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Economic Security Study Group

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Economy Security Study Group

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1. Introduction

Against the backdrop of high-tech friction between the U.S. and China, there is growing attention to economic security. The Japanese government has approved an economic security bill in the Cabinet and submitted it to the Diet. The basic directions are as follows: (1) improve self-reliance (eliminate vulnerabilities in core infrastructure and supply chains), (2) ensure superiority and indispensability (improve technological and industrial competitiveness by strengthening R&D, etc., and prevent technology leakage), and (3) maintain and strengthen the international order based on fundamental values and rules.

One of the most important issues is to strengthen R&D capabilities to ensure Japan's superiority and indispensability. In the U.S. and China, core technologies related to semiconductors and telecommunications, as well as emerging technologies such as AI and machine learning, are subject to export control, and both countries are making efforts to improve their technological capabilities as a priority of their industrial technology policies. The confrontational structure between the U.S. and China has sharpened the movement toward decoupling from reliance on the other country's technologies.

In Japan, on the other hand, the economic security perspective is being considered in individual policy goals, such as trade management policies and comprehensive innovation strategies for security purposes. The U.S., as a security ally, and China, which is becoming more and more important economically, are both important states to Japan, and there is no way to prioritize one over the other diplomatically. In addition, as the confrontation between the U.S. and China becomes more acute, relations with third countries, such as those in Europe, and India are also important.

In any case, based on the premise that a country's advanced technological capabilities can create an advantageous diplomatic position, and given Japan's current advanced technological capabilities, it is necessary to consider what kind of technologies Japan should invest in from the perspective of mid- to long-term economic security, and what kind of technology policy it should pursue.

In fiscal year 2021, our Study Group took up AI/machine learning, quantum computers, and next-generation communication technologies, and examined them from the perspective of ensuring Japan's superiority and indispensability, especially related to the abovementioned (2), and compiled recommendations.

2. Technology-specific Considerations and Response Policies

2-1. AI and machine learning

AI, with a focus on machine learning, is at the core of information and communication technology (ICT) and is undoubtedly an area in which Japan should focus its investment from the perspective of economic security. In this field, where the U.S. is leading the way and China is rapidly gaining strength, Japan should differentiate itself from the Internet-

based AI (machine learning using big data on the Internet) of Internet platformers in the U.S. and China, utilize high-quality data in the real world, and work on real-world AI that is highly reliable when implemented.

However, the U.S. and China are leading the way in development of cutting-edge software, such as the most advanced machine learning algorithms, so it is important for Japan to have an open strategy that includes international cooperation, including human exchange, and a strategy to catch up with advanced technologies that are making rapid progress.

Japan's competitiveness in this field is due to the existence of big data in the private sector, such as manufacturing sites. Therefore, for cross-border transactions of such data, certain controls should be applied to security-critical data, based on the basic policy of trading highly reliable data in the Data Free Flow with Trust (DFFT). In addition, it is necessary to take measures to utilize a multi-regime to ensure that rules for reliable data transactions are adopted and observed internationally.

2-2. Next generation computers, mainly quantum computers

In terms of computer hardware technology, semiconductor miniaturization has reached its limit, and technological innovation is slowing down in accordance with Moore's Law. It is necessary to have a strategy for domestic production of semiconductor technology and manufacturing processes as a basis for high-tech industries. However, the amount of investment required for the most advanced fabs is enormous, and it is necessary to verify the cost-effectiveness of injecting public funds into a field that is dominated by private business, including from the perspective of security.

Computers using quantum bits are highly important, as they enable massively parallel computations and provide a revolutionary improvement in computer processing power. However, the scope is considered to be limited. In addition, while practical applications based on superconductivity methods are in progress (Google, IBM, Alibaba Group, etc.), applications based on other principles are also being used (ion trap, silicon photonics, etc.).

Although quantum computing can be said to be a technological field that should be watched closely, it is still in the basic research phase and has not yet reached the stage where the technological development can be harnessed for practical use. Therefore, on the premise of fair and interactive information exchange among the research institutes involved, it would be appropriate to proceed with an internationally open strategy.

2-3. Next-generation communication technologies

5G technology standards have been established and are in the stage of practical application. Standard Essential Patents (SEPs) for 5G technology are held by Samsung

Electronics Co., Ltd., Qualcomm Technologies, Inc., Huawei Technologies Co., Ltd., and others. All of these technologies are necessary for the implementation of 5G communication networks, and they are interdependent in terms of technology.

With regard to Beyond 5G (6G), major companies in each country have started to study the required specifications from around 2018, and technical standardization work (technical standardization is essential because it is a communication technology that requires connectivity) is expected to be carried out for practical use in 2030. As with 5G, 6G is expected to be implemented based on international technical standards, so it should not be enclosed on a company or country basis. However, since 6G is a technology that will be used for communication in the air, sea, and space, it is necessary to pay attention to the implementation of the system from the perspective of security.

In addition, in the post-5G to 6G era, it is necessary to consider a new architecture that virtualizes and optimizes the entire digital infrastructure, not just the wireless domain. Photonics-Electronics Convergence Technology, which is technologically advanced in Japan, will be the key to eliminating the bottlenecks that will occur.

3. Recommendations for Ensuring Economic Security

3-1. Basic concept

As advanced science and technology and innovation become more and more closely linked, the degree of progress in science and technology of a country has become an important factor influencing not only industrial competitiveness but also diplomacy. For the development of science and technology, policies that promote international cooperation and coordination with the U.S., China, Europe, and other countries will be important. However, depending on the technological field, it is necessary to also consider the policy direction for overcoming competition with other countries.

In other words, in order to improve Japan's relative competitiveness in science and technology, the key point is how to strike a balance between international collaboration and coordination to access international cutting-edge technologies and how to prevent the leakage of Japan's own advanced technologies.

To successfully achieve this balance, it is also necessary to consider the characteristics of each technology. Many of the technologies that could be problematic in terms of security are General Purpose Technologies (GPT) that can be applied to various fields, and Dual Use Technologies that have a commercial use as well as the potential for military use. For this reason, it is necessary to make wide-ranging forecasts and manage the complex threats and risks posed by emerging technologies and associated innovations not only from the perspective of economic security but also from the perspective of comprehensive security.

It is important to note that advanced technologies are constantly evolving, and the

relative competitiveness and technological characteristics described above are changing. Therefore, it is necessary to take measures for each technological field flexibly while constantly updating information.

3-2. Economic security policy

Public research funding with the view to improving scientific and technological capabilities needs to be considered in terms of priority areas from the perspective of economic security. It is also important to enhance cross-sectoral science and technology innovation policies, such as measures to support industry-academia collaboration and R&D taxation.

To prevent and protect against technology leaks, there are measures to control information such as data and technical know-how through export and investment restrictions. At present, measures are taken under the Foreign Exchange and Foreign Trade Act, which was established from the perspective of security, but it is necessary to consider the pros and cons of a framework based on a broader perspective such as economic security.

In addition, there may also be restrictions on human resources, including academic personnel. However, as Japan's declining birthrate and aging population make it increasingly difficult to secure domestic human resources in the advanced technology fields, adopting a policy that is seen as isolationist in terms of human resources will only serve to further reduce Japan's relative competitiveness. While Japan's scientific and technological capabilities are declining worldwide, and international cooperation is lagging behind due to various internal and external factors, closed measures on science and technology should be applied to sensitive fields to a limited extent so that Japan will not be left behind in the brain circulation of global human resources.

3-3. Systems to ensure economic security

Measures that affect Japan's economic security, such as measures to restrict exports and investment in other countries and compulsory technology transfer, should be addressed through international organizations and multi-diplomacy. In addition, with the growing importance of issues related to advanced technologies in diplomacy, it is necessary to enhance the monitoring function of foreign countries' policies, etc., and to improve the structure and coordination of relevant ministries and agencies, including the Ministry of Foreign Affairs, in order to strengthen science and technology diplomacy. In particular, since this has become an issue at the level of summit diplomacy, as seen in the agreement on advanced technology cooperation at the summit meetings of Japan, the U.S., and the Quad, there is a need to strengthen the system for technology diplomacy in the Ministry of Foreign Affairs.

Technologies that are important from the perspective of economic security are changing daily. Therefore, in addition to the implementation of routine export controls and prevention of technology and data leakage, it is advantageous to establish a system of analysis and examination that goes beyond vertical divisions in order to prepare for the potential threat of new discontinuous innovation and game changers that combine emerging and existing technologies.

As a basis for anticipating, identifying, and dealing with these threats and risks, it is necessary to improve and strengthen cross-sectoral technological intelligence. It is effective to promote activities for future insight (formation of collective knowledge and practice of strategic planning with the participation of stakeholders such as governments and companies in the private sector that are responsible for medium- and long-term policies and corporate strategy), rather than the conventional technology forecasting that extrapolates the chronological development of technology in a vertical manner by field. It is necessary to enhance the think tank function in order to strengthen the network among cross-disciplinary experts and present options for forward-looking strategic planning.

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