Expanding Battles over Techno-hegemony between the United States and China

The battles over techno-hegemony between the United States and China are continuing and seem to be expanding. The United States and China are competing not only for technological superiority in emerging technology fields such as artificial intelligence (AI), quantum technology and hypersonic technology, but also for supply chains in critical technology fields such as semiconductors and information and communications equipment. Moreover, value-based differences over technology and data act as centrifugal forces that further separate the United States and China.

US-China Competition for Technological Superiority

The United States and China continue to vie for technological superiority and there has been no change in the US government's stance of seeking superiority in critical and emerging technologies since the inauguration of the new Biden administration. In March, President Biden released the Interim National Security Strategy Guidance, positioning China as 'the only competitor potentially capable of combining its economic, diplomatic, military, and technological power to mount a sustained challenge to a stable and open international system.' In its final report released in March, the National Security Commission on Artificial Intelligence (NSCAI) expressed concern that the United States would be overtaken by China in the field of AI, and recommended measures to promote innovation and maintain American superiority. In October, Michael Brown, director of the Defense Innovation Unit (DIU) at the US Department of Defense, said that the United States should invest in basic research in these areas in order to gain an edge in critical and emerging technologies.

Preventing the outflow of critical and emerging technologies is another policy that the US government continues to emphasize. In October, the National Counterintelligence and Security Center (NCSC) under the Office of the Director of National Intelligence (DNI) listed AI, bioeconomy, autonomous systems, quantum, and semiconductors as critical and emerging technologies that should be protected first. The Commerce Department added biotechnology software to its list of emerging technology export controls in October and is expected to include brain-computer interfaces in the future. Export controls were imposed on seven supercomputer-related entities in China in April, on eight quantum-computer-related entities based in China in November, and on Chinese companies and research institutes allegedly misusing biotechnology to support surveillance and military modernization in December. Nevertheless, it has been pointed out that researchers associated with the Chinese military are conducting joint research with overseas research institutes in critical and emerging technology fields such as AI technology and

brain science. In December, a world-renowned nanotechnology professor at Harvard University was convicted of lying to US authorities about his participation in China's Thousand Talents Plan.

The new Biden administration has placed greater emphasis on cooperation with allies and friends than the previous Trump administration. For example, at the Japan-US Summit Meeting in April, the two countries agreed to deepen Japan-US cooperation in research and development (R&D) in fields such as AI, quantum information science, and biotechnology. In addition, the two leaders announced that, under the Japan-US Competitiveness and Resilience (Core) Partnership they launched, their countries would invest in research, development, demonstration and dissemination of secure networks such as 5G and next-generation mobile communications networks and advanced information and communications technology (ICT) and cooperate in fostering and protecting critical technologies. Furthermore, efforts were sought to complement traditional international cooperation frameworks through new plurilateral measures consisting of a small set of countries sharing common interests and values. Established in September, AUKUS, consisting of Australia, the United Kingdom and the United States, drew attention to the issue of nuclear submarines, but also announced that it would strengthen its integrated capabilities and interoperability with a focus on cyber, AI, and quantum technologies. In the same month, Japan, the United States, Australia and India, too, announced the establishment of cooperation in critical and emerging technologies via the QUAD. The US-EU Technology Trade Council (TTC), which also met for the first time in September, decided to closely coordinate information sharing on investment screening, export control, and the development and implementation of AI by the next meeting.

China is scrambling for technological superiority as well. The 14th Five-Year Plan, announced in March, indicated the Chinese authorities' determination to emphasize technological innovation by focusing on seven fields, including AI, quantum information, integrated circuits, brain science, and aerospace science and technology. In fact, China's technological progress has been spectacular. Reports that China tested a nuclear-capable hypersonic glider orbiting the Earth in July and August caused much interest and concern. It was also reported that the engine of the J-20, which was demonstrated at an air show in September, was made in China instead of Russia. As the former chief software officer of the US Air Force pointed out, the United States is losing to China in AI development in the military sphere, thus the era in which the United States had overwhelming technological superiority and China was playing catch-up is coming to an end.

However, China's speed and rates of achievement in innovation vary by technological field, and some observers contend that China's technological innovation has not made much progress. The impact of the US government's export controls on semiconductors is particularly significant. The smartphones that

Huawei launched in July did not support 5G, and the company's sales are reportedly down significantly. Huawei has been unable to procure advanced chips from Taiwan Semiconductor Manufacturing Corporation (TSMC), Google apps, and Qualcomm 5G wireless modems, leading some to speculate that the company is running out of the stock of chips it developed on its own. China's largest foundry, Semiconductor Manufacturing International Corporation (SMIC), has also been unable to procure lithography equipment from ASLM in the Netherlands. In July, Tsinghua University's Tsinghua Unigroup, which had been expected to play a leading role in improving China's semiconductor self-sufficiency rate, admitted bankruptcy. This will make it difficult to achieve the Chinese government's goal of 75% semiconductor self-sufficiency by 2030. In addition, some point out that technological innovation in China has been hampered by tighter regulations on the big-tech BATH (Baidu, Alibaba, Tencent, Huawei) companies, as illustrated by Tencent and Baidu being punished for antitrust violations in March.

Competition amid Economic Interdependence

Battles over techno-hegemony go beyond superiority in technology. As competing countries are economically interdependent, networks linking their industrial and technological bases are sometimes used for foreign policy and national security purposes in what has been termed the weaponization of interdependence.

As a result, concerns about the risks to cross-border supply chains have increased. The escalating tension between the United States and China, as well as the coronavirus crisis, exacerbated such concerns, and governments have begun to review and restructure their supply chains. In particular, the US government's efforts to restructure supply chains were distinctly oriented toward excluding China. In February, President Biden issued an Executive Order 14017 demanding supply chain reviews for four areas of products (pharmaceuticals,

U.S. President Joe Biden delivers holds a semiconductor chip as he speaks prior to signing an executive order, aimed at addressing a global semiconductor chip shortage, February 2021. (Photo by REUTERS/Aflo)

semiconductors, batteries and minerals including rare earths), the results of which were to be reported within 100 days, and for six sectors (defense industrial infrastructure, public health, ICT, energy, transportation and agricultural products), the results of which are to be reported within a year. The results of the review for four product supply chains published in June identified risks such as weak supply chains, malicious supply chains, and inappropriate use of older-generation semiconductors, and made recommendations for strengthening supply chains, including use of the Defense Production Act (DPA).

As the US-China conflict and the coronavirus crisis disrupted semiconductor supply chains and caused semiconductor shortages on a global scale, semiconductor supply chains began attracting a great deal of attention. Semiconductors are not only essential for the digital world but are also widely used in the latest defense equipment. The US government appears to have embarked on efforts to rewind existing trans-Pacific semiconductor supply chains to its side of the international system. One such attempt is reshoring advanced semiconductor manufacturing processes. The reason for this was the growing sense of crisis within the US administration over the country's dependence on certain countries for the most advanced semiconductor manufacturing processes, although the United States did certainly also lament its declining share of the global semiconductor market. In June, the Senate passed the "US Innovation and Competition Act," which provides legal backing for the $50 billion pledged by President Biden to fund semiconductor manufacturing and other projects. In September, a public-private consultative meeting on semiconductor supply chains was held to discuss public-private cooperation to improve the transparency and resilience of supply chains.

In addition, reviews of the supply chains for critical goods and technologies such as semiconductors were pursued through international cooperation. This is also called friendshoring as opposed to reshoring. Japan and the US announced that they would cooperate on sensitive supply chains, including those for semiconductors, in the aforementioned Japan-US Core Partnership. In November, Japan and the US agreed to establish the Japan-US Commercial and
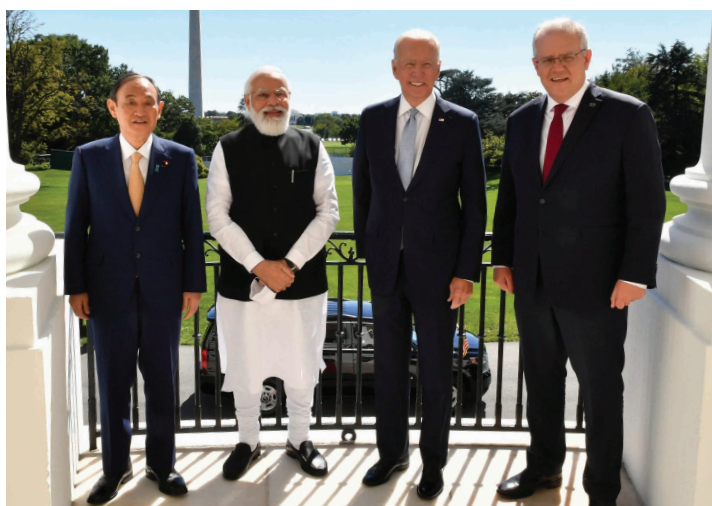
Japan-U.S.-Australia-India 'Quad' Leaders Meet in Person for First Time, September 2021. (Photo by Press Information Bureau via AP/Aflo)

Industrial Partnership (JUCIP) to advance cooperation toward strengthening industrial competitiveness and supply chain resilience in Japan and the US in cooperation with like-minded countries. Cooperation with Taiwan was also increased. Strengthening supply chains was an important topic at the second US-Taiwan Economic Prosperity Partnership Dialogue (EPPD) held in November. In December, the United States indicated its intention to launch a new technology trade and investment cooperation (TTIC) framework and, in particular, the US government expressed its continued interest in working with Taiwan on common commercial concerns in the area of semiconductor supply chains and related ecosystems. With regard to US-ROK relations, the first US-ROK Semiconductor Partnership Dialogue was held in December to enhance public-private partnerships between the two countries. Efforts were also sought

through plurilateral measures. At the second QUAD Summit in September, the leaders launched the Semiconductor Supply Chain Initiative, and at the US-EU TTC they announced the realignment of the global semiconductor supply chain, the identification of gaps in the semiconductor value chain, and the strengthening of domestic semiconductor ecosystems. In October, the Biden administration also announced plans to launch a new Indo-Pacific Economic Framework to advance cooperation with allies in technology and supply chains. The focus is on the digital economy, supply chains, workers' rights and sustainability. In this way, the US government is seeking cooperation in identifying vulnerabilities in the supply chain and developing industries. These were efforts to rewind the semiconductor supply chains, which had already extended beyond national borders, to their own side of the international system.

The US government is also keenly interested in restructuring the supply chain for information and communications equipment. Information and communications equipment, like semiconductors, is a keystone of the digital society. However, software and hardware vulnerabilities in information and communications equipment undermine the security and reliability of the digital society. In particular, the frequent occurrence of ransomware attacks, which are carried out through malware previously installed on information and communications equipment, has raised interest in securing the supply chain of information and communications equipment. In May, a ransomware attack on Colonial Pipeline disrupted gas supplies to the southeastern areas of the United States. Ransomware attacks reported in July exposed vulnerabilities in the software of US IT company Kaseya. The impact was worldwide and the amount of damage was the largest ever. Although it has been pointed out that it is difficult to identify the attributions of cyber-attacks, connections with the militaries and government agencies of Russia, China, North Korea and Iran was suspected. In July, Japan, the United States, the United Kingdom, Australia, as well as other countries and institutions jointly accused China of carrying out ransomware and other attacks around the world. There are concerns that malware could be activated, affecting critical infrastructure, government facilities, and defense equipment in an emergency.

Against this backdrop, the Biden administration, which is committed to securing the supply chain for telecommunications equipment, appears to be pushing ahead with the Trump administration's review of the supply chain, mainly with China in mind. The temporary information and communications technology and services (ICTS) supply chain security rules that the Commerce Department issued just before Trump left office were carried over into the Biden administration and took effect in March. Since then, the Biden administration has been busy identifying ICTS supply chain risks by summoning Chinese companies that conduct ICTS business in the United States and holding virtual meetings on supply chain risk. The US government also pushed for the removal of Chinese equipment from the ICTS supply chain. Since July, subsidies have been provided to companies that switch from Huawei and ZTE equipment to

other products. Furthermore, President Biden signed in November the Secure Equipment Act, making it impossible for ZTE, Huawei, Hytera, Dahua and Hikvision to obtain new equipment licenses in the US. The five companies were already barred from government procurement under the Trump administration, and the Biden administration's action means they will be effectively barred from the private sector as well.

On the other hand, the Chinese authorities, faced with disruptions in the supply of foreign technology due to the US-China competition, are also seeking to increase domestic production capacity and build alternative supply chains in order to mitigate supply chain vulnerabilities and ensure independence. In January, Chinese authorities announced the Basic Electronic Components Industry Development Action Plan, a plan to strengthen the electronic components industry, and declared their intention to focus on improving the development capabilities of the electronic components industry (semiconductors, sensors, printed circuit boards, optical communication components, etc.). In May, the government ordered 96 major state-owned enterprises to accelerate the development of core technologies for machine tools, high-value-added semiconductors, new materials, and electric vehicles.

Moreover, the stock market is showing signs of a decoupling between the United States and China. The US government has imposed a ban on the trading of listed securities of Chinese companies for security reasons. The US government added Chinese defense and surveillance technology companies to this ban in June and drone and AI development companies in December. In December, the Chinese authorities announced plans to tighten regulations on Chinese companies' listing on overseas markets and to prohibit them from listing or offering additional shares on security grounds. Furthermore, Chinese authorities are also trying to strengthen their capital markets by encouraging them to raise funds on the mainland and in Hong Kong. In November, trading began on the Beijing Stock Exchange, which is said to be a market for high-tech companies and start-ups, suggesting China's intention to reduce its dependence on the United States for capital. However, China seems to want to continue to enjoy the benefits of an open international economic order. At the World Economic Forum in Davos in January, Chinese President Xi Jinping expressed his negative view on decoupling, saying, "decoupling…or sanctions…will only push the world into division and even confrontation.".

Value aspects of technology

The issue of value aspects of technology has also surfaced. In October, the US Commerce Department issued a draft interim final rule on export controls for cybersecurity tools used in surveillance and malicious cyber activity. The measure, due to take effect in 2022, did not specify the names of companies or organizations, but in November the Commerce Department targeted four companies, including Israel's NSO, which has come under fire for exporting Pegasus spyware to government agencies and

public security agencies in authoritarian countries. In December, the US Treasury Department imposed economic sanctions on the Chinese AI company SenseTime Group and others for human rights violations caused by the misuse of technology. A working group on the "misuse of technology that threatens security and human rights" set up at the US EU TTC in September said it would consider measures to counter illegal surveillance. In the same month, the EU enacted a new general export regulation (Regulation (EU) 2021/821) and instituted catchall controls on cyber surveillance technology. At the Democracy Summit held in December, the United States, Australia, Denmark and Norway announced the launch of the Export Control and Human Rights Initiative to prevent the misuse of technology by authoritarian governments and promote a positive vision of technology underpinned by democratic values. Canada, France, the Netherlands and the United Kingdom also endorsed the initiative.

Value-based differences in countries' position on data also stood out. The QUAD pointed out the importance of data sharing among democratic countries and data governance based on democratic values as technological competition in the AI field intensifies. In addition, authorities in the United States and the EU agreed to establish a working group on data governance and technology platforms at the US-EU TTC to promote information sharing on data governance, etc., while acknowledging differences in the way data is handled between the United States, which tends to emphasize technological innovation and voluntary data governance by companies, and the EU, which demands strict data protection. In December, the US and UK governments issued the US-UK Joint Statement on Deepening the Data Partnership to promote and advance data protection and interoperability between the two countries and to create a global data ecosystem.

China, on the other hand, has tightened state control over data. The Data Security Act went into effect in September and the Personal Information Protection Act went into effect in November. Complementing the Cybersecurity Act of 2017, these two laws are said to have completed the legal framework for data control. In fact, data control in China was strengthened with the enforcement of the Basic Information Infrastructure Safety Protection Ordinance under the Cybersecurity Act in September and regulations governing the management of vehicle driving data in October. These measures highlight the Chinese authorities' strategic goal of creating an independent data zone while preventing foreign governments, particularly that of the United States, from using their data. In December, Chinese ride-hailing company DiDi delisted its shares from the New York Stock Exchange and announced that it would be re-listing on the Hong Kong Stock Exchange. Chinese authorities were reportedly worried about data leaks to the US.

Perspectives and recommendations

Even after the inauguration of the new Biden administration in the United States, the race for technological supremacy between the United States and China continues unabated. Indeed, competition in technology

is seen to be expanding due to factors such as the global shortage of semiconductors. The United States and China are scrambling to shift the center of gravity of the international economy to their own sides by stepping up their gears in advancing their competitive edge in technology. The review and restructuring of the semiconductor supply chain is one such effort. Moreover, differences in national values and norms are clearly reflected in export control policies and the way data is handled.

In an era of competition between the US and China for technological hegemony, flexible and balanced economic and technological security policies are required. Although both countries have taken a series of measures to maintain or gain technological superiority, they have not become completely decoupled over economic and technology issues. In October, the US Department of Commerce acknowledged that it has issued export licenses worth over US$100 billion to Huawei and SMIC over a period of five months from November 2020. There are also reports that US companies are continuing to invest in Chinese chip-related companies, so the US government and US private companies have different approaches to China. For companies in countries such as China deeply embedded in international supply chains, excessive reshoring can threaten efficiency of supply chains. Depending on the level of technology, interdependence may be maintained or circumstances akin to decoupling may ensue. Governments and companies are strategically switching between the accelerator and the brake, taking into account the policies of the US and China and their implications.

While Japan shares security interests and democratic values with the US, it is deeply tied to China economically. Based on these circumstances, the Japanese government needs to address technology policy from the viewpoint of economic security. The Kishida Cabinet, which was inaugurated in October, appointed the first minister responsible for economic security. The current challenges are strengthening supply chains, ensuring the security and reliability of core infrastructure, promoting public-private technical cooperation for supporting the development of critical technologies, and ensuring patent nondisclosure. These are important policy issues that need to be urgently addressed amid the international politics of competition for techno-hegemony. In addition to establishing a new fund to support R&D in advanced technologies for which concrete measures have already been devised and making the semiconductor supply chain more robust, ensuring the security and reliability of core and digital infrastructure is a particularly urgent and important issue. Furthermore, it is necessary not only to undertake efforts to deepen the understanding of private companies and research institutes on Japan's economic security situation but also to promote policies that support these parties in taking concrete measures as soon as possible. Scheduled to host the G7 Summit in 2023, Japan will be also expected to play a leading role in making data processing rules. As the battle lines for technological hegemony between the United States and China expand, it is important to promote a balanced approach to economic security in both domestic and foreign policy. ■