Force on American Innovation. 2019. "Second Place America? Increasing Challenges to U.S. Scientific Leadership." https://www.innovationtaskforce.org/wp-content/uploads/2019/05/Benchmarks-2019-SPA-Final4.pdf

The CHIPS Incentives Program. 2023. "Notice of Funding Opportunity (NOFO)." https://applications.chips.gov/s/funding-program/a0O3d000002BQTNEA4/nofo-1-frontend-and-backend-commercial-fabrication-facilities

The Korea Herald. 2022. "Minister confirms South Korea's participation in US-led chip alliance." https://www.koreaherald.com/view.php?ud = 20221218000120

The New York Times. 2019. "Made in China, Exported to the World: The Surveillance State." https://www.nytimes.com/2019/04/24/technology/ecuador-surveillance-cameras-police-government.html

https://doi.org/10.1017/bap.2024.26 Published online by Cambridge University Press

The New York Times. 2020. "U.S. to Expel Chinese Graduate Students with Ties to China's Military Schools." https://www.nytimes.com/2020/05/28/us/politics/china-hong-kong-trump-student-visas.html
The New York Times. 2023. "U.S. Pours Money Into Chips, but Even Soaring Spending Has Limits." https://www.nytimes.com/2023/01/01/technology/us-chip-making-china-invest.html
The Policy Planning Staff, Office of the Secretary of State. 2020. "The Elements of the China Challenge." https://www.state.gov/wp-content/uploads/2020/11/20-02832-Elements-of-China-Challenge-508.pdf
The Wall Street Journal. 2023. "Biden Reaches Deals on Climate, Chips With Heads of Mexico, Canada." https://www.wsj.com/articles/biden-lopez-obrador-trudeau-reach-deals-on-chips-climate-immigration-11673356428
The White House. 2021. "Executive Order on Addressing the Threat from Securities Investments that Finance Certain Companies of the People's Republic of China." https://www.whitehouse.gov/briefing-room/presidential-actions/2021/06/03/executive-order-on-addressing-the-threat-from-securities-investments-that-finance-certain-companies-of-the-peoples-republic-of-china/
The White House. 2022. "FACT SHEET: United States and 60 Global Partners Launch Declaration for the Future of the Internet" https://www.whitehouse.gov/briefing-room/statements-releases/2022/04/28/fact-sheet-united-states-and-60-global-partners-launch-declaration-for-the-future-of-the-internet/
The White House. 2023a. "Building a Clean Energy Economy: A Guidebook to the Inflation Reduction Act's Investments in Clean Energy and Climate Action." https://www.whitehouse.gov/cleanenergy/inflation-reduction-act-guidebook/
The White House. 2023b. "Joint Declaration on The Americas Partnership for Economic Prosperity." https://www.whitehouse.gov/briefing-room/statements-releases/2023/01/27/joint-declaration-on-the-americas-partnership-for-economic-prosperity/
The White House. 2023c. "FACT SHEET: Partnership for Global Infrastructure and Investment at the G7 Summit." https://www.whitehouse.gov/briefing-room/statements-releases/2023/05/20/fact-sheet-partnership-for-global-infrastructure-and-investment-at-the-g7-summit/
The White House. 2023d. "National Standards Strategy for Critical and Emerging Technology." https://www.whitehouse.gov/wp-content/uploads/2023/05/US-Gov-National-Standards-Strategy-2023.pdf
The White House. 2023e. "Executive Order on Addressing United States Investments in Certain National Security Technologies and Products in Countries of Concern." https://www.whitehouse.gov/briefing-room/presidential-actions/2023/08/09/executive-order-on-addressing-united-states-investments-in-certain-national-security-technologies-and-products-in-countries-of-concern/
Thomson Hine LLP. 2020. "Additional Chinese Military Companies Listed Under Section 1237 and Subject to Investment Ban" https://www.thompsonhinesmartrade.com/2020/12/additional-chinese-military-companies-listed-under-section-1237-and-subject-to-investment-ban/#
Tyson, Laura and John Zysman (eds.) 1982. *American Industry and International Competition*. Ithaca: Cornell University Press, 423.
Tyson, Laura and John Zysman. 1983. "American industry in international competition: Government policies and corporate strategies." *California Management Review* 25.3: 27–52.
Tyson, Laura and John Zysman. 2022. "From Sanctions to Semiconductor Resilience and Security." https://www.project-syndicate.org/commentary/how-the-west-can-secure-its-semiconductor-supply-chain-by-laura-tyson-and-john-zysman-2022-03
U.S. Congress Joint Economic Committee. 1982. *The Mercantile Challenge to the Liberal International Order*. Washington, D.C.: US Printing Office.
U.S. Department of Defense (1.14.2021). https://www.defense.gov/News/Releases/Release/Article/2472464/dod-releases-list-of-additional-companies-in-accordance-with-section-1237-of-fy/
U.S. Department of Defense (10.5.2022). https://www.defense.gov/News/Releases/Release/Article/3180636/dod-releases-list-of-peoples-republic-of-china-prc-military-companies-in-accord/
U.S. Department of Defense (3.13.2023). "AUKUS: The Trilateral Security Partnership between Australia, U.K. and U.S." https://www.defense.gov/Spotlights/AUKUS/
U.S. Department of Justice. 2020. "The China Initiative: Year-in-Review (2019-20), https://www.justice.gov/opa/pr/china-initiative-year-review-2019-20.
U.S. Department of State. "The Clean State," https://www.state.gov/the-clean-network/
USTR. 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." https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF
Vernon, Raymond. 1992. "International investment and international trade in the product cycle." *International economic policies and their theoretical foundations*. Academic Press, 415–435.
Watkins, Jay R. 2015. "Future Crimes: Everything Is Connected, Everyone Is Vulnerable, and What We Can Do About It Reviewed by Jay R. Watkins." *Studies in Intelligence* 59.3, 27–28.
Weiss, Linda and Elizabeth Thurbon. 2019. Economic statecraft at the frontier: Korea's drive for intelligent robotics. Review of International Political Economy.
World Bank Group and the Development Research Center of the State Council, P. R. China. 2019. *Innovative China: New Drivers of Growth*. Washington, DC: World Bank, 19–27.
Wray, Christopher. 2020. "The Threat Posed by the Chinese Government and the Chinese Communist Party to the Economic and National Security of the United States." https://www.fbi.gov/news/speeches/the-threat-posed-by-the-chinese-government-and-the-chinese-communist-party-to-the-economic-and-national-security-of-the-united-states

https://doi.org/10.1017/bap.2024.26 Published online by Cambridge University Press

Wübbeke, Jost, Mirjam Meissner, Max J. Zenglein, Jaqueline Ives, and Björn Conrad. 2016. "Made in China 2025." *Mercator Institute for China Studies. Papers on China*, 2.74, 4.
Yellen, Janet. 2023. "Remarks by Secretary of the Treasury Janet L. Yellen on the U.S.-China Economic Relationship at Johns Hopkins School of Advanced International Studies." https://home.treasury.gov/news/press-releases/jy1425
Yeon, Wonho. 2020. "U.S.-China Technological Rivalry and Its Implications for Korea." World Economy Brief, KIEP. https://www.kiep.go.kr/gallery.es?mid=a20301000000&bid=0007&act=view&list_no=5116&cg_code=
Yeon, Wonho. 2021. "How the U.S.-China Technological Competition Impacts Korea," Korea on Point. https://koreaonpoint.org/view.php?page=6&topic_idx=11&idx=30
Yeon, Wonho. 2022a. "U.S.-China Strategic Competition and Economic Security Strategy of Korea," *Between the Eagle and the Dragon: Challenges and Opportunities for South Korea in the US-China Competition*. The Wilson Center, 51–60.
Yeon, Wonho. 2022b. "The US Leads China in the Chip Race." *Global Asia* 17.4. https://www.globalasia.org/v17no4/focus/the-us-leads-china-in-the-chip-race_wonho-yeon
교육부. 2022. "정책을 말하다⊠ - 윤석열정부 110대 국정과제_교육 분야 : 자율과 창의로 만드는 담대한 미래 창의적 교육의 미래 인재 육성," 행복한교육 2022년 06월호.
과학기술정보통신부. 2022a. "국가전략기술육성방안 발표" https://www.msit.go.kr/bbs/view.do?sCode=user&mId=113&mPid=112&pageIndex=&bbsSeqNo=94&nttSeqNo=3182291&searchOpt=ALL&searchTxt=
과학기술정보통신부. 2022b. "제5차 과학기술기본계획(2023~2027) 발표" https://www.msit.go.kr/bbs/view.do?sCode=user&mId=113&mPid=238&pageIndex=&bbsSeqNo=94&nttSeqNo=3182520&searchOpt=ALL&searchTxt=
과학기술정보통신부. 2023. "과학기술정보통신부, 2023년 연구개발사업 종합시행계획 확정." https://www.korea.kr/briefing/pressReleaseView.do?newsId=156545875
기획재정부. 2023. "반도체 등 투자 활성화를 위한 세제지원 강화방안 추진." https://www.korea.kr/briefing/pressReleaseView.do?newsId=156546154#pressRelease
동아사이언스. 2020. "중국은 왜 천인계획에 그토록 공을 들였나." https://www.dongascience.com/news.php?idx=39849
문정인. 2020. 『문정인의 미래 시나리오: 코로나 19, 미중 신냉전, 한국의 선택』. 서울: 청림, 216–222.
연원호, 나수엽, 박민숙, 김영선. 2020. 『미중 간 기술패권 경쟁과 시사점』. 대외경제정책연구원, 90–99.
연원호. 2021. "기술패권 경쟁", 신종호 (편) 『미중 전략경쟁과 한국의 대응: 역사적 사례와 시사점』. KINU 연구총서 21-22, 통일연구원, 73–103.
國分俊史. 2020. 『エコノミック・ステイトクラフト経済安全保障の戦い』. 日経BP日本経済新聞出版本部.
北村滋. 2022. 『経済安全保障　異形の大国、中国を直視せよ』. 中央公論新社.
中共中央 国务院. 2021. 《国家标准化发展纲要》. https://www.gov.cn/zhengce/2021-10/10/content_5641727.htm

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