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Chinese Industrial Technology and Science Policy under the Dual Circulation Strategy with special reference to the influence for Asian countries

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Executive Summary

This paper is the final report of the Research Study Group "Chinese Industrial Technology and Science Policy under the Dual Circulation Strategy with special reference to the influence for Asian countries" (Fiscal year 2021).

Chapter 1 (Yoichi MAIE) had analyzed the background of the Dual Circulation Strategy and had investigated "Several Major Issues in the National Medium and Long Term Economic and Social Development Strategy." This strategy defined the direction of science, technology and industrial policy of "Outline of the 14th Five Year Plan and Vision 2035" and intended to realize "Manufacturing powerhouse."

Chapter2 (Tomoo MARUKAWA) had investigated the current situation of "Made in China 2025" and "National Standardization Development Outline 2035." These two policy packages had already changed its format but the main contents are continuing.

Chapter 3 (Taeko MOTOHASHI) had analyzed the strategy of Intellectual Property Rights. China had been strengthening the judicial power, legislation and administrative operation. Foreign countries have to focus on these activities.

Chapter 4 (Haruo KURASAWA) had investigated the situation of China-U.S. conflict on science and technology. China had been developed its power all around this field, and had decided to strengthening the basic research. It is expected that the conflict between two giants will be continue in the long run.

Chapter 5 (Jianmin JIN) had made survey on digital industry and the basis of digital transformation. China intends to build "Digital China." The construction of infrastructure had been developed but the level up of semiconductor industry is waiting.

Chapter 6 (Kouta TAKAGUCHI) discussed the social implementation of Information Technology and its influences. He pointed out three epoch-making factor that is spreading of mobile internet, investment boom and founding support for entrepreneur. Recent days it should be careful to the regulation for IT giants.

Chapter 7 (Zhijia YUAN) focused on overseas expansion of Chinese enterprises. It had been affected local situation of industrial technology through foreign direct investment of Chinese enterprises. On some industry they had replaced the enterprises from developed countries, and had lead technical standard.

Chapter 8 (Kouichi ISHIKAWA) discussed the influence of Dual Circulation Strategy in the trade order of East Asia. Regardless of China-U.S. conflict in trade order, in domestic circulation, China will not prevent international trade and investment. In international circulation, China will continue to build multinational FTA. From this point of view, the strategy will facilitate economic relationship in East Asia.

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Introduction

Yasuo Onishi

China has had to adjust its development strategy owing to intensifying friction with the U.S. and the global COVID-19 pandemic. The Dual Circulation Strategy (2020), which seeks to redefine the relationship between domestic and international circulation, has been proposed as a response. The strategy was announced in a speech by General Secretary and President Xi Jinping at a key meeting of the Communist Party of China (CPC). It was based on the Outline of the 14th Five-Year Plan for Economic and Social Development and Long-Range Objectives Through the Year 2035 (from 2021), which had been under formulation for some time and which presents long-term goals based on the ideas of the strategy. The initial approach of this Research Study Group was that by analyzing the strategy and the five-year plan in relation to each other, it would be possible to confirm the future direction of China's science and technology policy.

Starting from this point, this report aimed to go beyond the policy level to forecast the nature of the domestic and international circulation envisioned by the Dual Circulation Strategy. In covering the "domestic circulation" in the Dual Circulation Strategy, we intended to discuss changes in industrial and scientific policies and their current status, the rapid development of digital industries and technology, and the implementation of such technologies in society. In discussing "international circulation," we attempted to examine the state of international intellectual property strategies, responses to the intensification and prolongation of U.S.–China friction, and the impact of China's economic expansion on the world, keeping in mind the industrial, scientific, and technological aspects of the situation.

As reports and discussions progressed at the Research Study Group, albeit over a short period of time, it became clear that there were many points where the above ideas were off the mark and where further clarification of the issues was needed. For this report, we have developed our argument by incorporating such points in a new way.

Here, in line with the structure of the report, I would like to introduce and summarize the development of the above-mentioned issues and the corresponding analysis of each chapter. This discussion will serve in place of a preface.

(1) Dual Circulation Strategy and Industrial, Science and Technology Policy

The initial approach of the Research Study Group was to summarize and analyze the 14th Five-Year Plan with an awareness of the Dual Circulation Strategy as a premise for the overall discussion and to confirm the current status of industrial policy and science and technology policy. Chapter 1 (Yoichi Maie) begins with the background to the proposal of the Dual Circulation Strategy. The Strategy was first announced in April 2020, in a speech by General Secretary and President Xi Jinping at the seventh meeting of the CPC Central Financial and Economic Affairs Commission, entitled "Several Major Issues in the National Medium and Long Term Economic and Social Development Strategy." Xi Jinping's speech identified six critical issues (numbered below in order of appearance in his address). Of the six issues, Maie

states that the following were lessons learned from the experience of U.S.–China conflict and that policies developed in regard to them will show the direction in which China can move away from dependence on the U.S.: (1) implementation of strategies to expand domestic demand; (2) optimization and stabilization of industrial chains and supply chains; and (4) adjustment and optimization of science and technology input and output structures.

This understanding is reflected in the corresponding items of the 14th Five-Year Plan, which defines the direction of science and technology and industrial policies for the Plan period. Chapter 1 organizes and analyzes policy specifics, focusing on three main areas: technology policy, industrial policy, and forming a strong domestic market. The first two of these items are contrasted with the 13th Five-Year Plan, and their characteristics are pointed out. Through these measures, the ultimate goal is to make China a "manufacturing powerhouse."

The third item directly corresponds to the Dual Circulation Strategy and is analyzed as indicating a stance of coping with the protracted U.S.–China confrontation by establishing a new development model through the expansion of domestic demand. Chapter 1 concludes with a discussion of the Ministry of Commerce's 14th Five-Year Plan, anticipating the specifics of "Facilitating General Domestic Circulation" and "Promoting Domestic and International Circulation," as well as the views of Chinese experts.

The initiatives "Made in China 2025" and "National Standardization Development Outline 2035" are industrial and science/technology policy packages that were proposed prior to the Dual Circulation Strategy. Their titles are used to underpin the view that China is aiming for hegemony in the fields of industry and technology. What, however, is the current situation in this regard? Chapter 2 (Tomoo Marukawa) attempts to clarify this from Chinese policy documents and to look ahead to the future.

First, "Made in China 2025" should be considered a dead letter. This can be inferred from the fact that no mention is made of it in the 14th Five-Year Plan. Were it operable, a "Made in China 2025" roadmap should have been created for each sector under the Plan. However, as noted in Chapter 1, the 14th Five-Year Plan includes the implementation of the "manufacturing powerhouse" strategy and the goal of developing "strategic emerging industries." Taken together, these approaches incorporate the policies of "Made in China 2025," and in that sense, it is alive and well.

Next is the "National Standardization Development Outline 2035," which, Marukawa concludes, is not in operation either. The National Standardization Development Outline (October 2021) stated that standardization should come from both the government and the market. It should be promoted in both domestic and international directions, and the focus should be on quality and effectiveness rather than simple quantity of standards. The above analysis suggests that China's science and technology policy is, if anything, open to the outside world and that the government is optimistic that matching domestic and foreign standards and promoting market opening will lead to improved national competitiveness.

Proceeding on this basis, Chapter 2 provides case studies of two industries: integrated circuits and new energy vehicles / automated driving. Both industries are "strategic emerging industries," and their trends are important. China has been leveraging its integrated circuit industry with copious state investment, which Chapter 2 analyzes. The analysis of the investments of the China Integrated Circuit Industry Investment Fund is particularly valuable. The analyses of the integrated circuit industry and new energy vehicles / automated driving industry are also of deep interest. The chapter makes the important point

that these industries have already reached a stage of development where they can be self-sustaining, whereby government policy has shifted from protection to openness.

(2) Intellectual Property Strategy; U.S.–China Friction

The second problematic issue to be examined is what strategy China is taking (or intends to take) in regard to the "international circulation" aspect of the Dual Circulation Strategy.

Chapter 3 (Taeko Motohashi) analyzes the "promotion of creation and utilization of intellectual property rights" that the Dual Circulation Strategy calls for. With intellectual property rights as the axis, the framework of the analysis is to confirm how the relevant legislation operates and is enacted by the three branches of government (judicial, legislative, and administrative) and to examine the relationship between this and the Dual Circulation Strategy.

First, in the judicial field, it can be confirmed that a legal hearing system for intellectual property cases has been established and IP rights protection has been strengthened. Measures include the establishment of IP Courts and Tribunals. On the other hand, one of the most notable developments is China's move to secure leadership in international IP regulation. An example is the invocation of the anti-suit injunction in international standard-essential patent litigation. This is a "a court order forbidding the respondent, as the addressee, from filing a lawsuit in a country or region outside China or applying for execution of a foreign judgment; by imposing a fine for violation, it can have the effect of indirectly prohibiting or restricting access to foreign judicial proceedings" (Chapter 3).

In the legislative field, the Patent Law (encompassing invention patent, utility model, and design rights) was revised and went into effect in June 2021. The revised law strengthens domestic patent protection. In the international arena, the Regulations on Technology Import and Export Administration have been tightened, while regulations have been put in place on the import and export of technology, invention patents of foreign companies, and the licensing and transfer of those patents to Chinese companies.

In the administrative field, the Outline for Building an Intellectual Property Powerhouse (2021–2035) was promulgated in 2021. The program is designed to promote applications for registration of IP rights through tax reductions and subsidies for application fees on the basis of "high-tech enterprise certification." Going forward, quality will be more important than quantity in company certification and applications. In addition, support is being provided for the establishment of "invention patent federations" or "IP rights federations" to improve external competitiveness.

The direction of measures in this area, as described above, is in line with the provisions of the Dual Circulation Strategy. However, notably, there are some trends, such as anti-suit injunctions, that may cause international friction. The EU and other actors have already expressed concern about anti-suit injunctions.

Chapter 4 (Haruo Kurasawa) analyzes the U.S.–China confrontation in the field of science and technology. First, China's scientific and technological capabilities are objectively confirmed through such indicators as R&D expenditures, number of research personnel, and number of papers. It is suggested that China's catching up with and surpassing the U.S. in these indicators has been an indirect cause of the conflict between the two countries.

Next, shifts in China's science and technology policies are laid out. Kurasawa stresses the point that

China has shifted its focus in "science" to emphasize "science and technology" in the form of basic research. In the 2018 "Some Opinions on the Overall Strengthening of Basic Science Research," the goal was set to lead the world in key areas by 2035 and become a "science and technology powerhouse" by the mid-21st century. Also, the opening of Part Two of the 14th Five-Year Plan ("Adhering to innovation-driven development and comprehensively fashioning new development advantages") states that "We will adhere to the core position of innovation in China's overall modernization, [and] have [science and technology] self-reliance and self-improvement act as strategic support for national development."

However, this shift has raised alarm in the U.S. and triggered intensified U.S.–China friction in the field of science and technology. The U.S. is wary of Chinese hegemony in cutting-edge industries that are directly related to its security concerns, but as Kurasawa points out, all technologies are basically dual-use. More specifically, there are overlapping areas of interest between the United States and China, which Chapter 4 summarizes in the tables "Advanced Fundamental Technologies Subject to U.S. Export Controls" and from the 14th Five-Year Plan to "Conquering Science and Technology Frontier Areas." Therefore, long-term friction between the two countries should be expected.

Chapter 4 uses space as a case in point to summarize the reality of U.S.–China friction. It compares the two countries from the perspective of human resources and shows how China has made great strides in university rankings within the Asia region. No conclusions are given as to what the future of U.S.–China friction will be, but at the end of the chapter, China's weaknesses are also pointed out.

(3) Growth of Digital Industries and Social Implementation of Digital Technologies

The third problematic issue is ascertaining the fast-changing status of China's digital industry and technology and the actual social implementation of digital technology as a prerequisite for discussing policy.

Chapter 5 (Jin Jianmin) discusses China's digital industry and digital transformation (DX) infrastructure. The digital industry is emphasized as a lever for breaking away from over-reliance on external technology and for building strong industries and supply chains, as stated in the Dual Circulation Strategy. As pointed out at the beginning of the chapter, startups, including small and medium-sized enterprises, can play a major role in the digital industry. Data will also play a major role because it can be assumed that China will leverage its advantages, such as its population of 1.4 billion. Population at this scale provides vast amounts of data and a wealth of technology application scenarios. Therefore, while it is obviously necessary to discuss the digital industry per se, it is also necessary to discuss the reality of DX, which creates demand for it.

First, the history and current status of the digitization of China's economy and society is reviewed, and the "Digital China" goals in the 14th Five Year Plan are explained. The framework set out by the Plan involves transforming production models, lifestyle models, and governance models through DX, with the realization of a digital economy, digital society, and digital government as the goal.

Of these goals, building a digital economy requires digital infrastructure (new digital technology infrastructure such as AI and cloud technology, and communications network infrastructure such as fifth-generation (5G) technology and the "internet of things" (IoT)). It also requires the social implementation of digital technology. Chapter 5 focuses on the case of the semiconductor industry to discuss digital

infrastructure. The Chinese government has invested heavily in the semiconductor industry. While this has led to growth in semiconductor production capacity as such, the country is not self-sufficient in high-end integrated circuit chips.

Social implementation is discussed in terms of 5G networks. Chapter 5 confirms that the active selection of 5G terminals by consumers, combined with the accelerated development of 5G networks, is rapidly spreading throughout all of China. However, we cannot ignore the fact that the development of 5G networks has been delayed owing to the 2021 shortage of semiconductor chips. There are also uncertainties such as the impact of U.S. regulations and whether attractive consumer and corporate solutions will be developed in the future. The success or failure of building a "Digital China" will depend on overcoming these challenges, according to Jin.

Chapter 6 (Kouta Takaguchi) discusses the social implementation and impact of information technology (IT) in China. First, the opportunities and circumstances that led to China's emergence into the limelight as a "digital superpower" will be analyzed. Takaguchi states that China embarked on becoming a digital superpower in 2014, triggered by the concentration of "mobile Internet penetration" (technological shift), "risk money investment boom" (financial shift), and "business start-up support" (policy shift). It is noteworthy that although the government initially provided the IT infrastructure development represented by 4G, along with various funds, it was *individuals* who used these funds to start new businesses.

These characteristics are also observed in the development of IT services, where China leads the rest of the world. Mobile payments, for example, began rapid growth with Alibaba, Tencent, and others, triggered by allowing private (non-commercial bank) participation in credit and debit cards. In the process, service content has diversified, and smartphones have come to be equipped with functions that Takaguchi calls a "convenience store in the palm of your hand." Currently, smartphones can be used to make various types of payments, purchase investment products and insurance, make reservations at movie theaters and tourist attractions, pay utility bills, and complete administrative procedures, making them the equivalent of Japan's convenience stores.

China tends toward "renting rather than owning" and "hiring the services of workers for a certain period of time" rather than actually selling goods and services. The sharing economy is one example. This characteristic, Takaguchi notes, will lead to the development of the gig economy.

This chapter also presents the current state of e-commerce (EC). China's EC market, already the largest in the world, is also diverse. Takaguchi notes that EC is not limited to simply developing sales channels but also functions as a research tool for analyzing consumer reactions and preferences. Armed with data on 1.4 billion people, China's EC business could expand globally.

However, the trend toward regulation of IT companies, which has been conspicuous over the past few years, coupled with the lack of innovative services to replace those described here, raises concerns about the future. Ongoing attention to the trends is required, as well as to the government's policy intentions.

(4) Relations with Neighboring Asian countries

The fourth problematic issue is the future of China's presence in the "international" aspect of the Dual Circulation Strategy. In terms of the problematic of this report, the issue is to predict the impact of

China's scientific and technological development on neighboring Asian countries.

Chapter 7 (Zhijia Yuan) focuses on the expansion of Chinese companies into Southeast Asia and examines how this has affected the industries and technologies in the target countries, selecting the consumer electronics and automobile industries as case studies.

Chinese companies have been entering the consumer electronics industry since 2000. They are characterized by the fact that they often start with mergers and acquisitions (M&A) of local companies, adopt a double-brand strategy that uses brands acquired through M&A, and enter markets where competition with companies from developed countries is less severe. They are also characterized by aggressive localization of human resources, raw materials, and intermediate goods, etc. from the outset of market entry. This is a rational choice in that it compensates for the perceived inferiority of Chinese firms relative to their counterparts in developed countries. At the same time, Chinese firms are gradually increasing their presence in higher-level markets (segments) as their technologies and quality improve. In addition, among target counties, there have been cases of M&A of companies in developed countries.

The same characteristics as described above can be observed in Chinese firms' entry into the automotive industry. Here, however, we also see a pattern of, first, establishing technology and brand after M&A of a company in a developed country and then entering the market in earnest with the new brand. As is the case with consumer electronics, Chinese-overseas Chinese networks are being fully leveraged. This is exemplified by the tie-up between SAIC Motor and the Charoen Pokphand Group in Thailand and Geely Automobile's acquisition of Proton in Malaysia. These firms' localization from the outset of expansion is similar to that of consumer electronics but it is more thorough, including the appointment of local personnel to the management team and high local content (localization rate).

Notably, the companies have already gained a large market share by introducing state-of-the-art products, such as electric vehicles (EVs), to the local market.

As is evident from the cases of the two firms, the expansion of Chinese firms into Southeast Asia has begun to change the local industrial structure. It is already a reality that Chinese companies are taking market share and increasing their presence in the supply chain through localization. In addition, Chinese companies are establishing dominance in new fields such as EVs. It can be said with certainty that local industries and technologies will be greatly affected by these changes.

Chapter 8 (Koichi Ishikawa) examines the implications of the Dual Circulation Strategy in the East Asian trade order. Specifically, the analysis focuses on how ASEAN is responding to China's Dual Circulation Strategy in the context of two trends pulling in opposite directions, that is, liberalization and increased regulation. First, in the trend toward liberalization, wide-area FTAs have been realized and expanded within the region. The ASEAN Free Trade Area (AFTA), which covers the ASEAN region, has been the axis of the Regional Comprehensive Economic Partnership, which encompasses six countries outside the region. This has the potential to eventually be tied to the Comprehensive and Progressive Trans-Pacific Partnership Agreement.

On the other hand, the trend toward tighter regulation involves trade and investment restrictions under the guise of security measures. This trend has manifested itself in parallel with U.S.–China friction. World Trade Organization rules also include a provision that allows exceptional measures for security reasons. This has been triggered by the U.S. imposing tariffs that primarily target China, breaking the tacit

understanding that it should be cautious about invoking such measures in the first place. Subsequently, China has introduced similar trade and investment restrictions, and the friction is expected to be prolonged.

What has been ASEAN's response? While U.S.–China friction has now escalated into a confrontation over technological hegemony and security, ASEAN has maintained its stance of avoiding choosing between the U.S. and China. While this is not surprising given the bloc's close diplomatic and economic ties with both China and the U.S., it is clear that ASEAN is playing off both China's Belt and Road Initiative and the U.S.-backed Free and Open Indo-Pacific Strategy, with an eye toward securing ASEAN's independence.

What is the impact of the Dual Circulation Strategy on ASEAN? First, regarding domestic circulation, it has been pointed out that tariff hikes and import restrictions are not being implemented for the purpose of the Dual Circulation Strategy and that expanding domestic demand in China could lead to increased imports from ASEAN.

Regarding international circulation, as mentioned above, ASEAN and China are deepening their trade interrelationships and supply-chain development within the framework of bilateral and multilateral FTAs, and there is no conflict of interest. Rather, ASEAN is benefiting from the growing trend of production transfers from China to ASEAN owing to the U.S.–China friction. Ishikawa's conclusion is that the Dual Circulation Strategy will have more benefits than disadvantages for ASEAN.

(5) Current Status and Challenges of Science and Technology Development in China

The analyses undertaken in the chapters above will help to clarify the current state of science and technology in China. Finally, let us outline the significance and future of the Dual Circulation Strategy, focusing on science and technology.

First, the emphasis on "domestic circulation" under the Dual Circulation Strategy places priority on the domestic market and domestic demand. The intention is not, however, to replace the "international circulation" with domestic circulation but rather to place greater emphasis on economic security than before, while continuing to open up to the outside world (i.e., engage in international circulation). It seems reasonable to position the strategy as a direct response to intensifying friction with the U.S.

Second, the explicitly stated direction of industrial policy is to aim for innovation-driven development with "strategic emerging industries" taking the lead, with the goal of building a "manufacturing powerhouse." In response, science and technology policy is spurring R&D in technologies that could lead to innovation in the industrial groups designated as emerging industries. This is the same goal as "Made in China 2025," and while this policy package has disappeared, its intent lives on.

Third, there is a growing movement to internationalize Chinese technical standards. The increase in the number of international applications for invention patents is indicative of this development. It appears that the intention is not so much to achieve technological hegemony as it is to achieve commonality of technological standards internationally and to gain an advantage for China (Chinese companies) within that field. The imposition of anti-suit injunctions in lawsuits over invention patent licensing rights also appears to be part of this process.

Fourth, while it is true that the background of the friction between the U.S. and China is the intention of the U.S. to prevent China's technological hegemony, what is more important is the fact that China has

shifted its focus in "science" to emphasize "science and technology" in the form of basic research. China's emphasis, as indicated by the 14th Five-Year Plan, is in the area of advanced science and overlaps with that of the United States. Thus, U.S.–China friction in the field of science and technology is expected to be protracted.

Fifth, the development of China's digital industry and technology and the social implementation of digital technology has been remarkable. The national goal is to build a "Digital China" with a digital economy, digital society, and digital government, and the pace of digital network promotion based on 5G technology has been rapid. However, domestic production of advanced semiconductor chips has not been realized, and this could be a bottleneck if U.S.–China friction continues.

Sixth, the influence of Chinese science and technology is expanding as Chinese companies expand overseas in earnest. ASEAN is a leading example. For example, Chinese firms are expanding mainly in areas where firms from developed countries are withdrawing, and Chinese technology is being transferred in these areas. In addition, in emerging fields such as EVs, Chinese companies are taking market share ahead of companies from developed countries, and Chinese technology has become the standard in this field.

This Research Study Group was launched to investigate the possible impacts of the Dual Circulation Strategy. As the outline discussion above demonstrates, China has reached a position where it can lead the world in several areas, including IT industry and services. It is also clear that international cooperation in importing key components such as semiconductors is essential for future development. The same holds true for China's scientific and technological development.

Although the text of the Dual Circulation Strategy is strongly oriented toward securing leadership in economic development, it can actually be understood as a rational strategy to secure China's economic security under increasingly complex circumstances and to reaffirm its path of development. Friction between the U.S. and China is likely to be prolonged, especially in the field of science and technology. As Japan is forced to take a delicate position in this context, there is a need to pay ongoing attention to the impact that the orientation of the Dual Circulation Strategy will have on the field of science and technology.

1 The 14th Five-Year Plan for Economic and Social Development and Long-range Objectives Through the Year 2035 and the Dual Circulation Strategy

Yoichi Maie

Foreword

The Outline of the 14th Five-Year Plan for Economic and Social Development (the "14th Five-Year Plan") and the Long-Range Objectives Through the Year 2035(the "Long-Range Objectives") were discussed and adopted at the Fourth Session of the 13th National People's Congress (equivalent to the national parliament) held in Beijing on March 5 to 11, 2021[1]. China operates its economic and social policies under a five-year plan. The period 2021 to 2025 is the term of the 14th Five Year Plan, and the contents of the Plan will be very significant in terms of the outlook for China's economic and social policies over the coming years. In addition, the Long-Range Objectives include long-term goals to 2035. The 14th Five Year Plan can be understood as a milestone toward the realization of these long-term goals.

How, then, are China's industrial technology policy and the Dual Circulation Strategy positioned in the 14th Five-Year Plan? And what are their contents? From this perspective, this chapter first reviews the background of the proposed Dual Circulation Strategy and then examines its policy positioning and content, also comparing it to the 13th Five-Year Plan (2016–2020). The objective of this chapter is to examine the direction of the Dual Circulation Strategy on this basis; we will also examine the policies of the Chinese government and the views of experts.

1.1 Policy Development Regarding the Dual Circulation Strategy

The Dual Circulation Strategy was first raised at the central level in April 2020 in a speech by President Xi Jinping at the 7th meeting of the Central Financial and Economic Affairs Commission, entitled "Several Major Issues in the National Medium and Long Term Economic and Social Development Strategy." The speech was published in the November 1, 2020 issue of the CCP's official journal, *Qiushi*, No. 21, 2020[2].

[1] The full text of the Outline of the 14th Five-Year Plan and Long-Range Objectives Through the Year 2035 is available on the website of the Central People's Government of the People's Republic of China at http://www.gov.cn/xinwen/2021-03/13/content_5592681.htm.

[2] Xi Jinping, "Several Major Issues in the National Medium and Long Term Economic and Social Development Strategy," *Qiushi* (No. 21, 2020), November 1, 2020 (http://www.qstheory.cn/dukan/qs/2020-10/31/c_1126680390.htm).

In his speech, President Xi stated that he had considered the nation's medium- to long-term economic and social development in connection with infection prevention and control and identified six critical issues: ① implementation of strategies to expand domestic demand; ② optimization and stabilization of industrial and supply chains; ③ development of urbanization strategies; ④ adjustment and optimization of science and technology input and output structures; ⑤ realization of harmonious coexistence between people and nature; and ⑥ strengthening of the public health system.

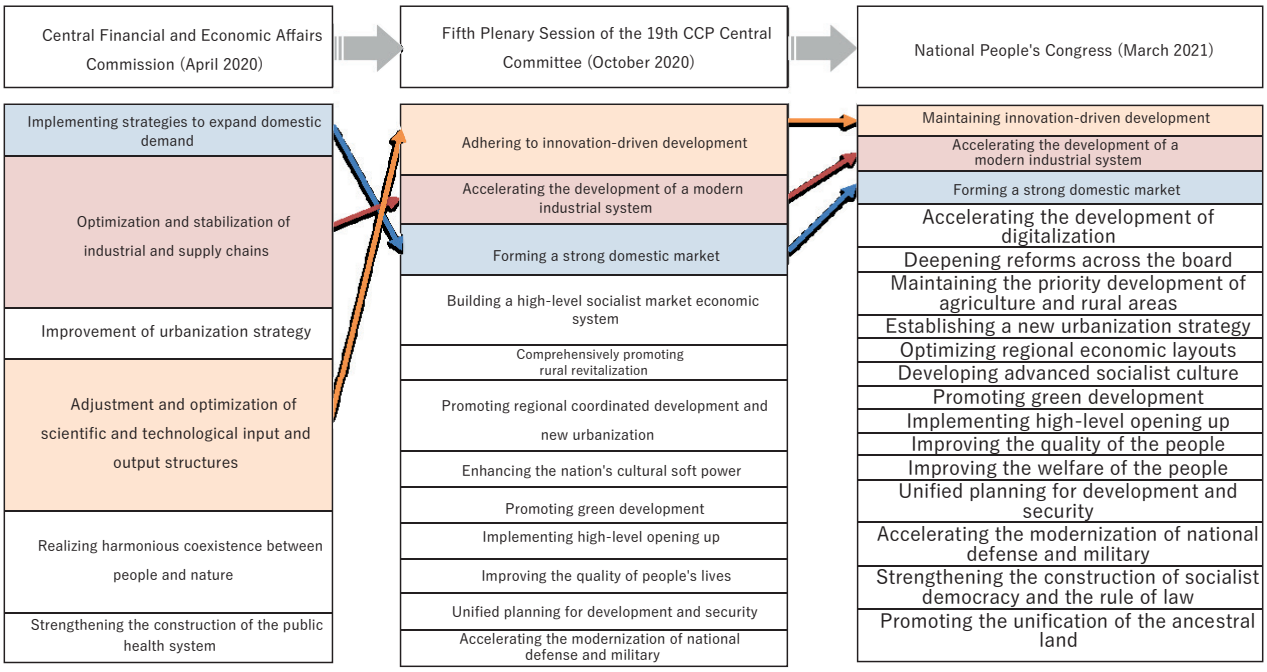
Of these, ①, ②, and ④ are noteworthy from the perspective of industrial technology policy and the Dual Circulation Strategy. These three issues are lessons that have emerged from the U.S.–China friction, and they suggest approaches to breaking away from dependence on the U.S. by accelerating the shift to increased domestic demand, rebuilding industrial and supply chains anew, and promoting the domestic production of technology (Table 1-1).

Table 1-1: Summary of President Xi's Speech at the 7th Meeting of the Central Financial and Economic Affairs Commission

	Item	Main contents
①	Implementing strategies to expand domestic demand	This is necessary for the retention of long-term, sustainable and healthy development of the Chinese economy. It is advantageous for constructing a new development structure in which general domestic circulation is the main component and the domestic and international dual circulations mutually promote each other, as well as for forming new advantages in participation in international competition and cooperation.
②	Optimization and stabilization of industrial and supply chains	China must develop its strengths, improve and strengthen the world-leading position of its dominant industries, enhance the dependence of international industrial chains on China, and form a strong counter and deterrent capability against artificial supply cutoffs on the part of foreign countries. China must compensate for its weak points; build independent, controllable, safe, and reliable domestic production and supply systems in areas and nodes related to national security, capable of self-cycling at critical times; and ensure the normal operation of the economy even under extreme circumstances.
③	Adjustment and optimization of scientific and technological input and output structures	China must optimize the allocation of scientific and technological resources, improve scientific and technological innovation capacity, and follow a path of scientific and technological R&D that is consistent with China's national conditions. We should create a new mechanism for applying scientific and technological advances, with enterprises being the main actors and the government coordinating the efforts of all sides to solve both the "first mile" problem of conducting basic research and the "last mile" problem of commercializing and applying advances so as to ensure that innovation and value chains are effectively connected among businesses, universities, and research institutes.

Source: Xi Jinping, "Several Major Issues in the National Medium and Long Term Economic and Social Development Strategy," *Qiushi* (No. 21, 2020) (prepared by the author).

The strategic direction laid out in the speech is reflected in the CPC Central Committee's proposals for the formulation of the 14th Five-Year Plan (2021–2025) for National Economic and Social Development and the Long-Range Objectives Through the Year 2035, discussed and adopted at the Fifth Plenary Session of the 19th CCP Central Committee in October 2020, and in the Outline of the 14th Five-Year Plan and Long-Range Objectives to 2035, discussed and adopted by the National People's Congress in March 2021 based on the CPC Central Committee's proposals, in the items "adhering to innovation-driven development," "accelerating the development of a modern industrial system," and "forming a strong domestic market" (Figure 1-1).



Source: Several Major Issues in the National Medium and Long Term Economic and Social Development Strategy (April 2020); Recommendations of the CPC Central Committee for Formulating the 14th Five-Year Plan and Long-Range Objectives for 2035 (October 2020); Outline of the 14th Five-Year Plan and Long-Range Objectives to 2035 (March 2021) (prepared by the author).

Figure 1-1: Trends in China's Policy Development

1.2 Industrial Technology Policy and the Dual Circulation Strategy in the 14th Five-Year Plan

1.2.1 Positioning in the Plan

How are industrial technology policy and the Dual Circulation Strategy positioned in the structure of the 14th Five-Year Plan? Let us look at this question by comparing it to the 13th Five Year Plan. While Part I in both documents is a general discussion and the remainder a discussion of each topic, Part II goes on to focus on "innovation-driven development" as a technology policy. Next, in Part III, industrial policy is listed as "accelerating the development of a modern industrial system" in the form of integrating the optimization of the industrial system with the construction of infrastructure networks. In addition, "forming a strong domestic market" was newly established in Part IV of the 14th Five Year Plan as part of the Dual Circulation Strategy. In terms of policy, it can be seen that industrial technology policy and

the Dual Circulation Strategy are given high priority (Table 1-2).

Table 1-2: Structure of the 14th Five-Year Plan Compared to the 13th Five-Year Plan

13th Five-Year Plan (2016–2020)		14th Five-Year Plan (2021–2025)	
Part	Item	Part	Item
Part I	Guiding Thinking, Major Objectives, and Development Philosophy	Part I	Embarking on the New Journey to Build China into a Modernized Socialist Country in an All-Round Way
Part II	Innovation-Driven Development	Part II	Adhering to Innovation-Driven Development
Part V	An Optimized Modern Industrial System	Part III	Accelerating the Development of a Modern Industrial System
Part VII	Modern Infrastructure Networks		
		Part IV	Forming a Strong Domestic Market
Part VI	The Cyber Economy	Part V	Accelerate Digitalization-Based Development
Part III	New Systems for Development	Part VI	Comprehensively Deepening Reforms
Part IV	Agricultural Modernization	Part VII	Adhering to Prioritizing the Development of Agriculture and Rural Areas
Part XIII	The Fight Against Poverty		
Part VIII	New Urbanization	Part VIII	Improving the New Urbanization Strategy
Part IX	Development Coordinated Between Regions	Part IX	Optimizing Regional Economic Layouts
Part XVI	Socialist Cultural and Ethical Progress	Part X	Developing Advanced Socialist Culture
Part X	Ecosystems and the Environment	Part XI	Promoting Green Development
Part XI	All-Round Opening Up	Part XII	Putting High-Level Opening Up to the Outside into Practice
Part XIV	Better Education and Health for All Citizens	Part XIII	Improving the Quality of Citizens
Part XV	Support for Public Wellbeing	Part XIV	Enhancing the People's Livelihoods
Part XVII	Better and More Innovative Social Governance	Part XV	Coordinating Development and Security
Part XIX	Coordinated Economic and Defense Development	Part XVI	Accelerating National Defense and Armed Forces Modernization
Part XVIII	Socialist Democracy and Rule of Law	Part XVII	Strengthening the Construction of Socialist Democracy and Rule of Law

Part XII	Deeper Cooperation Between the Mainland, Hong Kong, Macao, and Taiwan	Part XVIII	Promoting the Reunification of the Motherland
Part XX	Implementation	Part XIX	Implementation

Source: Outline of the 13th Five-Year Plan (March 2016) and Outline of the 14th Five-Year Plan and Long-Range Objectives to 2035 (March 2021) (prepared by the author)

1.2.2 Contents of Each Document

Let us examine the sections containing the industrial technology policy and the Dual Circulation Strategy in the 14th Five-Year Plan and compare them with corresponding sections in the 13th Five-Year Plan.

(1) Technology Policy

Part II, "Adhering to Innovation-Driven Development and Comprehensively Fashioning New Development Advantages," sets out the basic direction for technology policy: "We will adhere to the core position of innovation in China's overall modernization and be oriented toward the world's cutting edge in S&T, toward the main economic battlefields, toward the nation's major needs, and toward the lives and health of the people. We will deeply implement the strategy of reinvigorating China through science and education, the talent powerhouse strategy, and the innovation-driven development strategy; refine the national innovation system; and speed up the effort to make China into an S&T powerhouse " and points out that "we will make scientific and technological self-reliance act as strategic support for national development."

Table 1-3: Composition Related to Innovation-Driven Development

13th Five-Year Plan				14th Five-Year Plan			
Part	Item	Chapter	Item	Part	Item	Chapter	Item
Part II	Innovation-Driven Development	Chapter 6	Ensure Innovation in Science and Technology Takes a Leading Role	Part II	Adhering to Innovation-Driven Development and Comprehensively Fashioning New Development Advantages	Chapter 4	Strengthening the Nation's Strategic S&T Power
		Chapter 7	Encourage Public Startups and Innovations			Chapter 5	Improving the Technological Innovation Capability of Enterprises
		Chapter 9	Prioritize Human Resource Development			Chapter 6	Stimulating the Innovative Vitality of Talent
		Chapter 8	Establish Innovation Promoting Institutions and Mechanisms			Chapter 7	Refining S&T Innovation Institutions and Mechanisms
		Chapter 10	Open Up New Space for Drivers of Development				

Source: Outline of the 13th Five-Year Plan (March 2016) and Outline of the 14th Five-Year Plan and Long-Range Objectives to 2035 (March 2021) (prepared by the author)

Part II consists of four chapters: (1) Strengthening the Nation's Strategic S&T Power, (2) Improving the Technological Innovation Capability of Enterprises, (3) Stimulating the Vitality of Human Resource Innovation, and (4) Refining S&T Innovation Institutions and Mechanisms (Table 1-3). The main points of each chapter are as given below. In addition, the 13th Five Year Plan included in Chapter 10, "Open Up New Space for Drivers of Development," the promotion of consumption sophistication, expansion of effective investment, and cultivation of new export advantages, but as described below, this chapter has been moved to Part IV, "Forming a Strong Domestic Market," which is the Dual Circulation Strategy in the 14th Five-Year Plan.

(1) Strengthening the Nation's Strategic S&T Power

The country will "formulate an action agenda for becoming an S&T powerhouse, improve the new structure for leveraging national capabilities under the conditions of the socialist market economy, successfully fight tough battles for key and core technologies, and raise the overall effectiveness of the innovation chain."

The country will "implement a ten-year action plan for basic research and focus on deploying a number of basic discipline research centers." In addition, the proportion of basic research funding as a portion of R&D funding will be raised to over 8%

(2) Improving the Technological Innovation Capability of Enterprises

The country will develop mechanisms to guide the market for technological innovation, strengthen the position of enterprises as innovation actors, promote the accumulation of various innovation elements in enterprises, and form a technological innovation system that deeply integrates industry–academia–government collaboration (enterprises, universities, research institutions, and commercialization sectors), with enterprises as the main actors and the market as the guide. The integration of various innovation elements into enterprises will be promoted.

Companies will be encouraged to invest more in R&D; preferential policies such as additional tax credits for R&D expenses and tax incentives for high-tech companies will be more strongly implemented.

(3) Stimulating the Vitality of Human Resource Innovation

"We will implement policies that respect labor, knowledge, talent, and creativity; deepen the reform of the talent development institutions and mechanisms; comprehensively cultivate, recruit, and make good use of talent; and give full play to the role of talent as the number-one resource."

The deepening of innovation, entrepreneurship, and creativity will be promoted, and the construction and deployment of model centers for mass entrepreneurship and innovation will be optimized.

(4) Refining S&T Innovation Institutions and Mechanisms

"We must deeply promote reform of S&T institutions; improve the national S&T governance system; optimize the national S&T planning system and operating mechanisms; and promote the integrated allocation of projects, bases, talent, and funds in key fields."

In order to improve the IP protection and operation system, IP strategy and a strict IP protection

system will be implemented, IP-related laws and regulations will be improved, and IP legislation in new fields and new industries will be accelerated.

Looking at key indicators related to innovation drive in the 14th Five-Year Plan period, the growth rate of R&D expenditures was set at an annual average of at least 7%. At a press conference on the closing day of the National People's Congress on March 11, 2021, Premier Li Keqiang pointed out that "Our R&D spending as a percentage of GDP is still modest, especially in terms of basic research. It only accounts for six percent of total R&D spending whereas the number in developed countries ranges between 15 to 25%," and then stated, "We will continue to increase input in basic research. We will also carry out institutional reforms regarding science and technology[3]."

The number of invention patents held (per 10,000) was 12, the same as the 13th Five Year Plan in terms of quantity, but limited to "high value-added" invention patents. In light of the fact that it is often pointed out that the number of applications for invention patents in China is high but the value of patents is still not particularly high, the government has indicated its intention to emphasize quality in invention patents as well.

In addition, instead of indicators such as the contribution rate of scientific and technological progress and the internet penetration rate, a new indicator has been set to increase the proportion of added value of core industries in the GDP from 7.8% in 2020 to 10% by 2025 (Table 1-4).

Table 1-4: Key Innovation-Driven-Related Indicators

13th Five-Year Plan					14th Five-Year Plan			
Indicator		2015	2020	Average annual growth rate [cumulative].	Indicator	2020	2025	Average annual growth rate [cumulative]
Degree of R&D investment (%)		2.1	2.5	[0.4]	Growth rate of R&D expenses (%)	-	-	>7
Number of invention patents held (per 10,000 persons)		6.3	12	[5.7]	Number of high value-added invention patents held (per 10,000 persons)	6.3	12	-
Contribution of scientific and technological progress (%)		55.3	60	[4.7]	Value added by core digital-economy industries as % of GDP (%)	7.8	10	-
Internet penetration rate (%)	Cable	40	70	[30]				
	Mobile	57	85	[28]				

Source: Outline of the 13th Five-Year Plan (March 2016) and Outline of the 14th Five-Year Plan and Long-Range Objectives to 2035 (March 2021) (Prepared by the author)

[3] Central People's Government of the People's Republic of China Website, March 11, 2021 (http://www.gov.cn/zhuanti/2021qglhzb/live/20210311bzljzh8672915.html).

(2) Industrial Policy

Part III, "Accelerating the Development of a Modern Industrial System and Strengthening the Foundations of the Real Economy," is the industrial policy. It sets forth the basic policy of "firmly placing the focus of economic development on the real economy, accelerating the promotion of the construction of a manufacturing powerhouse and quality powerhouse, promoting the advanced integration of advanced manufacturing and modern service industries, strengthening the supporting and leading role of infrastructure, and establishing a modern industrial system."

① In-depth implementation of the manufacturing powerhouse strategy

To maintain independent controllability, safety, and high efficiency, the upgrading of the industrial base and modernization of the industrial chain will be promoted, the basic stability of the weight of the manufacturing industry will be maintained, the competitive advantages of the manufacturing industry will be strengthened, and the quality development of the manufacturing industry will be promoted.

As part of this initiative, the construction of basic industrial capabilities will be strengthened. In order to achieve this goal, industrial infrastructure reconstruction projects will be implemented, and efforts will be accelerated to close bottlenecks and shortcomings in basic parts, basic software, basic materials, basic processes, and industrial technology infrastructure.

In addition, to improve the modernization level of industrial chains and supply chains, the combination of economy and safety will be maintained. The intention is to compensate for weaknesses; forge strengths; and implement industry-specific supply chain strategies and precise measures to form industrial chains and supply chains with stronger innovative capabilities, higher added value, and enhanced safety and reliability. Cooperation in international industrial safety will be strengthened, and the diversification of industrial chains and supply chains promoted.

A service sector value-added ratio (ratio of tertiary industry to GDP) was set in the 13th Five Year Plan. This ratio has not been raised in the 14th Five-Year Plan. Instead, a policy of maintaining "the basic stability of the weight of the manufacturing industry" has been adopted. While China had been emphasizing the development of its service industry to advance its industrial structure, it appears that, in light of the risk of decoupling between the United States and China, the country has once again come to the conclusion that it needs to further strengthen its manufacturing industry.

② Development and expansion of strategic emerging industries

Focusing on anticipating future industrial development, China plans to foster leading and pillar industries; the development of fusion and clustering, and the ecological development of strategic emerging industries. It has been planned to increase the share of added value contributed by strategic emerging industries to over 17% of GDP.

③ Promoting the growth and development of the service industry

The plan focuses on the needs of industrial transformation and upgrading, along with the enhancement of consumption by the public. The aim is to expand the effective supply of the service industry; improve service efficiency and service quality; and build new systems of high-quality, highly efficient, structure-

optimized, and competitive service industries.[4]

④ Construction of modernized infrastructure system

The construction of conventional and new infrastructure is to be promoted in a unified manner, and modernized infrastructure systems must be built. These systems are to be highly organized, well-developed, highly efficient, practical, smart, green, safe, and reliable[4].

1.2.3 Dual Circulation Strategy

Part IV, "Forming a Strong Domestic Market and Building the New Development Pattern," corresponds to the Dual Circulation Strategy. It sets out the following basic policies: adhering to the strategic foundation of expanding domestic demand; accelerating the development of improved domestic demand systems; organically combining the implementation of domestic demand expansion strategies with the deepening of supply-side structural reforms; leading and creating new demand through innovation-driven, high-quality supply; accelerating the construction of new development structures centered on general domestic circulation; and mutually promoting domestic and international dual circulation. It is apparent that the country is aiming to curb its dependence on the U.S. by launching a new development model based on the Dual Circulation Strategy and accelerating the expansion of domestic demand as a response to the U.S.–China confrontation, which is expected to be prolonged.

[4] The new infrastructure was raised at the Central Economic Work Conference in December 2018. The Conference set forth policies to accelerate the practical application of the 5G mobile communication system (5G) and accelerate the construction of new types of infrastructure such as AI, industrial Internet, and IoT to promote the formation of a strong domestic market.

Table 1-5: Composition of domestic market formation

13th Five-Year Plan					14th Five-Year Plan				
Item	Chapter	Item	Section	Item	Item	Chapter	Item	Section	Item
Innovation-Driven Development	Chapter 10	Open Up New Space for Drivers of Development			Forming a Strong Domestic Market and Building the New Development Pattern	Chapter 12	Facilitating general domestic circulation	Section 1	Increasing the adaptability of the supply system
								Section 2	Promoting the smooth flow of resources and factors
								Section 3	Strengthening the supporting role of the circulation system
								Section 4	Improving policy systems that promote general domestic circulation
			Section 3	Fostering new export advantages		Chapter 13	Promoting domestic and international dual circulation	Section 1	Promoting the coordinated development of imports and exports
								Section 2	Raising the level of international two-way investment
			Section 1	Comprehensively promoting consumption		Chapter 14	Fostering and accelerating the development of a well-developed domestic demand system	Section 1	Overall promotion of consumption
			Section 2	Expansion of effective investment				Section 2	Developing the investment space

Source: Outline of the 13th Five-Year Plan (March 2016) and Outline of the 14th Five-Year Plan and Long-Range Objectives to 2035 (March 2021) (prepared by the author)

Part IV consists of three chapters: ① "Facilitating General Domestic Circulation, ② Promoting Domestic and International Circulation, and ③ Strategies to Boost Domestic Demand (Table 1-5). The key points of each chapter are presented below; ② and ③ have been adapted from "Chapter 10: Open Up New Space for Drivers of Development" in the implementation of the innovation-driven development strategy in the 13th Five Year Plan, as mentioned above.

(1) Facilitating general domestic circulation

Relying on a strong domestic market, the intention is to create a higher level of dynamic balance across all stages of production, distribution, circulation and consumption, in which demand drives supply and supply creates demand, thereby promoting a virtuous cycle in the national economy.

As part of this initiative, supply-side structural reforms will be deepened to improve the adaptability of the supply system and the ability of supply to adapt to and drive the creation of new demand. In addition,

to strengthen the support functions of the distribution system, distribution system reforms will be deepened so as to facilitate distribution channels for products and services, improve distribution efficiency, and reduce transaction costs for society as a whole.

(2) Promotion of domestic and international dual circulation

On the basis of general domestic circulation, the state will cooperatively promote the construction of a strong domestic market and trade powerhouse; form a strong gravitational field of global resource elements; promote the coordinated development of domestic and foreign demand, imports and exports, foreign capital introduction and outward investment; and accelerate the cultivation of new advantages to participate in international cooperation and competition.

In promoting the cooperative development of imports and exports, China will reduce import tariffs and institutional costs; expand imports of high-quality consumer goods, advanced technology, key equipment, and energy resources; and promote the diversification of import sources. It will also develop export policies to optimize the quality and structure of export commodities and steadily increase their added value. Furthermore, it is planned to innovate the development of trading in services, to promote the construction of pilot and opening platforms for innovation and development of trading in services, and to increase the level of trade digitalization.

In improving the level of international two-way investment, it is intended to adhere to compatibility between the introduction of foreign capital and overseas expansion; efficiently utilize global resource elements and market space through high-level two-way investment; develop industrial chain and supply chain guarantee mechanisms; and promote the improvement of industrial competitiveness.

(3) Accelerating the development of a well-developed domestic demand system

Strategies will be implemented to expand domestic demand in an in-depth manner; strengthen the fundamental role of consumption in economic development and the key role of investment in optimizing the supply structure; and build a strong domestic market with strong demand for consumption and investment.

In the overall promotion of consumption, the plan is to adapt to the increasing sophistication of consumption by the public; link the expansion of consumption to the improvement of people's quality of life; promote the development of green, healthy, and safe consumption; and steadily enhance levels of consumption by the public. The Plan also calls for improvements to established patterns of consumption; accelerating the shift from purchase management to usage management of consumer goods such as automobiles; developing recovery and disposal systems for durable consumer goods; and promoting the development of home consumption.

In addition, new types of consumption will be fostered; information consumption, digital consumption, and green consumption will be developed; and the development of new business models and formats will be encouraged. In addition, the consumption of services will be developed, improvements to the quality of consumption will be promoted, as will expansion of its quantity; and the development of online and offline convergence will also be accelerated.

Meanwhile, in the development of the investment space, the government will accelerate complementary

supports for vulnerable areas. These include infrastructure, agriculture and rural areas, public safety, ecological and environmental protection, public health, disaster prevention and mitigation, and civilian security. Investment in strategic emerging industries will be expanded. The Plan will also promote the construction of key projects such as new types of infrastructure, new types of urbanization, and transportation and water conservation.

1.3 Direction of the Dual Circulation Strategy

So far, we have examined the policy positioning and content of the industrial technology policy and the Dual Circulation Strategy in the 14th Five-Year Plan. In what direction, then, does the Chinese government intend to promote its Dual Circulation Strategy? This section will review developments at the Ministry of Commerce related to the Dual Circulation Strategy.

1.3.1 "14th Five-Year Plan (2021–2025)" Commercial Development Plan

On July 8, 2021, the Ministry of Commerce released the 14th Five-Year Plan (2021–2025) for Commerce[5]. The basic policy concerning commercial policy until 2025 was set forth. In the plan, the Dual Circulation Strategy is positioned in Chapter 2: Contribution to the Construction of a New Development Structure. In Section 1, "Facilitating general domestic circulation," the chapter states that the government will work to promote consumption, develop a modern distribution system, improve the quality of supply, and support rural development to promote the formation of a virtuous circle in the national economy, relying on a strong domestic market.

Meanwhile, Section 2, "Promotion of domestic and international dual circulation," indicates approaches to be taken in stabilizing the basic foundation for foreign trade and foreign capital, raising the level of two-way investment, and the smooth operation of industrial and supply chains. These approaches are positioned in a policy framework of actively promoting the coordinated development of domestic demand and foreign demand, imports and exports, and the introduction of foreign capital and outward investment and accelerating the development of new advantages in participating in international cooperation and competition.

1.3.2 "Three Important" Categories and "5+5" Activities

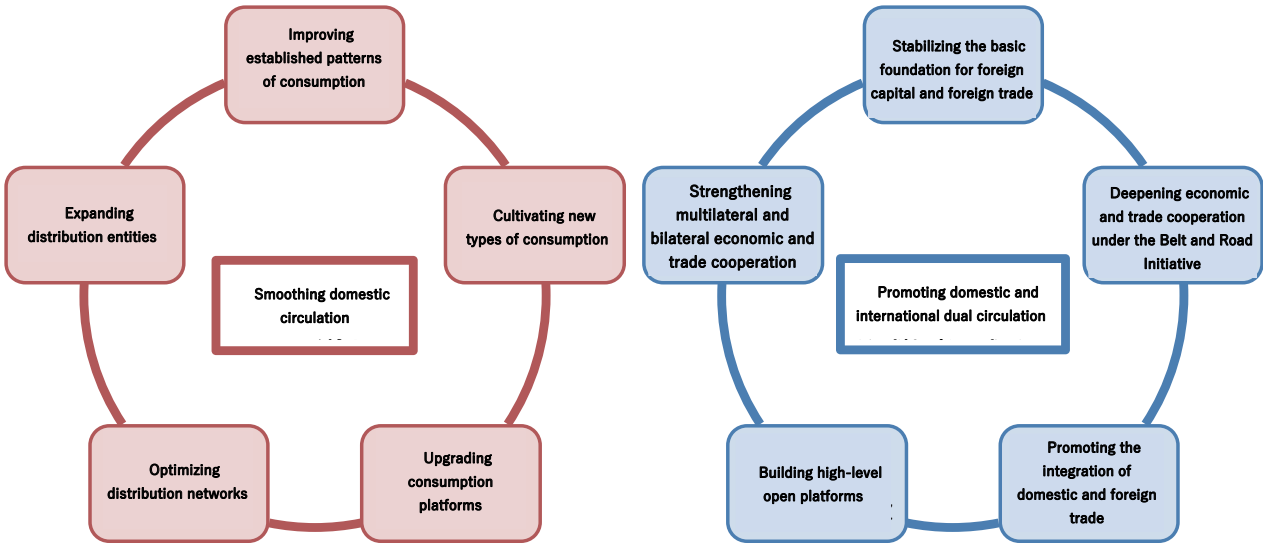
As a measure to promote this basic policy, a noteworthy statement was made by Commerce Minister Wang Wentao at a press conference held on August 23, 2021 under the theme of "The Role and Contribution of Foreign Investment in China's Building a Moderately Well-off Society in All Respects." The conference was hosted by the State Council Information Office[6]. Wang stated that the Ministry of Commerce has positioned commercial activities into "Three Important" categories: ① as an important

[5] Ministry of Commerce, Notice on the 14th Five-Year Plan for Commerce, July 8, 2021 (http://www.mofcom.gov.cn/article/zwgk/gztz/202107/20210703174101.shtml)

[6] Website of the State Council Information Office, August 23, 2021 (http://www.scio.gov.cn/xwfbh/xwbfbh/wqfbh/44687/46624/wz46626/Document/1710966/1710966.htm)

part of domestic general circulation (domestic trade); ② as an important hub connecting domestic and international dual circulation (foreign trade, foreign capital, domestic trade); and ③ playing an important role within the new development framework. The Ministry of Commerce has divided its specific activities for 2021 into "5+5" initiatives.

Specifically, the "Three Important' categories cover five key activities in "smoothing domestic circulation" (i.e., ① improving established patterns of consumption, ② cultivating new types of consumption, ③ upgrading consumption platforms, ④ optimizing distribution networks, and ⑤ expanding distribution entities). They also cover five key activities in "promoting domestic and international dual circulation" (i.e., ① stabilizing the basic foundation for foreign capital and foreign trade, ② deepening economic and trade cooperation under the Belt and Road Initiative, ③ promoting the integration of domestic and foreign trade, ④ building high-level open platforms, and ⑤ strengthening multilateral and bilateral economic and trade cooperation). Taken together, these activities constitute the basic essentials of commercial activities (Figure 1-2). The Dual Circulation Strategy is expected to be carried forward along these lines



Source: Statement by Wang Wentao, Minister of Commerce, at a press conference hosted by the State Council Information Office, August 23, 2021 (prepared by the author).

Figure 1-2: "5+5" Activities in the Dual Circulation Strategy

1.4 Experts' Views on the Dual Circulation Strategy

How do Chinese experts view the Dual Circulation Strategy? Let me share with you the views of a prominent Chinese researcher, Zhang Yunling, Professor and Academy Member, Chinese Academy of Social Sciences. Prof. Zhang gave the keynote speech at the 2021 Northeast Asia International Conference for Economic Development (NICE) in Niigata on January 22, 2021. The speech was titled "Northeast Asia in a New Context: the Key is Cooperation"[7]. In it, Prof. Zhang addressed the new strategy called

[7] The event was organized by the NICE Executive Committee (Niigata Prefecture, Niigata City, and the Economic Research Institute for Northeast Asia (ERINA)).

"Dual Circulation," making the following points. This strategy had already been discussed for years. It is important to understand that China cannot continue an economic growth model that relies heavily on exports. Rather than relying on foreign countries, China must mobilize domestic economic resources and markets to achieve more innovation.

Prof. Zhang then noted that "Nevertheless, this is not an inward-looking strategy, but an outward-looking development strategy." Dual Circulation is a different approach to thinking about China's relationship with the rest of the world. Until now, China has relied heavily on foreign markets. In the future, China will be linked to the outside world in new ways while becoming more dependent on its domestic market.

On the other hand, Prof. Zhang, stated, China may move closer to the U.S., who is a major importer and foreign investor. However, this economic transition will probably take a long time. At the very least, it will take 20 years[8].

Conclusion

It can be seen that the industrial technology policy and Dual Circulation Strategy in the 14th Five-Year Plan were formulated from a medium- to long-term perspective, taking into account the changes in the domestic and international environment during the five years of the 13th Five Year Plan and looking ahead to the next five years. As for changes in the external environment, it goes without saying that the biggest factor is the escalation of the U.S.–China conflict. The 14th Five-Year Plan outlines various policies aimed at breaking away from dependency on the U.S., which draw on lessons already learned from frictions between the U.S. and China. These policies include domestic production of technology through self-reliance and self-reinforcement of science and technology; restructuring of industrial chains and supply chains by maintaining the basic stability of the weight of the manufacturing industry; and expansion of domestic demand through a new "Dual Circulation" development model.

However, China is by no means turning inward. In anticipation of a prolonged confrontation between the U.S. and China, a high-level opening-up to the outside world was launched when the RCEP came into force in January 2022. China has also indicated its intention to promote the conclusion of more high-standard FTAs, for example, by applying for accession to the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) on September 16, 2021.

On the other hand, in regard to internal environmental changes, a major policy issue is identifying ways to respond to the decline in the working-age population owing to the falling birthrate and aging population. As labor input declines, productivity growth will be essential to curb the decline in economic growth. The 14th Five-Year Plan's initiatives to this end include the promotion of innovation and digitalization, with indicators such as an average annual growth rate of at least 7% in R&D expenditures and an increase in the share of the added value of core industries in the digital economy to 10% of GDP by 2025.

China prioritized its industrial technology policy and Dual Circulation Strategy while promoting the economic and social policies set forth in the 14th Five-Year Plan. From a medium- to long-term

[8] ERINA "ERINA Report Plus" No. 160 (June 2021) (https://www.erina.or.jp/wp-content/uploads/2021/12/er160_tssc.pdf)

perspective, China will steadily take steps toward its long-term goal of "basic realization of socialist modernization" by 2035. The proof of this goal will be "achieving a GDP per capita level of a medium-developed country."

2 Industrial Technology Policy Following "Made in China 2025"

Tomoo Marukawa

Foreword

In March 2021, China's National People's Congress adopted the Outline of the 14th Five-Year Plan (2021–2025) and Long-Range Objectives Through the Year 2035, which notably made no mention of the "Made in China 2025" policy. "Made in China 2025" was promulgated by the State Council in 2015, setting the target year as 2025, as per its title. In other words, China aimed to become a "manufacturing powerhouse" by 2025 to be able to "achieve independent assurance" of 40% of supply of "core basic components and key basic materials" by 2020 and to achieve a 70% "independent assurance" rate by 2025. "Made in China 2025" was incorporated as a core part of industrial policy in the 13th Five-Year Plan (2016–2020). Since the target year of "Made in China 2025" is 2025, one would naturally have expected to see it mentioned in the 14th Five-Year Plan. What, then, has become of "Made in China 2025"? What changes have occurred in China's industrial technology policy as a result of its disappearance from the Five-Year Plan? To illuminate these points, this chapter identifies recent changes in China's industrial technology policy based on the case of China's industrial policy, in general, and two industries, in particular: integrated circuits and new energy vehicles / automated driving.

2.1 "Made in China 2025" is a dead letter.

The fact that there was no reference to "Made in China 2025" in the Five-Year Plan suggests that it is already a dead letter. In fact, as of 2018, the Chinese government had reportedly instructed Chinese media to refrain from reporting on it[9]. Also, references to "Made in China 2025" by party and government officials have declined dramatically since. The Chinese government's motivation for retracting "Made in China 2025" was clear: the U.S. Trump administration was vehemently opposed to the policy. In an October 2018 speech, Secretary of State Mike Pompeo even accused China of demonstrating ambitions to control 90% of the world's high-tech industries. He was not alone in levelling such accusations.

However, "Made in China 2025" contained 19 implementation plans for each industry and issue[10]. If they are still in effect, then "Made in China 2025" is essentially continuing. Most of the 19 implementation plans ran through 2020. Therefore, it will be clear whether or not "Made in China 2025" is substantially still in effect by looking at whether or not such plans have been promulgated post-2021. The most important of

[9] *South China Morning Post*, June 26, 2018

[10] Tomoo Marukawa, "The Development of China's Industrial Policy and 'Made in China 2025'," *Japanese Journal of Comparative Economics*, Vol. 57, No. 1 (2020).

the 19 implementation plans was the "Technology Roadmap for Priority Areas," which set out specific domestic production targets for each industry and product and was to be updated every few years. Revised 2015 and 2017 editions were indeed created, but there have been no updates since then. The website of the Strategic Advisory Committee for Building a National Manufacturing Powerhouse, which prepares this roadmap (www.cm2025.org), has shown little activity since 2018, and the roadmap is unlikely to be updated.

In November and December 2021, the Ministry of Industry and Information Technology announced its plans for the 14th Five-Year Plan period for nine industries. Of these, only the plan for the robotics industry appears to be a continuation of the 19 implementation plans created under "Made in China 2025." Fourteen of the 19 implementation plans had no successor as of January 2022, even though 2020 was the final year of the plan. In this sense, "Made in China 2025" can be judged to be virtually a dead letter in substantive as well as de-facto terms.

However, that is not at all to say that the Chinese government will not take steps to develop its high-tech industry. The 14th Five-Year Plan includes chapters on implementing the "Manufacturing Powerhouse Strategy" and developing "strategic emerging industries." Since "Made in China 2025" is a combination of these two policies, it can be said that the *spirit* of the plan lives on in the 14th Five-Year Plan, albeit with different names and phrasing.

2.2 Non-Existence of the National Standardization Development Outline 2035

In regard to China's industrial technology policy, there is a persistent view outside the country that China is strategically using technology standards to achieve technological hegemony. For example, in January 2022, The Nihon Keizai Shimbun and other publications claimed that the Chinese government is aiming for hegemony in advanced technology by carrying out a strategy called "National Standardization Development Outline 2035" to make Chinese companies' technology the international standard[11]. However, these reports contained a number of errors. First, the Chinese government has never promulgated a policy called "National Standardization Development Outline 2035." It is true that the Chinese government's National Standardization Management Committee had been working on a research project called "National Standardization Development Outline 2035" in the past, and it was reported that it would soon promulgate a policy with such a name in 2018[12]. However, this project ended in January 2020. The National Standardization Development Strategy Study was initiated to succeed that study[13] and the "National Standardization Development Outline" was promulgated in October 2021.

In other words, there is no longer any possibility of a "National Standardization Development Outline 2035" since the "National Standardization Development Outline" has been promulgated in its place. The

[11] *Nihon Keizai Shimbun*, January 5, 2022; Nikkei Electronic Edition, January 16, 2022, etc.

[12] *Economic Daily*, January 11, 2018.

[13] National Standardization Management Committee, "National Standardization Development Outline 2035" Item Discussion Meeting and National Standardization Development Strategy Study Item Orientation Meeting in Beijing, January 15, 2020.

Chinese government's motivation for changing the name to "National Standardization Development Outline" was probably to refrain from issuing a policy with a similar name to "Made in China 2025" because of the backlash against China's perceived bid for technological hegemony.

There are four key points in the National Standardization Development Outline. First, a shift from government-led standardization to the creation of standards coming from both the government and the market; second, expanding standardization not only in the areas of industry and trade but also in the economy and society overall; third, evolving standardization from its domestic focus to cover both domestic and international arenas; and fourth, emphasizing quality and effectiveness rather than simply pursuing standardization projects in number.

The main content of the outline as a listing of the areas in which standardization must be promoted is organized into four major categories: science and technology, industry, environment, and urban/rural construction. For example, in environment-related areas, the outline calls for standards for calculating carbon dioxide emissions, for the labeling of low-emission products, for ecological recycling agriculture, and for agricultural product safety.

The outline also states that openness in standardization must be promoted. For example, China should participate in the creation of United Nations standards on civilian welfare, wellbeing, gender equality, and good-quality education, thereby contributing to the realization of the Sustainable Development Goals (SDGs). In addition, the country should actively adopt international standards and promote mutual recognition of standards between China and foreign countries to increase the degree of convergence between Chinese and international standards. It also sets a goal of increasing the rate of conversion of international standards into Chinese standards to at least 85% by 2025.

It is difficult to read from this outline any intention to impose the standards of Chinese companies as international standards. If anything, it emphasizes a liberal position of removing technical barriers to trade by having China adopt international standards. The outline also includes the phrase "actively participate in international standardization activities," which can be interpreted as an indication of China's intention to increase its influence over international standards.

In any case, however, one cannot read from this outline any intention on China's part to achieve technological hegemony. In the 2G cell-phone era, Japan unsuccessfully tried to compete with Europe's GSM, which had become the global de-facto standard, using the Japanese standard PDC. As a result, Japanese cell-phone makers, which had been among the top-ranked in terms of global market share in the early 1990s, followed the path of "Galapagosization" and lost their international competitiveness. The Japanese media, traumatized by that bitter experience, seems to have a tendency to immediately think of the strategic use of technical standards. However, the outline does not argue for the strategic use of technology standards but rather takes the optimistic attitude that promoting market opening by aligning domestic and foreign standards insofar as possible will lead to increased national competitiveness.

2.3 Industrial Policy for the Integrated Circuit Industry

Below, we will examine recent trends in industrial technology policy, focusing on integrated circuits (ICs) and new energy vehicles / automated driving. Both are "strategic emerging industries" and have seen

significant growth in recent years. In 2021, the production of new energy vehicles grew 2.5 times faster than the previous year, industrial robot production grew 45%, and integrated circuit production grew 33%, indicating rapid growth in strategic emerging industries. Let us start with the IC industry.

The Chinese government has made an extraordinary commitment to domestic production of ICs, having promulgated the "Outline for Advancing the National Integrated Circuit Industry" in 2014; this was the year before "Made in China 2025" was promulgated. The technology roadmap for "Made in China 2025" (2015 version) also targeted raising the rate of domestic production of ICs to 49% by 2020 and to 75% by 2030. This aggressive stance, however, instead raised alarm in Europe, the U.S., and Japan. To counter China's government-led efforts to strengthen its IC industry, the Japanese government was expected to pass a bill in December 2021, allowing for government subsidies to the IC industry and providing JPY 400 billion for a new plant to be built by Taiwan Semiconductor Manufacturing Company Limited (TSMC) in Kumamoto. In the U.S., a bill to subsidize the semiconductor industry to the tune of USD 52 billion has been passed by the Senate.

In addition, the U.S. has launched attacks targeting specific Chinese companies in an effort to crush China's ambitions. First, it banned the export of ICs to ZTE Corporation, a major telecommunications equipment manufacturer, claiming that the sanction was in response to the company's illegal exports to Iran in 2018. ZTE, which relied on Qualcomm for key ICs for smartphones, suffered factory shutdowns. Exports of U.S. ICs and software to Huawei have been restricted since 2019. Huawei seemed to have overcome the crisis by incorporating ICs and proprietary apps designed by its subsidiary HiSilicon into its smartphones. In the second quarter of 2020, Huawei had a 20% share of the global smartphone market, tying with Samsung as the world leader (Counterpoint survey).

Therefore, in May 2020, the U.S. government introduced a regulation that states that ICs made with U.S.-originated software and technology must be approved by the U.S. Department of Commerce when exported to Huawei, even if they are made in other countries. Huawei, which had outsourced IC manufacturing to TSMC, was thus prevented from supplying ICs for its 5G smartphones and lost 4% of its global market share in the first quarter of 2021.

The crises faced by ZTE and Huawei were both due to vulnerabilities in their cutting-edge ICs, which could not be manufactured in China. There is a contract IC manufacturing company in China called Semiconductor Manufacturing International Corporation (SMIC). However, owing to the pressure from the U.S. government, it is unable to import extreme ultraviolet (EUV) lithography equipment, which is essential for microfabrication below 10 nanometers, and its processing technology lags TSMC by at least four years.

The vulnerability of the IC industry has been exploited by the U.S. government, which has increased China's determination to produce ICs domestically. The Chinese government established the China Integrated Circuit Industry Investment Fund ("National IC Fund Phase I") in 2014 to promote IC domestic production. The fund has raised a total of RMB 98.7 billion in capital from the Ministry of Finance, China Tobacco, China Mobile, and others; further, it has invested in 81 IC-related companies as of January 2022[14]. Table 2-1 summarizes information on the recipients of this investment. The investment breakdown

[14] The original plan called for registered capital of RMB 137 billion, but as of January 2022, the capital was RMB 98.7 billion.

includes 25 investment companies, 5 IC foundries, 6 packaging and testing companies, 18 IC design companies (fabless), 8 integrated device manufacturers (IDMs) that include IC front-end processes, 8 manufacturers of various IC materials, 6 manufacturers of IC manufacturing equipment, 1 manufacturer of discrete semiconductors (LED chips), and 1 IC electronic design automation software (EDA) vendor. In addition, there are 14 other companies that received investment in the past but have already sold their holdings.

Table 2-1: Breakdown of Investment Recipients under the National IC Fund (Unit: companies, RMB 10,000)

	National IC Fund Phase I		National IC Fund Phase II		Investment company funded by Phase I	
	Number of companies	Amount invested	Number of companies	Amount invested	Number of companies	Amount invested
Investment	25	2,774,064	0	0	26	520,209
Foundries	5	3,136,871	5	2,662,249	6	2,045,824
Packaging	6	208,251	1	95,000	4	9,905
Design	18	133,301	6	72,311	98	188,532
IDM	8	2,874,851	3	2,441,045	7	94,022
Material	8	374,618	4	2,415	16	44,664
Equipment	6	25,495	2	30,467	23	52,133
Discrete semiconductors	1	33,461	0	0	15	17,564
Software	1	4,819	1	116	5	102,396
Manufacture of electronic and electrical products	0	0	0	0	14	13,602
Other	3	100,355	1	477	53	910,131
Total	81	9,666,087	23	5,304,080	267	3,998,981

Note: Some companies are in receipt of investment from multiple investment funds. There are three companies in which the National IC Industry Investment Fund has invested in both Phase I and Phase II, and 31 of the investment recipients in which Phase I has invested have in turn received investments in Phase II.

Source: Data from surveys of each company (accessed January 20 to 26, 2022) and statements on company websites (classified and prepared by the author)

All but one of the 81 investee companies' investment totals are listed on the website of the corporate information provider Qichacha. Going on this evidence, the total of these investments is just under RMB 96.7 billion, as given in Table 2-1. Looking at investment amounts, most investment was in foundries and IDMs that include IC front-end processes; these two areas together accounted for 62% of total investment.

In October 2019, the second phase of the National IC Industry Investment Fund (National IC Fund Phase II) was launched. It was funded by the Ministry of Finance, China Development Bank Capital, and China Tobacco, among others. National IC Fund Phase II has a registered capital of RMB 204.1 billion, which is even larger than the first phase, but as of January 2022, the actual capital contribution was only

just under RMB 40.8 billion. The original plan was to focus investments on IC design and to focus on automated driving, AI, IoT, and smart grids[15]. However, a look at investments as of January 2022 shows a similar trend to National IC Fund Phase I, except that there are no investments in investment companies and investments in IDM and foundries account for 96% of the total. SMIC has received the most support from the two funds, with a total investment of RMB 43.1 into six subsidiaries. In second place is Tsinghua Unigroup, which has had a total of RMB 28.6 billion invested in an IC memory factory and a mobile communications IC design company.

The Chinese government's support for the IC industry is not limited to these two funds. More than 17 local governments, including Beijing, Shanghai, Hubei, Guangdong, and Shenzhen, have established funds to invest in the IC industry[16]. These local government funds and private companies have also invested in the 25 investment companies funded by National IC Fund Phase I, creating a major flow of investment into the IC industry. According to data from Qichacha, while the number of companies directly invested in by National IC Fund Phase I is 81, the number of companies in which the Fund invests indirectly totals 965.

Among the investment companies invested by National IC Fund Phase I, the Shanghai Integrated Circuit Industry Investment Fund stands out for its size. The Fund is 35% funded by the Shanghai Municipal State-owned Assets Supervision and Administration Commission and 21% funded by a subsidiary of SAIC Motor, with an additional investment of RMB 3 billion (10.5% stake) from National IC Fund Phase I, for a total of RMB 27.2 billion to invest in 13 companies.

In order to clarify the current situation of indirect investment, whereby the companies in which National IC Fund Phase I invests make further investments, the two columns on the right of 2-1 compile data on the types of companies in which the 25 investment companies in receipt of National IC Fund Phase I funding have invested. In other words, these are sub-subsidiaries from the perspective of National IC Fund Phase I.

The size of the investments made through the 25 investment companies is considerably smaller per investment than the investments made directly by National IC Industry Investment Fund Phase I and Phase II. While IC Fund 1 averages RMB 1.2 billion and IC Fund 2 RMB 2.3 billion, average investment by the 25 investment companies is RMB 150 million per case. Of the 25 investment companies, the Shanghai Integrated Circuit Industry Investment Fund is exceptionally large; the other investment companies have invested small amounts in a large number of small and medium-sized enterprises. Especially in the area of IC design, a relatively small amount of RMB 19.24 million per project was invested in 98 companies.

In terms of overall direct and indirect investment by the National IC Industry Investment Fund, large investments have been made in a small number of foundries and IDMs to encourage the expansion of IC manufacturing capacity. Meanwhile, smaller investments in design, materials, and equipment have been spread across a number of startups to stimulate growth. Looking at the design companies in receipt of investment, many are fabless companies that develop ICs to be incorporated into various electronic and electrical products, including various fingerprint and image sensors, controllers for clocks and USB

[15] Su Jiannan and Feng Hua, "Overview of China's National and Local Integrated Circuit Industry Funds," in Yin Libo (ed.), *Report on Progress of Integrated Circuit Work (2018-2019)* (Social Sciences Literature Press, 2019), pp. 196-203.

[16] Ibid, p. 198.

memory devices, and power management products. Thus, a large number of IC design companies have indeed been started up to capture IC demand derived from China's electronics and electrical industries.

Other Chinese companies are also being targeted for investment. These firms are taking on the challenge of entering fields in which leading global manufacturers have established controlling positions (CPU cores, GPUs, FPGAs, and baseband ICs for smartphones). The Fund has also invested in companies that design AI-related neural processing units (NPUs) and manufacturers of new semiconductor materials such as GaN, GaAs, and SiC, as well as discrete semiconductors and ICs that use these materials. This demonstrates that the National IC Industry Investment Fund is not simply domesticating the entire IC industrial chain but also laying the groundwork for the future[17].

In terms of materials and manufacturing equipment, China's IC industry still relies heavily on imports. It is estimated that the domestic production rate of semiconductor materials is 19.8% while that of silicon wafers is 10% or less. As of 2019, the domestic production rate of semiconductor manufacturing equipment was said to be 17%. For example, domestic etching equipment can produce line widths up to 90 nanometers[18]. The National IC Industry Investment Fund is trying to establish an IC industry chain in China by directly and indirectly investing in 28 materials manufacturers and 31 equipment manufacturers.

Notably, the National IC Industry Investment Fund has invested, both directly and indirectly, in seven companies that develop software such as EDA tools used in IC design. In the field of EDA tools, three American companies (Synopsys, Cadence, and Mentor) hold 80% of the global market share. As a result, IC manufacturers around the world cannot make ICs without software from these three companies; this has given the U.S. government an excuse to intervene. The U.S. government has prevented Huawei from sourcing ICs from TSMC by forbidding Huawei to use U.S.-made EDA[19]. In China, a company called Empyrean Technology, founded in 2009, is developing EDA tools, and the National IC Industry Investment Fund has invested in the company. However, if such companies do not grow, China's IC industry risks being choked off by the U.S. government.

As described above, the Chinese government has been making strides to overcome weaknesses in the IC industry through the National IC Industry Investment Fund. However, China's domestic production rate for ICs was still only 24% as of 2020 according to the author's estimate, and the country continues to be dependent on imports[20]. To begin with, the IC industry is suited for intensive production in few locations by a very small number of companies worldwide. This is because while transportation costs are low for the industry, fixed costs such as R&D and capital investment are large. Other industries may frequently transition to local production in China, the world's largest market, for convenience of transportation and

[17] The author has compiled a list of the capitalization and business activities of a total of 371 IC and IC-related companies invested in by the National IC Industry Investment Fund, which is available upon request.

[18] China Investment Industry Research Institute, *Semiconductor Industry Chain in-Depth Research and Investment Outlook Report 2021-2025* (China Investment Industry Research Institute, 2021), pp. 140, 195, 207.

[19] "21st Century Economic Report, August 6, 2021: '(News Commentary) Huawei to be Squeezed in EDA Cutoff: Huawei to be Prevented from Manufacturing Cutting-Edge ICs At All Costs'"; Nikkei Crosstech, July 6, 2020

[20] Handel Jones of IBS Inc. estimates that China's domestic semiconductor production rate in 2020 will be 16.6%. However, this estimate does not include production by foreign firms producing in China. Presentation materials at SEMI Japan (December 15, 2021).

sales. In the case of ICs, however, there is little incentive to localize production, even though there are incentives to locate sales and technical support bases in countries with markets.

Thus, it is not easy for China to promote domestic production in the face of global production and supply trends in the IC industry. Indeed, the U.S. government embargo has forced Huawei to drastically reduce its smartphone business, but it would be an exaggeration to say that this was a situation that shook China's economic security. This is because the import of ICs by other smartphone manufacturers such as Xiaomi has not been hindered. Nor has China's development of 5G been hindered, with the number of 5G devices in use reaching 80% of the world's total. Further, U.S. IC exports to China have, if anything, increased rapidly since the inauguration of the first Trump administration, from USD 5.3 billion in 2017 to USD 10.4 billion in January to October 2021.

The U.S. is the world leader in the IC industry, and it was thought that American restrictions on IC exports to China would act as a passive protectionist policy, whereby China could nurture and grow its infant IC industry. However, in reality, IC exports to China are actually increasing. This exposes Chinese IC makers to competition from foreign makers. The bankruptcy of Tsinghua Unigroup in July 2021 can be understood in this context. Originally, Tsinghua Unigroup was simply an inconspicuous state-owned company aiming to industrialize the research outcomes of Tsinghua University. It only began to focus on the semiconductor business after Zhao Weiguo, who had profited from the real-estate business in Xinjiang, acquired 49% of the capital and took control of the company in 2009. The company entered the semiconductor industry in 2013 by acquiring two fabless cell-phone IC manufacturers, Spreadtrum and RDA, and merging the two companies into UNISOC. Subsequently, the company launched a series of large memory factories, including Yangtze Memory Technologies, Wuhan Xinxin, Chengdu Ziguang, and Nanjing Ziguang. These projects were financed by borrowing from banks and issuing bonds; they also received significant support from the National IC Industry Investment Fund. However, Tsinghua Unigroup's semiconductor business does not seem to be doing well, with the exception of its first acquisition, UNISOC. With the bankruptcy of Tsinghua Unigroup, the second phase of the Yangtze Memory project is starting in December 2021 with investment from Hubei and Wuhan government investment funds and the National IC Fund Phase II. However, it is questionable whether the project, which is increasingly state-controlled, can really produce competitive products.

2.4 New Energy Vehicles / Automated Driving

Among the key industries listed in "Made in China 2025," new energy vehicles (NEVs) have been making particularly remarkable progress recently. These include pure electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and fuel cell vehicles (FCVs). BEVs account for over 80% and PHEVs for less than 20% in China.

NEV sales in China grew briskly from 80,000 in 2014 to 1.26 million in 2018 but declined by 4% in 2019 compared to the previous year owing to the termination of subsidies on purchases in late 2019. Production and sales fell further in the first half of 2020, partly due to the COVID-19 pandemic, but the announcement in April that the purchase subsidy would be extended through the end of 2022 led to a sharp recovery in the second half of the year, with 1.37 million NEVs sold for the year. In 2021, sales grew even more,

reaching 3.52 million units per year. The New Energy Vehicle Industry Development Plan (2021–2035) promulgated by the State Council in October 2020 set a target of around 20% of new vehicle sales to be NEVs by 2025; the actual rate in 2021 was 13.5%. However, the percentage of NEV sales has been rising steadily, reaching 19% in December. The goal of around 20% of new vehicle sales being NEVs is likely to be achieved ahead of schedule.

The automotive industry, including NEVs, was one of the most protected of China's various industries. Import tariff rates on finished vehicles were as high as 25% until 2018, and if foreign automakers wanted to produce in China to avoid tariffs, they were required to establish a joint venture with a Chinese automaker. Furthermore, in 2015, the Ministry of Industry and Information Technology issued a policy titled "Industrial Standard Conditions for Automotive Power Storage Batteries," which stipulates that EVs equipped with storage batteries that are not on the list provided by the authorities will not receive purchase subsidies. Panasonic, LG Chem, and Samsung Electronics did not appear on this list, effectively requiring EVs produced in China to be equipped with storage batteries from domestic battery manufacturers.

However, since 2018, these protective policies have been successively revised. First, in June and July 2018, import tariffs on automobiles were reduced to 15% and the establishment of EV manufacturers with sole foreign investment was permitted. In addition, regulations for storage batteries were repealed in June 2019. This deregulation led the U.S. firm Tesla establishing a solely-owned EV factory in Shanghai in 2019. The Tesla EVs produced in Shanghai are powered by batteries made by Panasonic, LG Chem, and Chinese storage-battery manufacturer CATL. Tesla EVs, which also have self-driving capabilities, gained popularity in China and were the top-selling EVs in the first half of 2020.

The Wuling Hongguang Mini EV made by SAIC-GM-Wuling, which was launched in September 2020, took the top spot in sales from Tesla. These vehicles are limited in function to urban driving and have a very low price of JPY 500,000 to JPY 800,000 per vehicle, to compensate for their restricted range on a single charge.

Table 2-2: New Energy Passenger Car Sales

	2015	2019	2020	2021
BYD	58,869	219,362	181,765	584,020
SAIC-GM-Wuling	-	60,050	155,466	431,130
Tesla	-	-	137,459	320,743
Great Wall Motor	-	39,509	56,261	133,997
GAC Aion	-	42,205	60,033	126,962
SAIC General Motors	11,123	70,987	44,792	110,065
XPeng Motors	-	16,608	26,159	98,155
Chery Automobile	14,147	46,827	43,651	97,625
NIO	-	20,946	43,728	91,429
Li Auto	-	-	32,624	90,491
Geely Automobile	26,554	70,599	29,853	80,694

Changan Automobile	1,500	28,235	18,237	76,466
FAW-Volkswagen		2,414	30,813	70,383
Hozon Auto		10,006	15,091	61,674
SAIC Volkswagen	-	39,433	28,517	61,064
JAC Group	10,420	33,919	49,017	
BAIC	17,060	148,657	25,914	
BMW Brilliance	-	32,157	23,463	
Dongfeng Motor Corporation	-	24,437	6,287	
Zotye Auto	24,408	1,937	510	
Other	12,733	179,926	236,649	901,002
Total	176,814	1,088,214	1,246,289	3,335,900

Source: China Passenger Cars Association, 2019 and 2020 figures are supplemented from the *China Automotive Industry* Yearbook 2021 Edition.

Table 2-2 shows the sales figures for the major NEV manufacturers. BYD, which has been working on EVs since the industry's early stages, is ahead, but two American companies, Tesla and SAIC-GM-Wuling, are in close pursuit. BAIC, which used to boast a large sales volume mainly in its home city of Beijing, is rapidly losing market share, and other fluctuations are severe. In many cases, automakers that originally made gasoline-powered vehicles have entered the EV market by creating a separate business or company, but there are also companies like Tesla in China that have entered the automobile production market from a base in EVs. In China, such manufacturers are known as "new car manufacturers." In Table 2-2, XPeng Motors, NIO, Li Auto, and Hozon Auto fall under this category.

Along with the shift to NEVs, automated driving and network connectivity are attracting attention as the direction of change in the automotive industry in the future. The Chinese government has collectively referred to both as "intelligent net cars" and began pushing their development in 2018. In February 2020, the "Strategy for Innovation and Development of Intelligent Vehicles" was promulgated jointly by the National Development and Reform Commission and 11 other departments. The goal is to create the conditions that will make automated driving socially feasible by 2025, including not only the industrial system of intelligent net cars, but also the associated regulations, standards, infrastructure, product certification systems, and network safety measures. This will enable the mass production of intelligent net cars that can drive automatically under certain conditions, and also enable unmanned driving and other highly automated driving to a certain extent[21].

Thus, the popularization of intelligent net cars, including automated driving, is not simply an effort on the part of vehicle manufacturers, but also spans a variety of ministries, including those involved in transportation, internet safety, and product certification. Major IT companies are taking leadership in achieving this goal.

For example, Baidu has been working with automakers since 2013 to test the practical application of

[21] The draft of the strategy also provided numerical targets, but there are no numerical targets in the strategy as announced.

automated driving. In July 2021, BAIC announced the Apollo Moon, an EV equipped with an autonomous driving system. This EV's selling point is that despite being capable of autonomous driving, it is relatively inexpensive, at JPY 8.2 million. Baidu's self-driving cabs are already in operation in experimental areas such as Cangzhou in Hebei province, Changsha, Guangzhou, and the Yizhuangzhen area of Beijing.

Huawei also started a project in 2019 to support automobile production in terms of internet connectivity and automated driving. Huawei does not make its own cars, but has begun partnering with existing automakers to manufacture the Huawei Inside range of automobiles. The first EV manufactured in this manner was the Arcfox α-T, manufactured by BAIC under the Arcfox brand. Huawei also has similar partnerships with state-owned automakers Changan Automobile and Guangzhou Automobile Group.

Huawei is mainly developing the parts involved in communication between automobiles and other vehicles, traffic lights, passersby, etc. Such communication is collectively known as "V2X" (vehicle to everything), and there are two types of such technologies in the world. One is a technology system called "DSRC" (dedicated short range communication), which is being developed in Europe, the United States, Japan, and other countries, and is based on wi-fi technology. Key technology players include NXP, Cisco, and European, U.S., and Japanese automakers. By contrast, China is promoting a technology system called "C-V2X" (cellular vehicle to everything), which applies mobile communication technologies and components such as long-term evolution (LTE) and 5G to automobiles. The main players are Huawei and Datang Telecom, and 52% of the invention patents involved were applied for by Chinese companies[22]. In China, a C-V2X network is being laid over a wide area in the city of Wuxi, and the country is currently using C-V2X to develop infrastructure for intelligent net vehicles. The aforementioned "Strategy for Innovation and Development of Intelligent Vehicles" also states that China will participate in the establishment of international standards, which could be interpreted as China's goal of making C-V2X an international standard. However, the first step will be the development of a domestic system and successful commercialization.

Conclusion

This chapter has examined China's industrial technology policy over recent years. It can be concluded that there was a major tidal shift in industrial policy over the period 2018 to 2020. "Made in China 2025" has been withdrawn, and the plan to create a "National Standardization Development Outline 2035" has been rescinded. Automotive industry policy has shifted from protectionism to openness, and foreign manufacturers are gaining a large share of the NEV market. Although the policy of domestic production of ICs is still in place, given that the National IC Industry Investment Fund is still in existence, the bankruptcy of Tsinghua Unigroup, which was a major recipient of support, will force a major rethink of the conventional investment policy. Industrial policy on intelligent net cars demonstrates that China has moved beyond the catch-up phase and is now opening up new fields that no other country in the

[22] China Automotive Engineering Research Institute, et al. (eds.), *China Intelligent Connected Automotive Industry Exhibition Yearbook 2020*, Publishing House of Electronics Industry, 2021, pp. 85-90.

world has experience with. The government's role is to create the social conditions necessary for this new industry to take off. If the Chinese government is successful in its attempt, it will become a major contributor in the formulation of international standards.

3 IP Policies in the Dual Circulation Strategy

Taeko Motohashi

Introduction: The Dual Circulation Strategy and IP Policies

China's first statement of its long-term national intellectual property (IP) strategy was the 2008 "Outline of the National Intellectual Property Strategy[23]." The Outline positions IP rights (IPR) as a means to "improve China's capacity for independent innovation and aid in efforts to make China an innovative country," points out that "We must implement this intellectual property strategy [as] an important national strategy," and states that "We must concentrate our efforts, in order to greatly improve China's capacity to create, utilize, protect and administer intellectual property." Specifically, it sets out goals such as increasing the amount of IPR held, raising the number of invention patent registrations by Chinese applicants to the world's top level, and significantly increasing patent applications filed outside China[24] within five years.

As of 2008, the concept of the Dual Circulation Strategy does not seem to have been clearly in mind. However, "Promoting the Creation and Utilization of Intellectual Property," one of the key strategies in the Outline, clearly states: "Raise the proportion of exportation of the goods rich in intellectual property step by step. Promote fundamental changes in the trade growth pattern and optimize trade structure." The document also states that the government will gradually increase the proportion of exports of IP-intensive products, fundamentally change the trade growth pattern, and improve and upgrade the trade structure. In other words, in the area of IP policy, a new approach to economic development in line with the current Dual Circulation Strategy had already been suggested at that time. Specifically, this involved a departure from the "general international circulation" approach of incorporating foreign technology using abundant, cheap labor and exporting manufactured products based on the creation of IP premised on in-house technological development. The pivot was toward strengthening the "market competitiveness of Chinese enterprises and strengthen[ing] the core competitiveness of the country," and the accompanying improvement of the people's lives.

The long-term IP policy has been succeeded by the policies shown in Table 3-1, and in the process, there have been some policy changes, such as the need to shift from "quantity" to "quality" of patent applications, etc. However, the Outline for Building an Intellectual Property Powerhouse (2021-2035), released in September 2021, also reaffirmed that "the role of intellectual property as a strategic resource for national

[23] *National Development* [2008] No. 18. http://www.gov.cn/zwgk/2008-06/10/content_1012269.htm

[24] In China, the patent right for invention, the utility model right, and the design patent right are all stipulated in the Patent Law and referred to as "patent rights." In this report, the term "invention patent" is used to refer specifically to a patent for invention, and the term "patent" is used to refer to all three rights collectively.

development and a core element of international competitiveness has become more prominent," and passed on the major goal of "comprehensively improving intellectual property creation, use, protection, management and services." As a result, IP policy has been incorporated into the Dual Circulation Strategy.

It can be said that the importance of IP policy as a national strategy in China can be further understood by looking at it from the perspective of Dual Circulation; however, it is difficult to grasp what role IP policy actually plays in the Dual Circulation Strategy simply by looking at long-term IP policy as described above. Therefore, this chapter examines the relationship between recent IP policies and the Dual Circulation Strategy by analyzing how IP-related legislation is operated or enacted in the three branches of government (judicial, legislative, and administrative), actual cases, and the history of legal amendments.

Table 3-1: Major IP-related Policy Documents in Recent Years

Year of publication	Policy document: Name	Main contents
2008	Outline of the National Intellectual Property Strategy	• Improvement of the IP system through amendments to relevant laws, etc. • Promoting the creation and utilization of IP rights • Strengthening protection by increasing penalties for infringement of IP rights
2014	Action Plan for Further Implementation of the National IP Strategy (2014-2020)	• Increase in IP rights holdings and core patents • Setting numerical targets such as 14 invention patents per 10,000 population by 2020 • Significantly increasing the ratio of value-added to GDP in IP-intensive industries
2015	Several Opinions of the State Council on Accelerating the Building of an Intellectual Property Right Power under New Conditions	• From "Great Power" to "Powerhouse" From "quantity" to "quality" • Strengthening penalties for IPR infringement by raising the statutory maximum amount of damages and introducing a punitive damages system, etc. • Strengthening research on IP protection rules in new fields such as business models and big data
2016	National Plan for Protection and Application of Intellectual Property Rights During the Period of the Thirteenth Five-Year Plan	• Further increase in the number of IPRs, as well as a significant increase in high-quality resources such as core patents • Setting of numerical targets such as 60,000 applications under the Patent Cooperation Treaty by 2020 • Supporting the development of Industrial Intellectual Property Rights Federations
2019	Opinions on Strengthening Protections of Intellectual Property Rights	• Restriction of irregular patent applications and bad-faith litigation • Focus on solving the "difficulty of proof" problem through judicial interpretation • Strengthening examination capacity for patents, etc. and expediting the examination process

2021	Outline for building an Intellectual Property Powerhouse (2021-2035)	• Overall improvement of intellectual property creation, use, protection, management and services • Accelerate IP legislation in new fields and industries such as big data, AI, genetic engineering, etc. • Increasing the ratio of value-added to GDP in patent-intensive industries to 13% by 2025, and achieving other numerical targets
2021	National Plan for Protection and Application of Intellectual Property Rights During the Fourteenth Five-Year Plan Period	• Priority on quality; adherence to strengthened protections • The number of high-value patents per 10,000 population is to be 12 by 2025 • Developing a system for resolving IP disputes in a variety of ways • Promoting the creation of high-quality IPR in the fields of AI, quantum IT, life sciences, space technology, etc.

(Prepared by the author)

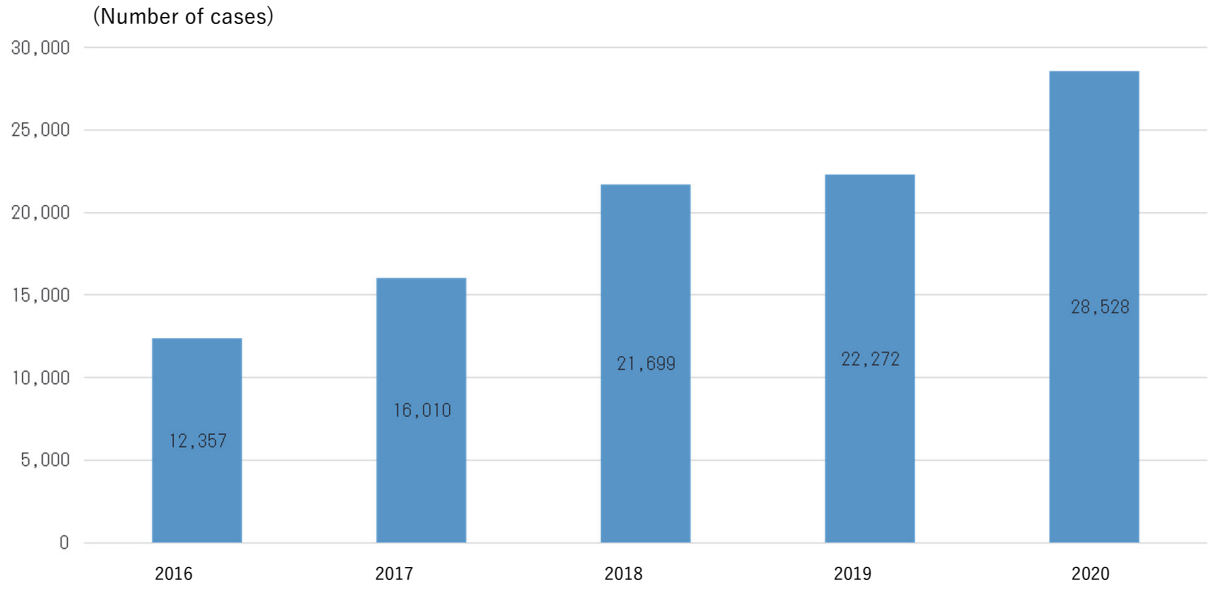
3.1 Recent Judicial Trends Regarding Intellectual Property

3.1.1 The "Domestic Circulation" Aspect

As the name "property rights" implies, IPR by themselves create economic value in the form of, for example, licensing fees or compensation, and if the distribution and monetization of the IP itself is promoted, this can constitute a form of domestic economic activity. It can also be argued that increasing the value of IP will encourage more applications and, in turn, more technological development. This point was already recognized in the 2008 "Outline of the National Intellectual Property Strategy," which specifically stated, "We need to encourage enterprises to be the principal entity in the creation and utilization of intellectual property." The key strategies were stated as follows: "Independent innovation is encouraged to acquire IPRs and be commercialized and industrialized, and enterprises are guided to realize the market value of their IPRs through rights transferring, licensing, pledging or other means." The outline also exhorted: "Lower the cost of right enforcement. Increase the cost of infringements. Curb infringements effectively." Thus, strengthening IP protection through the development of a system to make IP infringement lawsuits more accessible and the operation of judicial practice, such as the authorization of high compensation, will be key to promoting domestic circulation, mainly from the judicial aspect.

When looking at the judicial aspect of strengthening IP protection, the first thing that should be mentioned is the establishment of IP Courts and Tribunals. In accordance with the Decision of the Supreme People's Court on the Jurisdiction of IP Courts in Beijing, Shanghai and Guangzhou, promulgated in 2014, IPR Courts have been established in these cities to specialize in hearing IP cases. In addition, since 2019, the second instance of technical cases such as patent infringement lawsuits has been uniformly heard by the IP Tribunal of the Supreme People's Court. This decision on the Tribunal's jurisdiction gives the impression

that the overall trend is toward pro-patenting rulings, and that IP protections are being strengthened, even within the constraints of current law, through the application of interpretation of the law and other specific, individualized operations. In addition, as a result of the Supreme People's Court now uniformly handling second and final instances of technology-related cases, the standard of first-instance trials in local intermediate people's courts appears to have been raised overall. Against the background of the strengthening of IP protections in the operation of the judicial system, the number of patent infringement lawsuits accepted for first instance[25] has been increasing year by year, as shown in Figure 3-1.



(Prepared by the author)

Figure 3-1: Number of patent infringement lawsuits accepted at first instance

However, it is difficult to say that all of the problems with IP litigation in China that have been pointed out in the past, such as difficulty of proof, low compensation, and difficulty of enforcement, have been resolved. This point was also expressed in the 2019 "Opinions on Strengthening Protections of Intellectual Property Rights" and the Supreme People's Court's press conference at the issuance of the "Outline of People's Courts' Enforcement Work (2019-2023)" in the same year[26]. The operation of the judicial system based on the current legal framework alone has its limitations, and legislative measures will be indispensable for fundamental solutions. These will be discussed in the next section.

[25] Data were taken from the *Judgment Digests of the Intellectual Property Court of the Supreme People's Court (2020)*. "Patent infringement lawsuits" includes not only invention patent infringement lawsuits but also utility model and design infringement lawsuits.

[26] https://www.court.gov.cn/zixun-xiangqing-163012.html

3.1.2 "International Circulation" Aspects

(1) From "follower" to "leader" in international regulation: Anti-suit injunctions

In recent years, global litigation over telecom-related standard-essential patents (SEPs) has been frequent. Due to the nature of SEPs, SEP infringement lawsuits often erupt in parallel in many countries, and China is increasingly becoming the scene of such litigation. In such SEP litigation, anti-suit injunctions (ASIs) by Chinese courts have been attracting much attention in recent years.

An ASI is, in essence, a court order forbidding the respondent, as the addressee, from filing a lawsuit in a country or region outside China or applying for execution of a foreign judgment; by imposing a fine for violation, it can have the effect of indirectly prohibiting or restricting access to foreign judicial proceedings. In September 2020, the Supreme People's Court issued its first ASI over SEPs in *Huawei v. Conversant*[27]. The case concerns a lawsuit filed by Huawei in China to confirm non-infringement of 2G, 3G, and 4G SEPs held by Conversant, a Luxembourg corporation, and a lawsuit filed by Conversant against Huawei in Germany to enjoin infringement. After both the Chinese and German lawsuits had been decided in the first instance, Huawei filed a provisional injunction with the Supreme People's Court, the Chinese court of second instance, requesting that it be ordered not to apply for enforcement of the German judgment before the second-instance judgment in the Chinese lawsuit against Conversant had been issued. The Supreme People's Court granted Huawei's motion and ordered Conversant not to apply for enforcement of the judgment in the German lawsuit before the Chinese second-instance judgment was issued, and ruled that if Conversant violated this order, it would be fined RMB 1 million per day. After this ruling, a series of ASIs was issued in other SEP cases (Table 3-2).

Table 3-2: Major ASI Cases

ASI (Ruling)	September 2020	September 2020	2020	December 2020	December 2020
Right holder	Conversant	Conversant	Sharp	IDC	Ericsson
Licensee	Huawei	ZTE	OPPO	Xiaomi	Samsung
Court	Supreme People's Court	Shenzhen Intermediate People's Court	Shenzhen Intermediate People's Court	Wuhan Intermediate People's Court	Wuhan Intermediate People's Court
Case type	Non-infringement confirmed, license conditions finalized	License conditions finalized	Confirmation of breach of fair, reasonable, and non-discriminatory (FRAND) obligations and determination of license conditions including global fee rate	License conditions finalized	Global license conditions finalized
SEPs covered	2G, 3G, 4G	2G, 3G, 4G	3G, 4G, WIFI	3G, 4G	4G, 5G

[27] Civil Judgment Nos. 732, 733, 734-1 (2019), Final, Civil, IP, SPC of the Supreme People's Court

Summary of ruling	Conversant ordered not to apply for enforcement of the German lawsuit judgment before the Chinese second-instance judgment was issued	Conversant ordered not to apply for enforcement of the German lawsuit judgment before the Chinese second-instance judgment was issued	Sharp ordered not to file any new lawsuits against OPPO in other countries or regions prior to the first-instance judgment	IDC ordered to withdraw or stay, etc., its application for preliminary injunction in the District Court of Delhi, India, immediately upon service of this ruling	Ericsson enjoined from requesting an award of 4G and 5G license terms and conditions, including license fee rates, in any court in China or any other country or region until the judgment in this case becomes effective (immediate withdrawal or stay if the case has already been filed), and enjoined from filing an anti-ASI, etc. against the ruling
Status of litigation	Settlement	-	Settlement (October 2021)	Settlement (August 2021)	Settlement (May 2021)

(Prepared by the author)

In the case of *Xiaomi v. IDC*[28], Xiaomi had originally obtained an injunction in the Wuhan court ordering IDC to withdraw or stay its application for a preliminary injunction in the District Court of Delhi, India. IDC filed anti-ASIs in the Delhi and Munich courts against the ASI in the Wuhan court, both of which were granted. Also, in the case of *Sharp et al. v. OPPO*[29], OPPO first obtained an ASI in the Shenzhen court, but just seven hours later, Sharp obtained a ruling in a Mannheim court ordering OPPO to drop this Chinese ASI. However, the Shenzhen court that had issued the Chinese ASI then investigated Sharp for violating it, and Sharp voluntarily and unconditionally withdrew the German anti-ASI[30]. Thus, in SEP litigation, countries are exchanging ASIs against each other across national borders.

Every year, the Supreme People's Court of China releases important judgments for the previous year, and the two cases mentioned above, *Huawei v. Conversant* and *Sharp et al. v. OPPO*, were selected among the 10 most important cases for FY2020, announced in April 2021. The Notice by the General Office of the Supreme People's Court indicated the "exemplary and guiding role of model cases," and provided case summaries in which the significance of the ASIs was explained as given below (underlined by the author). The Notice indicated clear confidence in China's judicial functions and their international influence.

・"The ruling facilitated the parties' achievement of final global settlement discussions, ended global multi-state parallel litigation, and achieved favorable legal and social effects." (Huawei vs. Conversant

[28] Civil Judgment No. 169-1 (2020), First, Civil, IP, 01

[29] Civil Ruling No. 689A [2020], First, Civil, 03, Guangdong of the Shenzhen City Intermediate People's Court of Guangdong Province

[30] Document No. 146 [2021] of the Supreme People's Court (https://www.court.gov.cn/zixun-xiangqing-297991.html) [case summary].

case)

- "The case successfully resolved an anti-ASI by issuing a global ASI, and expressed the clear attitude of the Chinese judiciary. It provides a powerful judicial guarantee for companies to participate in fair international market competition and has important significance in demonstrating China's transformation from a follower to a leader in international IP regulation." (Case of *Sharp vs. OPPO*)

Meanwhile, in response to a series of ASIs by Chinese courts in SEP litigation, the U.S. noted in its April *2021 Special 301 Report* that ASIs had not been mentioned in the first phase of the economic and trade agreement signed by the U.S. and China in 2020. Nevertheless, the Supreme People's Court Notice on ASIs was a statement "promoting the extraterritorial application of China's IP law and from China's IP appellate court about how issuance of China's first SEP-related anti-suit injunction accelerated global settlement in a SEP dispute and was an example of the court 'serving' the 'overall work' of the Chinese Communist Party and the Chinese state." The *Report* thus demonstrated clear concern about the situation. In July 2021, the EU also submitted to the Council for Trade-Related Aspects of Intellectual Property Rights (TRIPS Council) Council a request to China for information regarding four ASI-related cases because they were not posted on the official Chinese government website, requesting transparency in procedures and other matters.

Thus, while it can be said that the ASIs issued by Chinese courts have in some respects facilitated the settlement of global disputes between parties over SEPs, they also have the potential to become a new source of international friction.

(2) Exercise of rights over Chinese-originated technology by a foreign company: The Sony Mobile case

In 2017, Sony Mobile (China) was ordered to pay over RMB 9 million in damages for infringement of an SEP for WAPI, China's national wireless LAN standard[31]. This case directly addressed the question of whether injunctions based on SEPs are possible. Prior to this, most disputes in China over SEP infringements were cases in which the right holder was a foreign company and the licensee was a Chinese company. In such cases, violations of the Antimonopoly Law were raised in regard to the terms and conditions offered by the foreign company in the license negotiations for the SEP, and the foreign company's negotiating stance, etc[32]. Alternatively, the court recognized FRAND rates[33]. The Sony Mobile case, however, was the reverse of the above, in that the SEP holder was a Chinese company and the licensee was Sony Mobile's Chinese subsidiary. Sony Mobile's negligence in the license negotiations was taken into consideration by the court, resulting in an injunction and an order to Sony Mobile to pay damages that were three times the normal license fee. Two well-known cases in which a Chinese company sued a foreign company for IPR infringement and the foreign company was ordered to pay a large amount of compensation are the 2007 Schneider case[34] and the 2009 Fujikasui case[35]. The former

[31] (2015) Beijing Intellectual Property Civil First Instance No. 1194 (Judgment of March 22, 2017). The court of second instance also upheld the first court's award of compensation.

[32] (2013) Guangdong High Court Civil Third Instance Final No. 306

[33] (2011) Shenzhen Intellectual Property Court Civil First Instance No. 857

case was based on infringement of a utility model right, while the latter was a case in which Fujikasui was held liable for joint tortious behavior with its assignee because the technology transferred to the Chinese company infringed the invention patent right of another Chinese company. The Sony Mobile case was similar to these cases in that heavy liability for infringement was imposed on the foreign (affiliated) company as a result. The case, however, is significant in its own right in that it demonstrates the realization of one of the key strategies in the 2008 "Outline of the National Intellectual Property Strategy," which states that "Technological innovation will take legal industrialization as the basic precondition, and make the acquisition of IPRs as its goal" and exhorts, "Formulate and improve policies related to standards and regulate the process of turning a [n invention] patent into a standard." As the power structure of telecommunication-related SEP holders changes dramatically, we can expect to see an increasing number of cases in which Chinese SEP holders file lawsuits against foreign-affiliated companies in China. In that case, it will be interesting to see how the Chinese courts will recognize the aforementioned ASI and license fee rates[36].

3.2 Recent IP Legislative Trends

3.2.1 "Domestic Circulation" Aspect

In 2020, the Patent Law was revised for the first time in 12 years since the previous revision in 2008; the revised law went into effect in June 2021. One of the main features of the current revision is the strengthening of patent protections, including the following revised/new provisions.

① Revision of provisions related to claims for damages in civil lawsuits for patent infringement (Articles 71 and 72)

- The lower and upper limits of statutory compensation raised from RMB 10,000 to RMB 30,000 and from RMB 1,000,000 to RMB 5,000,000, respectively
- Punitive damages: In cases of willful infringement where the circumstances are serious, the amount of compensation is multiplied by a factor of 1 to 5.
- If the right holder has exhausted proof, the court may order the submission of books of account, etc.
- Clarification of asset preservation

② Introduction of an open licensing system (Articles 50 to 52)

- If there is a willingness to license, and the payment method and criteria for the license fee have been clarified, the patent administrative department of the State Council will issue a public notice and grant an open license. During the open licensing period, invention patent fees are reduced or exempted.

Thus, the 2020 revised law provides certain solutions to the issues of difficulty of proof, low compensation, and difficulty of enforcement pointed out in the previous section[37]. It introduces a system to

[34] (2007) Zhejiang High People's Court Civil Third Instance Final No. 276

[35] (2008) Civil Third Instance Final No. 8

[36] In the above-mentioned case of *Sharp v. OPPO*, in August 2021, the Supreme People's Court issued a decision maintaining the original ruling that the People's Court of China has jurisdiction over the recognition of global license conditions.

promote the distribution and monetization of patent rights, following the license-of-right system practiced in the U.K. and Germany.

The strengthening of IP protections has been a point of contention during U.S.-China trade friction, and the current revision of the Patent Law reflects this. However, the raising of the cap on statutory compensation and the introduction of a punitive compensation system were stated in the 2015 "Several Opinions of the State Council on Accelerating IP Power Construction Under the New Conditions" and were already included in the draft revision of the Patent Law (transmitted draft) of the same year. However, given that the 2019 revised Patent Law draft further strengthened the punitive damages provisions compared to the 2015 draft, following the 2019 revised Trademark Law, it could be said that U.S.-China trade frictions given further impetus to matters that were already established policy under the national Dual Circulation strategy.

3.2.2 "International Circulation" Aspect

If the conventional "international circulation" involves dependence on international technology, centered on processing and trade, then the Regulations on Technology Import and Export Administration, a piece of administrative legislation in the field of IP, can be seen as a symbol of such dependence. The Regulations, enacted in 2001, target imports of technology into China and exports of technology from China to foreign companies. They directly apply to the licensing and transfer of invention patents, know-how, etc. of foreign companies to Chinese companies, and regulate the content of such agreements.

Formally speaking, the Regulations on Technology Import and Export Administration regulate both imports and exports, but in terms of content, they are more restrictive on imports. In particular, prior to the 2019 amendment, the following provisions imposed various obligations on foreign companies as licensors/transferors to protect Chinese companies as "importers" of technology.

- The transferor under the technology import agreement shall be liable for any infringement of the legal rights of others as a result of the assignee's use of the technology provided by the transferor in accordance with the agreement (Article 24(3), as amended).
- Prohibition of assignment back: During the period of validity of a technology import agreement, improved technology belongs to the party that made the improvement (Article 27 before amendment).

For technology agreements such as invention patent licenses and assignments between Chinese companies, the Contract Law applied until 2020[38]. This Law stipulated, for example, that both liability and assignment back in the event of infringement of a third party's rights as described above would be determined by contractual provisions between the parties[39]. This imbalance between the legal provisions applicable to domestic business-to-business contracts and those applied to foreign businesses has been

[37] In 2020, in response to the 2019 "Opinions on Strengthening Protections of Intellectual Property Rights" listed in Table 3-1, the judicial interpretation "Provisions of the Supreme People's Court on Evidence in Intellectual Property Civil Litigations (Interpretation No. 12 of 2020)" was promulgated. They included a provision on shifting the burden of proof for manufacturing-method invention patents for non-novel products.

[38] From January 1, 2021, the provisions of the Civil Code will apply.

[39]

pointed out in the past. In the course of the U.S.-China trade confrontations, Chinese regulations were once again condemned by name as "discriminatory" in the *Special 301 Report* of the Office of the United States Trade Representative released in March 2018. In the same month, the U.S. filed a request for consultations with the World Trade Organization. In response, China amended the Regulations in March 2019 to remove the above provisions. On the surface, this sequence of events appears as if China has given in to U.S. demands. However, it can be said that behind this decision was a value judgment that, with the steady growth of domestic companies in the nearly 20 years after their enactment, it was no longer necessary to rely on a set of regulations that lacked balance with domestic laws, and that were to be ultimately considered a "discarded card."

3.3 Recent IP Administrative Trends

3.3.1 "Domestic Circulation" Aspect

(1) Promotion of patent applications

Both the 2008 "Outline of the National Intellectual Property Strategy" and the 2021 "Outline for Building an Intellectual Property Powerhouse (2021-2035)" clearly state the need to improve the creation of IP. As will be discussed later, the emphasis is shifting from "quantity" to "quality," but it can be said that the promotion of IP applications for invention patents, including patent applications, is basically being maintained as a policy. Typical of such administrative policies that promote applications for invention patents are "high-tech enterprise certification" and other preferential policies for IP.

Preferential policies for IP are divided into national and regional-level policies. The former mainly provide preferential treatment to companies in terms of taxation, while the latter mainly involve the provision of subsidies for applications for invention patents.

① Preferential policies for IP at the national level

As a preferential policy for IP at the national level, we should first mention the "high-tech enterprise certification" system. The high-tech enterprise certification system started in the early 1990s for "high-tech industrial development zones," and was later expanded nationwide in 2008 with the implementation of the "Measures for the Administration of High-tech Enterprise Accreditation" and the "Guidelines for Management Operations for High-tech Enterprise Accreditation." Upon receiving "high-tech enterprise certification," a company is entitled to a reduced corporate income tax rate of 15%. The definition of a "high-tech enterprise" is "a resident enterprises registered in the Chinese mainland (excluding those registered in Hong Kong SAR, Macao SAR, and Taiwan) that are included in the High-tech Fields Supported by the State and also engage in ongoing research and development (R&D) and commercialization of technological achievements. These enterprises must also have established core independent intellectual property rights and conduct their business operations accordingly" (Article 2 of the Measures for the Administration of High-tech Enterprise Accreditation). In accordance with this definition, one of the requirements for certification is the number of invention patents and other IPR held by the enterprise, as well as other indicators of the enterprise's IPR.

Other measures include an exemption from corporate income tax for the portion of income from technology transfers (non-exclusive licensed use rights for five years or over) by resident enterprises not

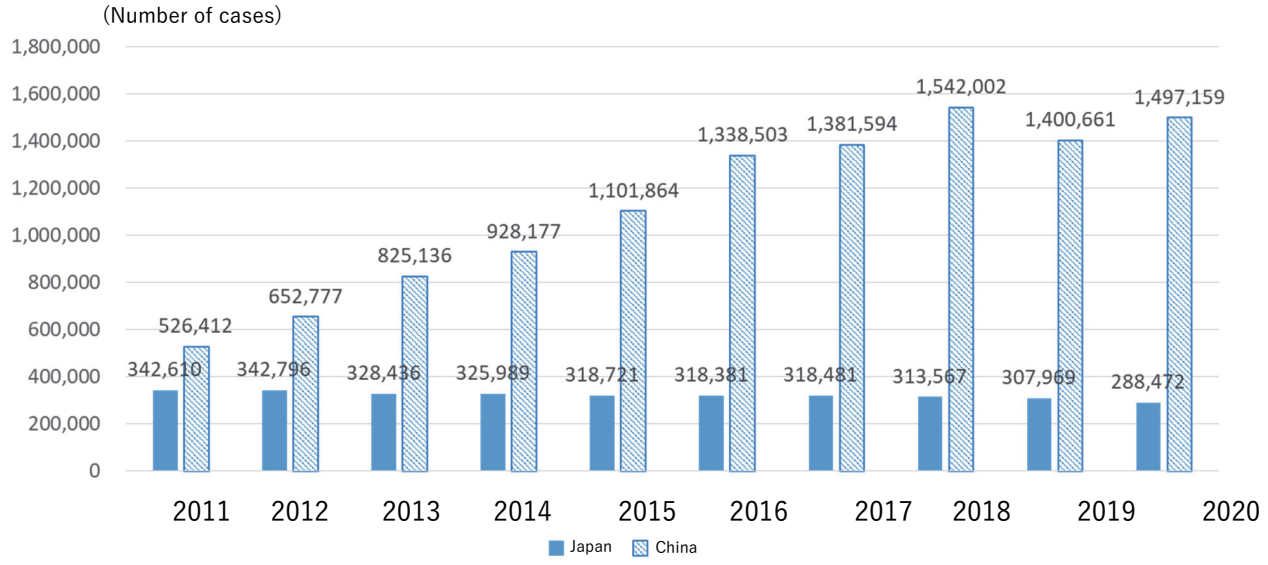
exceeding RMB 5 million, and a tax rate reduction of half for the portion exceeding RMB 5 million (Ministry of Finance and State Taxation Administration Announcement No. 116 [2015]).

② Preferential policies for IP at the local level

The specifics of IP preferential policies for IP at the local level vary from one local government to another, but the majority of policies appear to have been subsidies for filing fees. As discussed below, these subsidy programs have been phased out. In the case of Shanghai, for example, it was stipulated that for domestic applications for invention patents, 80% of the application fee and up to 2,000 RMB for application agent fees, etc. would be provided (Shanghai Patent Funding Subsidy Measures[40]).

(2) Preferential policies encouraging a shift from "quantity" to "quality"

Encouraged by the above-mentioned preferential policies for intellectual property at the national and local levels, the number of applications for invention patents, and other applications for registration of IPR have increased year by year. Figure 3-2 graphs the number of domestic applications for invention patents in China and those in Japan from 2011 to 2020[41].



(Prepared by the author)

Figure 3-2: Number of Domestic Applications for Invention Patents in Japan and China

The number of applications for invention patents in China has continued to increase steadily since it surpassed the one million mark in 2015. Despite a slight downturn in 2019, it has nearly tripled in the past 10 years, reaching nearly five times the number in Japan. In terms of *quantity* at least, it is safe to say that China has become an IP powerhouse, surpassing Japan.

On the other hand, there have also been problems such as the emergence of technically low-level rights

[40] The said Measures have been suspended since January 1, 2022.

[41] Data for China is based on the annual reports of China National Intellectual Property Administration (CNIPA) for each fiscal year, and data for Japan refer to the status reports of the Japan Patent Office for each fiscal year.

and a large number of "non-normal" applications (multiple applications with clearly overlapping contents, applications with no obvious novelty, etc.) that are filed for the sake of subsidies.

For example, looking at the data on invalidation trials in FY2020, about 30% of invalidation trials against patents found them to be completely invalid. Combined with partial invalidation, more than half of all patents for which invalidation trials were filed were found to be invalid[42]. Although anyone can file a request for an invalidation trial in China, given the costs involved, such trials are unlikely to be filed in practice unless there is some interest in the case. It is thus easy to imagine that among the rights that continue to exist without a request for invalidation trial, there remain a considerable number at a level that could potentially be invalidated, at rates similar to those above. A simple comparison between China and Japan cannot be made due to differences in examination standards, etc. However, in Japan, the invalidation or cancellation rate in invalidation trials and oppositions in 2019 was 10% to 20%[43] (This includes partial invalidations or cancellations). It is thus certain that the quality of invention patent rights, etc. in China is improving as the technological capabilities of Chinese companies improve. However, at the same time, the inspection functions to ensure the quality of rights and the quality of examinations are not keeping up with the explosively increasing number of applications, and the reality is that a considerable number of rights that are not of high quality still exist.

In addition, in recent years, the number of cases of ex-post-facto revocation of high-tech enterprise certifications has been increasing rapidly in various regions. For example, in Beijing, between 2014 and 2018, 10 companies had their certifications revoked, while in 2019, 23 companies had their certifications revoked in one year, and in 2020, 65 companies had their certifications revoked. In Guangdong province, a total of 18 companies had their certifications revoked between 2013 and 2018, but in FY2019, 80 companies had their certifications revoked in one year, and in FY2020, 74 companies had their certifications revoked. Although the specific reason for the revocations are unclear, the background seems to be that there were not a few cases of unjustified certifications with low-quality patents.

In January 2021, CNIPA promulgated the "Notice of the China National Intellectual Property Administration on More Strictly Regulating Patent Applications." The Notice stated that China will steadily promote its transformation from an IPR-introducing superpower to a creative superpower and shift from emphasizing the quantity of patent applications to their quality. The 14th Five-Year Plan also instructed regional IP offices to: strengthen the crackdown on patent applications that do not aim to protect innovation; stop subsidizing patent applications at all levels by the end of June 2021; gradually reduce financial subsidies for registered patents during the 14th Five-Year Plan; and to stop all subsidies by 2025.

Thus, multilayered application support policies at the national and local levels have helped China to become, in numbers terms, an IP superpower in less than 40 years since the enactment of the Patent Law. While these policies have achieved a certain degree of success, the country has now reached a turning point. It is clear that this is due to the understanding that improving the quality of invention patents and other patents will contribute to "domestic circulation" in the true sense and, in turn, to "international

[42] The data is based on IPRdaily's "Statistical Analysis of China Patent Invalidation Decisions in 2020."
[43] https://www.jpo.go.jp/system/trial_appeal/document/index/shinpan-doko.pdf

circulation" centered on technology exports.

3.3.2 "International Circulation" Aspect

Here, we should mention a recent administrative policy initiative to support the establishment of "invention patent federations" or "IPR federations" to improve the competitiveness of domestic companies in international markets in the IP field.

The definition of an "invention patent federation" is not entirely clear, but on April 24, 2015, the "Guidelines for the Construction of Industrial Intellectual Property Rights Federations" were published. These state that an IPR federation or invention patent federation is, at the very least, a voluntary organization made up of two or more members who hold IPR, including invention patent rights, in a specific industry, and whose activities are based on the joint management of the IPR they hold. After the promulgation of these Guidelines, support for the development of IPR federations was also specified in the 2016 "'National Plan for Protection and Application of Intellectual Property Rights During the Period of the Thirteenth Five-Year Plan" listed in Table 3-1, and invention patent federations in various industries were established in various regions, with support and guidance from the central and local governments. Currently, there appear to be at least 100 federations, if not more.

A glimpse into why the central and local governments are pushing for the establishment of invention patent federations can be seen in the categorization by the Beijing Municipal Intellectual Property Office at[44] (excerpts; underlining added by author).

"Collaboration and Innovation Type": The purpose is to support companies in improving their competitiveness in the international market through close collaboration, by agreeing to align intellectual resources and focus on R&D with respect to core and fundamental technologies.

"Standard Joint Establishment Type": The objective is to jointly establish and disseminate technical standards related to core products of the industry, and to incorporate related SEPs into the technical standards to maximize the economic value of the invention patents.

"Joint Defense Type": The purpose of this type is to jointly address issues such as invention patent infringement lawsuits and high invention patent royalty fees when entering international markets.

"Joint Establishment Type": The purpose of this type is to have upstream and downstream companies in an industrial chain jointly establish an invention patent protection system to strengthen their position in the global market and to increase the stability of the international market share of the stakeholder companies.

Thus, there is a choice of focus on the "offensive" or "defensive" aspects of invention patents, i.e., whether to actively utilize invention patents or to prepare against invention patents held by foreign companies. In any case, it seems that the goal is to promote the new "international circulation" intended by the Dual Circulation Strategy through cooperation and collaboration in the invention patent aspect among domestic companies.

[44] Development of Intellectual Property Federations to Promote Industrial Transformation and Upgrading: Special Visit to Zhou Yan, Deputy Director-General of the Beijing Municipal Intellectual Property Office
http://m.dooland.com/index.php?s=/article/id/806973.html

The actual status of activities of many federations is not immediately clear, as many of them do not disclose their specific activities, etc. However, going on the current evidence, it does seem that many of them are still in the early stages, given the infringement disputes, etc., that have emerged at this point in time.

Conclusion

In this chapter, we have reviewed the trends and operational status of IP legislation in recent years from the judicial, legislative, and administrative aspects. We have demonstrated that in all aspects, even before the key phrase "Dual Circulation" was clearly used, the general movement in this area has been consistent with, or working toward, the direction that the Dual Circulation Strategy is aiming for. Developments regarding the ASIs discussed in 3.1.2 have the potential to develop into international friction, and so it will be necessary to continue to closely monitor future movements. On the other hand, the enhancement of the IP judicial system, including IP Tribunals, as described in 3.1.1, and the strengthening of protections through the legal reforms described in 3.2.1, indicate that there is a growing possibility that Japan, which has long been suffering from IPR infringement in China, will be able to receive appropriate relief in this regard. At the same time, however, this also means an increased risk of Japanese companies themselves being sued in China by Chinese companies with enhanced technological capabilities, as in the Sony Mobile case discussed in 3.1.2. Japanese companies are now faced with the need to review their IP strategies, both offensively and defensively, to keep pace with these changes.

4 Reading the Structure of U.S.–China Conflict in the Field of Science and Technology

Haruo Kurasawa

Foreword

We are all aware that it is impossible to measure a country's scientific and technological capabilities only by such indicators as R&D expenditures, number of researchers, and number of papers. Especially in a country like China, with a population of 1.4 billion, averaged data do not always reflect the actual situation. On the other hand, when the data are compared over a longer span of 10 years, it becomes immediately clear whether the numbers are rising or falling. Basic indicators for science and technology clearly show the rapid rise of China and the decline of Japan.

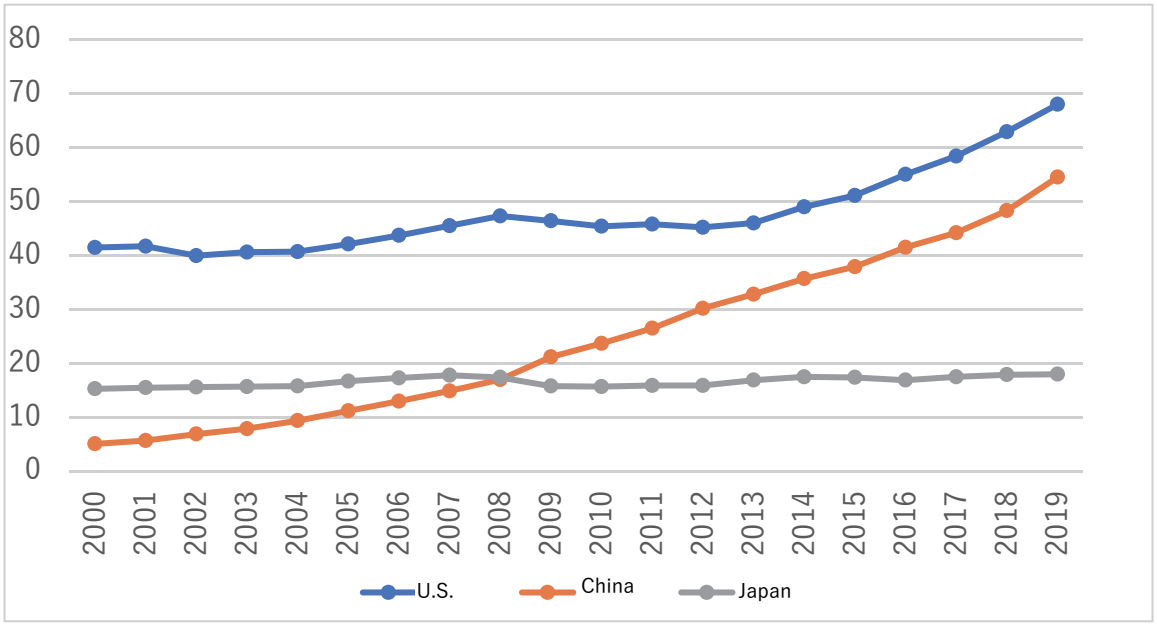
4.1 China's Science and Technology Capability in Indicators

4.1.1 China's R&D expenditures closing in on the U.S.

Among the science and technology indicators, R&D expenditures are extremely important. This is because there is a positive correlation between the funds invested and research results. (Nagayasu Toyoda, *The Crisis of a Nation Built on Science*, Toyo Keizai Inc.)

In addition to the IMF exchange rate conversion, there are other methods for comparing R&D expenditures, including the OECD purchasing power parity conversion, nominal amounts, and real amounts based on a base year. Figure 4-1 shows nominal amounts, but the issue is not the absolute value but the pattern of growth. It can be seen that China's combined public and private R&D expenditures have increased exponentially since 2000.

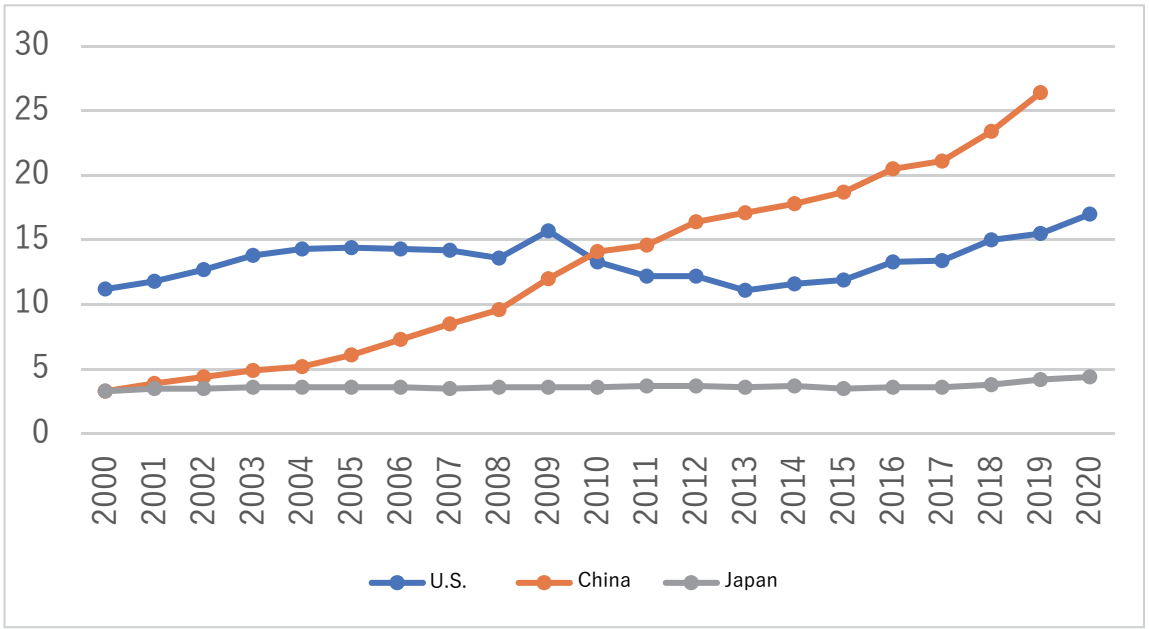
According to the "Communiqué on National Expenditures on Science and Technology in 2020" released by the National Bureau of Statistics of China et al. on September 22, 2021, total R&D expenditures in 2020 increased by 10.2% over the previous year to RMB 2.4393 trillion (approx. JPY 41.443 trillion, at a rate of RMB 1 = JPY 17). From the American perspective, China is seen as having outpaced the U.S. in increasing its scientific and technological capabilities while the U.S. has been waging the war on terror since the 9/11 attacks in 2001.



Source: *Science and Technology Indicators 2021*

Figure 4-1: Trends in Total R&D Expenditures in the U.S., China, and Japan (nominal amount in OECD purchasing power parity terms); Unit: JPY trillion

In terms of government science and technology budgets, China surpassed the U.S. in 2010 (Figure 4-2).



Source: *Science and Technology Indicators 2021*

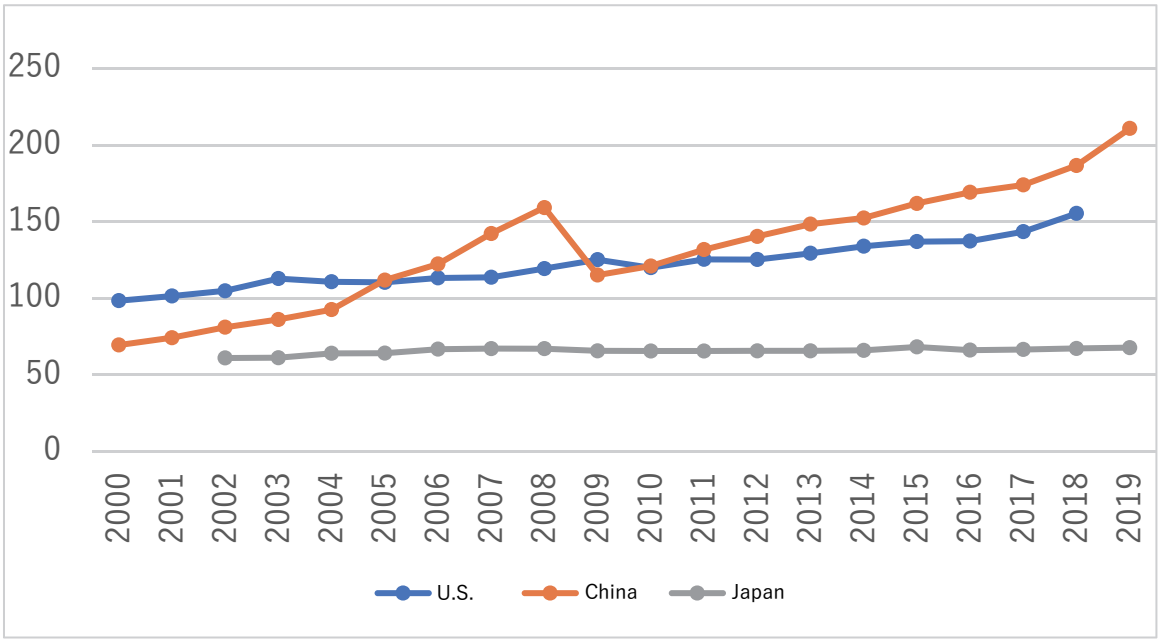
Figure 4-2: Trends in Science and Technology Budgets of the U.S., China, and Japan; Unit: JPY trillion

While the U.S. science and technology budget lacks consistency due to changes in administration every four years, China has steadily increased its science and technology budget since 2000. Article 59 of China's Law on the Progress of Science and Technology, as amended in 2008, stipulates that "the rate of increase

of government funds earmarked for [science and technology] endeavors shall be larger than that of the regular government revenues." It also specifies that the ratio to GDP "shall gradually increase." The most important strategy since the founding of the country has been the modernization of agriculture, industry, national defense, and science and technology, as advocated by Zhou Enlai. In particular, science and technology has been heavily protected as an important field that supports the modernization of agriculture, industry, and national defense. The year 2021 was the start of the 14th Five-Year Plan. The "Government Activities Report" given by Premier Li Keqiang at the National People's Congress in March called for an average annual R&D expenditure of at least 7%. In contrast to the lack of publicly disclosed GDP growth rates, R&D expenditures were given clear numerical targets.

4.1.2 Number of researchers surpasses that of the U.S.

It is researchers who are responsible for R&D. Figure 4-3 shows that the number of researchers has been growing steadily since 2000.



Source: *Science and Technology Indicators 2021*

Figure 4-3: Number of Researchers in the U.S., China, and Japan; Unit: 10,000 persons

By 2019, the number of researchers in China exceeded 2 million, more than 500,000 ahead of the United States. The number for China was about three times that of Japan. The number of researchers in China declined sharply in 2009, but this was not due to the 2007–2008 financial crisis. Rather, it was because the Chinese government had adopted the OECD's Frascati Manual and tightened the definition of "researcher." Conversely, if we extrapolated the growth in the number of researchers using the conventional definition, we would find a tremendous number of "reserve researchers." The number of university graduates in 2021 was approximately 9.09 million. China is arguably the world's largest source of highly skilled human resources.

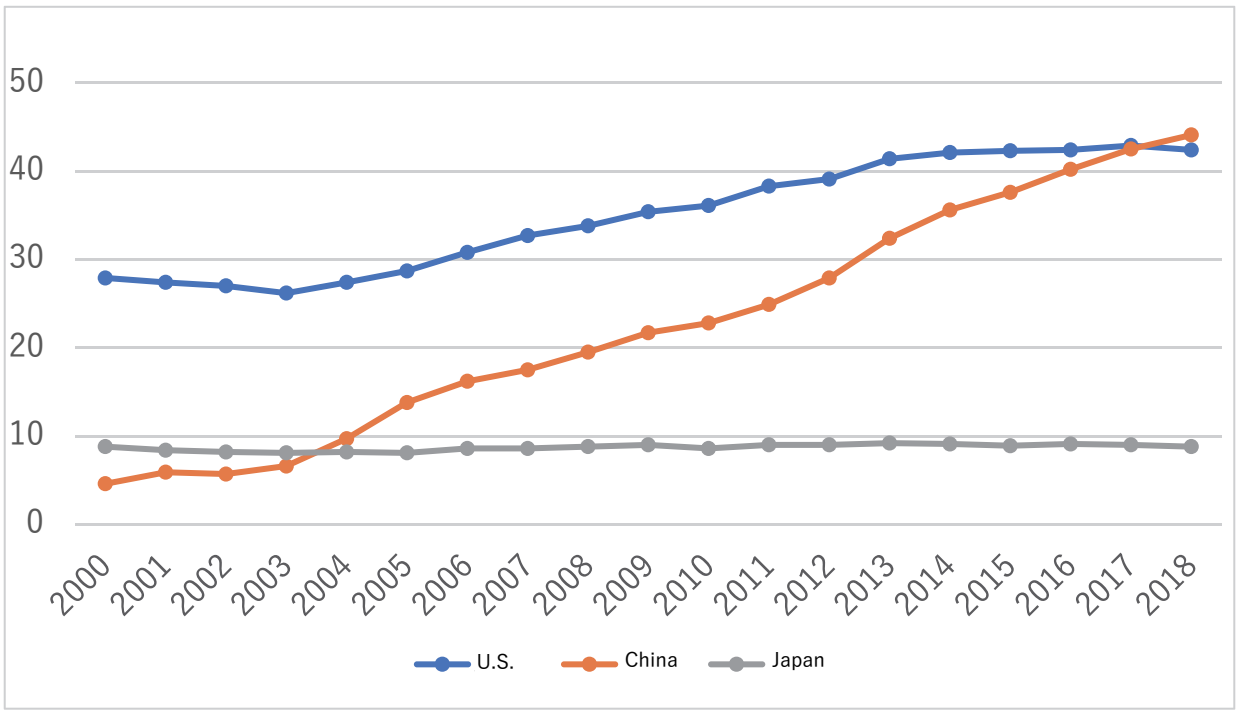
4.1.3 Number of papers widens the gap with the U.S.

Findings in science and technology are published in the form of papers. China has also taken the lead in the number of papers (Table 4-1). According to Scopus, the world's largest literature database, provided by Dutch publisher Elsevier, China topped the list with more than 440,000 articles in 2018, surpassing the United States with about 420,000 (Figure 4-4). Japan, which until 2003 was in second place behind the U.S., was in fifth place. A comparison with Figure 4-1 shows that China's growth has kept pace with increases in R&D expenditures. "Science and Engineering Indicators" (SEI), a report compiled by the U.S. National Science Foundation (NSF), also shows a similar trend. According to SEI data, China, which surpassed the U.S. in 2016, published about 670,000 papers in 2020, compared to 455,000 for the U.S., a difference of more than 220,000. China's share of the total number of papers worldwide was 22.77%, that of the U.S. 15.5%, with Japan ranking 6th at 3.43% (Table 4-1). Considering the long lead times of scientific and technological research, this is a phenomenal growth rate.

Table 4-1: Number of Science and Technology Papers and Share by Major Country

Ranking	Country	2010	2020	Share (%)
1	China	308,769	669,744	22.77
2	U.S.	409,512	455,856	15.50
3	India	60,555	149,213	5.07
4	Germany	97,255	109,379	3.72
5	U.K.	94,081	105,564	3.59
6	Japan	108,534	101,014	3.43
7	Russia	33,855	89,967	3.06
8	Italy	58,252	85,419	2.90
9	South Korea	50,224	72,490	2.46
10	Brazil	41,501	70,292	2.39

Source: NSF "Science and Engineering Indicators"



Source: Scopus

Figure 4-4: Number of Papers in the U.S., China, and Japan Unit: 10,000 papers

4.1.4 U.S. dominance in "quality" of papers

Although the number of Chinese papers has increased, the false reputation that Chinese papers are "poorly produced" and "full of junk papers" continues to prevail. According to "Benchmarking Scientific Research 2021" published by the National Institute of Science and Technology Policy, China overtook the U.S. for the first time in terms of the "Top 10% Corrected Papers" for high-profile papers. The U.S. had about 37,000 cases, compared to about 40,200 cases in China, which ranked first. Japan was in 10th place, also surpassed by India. In addition, in terms of the number of authors of the top 1% most cited papers by country, published annually by Clarivate Analytics, the U.S. remains at the top, with 2,622, and 935 for China (Table 4-2). China had almost doubled from 482 in 2018. Japan is not even in the top ten. The authors of the top 1% papers have an extremely high probability of producing future Nobel Prize laureates.

Table 4-2: Number of Authors of Top 1% Most Cited Papers

Ranking	Country	Number of authors (persons)	2018 (%)	2019 (%)	2020 (%)	2021 (%)
1	U.S.	2622	43.3	44	41.5	39.7
2	China	935	7.9	10.2	12.2	14.2
3	U.K.	492	9	8.3	8	7.5
4	Australia	332	4	4.4	4.8	5
5	Germany	331	5.9	5.3	5.4	5
6	Netherlands	207	3.1	2.6	2.8	3.1
7	Canada	196	2.7	2.9	3.1	3
8	France	146	2.6	2.5	2.5	2.2
9	Spain	109	1.9	1.9	1.6	1.7
10	Switzerland	102	2.2	2.5	2.4	1.5

Source: Clarivate Analytics Highly Cited Researchers by Country or Region

As I cautioned at the beginning of this paper, it is not possible to evaluate a country's scientific and technological capabilities based on indicators alone, but at least a dispassionate look at scientific and technological fundamentals clearly shows the rapid rise of China and the decline of Japan. It is easy to imagine that the researchers and research results that will eventually drive global innovation, including Nobel prizes, will come from China.

4.2 China's Changing Science and Technology Policy

4.2.1 Becoming a scientific and technological powerhouse

One of China's strengths in science and technology is clear and rapid decision-making by the Chinese Communist Party (CCP). It was not until 2012, just before the start of the Xi Jinping administration, that the country made a major shift away from being the "world's factory" to becoming a "science and technology powerhouse" founded on basic science. In September 2012, the CCP and the State Council issued "Opinions on Deepening the Reform of the Scientific and Technological System and Speeding up the Building of a National Innovation System," recognizing that China lacks "core technologies" and setting a goal of building an innovation system that would contribute to economic and social development.

In February 2013, the State Council announced the "The Medium-and Long-term Development Plan on National Major Science and Technology (S&T) Infrastructure (2012-2030)" and began construction of research infrastructure, including ocean exploration systems, high-energy synchrotron radiation facilities, space environment utilization systems, and earth simulators. In December 2014, in order to streamline and consolidate the proliferation of development plans and projects, the State Council announced the "Measures for Deepening Reform of the Management of Science and Technology Initiatives." Financing for basic and cutting-edge research was placed in the hands of the National Natural Science Foundation of China, and projects leading to industrial and social transformation were reorganized as "national key science and technology projects."

4.2.2 Major shift to emphasis on basic research

In February 2018, the State Council issued "Some Opinions on the Overall Strengthening of Basic Science Research," which set the goals of: raising China's overall level and international influence in basic science by 2020; achieving a leading global position in key fields by 2035; and becoming a major global center and a global science and technology powerhouse by the mid-21st century. Since many basic science studies are not directly related to industry, results cannot be expected without government support. The Chinese government is currently formulating a 10-Year Plan on Basic Research.

Meanwhile, a series of industrial strategies were launched in rapid succession: "Made in China 2025," "Guiding Opinions concerning Vigorously Moving Forward the 'Internet Plus' Plan," and "Opinions of the State Council on Promoting the High-Quality Development of Innovation and Entrepreneurship" in 2015; "Outline of the National Innovation-Driven Development Strategy" in 2016; and the "New Generation Artificial Intelligence Development Plan" in 2017. The 14th Five-Year Plan, released in March 2021, also lists "Strengthening the nation's strategic S&T Power" in the opening of Part Two ("Adhering to innovation-driven development and comprehensively fashioning new development advantages") of its 19 Parts and 65 Articles.

Although "science and technology" is often expressed as a single phrase, there is a fundamental difference between the two. In science, especially basic science, originality is valued and the search for truth is held up as an ideal. On the other hand, technology is basically a matter of imitation. In addition, basic research does not necessarily aim to create any direct social benefit, and the lead time until results are produced is long. On the other hand, technology is based on industrial applications. In this sense, it can be said that China has now begun to shift its emphasis from the bias toward technology that has supported the "world's factory" approach to an emphasis on basic science aimed at creating true innovation.

Symbolic of this is the notice issued by the Ministry of Education, the Ministry of Science and Technology et al. on February 20, 2020, entitled "Regulations on the Use of SCI Indicators for College and University Theses and the Establishment of a Correct Evaluation Direction." The Science Citation Index (SCI) is a citation system designed by Thomson Reuters. In China, researchers who have published papers in highly cited journals such as *Nature* and *Science* have been given preferential treatment in terms of degree examinations, personnel evaluations, research funding allocations, and compensation. However, there has been a growing awareness that excessive competition for immediate results is leading to the neglect of basic research and graduate-school education, which are less likely to produce such immediate returns. The February 2020 notice requested that the SCI indicators not be linked to researchers' compensation, and that the indicators not be made a condition for awarding degrees. This is intended to encourage researchers to settle down and make progress on research that is innovative and of high scientific value. It is also consistent with the administration's goal of shifting from quantity to quality.

4.3 The Nature of the U.S.-China Conflict over Science and Technology

4.3.1 China's industrial policy stirs U.S. nerves

In a 2019 report, the Information Technology Innovation Foundation, an American science and technology thinktank, concluded that China is moving beyond being a copying powerhouse and aiming to become a global leader in innovation. The previous year, in October 2018, then Vice President Pence expressed his opposition to China as follows.

"Through its 'Made in China 2025 Plan,' the CCP aims to control 90% of the world's cutting-edge industries, including robotics, biotechnology, and artificial intelligence. In order to gain a dominant share of the 21st century economy, the Chinese government has instructed its bureaucrats and corporations to acquire, by any means necessary, the intellectual property that is the foundation of U.S. economic leadership. Worst of all, China's security agencies are the masterminds behind the massive theft of U.S. technology, including cutting-edge military programs."

Pence's speech, which is said to have opened the U.S.-China "New Cold War" in the field of science and technology, sums up American perception. The U.S. asserts that China is trying to control "90%" of "cutting-edge industries." However, no basis for the "90%" figure has been provided. The "cutting-edge industries" envisioned by the U.S. include robotics, biotechnology, AI, and other fields directly related to national security.

4.3.2 IP Wars and the Dual Use Issue

Furthermore, the U.S. is deeply concerned over China's targeting of IP that has supported U.S. hegemony in the field of science and technology. China has already overtaken the U.S. to take the top spot in the number of international applications for invention patents, one of the indicators of a country's IP strength. Moreover, the U.S. recognizes that China's methods of acquiring IP are not legitimate and that its security agencies are "stealing" it. In the background to the accusation is People's Liberation Army (PLA) Unit 61398, believed to operate under the 2nd Bureau of the People's Liberation Army General Staff Department Third Department. This pioneering cyber unit of the PLA is alleged to have stolen data including Google algorithms, blueprints for F-35 fighter jets, gas pipeline technology, health management system data, and nuclear-related information. (David Sanger, *The Perfect Weapon: War, Sabotage and Fear in the Cyber Age*, Asahi Shimbun Publications)

Basically, all technologies are "dual-use." While there have been many examples of military technologies being converted to civilian use in the past, we are now in an era where civilian technologies are being converted to military purposes. This is a shift from "spin-offs" to "spin-ons." China's policy of military-civilian fusion has brought the idea of "economic security" into focus in Japan, among other countries.

4.3.3 Cutting-edge technology to control mortality

Table 4-3: Advanced Infrastructure Technologies Subject to U.S. Export Controls

1. Biotechnology	· Nano biology · Synthetic biology · Genetic engineering · Neural engineering
2. AI and Machine Learning	· Neural network deep learning · Evolutionary and genetic computing · Reinforcement learning · Computer vision · Expert systems · Speech and sound processing · Planning · Audio and video manipulation technology · AI cloud technology · AI chipsets
3. Positioning Technology	· Positioning and navigation
4. Microprocessors	· System-on-a-chip · Stack memory on chip
5. Advanced Computing	· Memory-intensive logic
6. Data Analysis Technology	· Visualization · Automatic analysis algorithms · Context-aware computing
7. Quantum Information and Quantum Sensing	· Quantum computing · Quantum cryptography · Quantum sensing
8. Logistic Technology	· Portable power · Modeling and simulation · Asset visualization technology · Delivery-based logistics
9. Additive Manufacturing Technology	· 3D printers, etc.
10. Robotics	· Micro drones · Group control technology · Self-assembling robots · Molecular robots · Robot compilers · Smart dust
11. Brain-Computer Linkage	· Neural control coordination · Linkage of mind and machine · Direct linkage with the nervous system · Brain-machine linkage
12. Hypersonic Technology	· Flight control algorithms · Propulsion technology · Thermal protection systems · Special materials

13. Advanced Materials	· Camouflage adaptation · Functional fibers · Biomaterials
14. Advanced Security Technologies	· Face and voiceprint recognition technology

Source: Prepared by the author from the U.S. government websites.

4.3.4 Frontier Areas in China

On the other hand, the top three themes identified as important initiatives in the 14th Five-Year Plan are R&D in engineering technologies directly related to security, including artificial intelligence, quantum technology, and semiconductors. In particular, the U.S. holds the chokepoint for semiconductor integrated circuits, indicating an urgent need for independence in this field (Table 4-4).

Table 4-4: Strategies for Science and Technology Frontier Areas from the 14th Five-Year Plan

1. Next-Generation AI	· Breakthroughs in basic theory · Research and development of dedicated AI chips · Establishment of platforms for deep learning research · Learning, reasoning and decision-making · Image recognition and speech recognition · Natural language processing
2. Quantum Information	· Quantum communication technology · Development of general-purpose quantum computers and quantum simulators · Quantum precision measurement technology
3. Integrated Circuits	· Integrated circuit design tools · Development of manufacturing equipment and new semiconductor materials · Insulated gate bipolar transistors (IGBTs) · Micro electro mechanical systems (MEMS) · Advanced storage technology · Development of wide-bandgap semiconductors such as silicon carbide and gallium nitride (SiC/GaN)
4. Brain Science and Neural Network Research	· Brain and cognitive sciences · Brain information technology · Brain disease mechanism research · Science of intelligence development of children and adolescents · Neural network and brain-machine interface (BMI) research
5. Biotechnology	· Application of genome editing technology · Cytogenetics and cell culture · Synthetic biology · Innovations in biopharmaceutical drug discovery, etc. · Vaccine development · In-vitro diagnosis · Antibody research · Bioagriculture-related technologies and creation of new varieties · Research on biosafety technology

6. Clinical Medicine and Life Care	· Cancer; cardiac, cerebrovascular, respiratory, and metabolic diseases · Healthcare technology · Regenerative medicine · Microbiome technology · Research and development of advanced therapies · Serious chronic and non-chronic disease prevention research
7. Deep Space, Deep Earth, Deep Sea and Polar Exploration	· Cosmogenesis, cosmic evolution, deep earth fundamental research · Mars orbit, asteroid exploration · Development of next-generation large rockets and reusable rockets · Deep earth exploration · Deep-sea exploration vessels · Three-dimensional polar observation platform and icebreaker · Lunar exploration project · Deep-sea exploration (*Jiaolong* manned submersible) · Polar exploration (*Xue Long* research vessels)

Source: 14th Five-Year Plan (Prepared by the author)

AI is probably the technology that will bring the most significant changes to industry and society in the 21st century. In this area, too, China is advancing almost on equal footing with the U.S. The U.S. and China together account for 80% of the number of AI-related papers, and Japan is said to be two laps behind. Professor Yutaka Matsuo of the University of Tokyo's Graduate School of Engineering, a leader in AI research in Japan, said, "I think the U.S. and China are both at the top, followed by the U.K., Canada, Germany, Singapore, etc., with Japan still behind them."

4.4 The Future of Space Hegemony

Space exploration undertaken as a national project is an important indicator for measuring a country's scientific and technological capabilities. In the past, the United States and the Soviet Union engaged in a fierce competition for space supremacy, starting with the "Sputnik Shock" in 1957. In the history of science, it is called the "Space Race." Today, America's rival is not the Soviet Union but China.

4.4.1 Competition over the Moon and Mars

In 2021, the 100th anniversary of the founding of the CCP, China succeeded in the soft landing of the probe *Tianwen-1* on Mars. Coincidentally, the U.S. Mars rover *Perseverance* has also begun exploration of Mars. The exploration of Mars was pioneered by the Soviet Union. Since 1960, more than 20 Mars probes have been launched, but they have been dogged by repeated failure. In addition to the distance of over 70 million kilometers, the technical hurdles to exploration are high, involving insertion into Mars orbit and soft landing. Even for the U.S., it took 12 years from the launch of *Mariner 3* in 1964 to the soft landing of *Viking 1* in 1976. It has even been said that a "graveyard of probes" lies between Earth and Mars. With the Tianwen-1 program, China achieved a Mars landing with only one mission.

U.S. rivalry had been sparked by the soft landing on the far side of the Moon by *Chang'e-4* in January

2019. Since neither the U.S. nor the Soviet Union had ever achieved this before, and since water was assumed to exist in the craters on the far side of the Moon, the U.S. felt a sense of urgency. Water is not only necessary to sustain life at a permanent lunar base, but is also an essential source of energy. When water is broken down into hydrogen and oxygen using nuclear energy, it can be used as an energy source, including rocket fuel. On March 26, 2019, Vice President Pence told the National Space Council that "Last December, China became the first nation to land on the far side of the Moon and revealed their ambition to seize the lunar strategic high ground and become the world's preeminent spacefaring nation. ...And let me be clear: The first woman and the next man on the Moon will both be American astronauts, launched by American rockets, from American soil."

China also successfully recovered lunar samples with *Chang'e-5* in December 2020. Remote sample collection is extremely challenging. Chinese researchers who analyzed samples brought back by *Chang'e 5* announced on January 7, 2022, that "the presence of water has been confirmed" (*Science Advances,* January 7 2022). A new space race between the U.S. and China for the first manned lunar exploration of the 21st century has already begun.

4.4.2 China is the sole player in low orbit.

In the field of space exploration, China has an overwhelming lead in the area of quantum communications satellites. The quantum communications satellite *Micius*, (Mozi), launched in 2016, was the world's first successful quantum teleportation of 7,600 kilometers. Quantum communications are said to be absolutely unbreakable, but they have a range of less than 100 kilometers on the ground. Professor Pan Jianwei of the University of Science and Technology of China, who was studying under Dr. Anton Zeilinger of the University of Vienna, Austria, succeeded in developing the world's first such network. It was completed in January 2021, and connected 32 locations, including Beijing and Shanghai. It is reportedly beginning to be used in the security and financial sectors. The U.S. makes no mention of "quantum communications satellites" at all. In her book, *The Day China Takes Over Space*, Professor Setsuko Aoki of Keio University writes, "If anything, the eerie silence of U.S. space and defense officials, who know the importance of quantum science satellites, eloquently illustrates how great the shock has been."

China leads the world in the number of rocket launches, ahead of the U.S. and Russia. In 2021, its number of launches in a single year reached a record high of 55. The Long March series of rockets has been launched more than 400 times. The BeiDou Navigation Satellite System is becoming a global infrastructure platform. In June 2020, its 55-strong fleet, including 35 state-of-the-art BeiDou-3 satellites, was completed and began positioning, navigation, and time-information services. Compatible chips can be installed in smartphones (including iPhones) and automobiles, potentially replacing the U.S.-led GPS. At least 30 countries enrolled in the Belt and Road Initiative are already using the BeiDou System. The advantage of the BeiDou system lies in its accuracy. In contrast to GPS's accuracy of several meters, BeiDou's standard is 50 centimeters, and this will be upgraded to several centimeters in the future. China was shocked by the U.S.'s degradation of GPS accuracy during the 1990 Gulf War. The Iraqi army, which was using GPS, fell into chaos. Also, in 1993, when the Chinese cargo ship *Yinhe* was inspected by the U.S. authorities on suspicion of transporting chemical substances to Iran, its GPS was cut off and the ship was forced to drift at sea. This experience made China keenly aware of the importance of building its own

positioning and navigation system. It is the BeiDou system that will make up for the perceived humiliation of the *Yinhe* Incident.

Today, as space travel is becoming a reality, the competition between the U.S. and China is also intensifying in space experiments in microgravity environments. The U.S.-led International Space Station (ISS) is to be retired in 2024. While there are discussions in the U.S. Congress to extend the project until 2030, the station's operation will be shifted to the private sector. Meanwhile, in April 2021, China successfully launched *Tianhe*, the core of the Tiangong space station. On June 17 2021, three astronauts were dispatched on *Shenzhou 12*, and on October 16th, three astronauts were transferred to Tiangong as replacement crew members on *Shenzhou 13*. The three conducted a long-term experimental stay of about six months.

4.4.3 Space exploration as a national policy and challenges by private ventures

China's strength in the field of space exploration is its vast administrative apparatus and human resources to implement the decisions of the CCP. The China National Space Administration, under the Ministry of Industry and Information Technology of the State Council, is responsible for space policy, and the state-owned enterprises China Aerospace Science and Technology Corporation and China Aerospace Science and Industry Corporation, which are the actual workforce, employ over 300,000 people. If the Chinese People's Liberation Army Strategic Support Force and other such forces are added to this number, the number is estimated to be close to 500,000. Compared to the 18,000 employees of the National Aeronautics and Space Administration (NASA), the sheer size of the organization and its human resources is overwhelming. Japan's Japan Aerospace Exploration Agency (JAXA) has about 1,600 employees.

On the other hand, the strength of the U.S. lies in the vitality of its private space ventures. Space ventures of all sizes, including SpaceX led by Elon Musk and Blue Origin led by Amazon founder Jeff Bezos, continue to take on the challenge of realizing diverse ideas. Another strength of the U.S. is its cooperation with allies such as Canada, Europe, and Japan. Twelve countries, including Japan, Canada, the United Kingdom, Italy, and Australia, have already announced their participation in the Artemis program, which aims for a manned flight to the Moon.

Space is already a "War-Fighting Domain" along with cyberspace and the electromagnetic domain. It is the understanding of both the U.S. and China that "Who controls space controls everything."

4.5 New Brain Circulation and the Future of Universities

4.5.1 U.S.-China comparative university rankings

The next generation of innovators will come from universities. Universities around the world are all competing for talent. University rankings are the most important factor that the best and the brightest place emphasis on when choosing a university. Although it is not given much importance in Japan, universities around the world are engaged in fierce competition to improve their rankings, which are also an indicator of brain circulation.

In the 2022 edition of the authoritative *Times Higher Education* (THE) rankings, the top ten was still dominated by American and British regulars such as Oxford, Caltech, Harvard, Stanford, and Cambridge,

but Tsinghua University and Peking University were ranked joint 16th, which came as a shock to many in academic and other circles. The University of Tokyo and Kyoto University are ranked 35th and 61st, respectively.

In 2011, when the THE rankings began under the current rules, Tsinghua University was ranked 58th. Only 10 years later, in 2021, it was ranked 20th, and in 2022, it had moved up to a position where it could be a contender to join the top ten. The THE evaluation criteria's are education, research, number of papers cited, internationality, and funding from industry. Taking research alone, Tsinghua University is already in the top ten, in eighth place, and Peking University in ninth. The Chinese government is using "selection and concentration" as a national policy to support China's entry into the top ten through initiatives such as the 211 Project, the 985 Project, and "Double First-Class."

4.5.2 China as Asian champion

When we extract Asian universities from the THE rankings, China's rapid progress is obvious. The University of Tokyo, the top university in Asia until 2015, lost its lead in 2016 when it was overtaken by the National University of Singapore. In turn, Tsinghua University overtook it to take the top spot in 2019. Tsinghua University and Peking University are not alone. The Asian university rankings are dominated by schools such as Fudan University, Zhejiang University, Shanghai Jiao Tong University, the University of Science and Technology of China, Nanjing University, Wuhan University, Southern University of Science and Technology, Huazhong University of Science and Technology, and the University of Hong Kong. Japan's Osaka University, Nagoya University, Tohoku University, and Tokyo Institute of Technology have disappeared from the top 30. Ten years from now, the composition of university rankings and brain circulation will undoubtedly have changed significantly.

Table 4-5: Trends in Asian University Rankings

Ranking	2011	2015	2022
1	The University of Tokyo (Japan) *26th globally	The University of Tokyo (Japan) *23rd globally	Tsinghua University (China) *16th globally
2	Pohang University of Science and Technology (South Korea)	Singapore National (Singapore)	Peking University (China) *16th globally
3	Singapore National (Singapore)	The University of Hong Kong (Hong Kong)	Singapore National (Singapore)
4	Peking University (China)	Peking University (China)	The University of Hong Kong (Hong Kong)
5	The Hong Kong University of Science and Technology (Hong Kong)	Tsinghua University (China)	The University of Tokyo (Japan)
6	University of Science and Technology of China (China)	Seoul National University (South Korea)	Nanyang Technological University (Singapore)

7	Kyoto University (Japan)	The Hong Kong University of Science and Technology (Hong Kong)	Chinese University of Hong Kong (Hong Kong)
8	Tsinghua University (China)	Korea Advanced Institute of Science & Technology (KAIST; South Korea)	Seoul National University (South Korea)
9	Korea Advanced Institute of Science & Technology (KAIST; South Korea)	Kyoto University (Japan)	Fudan University (China)
10	National Tsing Hua University (Taiwan)	Nanyang Technological University (Singapore)	Kyoto University (Japan)
11	Seoul National University (South Korea)	Pohang University of Science and Technology (South Korea)	The Hong Kong University of Science and Technology (Hong Kong)
12	Hong Kong Baptist University (Hong Kong)	Chinese University of Hong Kong (Hong Kong)	Zhejiang University (China)
13	Tokyo Institute of Technology (Japan)	Tokyo Institute of Technology (Japan)	Shanghai Jiao Tong University (China)
14	National Taiwan University (Taiwan)	Sungkyunkwan University (South Korea)	University of Science and Technology of China (China)
15	Nanjing University (China)	National Taiwan University (Taiwan)	Hong Kong Polytechnic University (Hong Kong)
16	Osaka University (Japan)	Osaka University (Japan)	Korea Advanced Institute of Science & Technology (KAIST; South Korea)
17	Tohoku University(Japan)	Tohoku University(Japan)	Nanjing University (China)
18	Hong Kong Polytechnic University (Hong Kong)	City University of Hong Kong (Hong Kong)	National Taiwan University (Taiwan)
19	National Sun Yat-sen University (Taiwan)	Fudan University (China)	Sungkyunkwan University (South Korea)
20	Sun Yat-sen University (China)	Hong Kong Polytechnic University (Hong Kong)	City University of Hong Kong (Hong Kong)
21	Nanyang Technological University (Singapore)	Korea University (South Korea)	Yonsei University (South Korea)
22	National Chiao Tung University (Taiwan)	University of Science and Technology of China (China)	Wuhan University (China)
23	Yonsei University (South Korea)	Yonsei University (South Korea)	Southern University of Science and Technology (China)
24	Zhejiang University (China)	Nagoya University (Japan)	Ulsan National University of Science and Technology (South Korea)
25	*Only 200 schools in 2011	Tokyo Metropolitan University (Japan)	Huazhong University of Science and Technology (China)

26		Nanjing University (China)	Pohang University of Science and Technology (South Korea)
27		National Tsing Hua University (Taiwan)	Korea University (South Korea)
28		National Chiao Tung University (Taiwan)	University of Macau (Macao)
29		Shanghai Jiao Tong University (China)	Taipei Medical University (Taiwan)
30		Tokyo Medical and Dental University (Japan)	Sejong University (South Korea)

Source: *Times Higher Education 2022* (prepared by the author)

Conclusion: Japan and the Future of U.S.-China Science and Technology Hegemony

The author has no intention of unreservedly praising China's policies on science, technology, education. China is faced with numerous weaknesses in its conflict with the U.S. for scientific and technological hegemony. First, it has a dwindling number of partner countries willing to engage in international cooperation. While the U.S. can establish a wide range of scientific and technological cooperation frameworks with its allies in Europe and Asia, China's leading partners may be limited to Russia and a few other countries. Formerly, many Chinese papers were internationally co-authored, and joint research with the U.S. in particular led to favorable estimates of China's scientific and technological capabilities. Human networks are being decoupled through means such as visa restrictions by the U.S. on Chinese researchers and students. In the long run, these moves will be detrimental to both the U.S. and China. The arrest, indictment, and conviction of U.S. Nobel Prize candidate Dr. Charles Lieber of Harvard University for his participation in the Thousand Talents Plan, shocked the U.S. scientific community.

The dual structure of power in research institutions and universities will also eventually become problematic. In addition to a president, universities and research institutes are furnished with a Communist Party secretary. The frequent turnover of Peking University presidents that occurred several years ago is said to have stemmed from a power struggle between the president and the party secretary in the background. In addition, due to the political turmoil caused by the Cultural Revolution and other factors, China has always had a weak tradition of basic research. It lacks the ideal of contributing to humanity. Researchers' freedom of speech is not always guaranteed. Research that does not conform to party policy is disregarded. China's areas of specialty are unduly biased toward engineering. The country has also suffered from the expansion of universities, which has led to deteriorating educational standards, and inefficiencies in research and development.

The development of science and technology cannot be achieved by one country alone. Although Japan has regressed in terms of numbers of papers, it still produces a great deal of outstanding research. As the confrontation between the U.S. and China grows more severe, Japan has a role to play in minimizing conflict in the field of science and technology by deepening cooperation with other Asian and European countries.

5 Current Status and Direction of China's Digital Industry and DX Infrastructure

Jin Jianmin

Foreword

China's economic growth has maintained a trend of high growth for several decades, riding the tiger of globalization while facing down various difficulties. However, in the wake of the global financial crisis, the country has been shifting to an innovation-driven development strategy in order to move to a new stage that emphasizes quality over quantity. At the same time, a home country/region-first industrial and technological policy that runs counter to globalism (which is characterized by liberalization of trade and investment) is beginning to emerge worldwide. This is evidenced in the trade disputes that have sprung up between the U.S. and China. In addition, the COVID-19 pandemic has necessitated new mechanisms for ensuring resilience in economic and social life. Furthermore, the COP26 agreement to promote countermeasures against global warming has led to the need to balance economic growth with decarbonization initiatives to achieve carbon neutrality.

Against this backdrop of drastic economic and social changes at home and abroad, China has come up with a new "Dual Circulation" development strategy that aims for technological independence and the establishment of a robust supply chain, based on domestic demand, while promoting domestic-foreign cooperation and breaking away from excessive dependence on external technologies. A high priority in the new development strategy is the digital economy. This is because China has the following advantages: the digital economy is not necessarily dominated by large corporations, and startups such as venture companies can also play a major role; data is replacing oil as a key asset; and a population of 1.4 billion people provides a wealth of technological application scenarios. On the macro-economic front, China is expected to expand digital consumption, increase investment in digital infrastructure, and expand digital trade, as typified by e-commerce. In other words, China seems to have determined that it can demonstrate its superiority in promoting the digital economy. Indeed, digital technologies and industries are becoming a driving force for economic growth, and countries around the world are accelerating their efforts to promote digital innovation and digital transformation (DX) as a central part of their economic and social policies. Digital competitiveness has become a core element of international competitiveness.

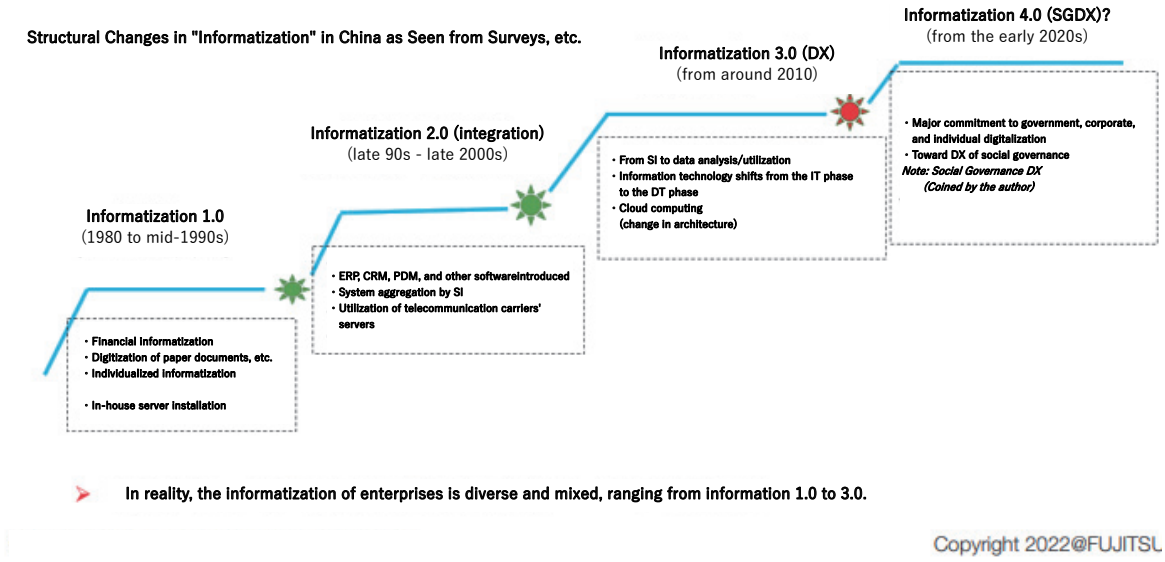
This chapter reviews policies and developments in China's digital economy, and examines policy trends related to the development of digital and DX infrastructure. We will look at semiconductors and 5G as example fields. We will also consider the implications of the above for Asia and Japan.

5.1 Digitalization of China's Economy and Society as Seen in the 14th Five-Year Plan

From the perspective of China's governance system, the current status and future direction of economic development can be observed by examining the policies, policy objectives, and policy measures listed in the Five-Year Plan, which the government enacts every five years. Therefore, in considering China's digital economy and digital infrastructure, which is the research topic of this chapter, it is essential to review the goals for the digital economy and the promotion policies for industrial technology contained in the 14th Five-Year Plan. This Plan was ratified at the National People's Congress in March 2021.

5.1.1 Evolving informatization and digitalization in China

Compared to the major developed countries, China's informatization and digitalization has progressed quite steadily, albeit with some time lag. This evolution began with the informatization of companies (Informatization 1.0) in the early 1980s. It then evolved into the integration of IT systems (Informatization 2.0) in the late 1990s, and subsequently into DX (Informatization 3.0) from around 2010. With the COVID-19 pandemic as a catalyst, China is now moving toward DX of governance of the entire socio-economic system, involving not only industry but also individuals and all sectors of government (Informatization 4.0). Indeed, true digitalization has begun, with digital technology becoming the next-generation infrastructure base technology that will support not only the economy but also social development and modernization of governance (Figure 5-1).



Source: Qianzhan Industry Research Institute; interviews, etc.; prepared by the author.

Figure 5-1: Evolving Informatization/Digitalization in China

During the Informatization 1.0 and Informatization 2.0 phases mentioned above, few IT technologies originated in China. The main impetus was to catch up with advanced IT countries such as the U.S. China had no leading IT firms providing products and services, and multinationals from Europe, the U.S., Japan, and other advanced IT countries were the main players in the Chinese market.

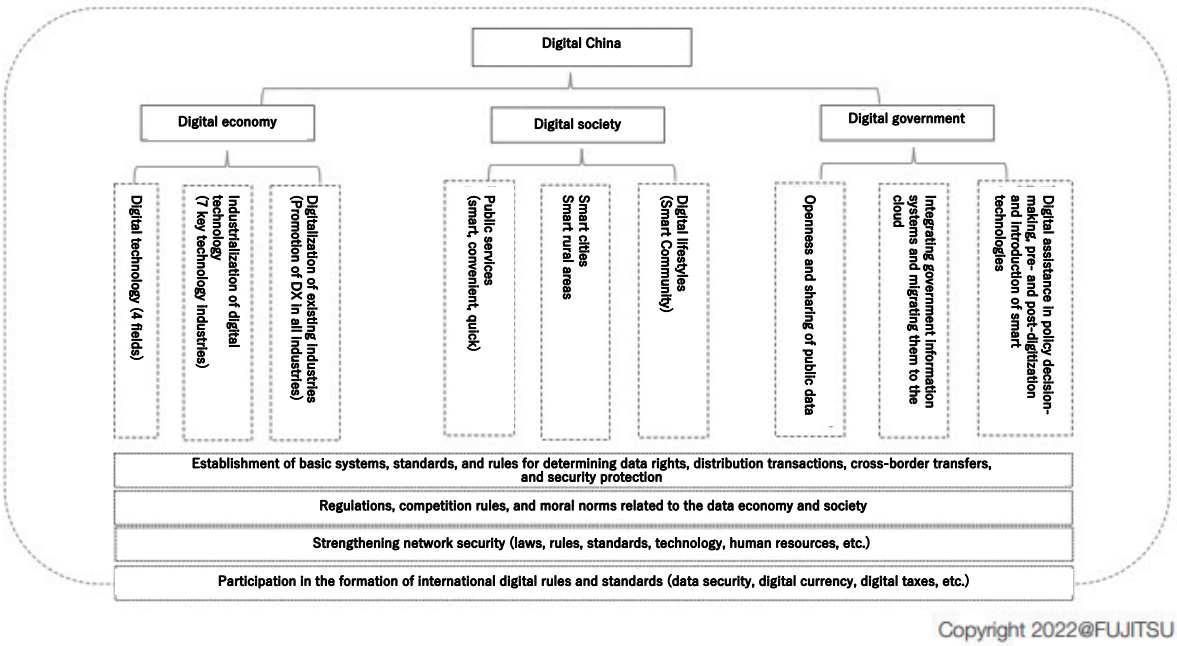
Chinese-originated business models and technologies began to develop as next-generation digital technologies came onstream during the Informatization 3.0 phase and new internet-based companies such as Baidu, Alibaba, and Tencent (BAT) emerged. In particular, Chinese internet startups have focused on China's social issues, and socially implemented innovations that use digital technology to resolve such issues have flourished. These market-oriented digital innovations have continued to expand the digital market by bringing value to consumers and providing a positive experience. These economic and market trends eventually attracted the attention of the government, which embarked on a digital economy promotion policy to further expand the digital market and digital industry.

5.1.2 Establishment of KPIs related to the digital economy in the 14th Five-Year Plan, and concretization of digitization policies

China's policies for promoting the digital economy have been tweaked according to the situation of industrial and economic development. For example, numerical targets for the internet penetration rate (as an indirect target for the digital economy) were set as a key performance indicator (KPI) for driving innovation in the 13th Five-Year Plan (2016-2020). Furthermore, the 14th Five-Year Plan (2021-2025) set a target for the added value of core industries in the digital economy as a share of GDP (to increase from 7.8% in 2020 to 10% in 2025).

(1) The policy framework for promoting digitalization: Building "Digital China"

Figure 5-2 lays out the digital policy framework (targets and policies) for promoting "Digital China" under the 14th Five-Year Plan (Part 5). The goal is to build a digital economy, digital society, and digital government, and to drive the transformation of production, lifestyles, and governance models through DX.



Source: Prepared by the author based on the 14th Five-Year Plan and Long-Range Objectives Through the Year 2035

Figure 5-2: Framework for Building a Digital China that Embraces the Economy, Society, and Government

As shown in Figure 5-2, the digital economy is unlike digital society and digital government, which constitute fields of social implementation. That is to say, while the digital economy itself is a *target* of digital technology implementation, it is also a *provider* of digital technologies and digital infrastructure. This digital framework also includes provisions for institutional development (soft infrastructure) in the digital economy, digital society, and digital government sectors. In the past, Chinese government policy did not generally encourage domestic capital investment in the internet industry, and did not impose many regulations on it. However, recently, rules have begun to be established, and trends in this regard merit ongoing observation.

(2) Key areas of digital technology and digital industry

The 14th Five-Year Plan defines priority areas for policy initiatives regarding digitization. Overall, the strategy can be summarized into three rubrics--core technology strategy, digital technology industrialization policy, and industrial digitalization policy--with the following prescriptions.

① Technological strategies to achieve superiority (including policies to overcome industry weaknesses)

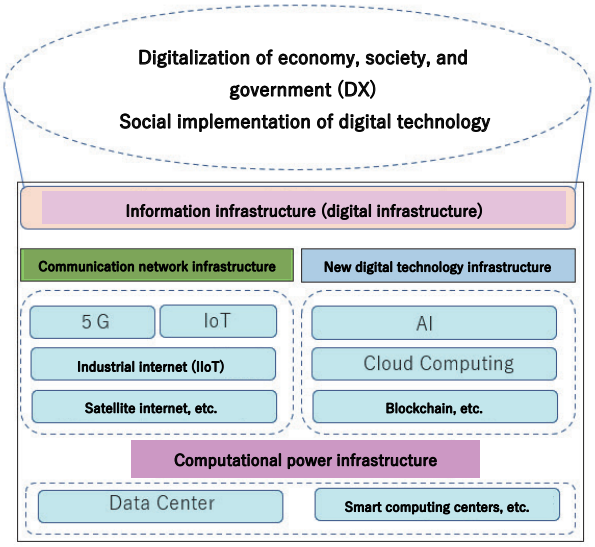
- Priority core technology developments include, in the hardware field, high-end chips and sensor technology that will form the basis of IoT; and in the software field, operating system products and core AI algorithms.
- Four medium- to long-term future technologies are mentioned: quantum computing, quantum communications, neurochips, and DNA chips.

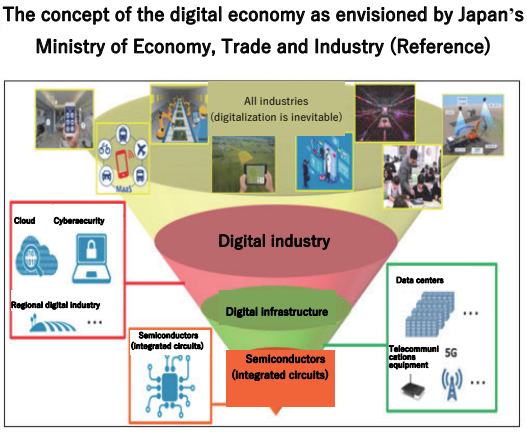
② Digital technology and industrialization

- The following are to be accelerated: industrialization and social implementation of AI, big data, blockchain, cloud computing, internet security,
  telecommunications equipment including 5G, and core electronic components.
- The promotion of vertical 5G adoption is to include 5G + smart transportation, 5G + smart energy, and 5G + medical care.
- The Plan also stipulates standardization, openness, and encouragement of sharing (promotion of distribution) of private-sector data.

③ Digitalization of existing industries

- Cloud-native, data-driven, end-to-end (E2E) digitalization is to be promoted.
- Smart Agriculture is to be promoted.





Source: Prepared by the author based on relevant materials from the Chinese government and the website of Japan's Ministry of Economy, Trade and Industry

Figure 5-3: Composition of Digital Infrastructure Supporting the Digital Economy

As shown in Figure 5-3, China's policy for promoting the digital economy consists of digital infrastructure as an industrial base and the social implementation of digital technologies (industrialization of digital technologies and DX of existing industries). We should note that "digital infrastructure" refers to three areas: communications infrastructure, next-generation digital technology infrastructure, and computing power infrastructure. Comparing Japan and China in terms of their thinking on the key components of the digital industry (semiconductors, 5G, data centers, cloud, etc.), Japan's Ministry of Economy, Trade and Industry specifically lists semiconductors and security, while China lists industrial internet and satellite internet. In both China and Japan, promoting digital infrastructure is considered a priority.

With regard to digitalization in China, the focus thus far has been on social implementation (visible capabilities). Going forward, however, more emphasis will be placed on promoting digital infrastructure (invisible technologies) in tandem with social implementation. Below, we examine developmental trends in the technology industry with regard to semiconductors and 5G, which we shall take as example areas of key digital infrastructure.

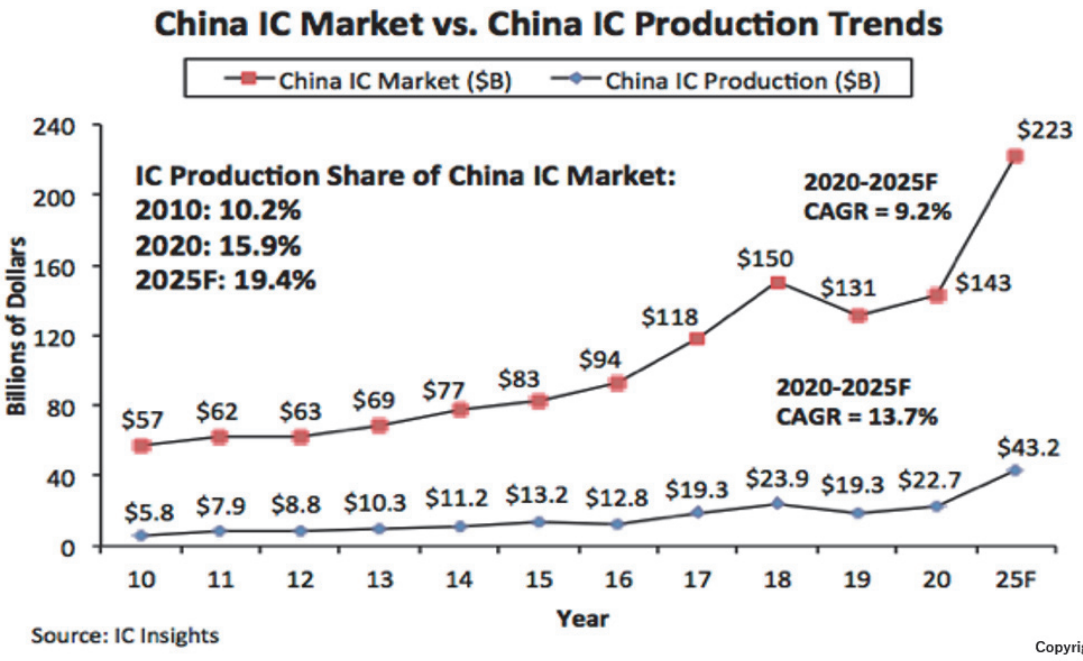
5.2 The Digital Infrastructure Technology Industry: Semiconductors

China's digital economy policy is prioritizing the promotion of the semiconductor industry because future economic growth is expected to increasingly depend on the continued introduction of advanced electronic systems. While the semiconductor chip (IC chip) is a key module within such electronic systems, China's domestic semiconductor industry is not able to meet the needs of digitalization. The country's policy

priorities in this area reflect this fact.

5.2.1 Gap between growing IC chip market needs and supply capacity in China

China has been the largest consumer of ICs since 2005, but it has failed to significantly increase domestic IC production. In response to the domestic supply shortage, Chinese industry has reacted on the basis of the principle of comparative advantage. It has specialized in electronic and digital finished products (assembly), looking to highly efficient supplier countries and regions such as Japan, the U.S., South Korea, and Taiwan for the supply of technology- and capital-intensive semiconductors.



Source: IC Insights

Figure 5-4: China's Semiconductor Market and Production Trends and Forecasts

As Figure 5-4 shows, the disparity between China's semiconductor demand and its supply capacity has developed into a yawning chasm.

According to IC Insights, a U.S.-based semiconductor market industry research firm, of the USD 22.7 billion worth of ICs manufactured in China in 2020, local Chinese companies produced only USD 8.3 billion (36.5%), accounting for just 5.9% of the country's USD 143.4 billion IC market. The remainder was produced by foreign companies with IC wafer fabs in China. These companies include Taiwan Semiconductor Manufacturing Company Limited (TSMC), SK Hynix, Samsung, Intel, and United Microelectronics Corporation. Incidentally, of the USD 8.3 billion in ICs manufactured by local Chinese companies, about USD 2.3 billion came from vertically integrated device manufacturers, and USD 6 billion from foundries such as Semiconductor Manufacturing International Corporation (SMIC).

5.2.2 China's accelerating policies for promoting the semiconductor industry, and its expanding production capacity

The Chinese government is not unaware of the precariousness of its supply-chain situation. Since around

2006, it has been working to promote the semiconductor industry based on the concepts of independent innovation and increasing the rate of domestic production. In particular, various industrial policies were enacted in 2014, including the "Guidelines to Promote a National Integrated Circuit Industry." These put in place investment and tax exemption policies, such as the establishment of a large-scale investment fund, accompanied by government-funded industry supports. In particular, the U.S. restrictions on semiconductor exports to China as a result of the U.S.-China trade dispute since 2017, as well as the subsequent technology restrictions and extraterritorial application of U.S. restrictions to third countries, have created a sense of crisis in China. There is a sense that the country is being "controlled by others" (*shòuzhìyúrén*). This has led it to rush to take measures to strengthen its supply chains, in a context similar to what Japan, the U.S., and Europe refer to as "economic security." Against this background, the sense of urgency regarding China's promotion of semiconductors (i.e., import substitution) no longer appears to be limited to the government, but has become the consensus across the entire industrial sector.

According to Chip Insights, a Chinese research firm specializing in semiconductors, the IC chip production bases in China as of the end of June 2021 are as follows.

① 12-inch (300 mm)
- In operation: 27 lines with a capacity of 1.18 million units (including 500,000 units produced with foreign investment)
- Under construction/contracted: 29 lines, capacity 1.32 million units

② 8-inch (200 mm)
- In operation: 28 lines, capacity 120 units
- Under construction/contract: 10 lines, capacity 270,000 units

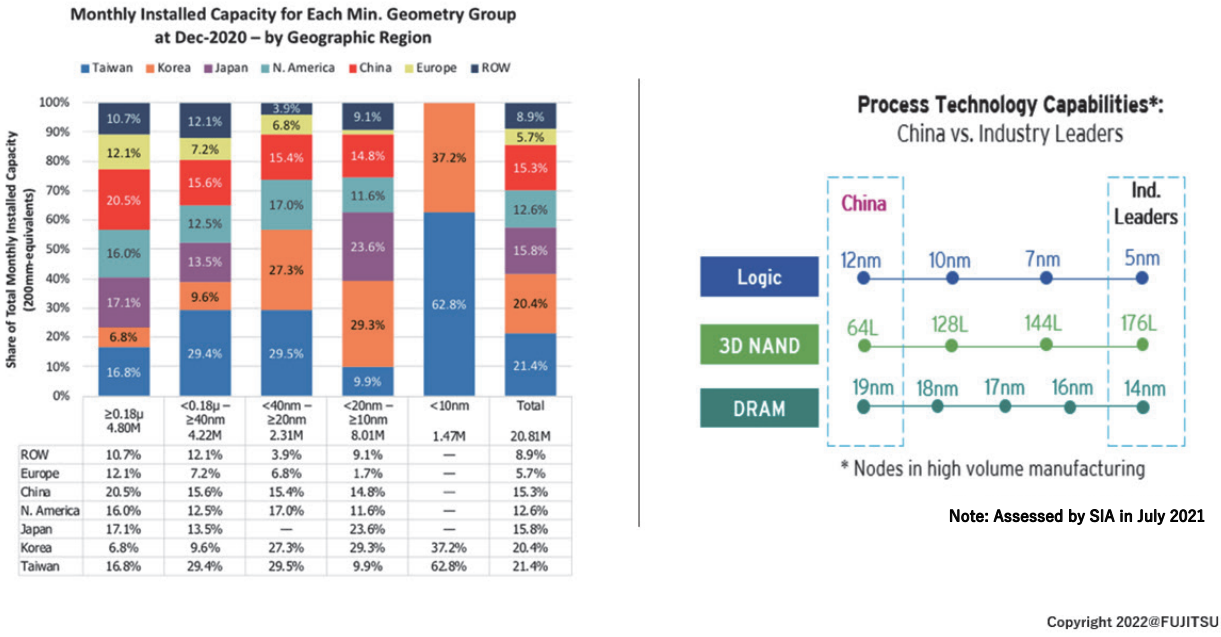
③ 6-inch (150 mm) and smaller
- In operation: 4 million units (6-inch equivalent)

As can be seen from the above numbers on IC chip production lines, the development of semiconductor production bases in China is based on the 12-inch size.

It also appears that dedicated investments funds established under the leadership of the central government are stimulating the growth of China's semiconductor industry. The first-phase investment fund (September 2014) had capital of about USD 15.5 billion, and the second-phase fund (October 2019) capital of about USD 32 billion. Local-government investment funds, totaling about USD 57.7 billion, have also been disbursed. As regards investment areas, in terms of value, the first-phase investment fund (which invested in about 70 companies), was angled 67% toward manufacturing firms, 17% to design, 10% to packaging and testing, 6% to equipment and materials, and 6% to other firms. The first-phase fund has already begun to exit (sell shares to third parties or go public) since 2020. The second-phase fund will continue to invest in the entire semiconductor supply chain, but will likely prioritize investments in the design, equipment, and materials areas. The fund will also prioritize investments in storage, 5G, and AI-related areas.

China's semiconductor industry has certainly grown considerably through policies to attract foreign investment and promote local industry. As shown in Figure 5, China's production capacity share at the end of 2020 was 15.3%, which, although not as high as Taiwan and South Korea, was closing in on Japan,

and was expected to surpass Japan in 2021. Moreover, from a technical standpoint, China also account for a significant production share of line widths of 12 nm to 40 nm. However, a high percentage of production in these relatively advanced technological fields is undertaken by foreign semiconductor production bases in China, and the technological level and mass production capacity of local Chinese firms are likely to be limited. According to the U.S.-based Semiconductor Industry Association (SIA), as of 2021, the IC chip mass-production technology level of local Chinese companies is assessed to be three generations behind in logic and 3D NAND flash memory, and four generations behind in DRAM (Figure 5-5).



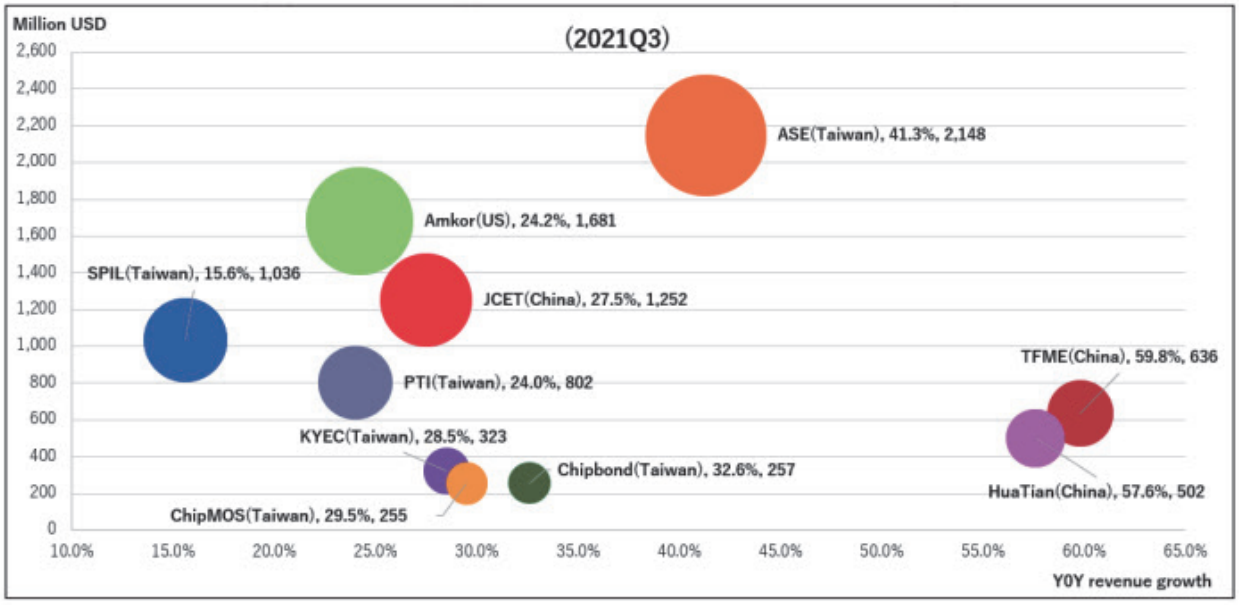
Source: IC Insights, SIA Research

Figure 5-5: IC Chip Production Capacity in China and Major World Countries/ Regions; Technology Gaps between China and the World

The above-mentioned policy of promoting high-end IC chips in China's digital industry hinges on the question of how to bridge this technology gap with the world's leading companies. However, the U.S. has not stopped at export restrictions and technology restrictions for IC chips below 14 nm. It also restricts the export of advanced production equipment and development tools to China, including via third countries, through extraterritorial application and pressure. For example, extreme ultraviolet (EUV) lithography equipment produced by the Dutch manufacturer ASML cannot be exported to China. This equipment is necessary for the production of semiconductors at the highest level, starting at 7 nm. Of course, China's leading foundry manufacturer SMIC has developed 7-nm production technology using flip-flop technology; it has also declared that it entered risk production in 2020. However, even if 7-nm mass production can be achieved, it is hard to imagine the development and production of more advanced technology (5 nm and beyond) without EUV. Unless a miracle of some sort emerges, such as the lifting of restrictions on EUV and other exports to China, the successful development of EUV by China itself, or the emergence of alternative technologies for chip production and equipment, the advancement of China's digital technology and industry will be limited.

5.2.3 Expansion into Asia from the OSAT field

Although China is noticeably behind in semiconductor equipment and materials, as well as in front-end chip production processes, it is in a leading position in the global outsourced semiconductor assembly and test (OSAT) arena. As Figure 5-6 shows, there are three Chinese companies among the top 10 in the global OSAT market.



Source: Prepared by the author based on Trend Force data. Copyright 2022@FUJITSU

Figure 5-6: World OSAT Top 10 Sales and Growth Rates (2021, Q3)

According to SIA, Chinese manufacturers account for about 38% of the global market, with an estimated 30% of production capacity located overseas (in Asia). The top three Chinese companies have OSAT sites in South Korea and Singapore (JECT), and Malaysia (Tongfu Microelectronics (TFME) and Huatian), respectively, increasing the presence of Chinese manufacturers in the global OSAT market. However, all three companies' overseas expansion has been achieved through M&As and capital investment. These strategies have become difficult in recent years due to geopolitical factors such as national security screening, which has been stepped up in various countries and regions.

5.3 The Digital Infrastructure Technology Industry: Semiconductors: 5G

Over the past few years, the number of business management activities and government services in virtual space has increased, as indeed has the number of individual lives being lived in this arena. Numbers of IoT devices and quantities of data traffic have skyrocketed in tandem. The next-generation digital infrastructure, 5G, is expected to facilitate such virtual activities (digital activities) and realize an efficient and reliable economic society.

5.3.1 Consumers' active choice of 5G-enabled handsets

In fact, consumer-oriented (B2C) public 5G is beginning to spread several times faster than previous telecom network technologies. By the second half of 2021, penetration had increased to the point where new 5G-enabled mobile handset sales in China accounted for more than 80% of total sales (75.9% for the full year of 2021). According to China's Ministry of Industry and Information Technology, as of the end of 2021, the number of 5G base stations opened in China reached 1.425 million (5.9 million 4G base stations in the same period) and the number of 5G subscribers and users reached 355 million (1.643 billion total mobile handset subscriptions and 730 million 5G plan subscribers in the same period). In addition, 5G-related investment of RMB 184.9 billion (approx. JPY 3.143 trillion) in 2021 accounted for 95.1% of the total investment related to wireless communications.

The accelerated penetration of 5G among consumers in China is due to the increasingly good cost performance of 5G handsets themselves, and the policy of front-loaded development of 5G infrastructure. For example, as of the end of October 2021, around 60 manufacturers, mainly local companies, were supplying the market with some 450 types of terminals, and fierce competition had simultaneously reduced costs and improved performance. The average price of a 5G handset fell from RMB 3,733 in January 2021 to RMB 2,850 in September (a decrease of about 24%). 5G handsets priced below RMB 1,000 are also on the market, offering choices for each consumer segment.

This positive consumer choice for 5G has encouraged telecommunications carriers to innovate in their 5G infrastructure development and solution vendors.

5.3.2 5G network development ahead of schedule

On the other hand, China has two of the world's top four 5G equipment providers (Huawei, Ericson, Nokia, and ZTE), making it easy for the country to move forward with the development of 5G networks. Figure 7 gives the results of a large-scale public 5G equipment tender. While the bidding was led by domestic vendors Huawei and ZTE, foreign vendors Ericson and Nokia also participated, and accounted for a certain share of the winning bids (Table 5-1).

Table 5-1: 5G Infrastructure Upgrades Ahead of Schedule and Formation of Equipment Industry Ecosystem
China 5G; Overview of Market Major Equipment (Base Stations) Centralized Procurement (as of 08/01/2021)

Frequency of centralized procurement			1	2	3	4	Total
Centralized procurement carrier			China Mobile (NSA, 2.6G bend)	China telecom/ China Unicom (3.5G band)	China Mobile/CBN Joint (700M band)	China telecom/ China Unicom (2.1G band)	
Date of public notice of bidding results			2020.03.27	04/24/2020	07/16/2021	07/30/2021	
Name of company winning bid Name	Huawei	Number of base stations	132,787	145,000	288,237	137,504	703,528
		Share of successful bids	57.20%	58.00%	60.00%	58.62%	58%
	ZTE	Number of base stations	66,653	75,000	148,932	86,200	376,785
		Share of successful bids	28.71%	30.00%	31.00%	35.62%	31%
	Ericsson	Number of base stations	26,604	22,500	9,606	7,938	66,648
		Share of successful bids	11.46%	9.00%	2.00%	3.28%	6%
	Dtmobile (Datang Telecom)	Number of base stations	6,099	7,500	14,407	10,358	38,364
		Share of successful bids	2.63%	3.00%	3.00%	4.28%	3%
	NOKIA	Number of base stations	0	0	19,215	0	19,215
		Share of successful bids	0	0	4.00%	0	2% (of the total)
Total base stations			232,144	250,000	480,397	242,000	120,4541
Unit price（RMB 10,000/bases)			16.0	13.0	8.0	8.3	Average 10.6

Note: Excluding 5G test network procurement and small-scale independent bidding conducted privately; third centralized procurement (value) and fourth centralized procurement (each carrier's final share adjustment) are industry survey estimates.

Data: Compiled by the author based on "Telecom Industry News"

China is thus allowing foreign vendors access, despite the fact that the Western countries concerned are shutting Chinese vendors out of the 5G network market. This may be due to the country's desire to maintain its technological diversity, relationships with global companies, and open market stance. The results of the bidding process show that the unit price of base stations (price/station) has dropped significantly, nearly halving in a little over a year. In addition, the large-scale development of base stations is also forming a supply chain for 5G equipment, and in fact foreign vendors such as Ericson and Nokia are also seen to be utilizing Chinese suppliers.

5.3.3 Promotion of enterprise 5G use

On the other hand, industry is also paying attention to the advantages of 5G, such as ultra-high speed, low latency, and multiple simultaneous connections, which have been difficult to achieve with conventional enterprise (business-oriented) communications technologies. Enterprise 5G can be divided into: ① the local 5G construction method adopted mainly in Japan and Germany, where individual companies build their own 5G infrastructure (spectrum must be allocated to individual companies); and ② the method of slicing (logical virtualization) public 5G infrastructure to build enterprise-specific 5G tailored to corporate needs. In China, the slicing technology described in method ② above is widely used because of its high frequency utilization efficiency, the sharing of carriers' 5G infrastructure, economies of scale and lower utilization costs for individual companies. Also attractive is the fact that infrastructure development and operation can also be shared, reducing the demand for human resources and know-how from individual companies. Incidentally, China has not allocated frequencies for local 5G.

However, method ② is likely to be affected by the operational status of the public 5G network, and there are concerns about ensuring data security. Therefore, in China, a system is being considered whereby the user plane function (UPF), which manages the transmission and reception of user data (business data), and multi-access edge computing (MEC), which stores and manages user business data, will be physically installed within the company. This is expected to achieve both data security and the benefits of 5G, such as reduced costs and low latency. So far, a cumulative total of 1,600 enterprise 5G networks (as of the end of November 2021) have been built in China.

Table 5-2: Key Objectives of China's 5G Application Development Action Plan (2021–2023 three-year plan)

		Name of indicator	Target	Meaning of indicator
2C Indicators	1	5G penetration rate (%)	40	Ratio of 5G individual users to total population
	2	Ratio of 5G traffic (%)	50	Ratio of 5G traffic volume to mobile internet traffic
2B Indicators	3	Percentage of large industrial companies adopting 5G (%)	35	Ratio of companies introducing 5G applications in production management activities
	4	Number of 5G model cases in priority industries	100	Number of models selected from 5G deployment cases in priority industries
	5	Average annual growth rate (%) of 5G IoT terminal users	200	Average annual growth rate of 5G IoT terminals (SIMs) in industry
Base indicators	6	Number of 5G base stations per 10,000 population	18	Average number of 5G base stations per 10,000 people nationwide
	7	Number of virtual 5G NW for corporate use only (sheets)	3,000	Enterprise-specific virtualization that leverages public 5G

Source: Authors' research and compilation based on relevant data from the Chinese government, industry, and companies

As the expansion of public 5G for consumers progresses (increase in subscribers and expansion of infrastructure development), the end-game in terms of China's policy to promote is shifting to enterprise 5G (vertical integrated business sectors for corporates) in the second half. In July 2021, the "Set Sail" action plan for application of 5G to industry and society at large was formulated. This was a three-year plan running from 2021 to 2023. The action plan focused on 15 industries in the three areas of ① information consumption (consumers), ② real economy (industry), and ③ consumer affairs (services for community residents). Table 5-2 gives the KPIs of the 5G application "Set Sail" action plan. The KPIs included two indicators for user development, three indicators for industrial application, and two indicators for net infrastructure. The main goal is to promote the development and introduction of commercial 5G networks.

In November 2021, the 14th Five-Year Plan for National Informatization (2021-2025) was released by the Chinese government. Taken together with the above-mentioned Set Sail action plan for 5G application, the following four indicators are related to 5G.

① Number of 5G base stations per 10,000 population: 5 (2020) to be increased to 26 (2025)

Combined with the Set Sail action plan targets mentioned above, the total number of 5G base stations was to increase from 771,000 in 2020 (5 stations per 100,000 people) to 1,425,000 at the end of 2021 (10.1 stations per 100,000 people), to approximately 2.54 million at the end of 2023 (18 stations per 100,000 people), and to approximately 3.67 million at the end of 2025 (26 stations per 100,000 people),

② 5G user penetration per percentage of population is to increase from 15% (2020) to 56% (2025).

The 56% penetration rate at the end of 2025 is higher than the 47% projected by the GSM global telecommunications industry association at the end of 2020.

This is comparable to the 55% penetration rate in the U.S.

③ Number of dedicated 5G networks (virtualized enterprise 5G) to be maintained annually: 800 (2020) to 5,000 (2025)

The number of virtualized 5G enterprises is to increase from 3,000 in 2023 to 5,000.

④ Coverage (%) of administrative villages (equivalent to a "village# in Japan): No coverage (2020) to 80% (2025)

These are KPIs for bridging the digital divide.

As we have seen above, the Chinese government's goal is to have nationwide 5G coverage by 2025, creating an environment in which 5G will be adopted as a matter of course. However, just as the shortage of semiconductor chips delayed the development of 5G base stations in 2021, it will be necessary to pay attention to uncertainties such as the regulatory situation in the U.S. and whether attractive solutions will be developed for consumers and businesses.

5.3.4 Expansion into Western countries has become difficult, but overseas expansion into emerging countries in ASEAN and elsewhere continues

Chinese companies lead the world in technology, practical experience in application, and accumulation of operational know-how. However, they are banned or restricted from operating in Western countries for geopolitical reasons of security. Nevertheless, as Figure 5-7 shows, according to the U.S. Council on Foreign Relations website, Huawei equipment is still being used in some developed European countries,

and most emerging economies. This situation is presumed to be the same for ZTE, another leading vendor.

Thus, while the world is divided on the issue of adopting Chinese 5G equipment vendors, the stance of ASEAN countries on the adoption of Chinese 5G vendors is becoming more balanced. The actual situation can be divided into the following three categories.

① Countries that proactively adopt Chinese 5G equipment

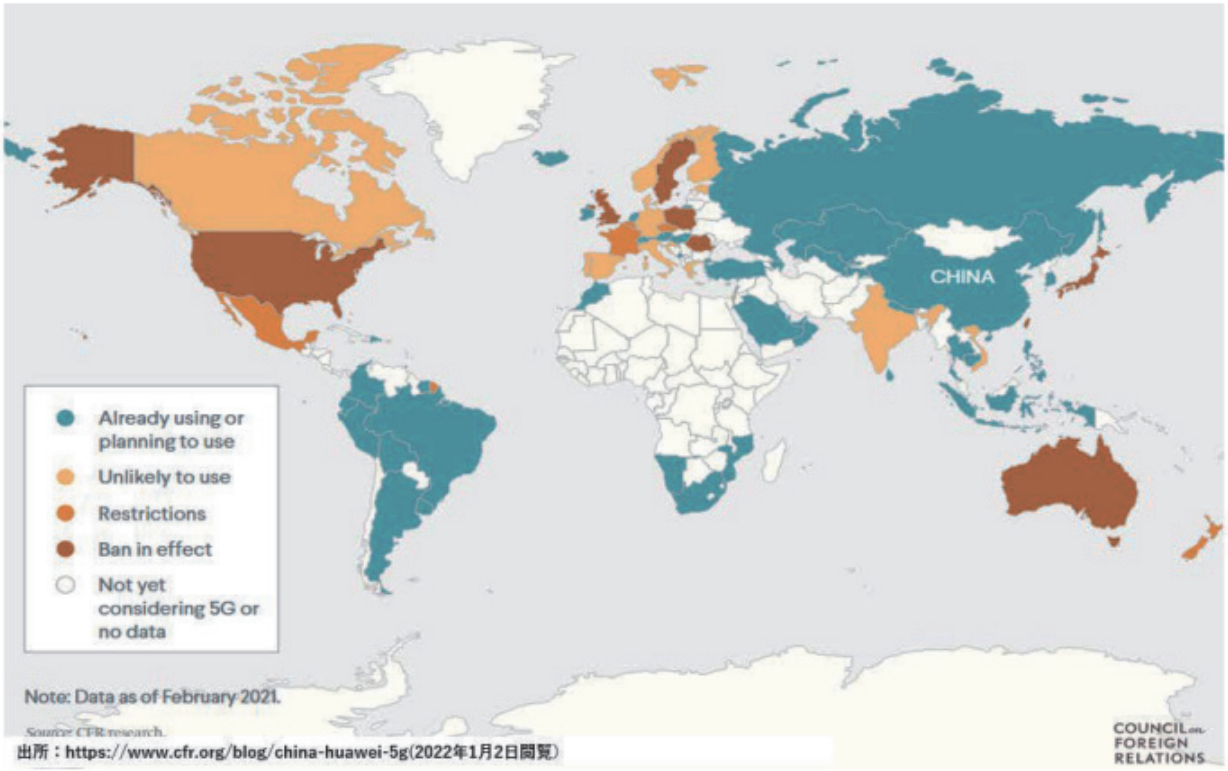
Thailand, Cambodia, Laos, Myanmar, and Malaysia employ other vendors but adopt Chinese vendors more proactively.

② Countries that adopt Chinese and other vendors

Most telecom carriers in the Philippines and Indonesia employ two vendors, a Chinese vendor and a Nordic vendor.

③ Countries that do not explicitly exclude Chinese vendors, but adopt few or none in effect

Vietnam and Singapore have not explicitly declared their intention to exclude Chinese vendors, but Vietnam appears to be seeking independent development, with Singapore's three major carriers using Scandinavian vendors, and the fourth-largest telecommunications carrier, TPG (Australian-owned), reportedly using Huawei equipment to deploy local 5G.



Source: https://www.cfr.org/blog/china-huawei-5g (viewed January 2, 2022)

Figure 5-7: Global Adoption of Chinese 5G Equipment Vendor (Huawei)

Conclusion: Balancing Innovation in Fundamental Technologies and Promoting Social Implementation

As discussed above, while China has maintained a policy of prioritizing the promotion of digital basic industrial technology for more than a decade, industrial supply capacity for semiconductors in particular has not kept pace with growth in demand. The policy to promote semiconductors having failed, the government is now forced to devote considerable resources to improving China's technological and industrial capabilities. On the other hand, with regard to 5G, China's technology is ahead of the competition. This is mainly due to private capital from sources such as Huawei. Policy in this area is, if anything, focused on the formation of a 5G market through social implementation. These two cases show that markets and government each have a commensurate role to play, and must be interconnected. In other words, digital infrastructure technologies such as semiconductors, 5G, AI, and cloud computing are market-unseen IT technologies, and unless they are socially implemented in a manner that creates customer-visible value, they may languish.

The importance of the digital economy has been growing rapidly in recent years, and the COVID-19 pandemic has accelerated DX. In addition, the value of data assets has become apparent, and semiconductors--the most important fundamental technology for digitalization--have become a strategic product. From the perspective of economic security and ensuring supply-chain resilience, the world's major countries have all begun to adopt policies that place top priority on the promotion of their own digital infrastructure industries. This is particularly the case for Japan, the U.S., Europe, and China,

On the other hand, in today's emerging digital society the societal needs that must be fulfilled by social implementation are now diverse and fragmented, unlike the uniform needs of the past, Therefore, digital technologies (products and services) that are needs-driven and maximize user value must be selected. We should also emphasize the importance of combining innovation in invisible fundamental technologies (such as semiconductors and 5G) with innovation in applications that directly create value for users (i.e., digital technologies such as IoT, AI, and blockchain).

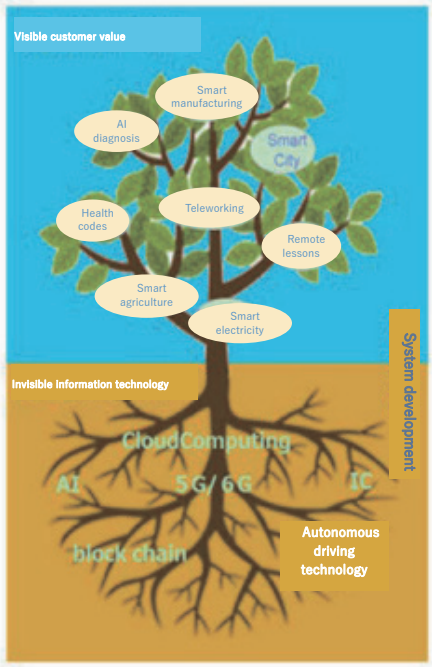


Figure 5-8: Fundamental technologies and social implementation

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6 Social Implementation and Impact of Information Technology in China

Kouta Takaguchi

Foreword

Information technology (IT) has developed into a major global industry, and Chinese companies are now in second place after the U.S. tech giants. While the GAFAM companies (Google, Apple, Facebook, Amazon, and Microsoft) are household words in Japan, a number of Chinese enterprises have also become widely known. These include the BAT companies (Baidu, Alibaba, and Tencent) and ByteDance, which created the globally used video-sharing app TikTok.

The themes of this chapter are how this proliferation of information technology has changed Chinese society, and what digitalization has meant to China.

6.1 The Starting Point of "Digital Powerhouse China"

When did China become a "digital superpower"?

In the fall of 2017, the state broadcaster China Central Television (CCTV) aired the documentary series *Amazing China*. The program aimed to promote the achievements of the first-term Xi Jinping administration in advance of the 19th Congress of the Chinese Communist Party (CCP). As the title of the program suggests, the theme is China's technological prowess, which has astonished the world. Along with coverage of national projects, the series also featured services provided by private IT companies, such as mobile payment via smartphones and IT services such as shared bicycles.

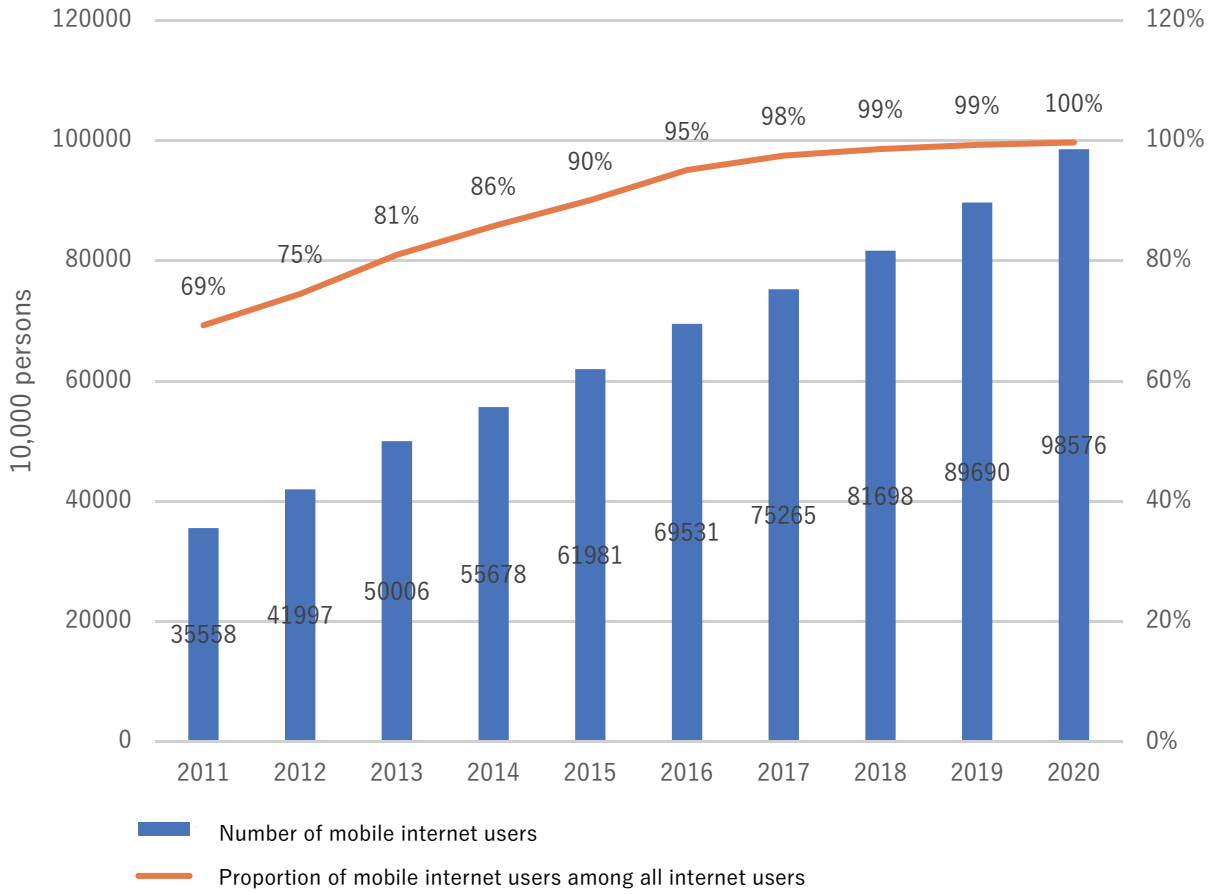
Five years previously, before the 18th Chinese Communist Party Congress, CCTV ran a campaign called "Are You Happy?" Hundreds of citizens were asked the question, "Are you happy?" Respondents answered with stories about the small joys of life, such as having become better off or being able to send their child to school. The campaign was launched in response to the Hu Jintao regime's promotion of the partial realization of a "*Xiaokang* society" (i.e., a moderately prosperous society) as a political achievement. It is astonishing to see how China's self-image changed so dramatically, from the "moderate prosperity" celebrated in 2012 to "a technological superpower that will amaze the world" just five years later.

At any rate, we should consider China's transformation into a "digital superpower" as a development that started somewhere in the last five years. The author believes that the tipping point was around 2014. This is because the technological shift of the spread of mobile internet, the financial shift of "risk money investment boom," and the policy shift of business start-up supports were concentrated in this period.

6.1.1 The technological shift: Mobile internet

4G (4th generation mobile communication system) services launched in China at the end of 2013. In

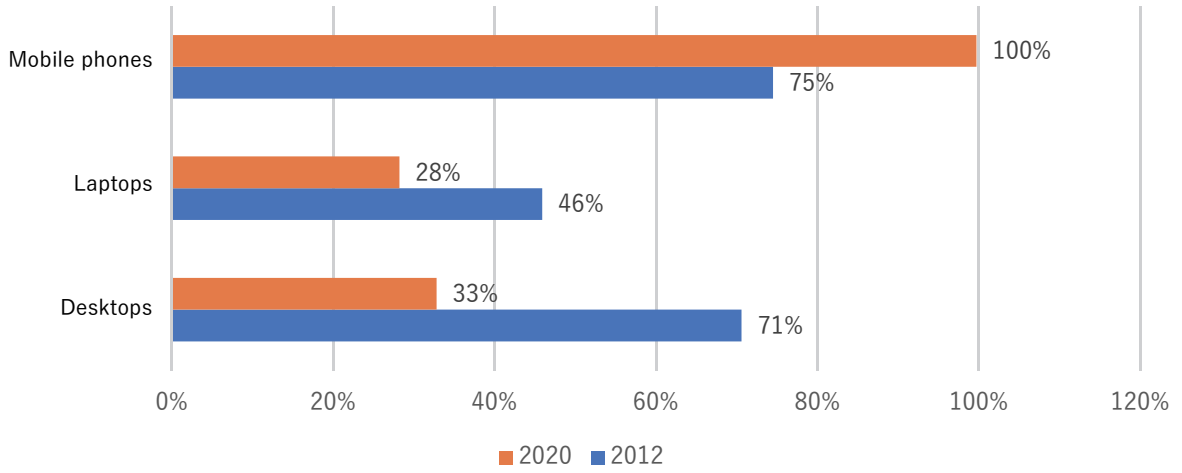
China, the phrase "*wan dao chao che*" ("overtaking on a curve") is used to express the idea of technological catch-up. Rather than a slow catch-up, it refers to a swiftly executed surge past the other party at the curve of technological change. China's cell-phone infrastructure is a prime example. It is commonly said that the country was 15 years behind the developed countries in 2G penetration, about 10 years behind in 3G, and only a little over one year behind in 4G. In 5G, it became the fastest in the world. As it is, with 4G, China now has a cell-phone infrastructure that is on par with the world's best.



Source: Statistical Report on the State of Internet Development in China, prepared by the author

Figure 6-1: Number and Share of Desktop and Mobile Internet Users

Figure 6-1 shows the number of mobile internet users in China and the proportion of mobile internet users among all internet users. There were mobile internet users in the 2G and 3G eras; the advent of 4G has accelerated this trend.



Source: Statistical Report on the State of Internet Development in China, prepared by the author

Figure 6-2: Trend in Internet-Connected Devices

Figure 6-2 shows the trend in internet-connected device share between 2012 and 2020. While internet access via computer has declined significantly in percentage terms, access via phone has reached 100%.

Although 4G is referred to as "mobile broadband," it differs significantly from the previous generation of standards in that it enables constant access to high-speed internet, just like fixed high-speed lines. As discussed below, a number of new internet services are being created to take advantage of this technical characteristic.

The success of 4G penetration was, of course, due to the Chinese government's policy of wanting to catch up with advanced countries in terms of infrastructure development, but there is no denying that chance also played a role. In approving 3G, the Chinese government assigned China Mobile, the largest telecommunications carrier in China, its own TD-SCDMA standard. However, the lack of global penetration put them at a disadvantage in handset development and other areas. Therefore, China Mobile was motivated to move away from 3G as quickly as possible, and took steps such as installing base stations and lowering rates. Other companies have followed suit, and 4G is spreading at a faster pace than in other countries. The failure of the policy of establishing China-specific standards for 3G has, oddly enough, led to the spread of 4G. Although attention tends to focus on the success of China's state-led industrial policies, this is a noteworthy case study that shows that they are not always successful.

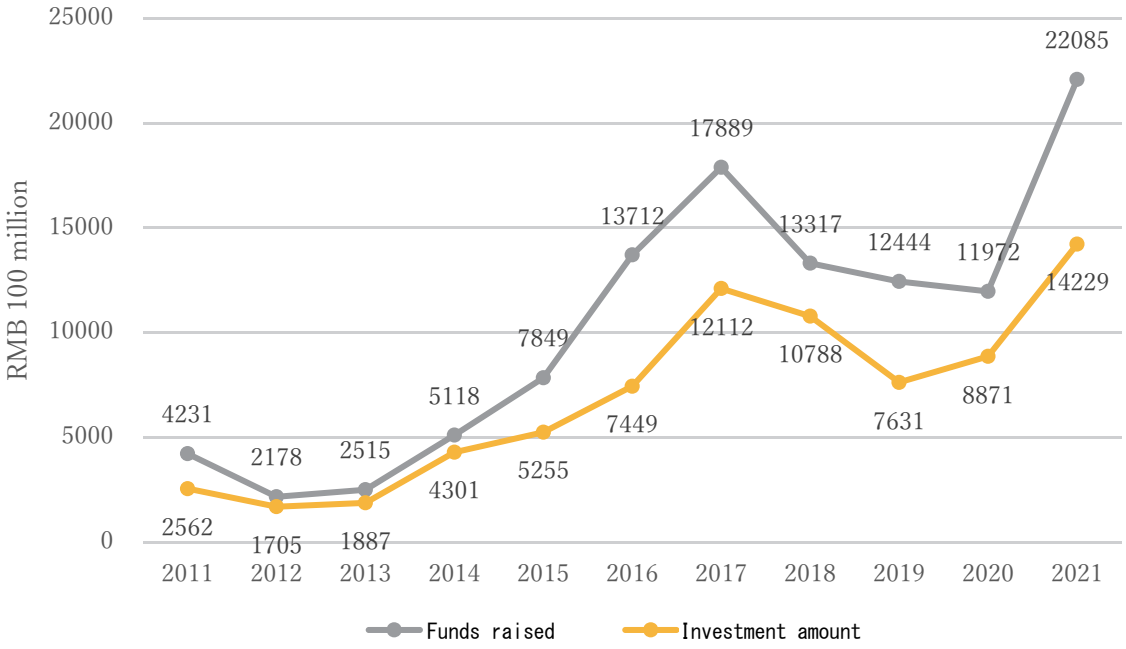
6.1.2 The financial shift: The "risk money investment boom"

The wave of digitalization in China was led by newly created venture companies. And it was venture capital that financially supported the development of venture companies. Takaguchi (2017) traces the founding and history of major Chinese companies; many of the earliest private companies were in the form of partially privatized public or state-owned enterprises. This pattern is common to computer maker Lenovo, consumer electronics manufacturer Haier, and beverage manufacturer Wahaha. Initial funding for starting a business from scratch has often been self-financed, borrowed from relatives or friends, or raised from private finance such as a scheme. The advent of venture capital, however, has opened up

opportunities for entrepreneurs who do not have the funds or connections.

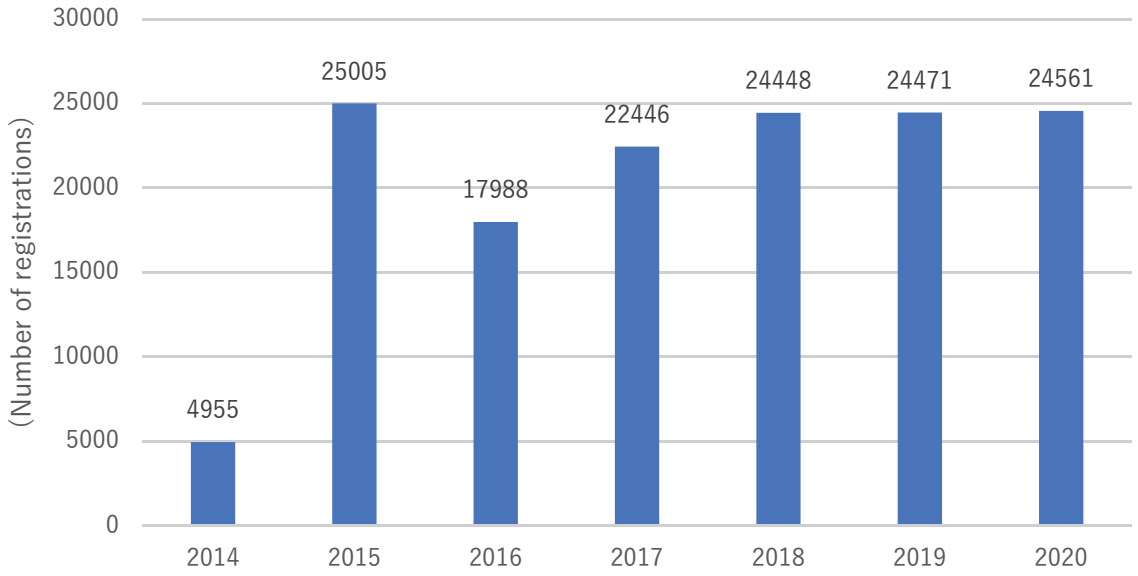
Venture capital, especially for early-stage startups called "angels" or "seeds," is often funded before the product is complete. It must be said that there were many cases of startups with only a business idea failing even after raising funds. "(In China, this approach is called "starting a business with only PowerPoint.") Nevertheless, there was widespread enthusiasm that everyone and anyone was in with a chance.

As Figures 6-3 and 6-4 show, the following have increased rapidly since the breakthrough year of 2014: equity investments in private companies; the amount of venture capital and private equity fund capital raised; and the number of venture capital and private equity funds registered.



Source: Zero2IPO Research Center report, "Review and Prospects of China's Stock Investment Market in 2021," prepared by the author

Figure 6-3: Chinese Venture Capital and Private Equity Investment



Source: Asset Management Association of China, official website

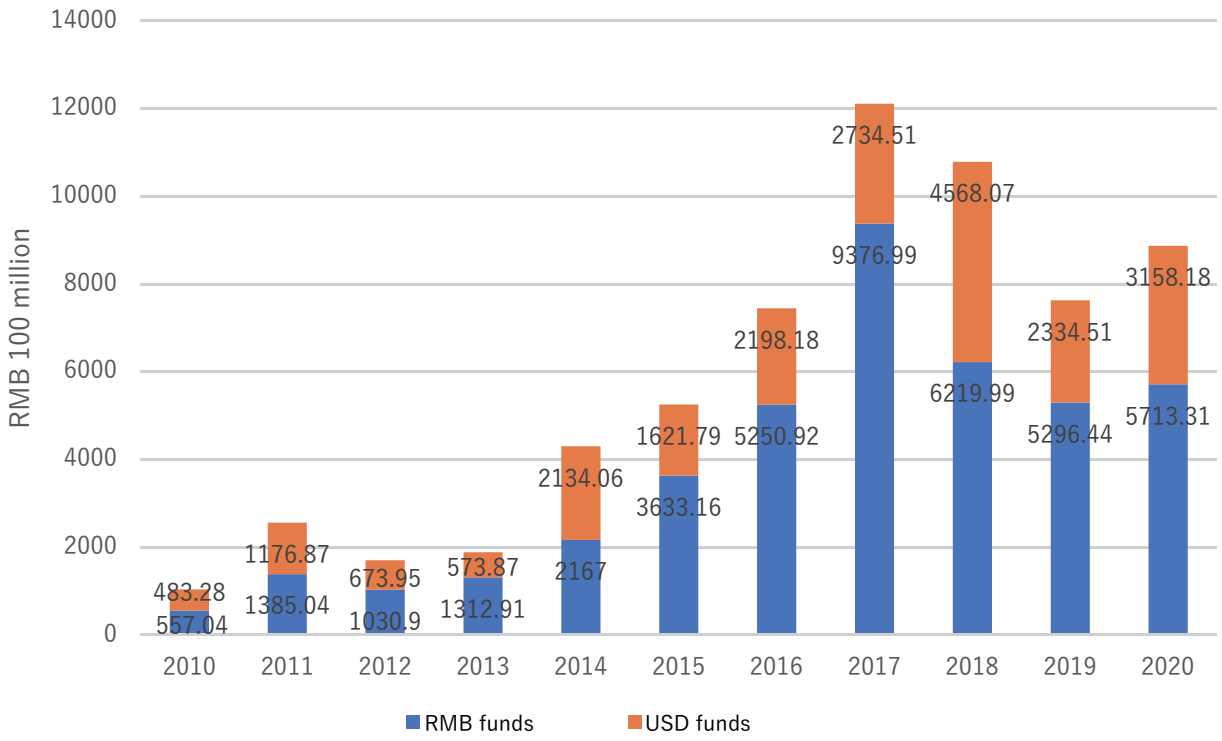
(prepared by the author)

Figure 6-4: Number of Registrations of Chinese Venture Capital and Private Equity Investment Firms

Venture investment in China began in the 1990s, but most venture capitalists were foreign. According to an interview with Liu Bo, General Manager and Managing Partner of TusStar, a venture capital firm affiliated with Tsinghua University, there were only 10 companies in 1995, 100 in 2000, and about 500 in 2005. Since 2015, however, the number of companies has remained above 20,000.

Even with the advent of Chinese venture capital, U.S. dollar funds that raise money overseas and invest in Chinese companies, had long been the norm. Venture capital firms generally make money when the companies they invest in go public, either through an initial public offering (IPO) or a buyout (sale to another company). However, China's domestic public market had strict listing requirements and changes to the policies governing it made IPOs unattractive. Thus, investment initiatives by U.S. dollar funds continued, and the trend toward IPOs in overseas markets remained the norm.

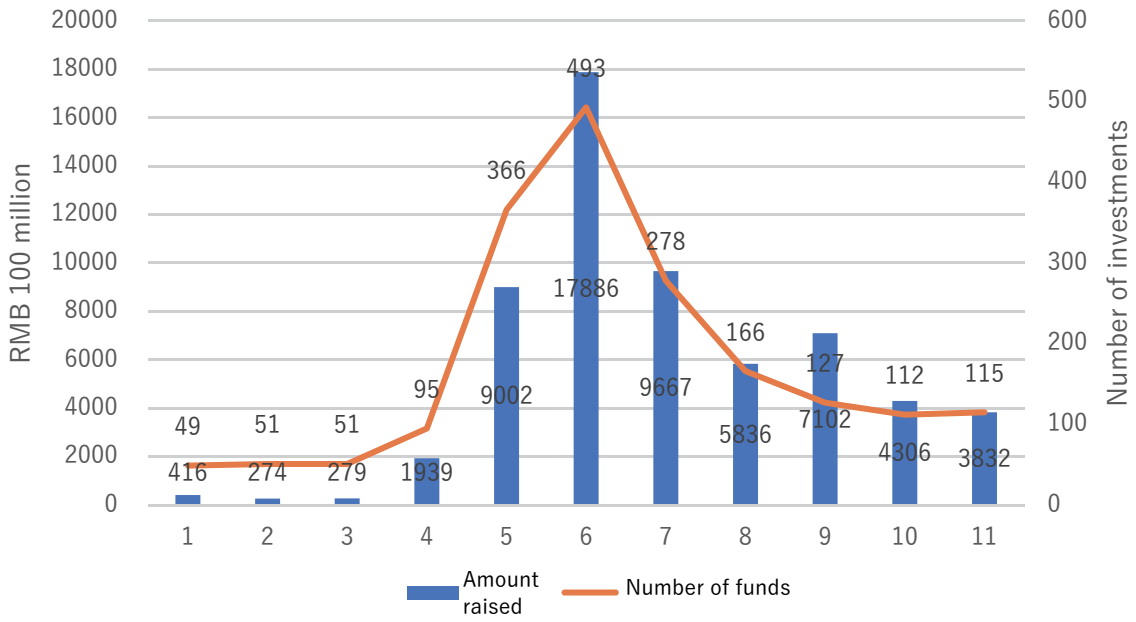
This dynamic changed dramatically in 2014. "Interim Measures for the Supervision and Administration of Privately Offered Investment Funds" was enacted in August of the same year and the "Announcement on Further Regulation of Certain Matters Concerning the Registration of Private Placement Fund Administrators" was released in 2016. The resulting policy developments led to the rapid growth of Chinese venture capital, so-called "RMB funds," which raise capital in RMB. In 2015, the amount of investment by RMB funds surpassed that of U.S. dollar funds (Figure 6-5).



Source: Zero2IPO Research Center report, "Review and Prospects of China's Stock Investment Market in 2020," prepared by the author

Figure 6-5: Trend Amounts Invested in RMB and USD Funds

Legal reforms have enabled private-sector money in China to be funneled into venture investment, and the government itself is also providing funds. The relevant state investment vehicle is the China Government Guidance Fund. As of the end of 2021, it manages a total of 1,988 funds with a cumulative fund size of RMB 6.16 trillion, a huge amount of money. The majority of the funds are called "industrial funds"; these are intended to promote specific and local industries. Some funds are also provided as seed capital to start-up companies in the early stages of their establishment. Although the rules of operation differ from region to region and fund to fund, private venture capitalists often participate in the capacity of supplying funds in which they serve as the manager (general partner) (Figure 6-6).



Source: Zero2IPO Research Center report, "Review and Prospects of China's Stock Investment Market in 2021," prepared by the author

Figure 6-6: Amount Raised by China Government Guidance Funds, Number of New Funds

6.1.3 The policy shift: Toward mass entrepreneurship and innovation

In September 2014, Premier Li Keqiang urged further efforts to promote "mass entrepreneurship and innovation." This policy was adopted in the 13th Five-Year Plan in 2016, and to become part of national industrial policy.

In the 13th Five-Year Program, mass entrepreneurship and innovation is discussed in Chapter 7, which is divided into two sections: the construction of innovation platforms and the promotion of open innovation, crowdsourcing, "digital aid" (mutual assistance), and crowdfunding.

The former advocates the proliferation of co-working spaces as places where start-up founders can base themselves. As of 2018, there were 6,959 co-working spaces nationwide, serving approximately 170,000 businesses. In addition, the cumulative funds earned by the companies located in these spaces is estimated to have reached RMB 38.3 billion yuan, creating 1.6 million jobs. (Figures compiled by the Department of Social, Science, Technology and Cultural Industry Statistics of the National Bureau of Statistics of China and the Department of Strategy and Planning of the Ministry of Science and Technology, 2019.) As is clear from the statistical items provided, these co-working spaces are not only expected to be used as offices, but also to provide connections with venture capitalists and other investors, as well as to support management and technical know-how. The author's interview coverage of Beijing co-working spaces revealed their highly practical aspects. They serve as venues for gathering information on various small business subsidies prepared by the local government, and for accessing assistance in preparing application documents.

However, co-working spaces play a varied mix of roles. Ito (2019) presents four types of co-working space operator: realtors, university/research institutions, venture capital firms, and major internet

companies. The services they offer also seem to differ depending on the resources they control.

Co-working spaces have begun to be incorporated into national policy; this began with Innovation Street in the Zhongguancun district of Beijing. Zhongguancun, an area near Peking University, has been known since the 1990s as a venue where high-tech companies gather. Innovation Street was developed there in 2013. Several venture capital firms were based in Zhongguancun, as well as co-working spaces and cafes where entrepreneurs gathered and mingled

The author interviewed Guo Yu, an entrepreneur active at a hub on Innovation Street. After graduating from college, Guo worked for the Alibaba Group, a major Chinese e-commerce company. During a business trip to Beijing, he visited Innovation Street and was surprised by the enthusiasm of the people there. This made him decide to start his own business. There was a café where tables could be rented for RMB 5 a night, and it was packed with engineers who stayed up all night writing programs. Entrepreneurs and investors were in close contact in one place, and this close relationship generated a sense of enthusiasm. The atmosphere was something like an entrepreneur's version of Tokiwa-so (the famous apartment building shared by budding manga artists). It must be said that the agility of the state in replicating nationwide the enthusiasm of a tiny group of people in the vicinity of Peking University has been breathtaking. However, it is not possible to create the enthusiasm found on Innovation Street simply anywhere. The construction of co-working spaces continued has under national policy, and it has even been said that there are more such spaces than venture businesses. There have also been cases where spaces are ostensibly educational ventures, but in reality are private tutoring businesses in which the "entrepreneurs" themselves are the teachers.

The other promotion measures (open innovation, crowdsourcing, digital aid, and crowdfunding), are all mechanisms to support venture companies and individual entrepreneurs who are not affiliated with large corporations.

"Open innovation" means not only working with a given company, but also actively collaborating with outside companies to create innovation. "Crowdsourcing" is a form of service whereby work is outsourced on a job-by-job basis rather than hiring someone. The term "*shu fu*" has been translated as "digital aid" because there is no exact foreign-language equivalent; it refers to a mutual assistance service in which several people cooperate with each other. P2P insurance, a form of fintech (or financial innovation), is a mutual aid service whereby insurance benefits, such as for illness, are settled on a monthly basis. Theoretically, if there are zero claimants, the premium for that month is zero. "Crowdfunding" refers to a service that solicits supporters for seed capital during the development stage of a new product.

Even though approached such as open innovation, crowdsourcing, and crowdfunding are growing in Japan and other developed countries, they all occupy niche positions. The adoption of the five-year plan as the core of national policy may seem odd, but China's IT and digitalization, which blossomed in the early 2010s, is unique in that it focuses on the utilization of individual resources.

6.2 IT Services in China

In this section, we will discuss examples of IT services that have become popular in China since the mid-2010s and have brought about significant changes in society.

6.2.1 Mobile payment

Mobile payment, which enables payment and money transfer by reading QR codes with a smartphone camera, is now well-known in Japan, but it was China that pioneered it. Its debut came in 2013, when Alibaba Group ("Alibaba"), the largest e-commerce company, released a mobile payment function for Alipay, which was originally a payment function for online shopping. Rival gaming and messaging app giant Tencent also added a mobile payment function to its own messaging app, WeChat.

The July 2013 "Administrative Measures for Bank Card Clearing Institutions" opened up the acquirer business, which expands the number of affiliated stores for credit cards and debit cards, to entities other than commercial banks. This deregulation has enabled the two companies mentioned above and other major IT companies to offer payment services (i.e., mobile payments) at brick-and-mortar stores.

Credit and debit cards are available as cashless payment methods in China, but their usage rates have never been high. The obstacles to adopting cashless payments have been the low number of stores that take them (they dislike the high fees) and the lack of motivation to switch from cash to cashless payments. However, Alibaba and Tencent's mobile payment systems involve extremely low fees. In addition, to promoting the adoption of the system, discount coupons for various services were distributed, and the use of the system spread at a rapid pace. According to the China Internet Information Center, the number of users reached 872 million at the end of June 2021.

Mobile payments have had a significant impact on society. The ability to transfer money between individuals in real time and with zero fees has made it extremely easy to send money and place orders to get work done. In Japanese department stores and drugstores, Chinese people can often be seen circling the sales floor with smartphones in hand, most of them engaged in what is known as "proxy purchasing." This is a type of personal import agency service whereby customers in China are told via photo and video about products currently being sold in overseas stores, and the products they want to order are purchased and sent to them. In addition to the mobile internet function of being able to send photos and videos, the ability to send the funds needed for a purchase on the spot has helped to avoid the risk of non-payment. Against this background, the proxy purchasing business has expanded.

The ability to send money as one would send an email has opened up numerous options. The has personal, compelling experience in this regard. When an article I had written was translated and reprinted without my permission in a Chinese newspaper, I protested through the chat function on the messaging app WeChat, and was immediately paid RMB 50 over the app as payment for the article.

Legally speaking, payment and remittance are separate entities, but from the user's perspective, the line between them is extremely vague. Even today, many small businesses still receive payments using the personal transfer function for payments between friends. Currently, regulations are being tightened and such methods are on their way to being banned, but this flexibility and ease of use may be the reason for the increase in the number of users.

In addition to simply being able to pay at a store, the integration of smartphones and payments has opened up many possibilities. Convenience is further enhanced by the integration of various functions, such as the purchase of investment products and insurance, or reservations at movie theaters and tourist attractions, payment of utility bills, and, in recent years, administrative procedures. The author calls this

extremely multifunctional mobile payment application a "convenience store in the palm of your hand." As a matter of fact, almost all of the aforementioned functions are services that Japanese convenience stores also offer. While convenience stores in Japan have tried to increase convenience and increase the frequency of customer visits by integrating various services, mobile payment apps in China are using similar means to increase the frequency of app use.

Since 2017, a system of simplified apps called Xiao Cheng Xu ("mini-programs") have been running on Alipay and WeChat. Despite its simplicity, there are an extremely large number of applications ranging from games and online shopping to video streaming. Users face a high psychological hurdle to install new applications on their smartphones, but with mini-programs, there is no such hurdle, as they can be easily called up every time they are used. As a result, many companies have either abandoned the idea of developing their own apps or have adopted the approach of developing their own apps while at the same time developing simple apps in mini-programs. As an example, Muji, a Japanese household goods brand, offers a membership management app called "MUJI passport" in Japan, but has abandoned the app in China, instead offering it in the form of a mini-program that runs on WeChat.

Mobile payment apps, which have extremely diverse functions in addition to payments and remittances, have come to be called "super apps" because of their rich functionality. Not only are they more convenient for consumers, but from the app provider's perspective, it is also easier to direct users to new services and functions that they want them to use. Some point out that super-apps are a major factor behind the successive birth and spread of new IT services in China. The super-app is also spreading abroad as a Chinese innovation that is being imitated by companies in other countries.

6.2.2 The Sharing Economy and the Gig Economy

A major topic in China in 2014 was the "ride-hailing app war." There were three companies providing ride-hailing apps for users to hail a cab from their smartphones. The three, DiDi Dache, Kuaidi Dache, and Uber, were locked in fierce competition. The competition was waged through discount coupons. On registering with a ride-hailing app, the user received multiple discount coupons. The new service was not only cheaper than existing taxis, but also cheaper than buses and the subway. This large-scale initiative thus became a hot topic. Alibaba and Tencent, which provide mobile payment apps, became shareholders of the ride-hailing app companies, and they encouraged the discount competition as a prelude to promoting their own payment apps.

The taxi business is generally a regulated industry worldwide. China is no exception. There was strong opposition to ride-hailing apps on the part of existing by taxi drivers, who saw them as an infringement of their vested interests. Their opposition escalated into strikes and incidents of vandalism, but the Chinese government and people supported the new app-based enterprises.

Taxi firms were already licensed businesses, but in many large cities there were far too few cabs to meet demand. It was difficult to catch a cab during the morning and evening rush hours, and there was no taxi dispatch service, as in Japan. Vehicles were often dirty, drivers often rude, and meters often tampered with. The public's support for the new ride-hailing apps was understandable. These apps made it easy to reserve a vehicle, and allowing users to rate the cabs improved the quality of service. In 2015, DiDi Dache and Kuaidi Dache merged to form DiDi. The company acquired Uber's Chinese operations the

following year, signaling the end of the "ride-hailing app" wars.

The ride-hailing app is considered a typical example of the global sharing economy. This is because the so-called "ride-sharing" system, in which ordinary citizens use their own cars to provide cab services, is common worldwide, although it has not been realized in Japan due to legal restrictions. Although there are some ride-sharing businesses in China, the mainstream approach is to provide a taxi-like service using dedicated vehicles.

What, we should now ask, is the sharing economy?

The Sharing Economy Association Japan defines it as "an economic model in which goods, places, skills, etc. are bought, sold, and rented between individuals and individuals, and companies, etc. via the internet." The two best-known examples globally are home-sharing (in the form of short-term housing rentals) and ride-sharing. Short-term housing rental is a service whereby individuals rent out their residence as accommodation via the internet; ride-sharing is a service in which individuals use their own cars to conduct cab businesses. The original "sharing" concept referred to a system in which individuals were compensated for renting out their personal possessions, time, and skills.

In China, however, the concept of renting out personal possessions has become less common, and "sharing" is now more a matter of renting out goods and services for a certain amount of time, rather than selling them. One of the services offered is the *gongxiang xiyiji* ("shared washing machine"). However, this corresponds to a laundromat in Japan and seems to be distinct from the sharing economy as such.

The concept of the sharing economy in China is best understood as "renting rather than owning" and "hiring labor force for a certain amount of time." In the latter sense, it is rather similar to the gig economy (from the word "gig," meaning a one-off session in jazz, applied to a form of service whereby skills and labor are hired for short periods of time).

Many of the Chinese IT services that blossomed in the mid-2010s belong to this sharing or gig economy. The State Information Center (2021) noted that a total of RMB 2.616 trillion of added value was created in 2019 in the key areas of transportation, accommodation, delivery, video distribution, skills and knowledge, and content (Table 6-1).

Table 6-1: Added value created by each sector of China's sharing economy

Sector	Added value created (2019, 100 million RMB)	Representative companies
Transportation	2950	Didi, Meituan Dache, etc.
Private accommodation	387	AirBnB, Xiaozi, etc.
Delivery	6276	Meituan, Wulama, etc.
Video streaming	4942	Huya, Yingke, Fighting Fish, etc.
Skills and knowledge	3063	Zhu Bajie, 58Dojia, Zhihu, Simalaya, etc.
Content	8542	TikTok, Toutiao, Kuaishou, Weibo, etc.
Total	26160	

Source: "Report on the Development of China's Sharing Economy"

In addition, Premier Li Keqiang emphasized the importance of the gig economy at a press conference after the 2021 National People's Congress, stating that China's gig economy was creating 200 million jobs.

This sharing economy includes many outlandish services that would be unimaginable in Japan. Zhang Xiaorong et al. (2020) introduce a numerous sharing-economy businesses that have emerged in China. One such service, Hui Jia Chi Fan ("Come Home for Dinner), was conceived as a sharing-economy service in which mothers who cook at home on a daily basis could sell extra food. For many people without any special skills, it must have been inspiring to think that they could earn an income by simply cooking an extra portion of dinner. Service users will also have found it a comfort to know that they could have a meal at home if they paid for it. The service appealed to the ideals of many, but in the end, the only vendors were unlicensed restaurants lacking hygiene permits, and the business was sadly discontinued. Such outlandish services have been able to attract the venture capital discussed above, and so develop; this has led to the emergence of a succession of non-traditional businesses.

While many firms have gone out of business, many others have become major enterprises that support society. Trucking is a sector in which the sharing economy is increasing its presence, with the Full Truck Alliance, a SoftBank Vision Fund investment recipient, having completed its IPO. The company is a sharing-economy platform that arranges long-distance trucks for inter-city travel, mainly for corporate clients. Meanwhile. firms such as Huolala and 51 Tongcheng handle relocation services and the intra-city delivery of large packages. These have become indispensable platforms in daily life. For businesses, a matching service called "factory-sharing," which matches idle factories with clients via the internet, is expanding.

6.2.3 E-Commerce and New Consumption

According to the Digital Economy Division, Commerce and Information Policy Bureau, Ministry of Economy, Trade and Industry (2021), the Chinese e-commerce market in 2020 was RMB 11.76 trillion, with an e-commerce conversion rate (e-commerce as a percentage of retail sales) of 31.6%. Both statistics are world-beating. The development of e-commerce is supported by a variety of services.

In addition to general online shopping malls, there are many other types of services such as: live commerce, which combines video streaming and online shopping; group purchasing services that offer discounts when multiple people buy the same product via social media; joint purchasing of fresh food that is delivered to a delivery center near the purchaser's home the day after the order is placed; and immediate delivery of orders in as little as 30 minutes. Alibaba, the largest e-commerce company, holds about 50% of the market share; its services have been refined through fierce competition with powerful players such as JD.com (second-largest) and Pinduoduo (third-largest).

The shift of mainstream retailing to the internet has also helped to support the rise of emerging Chinese brands. Emerging manufacturers that sell directly to consumers through online shopping are known worldwide as D2C (direct to consumer). This involves a business form known as "new consumption" in China, and such emerging manufacturers are emerging in considerable number. In many cases, cosmetics brands, such as Perfect Diary, started out focusing on online sales and later expanded into offline retail, becoming major manufacturers in just a few years.

The internet has not only provided a sales channel for emerging manufacturers, but has also functioned as a research tool to analyze consumer reactions and preferences. Today, these firms' capabilities are not limited to China; they have expanded their horizons globally. The Chinese apparel brand Shein operates a

cross-border e-commerce business that distributes extremely cheap apparel all over the world. Although the firm is not listed, it is rumored that it had the potential to overtake Inditex, the world's largest casual apparel firm, in terms of sales by 2022. Shein's strength lies in its production capacity, which allows it to release more than 1,000 kinds of very inexpensive products a day by maximizing its production capacity in China, and also in its ability to understand the needs of each country through the internet. It conducts extensive marketing utilizing influencers on Facebook and Instagram.

6.2.4 Digital Infrastructure

As the above-mentioned D2C services have developed, so has the digital infrastructure that supports them behind the scenes. A typical example is Cainiao Smart Logistics Network, a logistics support company under the Alibaba umbrella. The company plays a behind-the-scenes role in providing services to logistics companies. It is also involved in projects such as developing electronic addresses that allow data to be shared between multiple logistics companies, and standardizing address data. Its final-mile home-delivery business is currently handled by small and medium-sized franchisees, and standardized address labels and address databases have made it easier for new entrants to deliver packages.

In addition, the data infrastructure behind Clubhouse, a U.S. social media live-audio platform that at one time became a global hit, is being implemented by Agora in China. Agora is a digital infrastructure company that provides audio and video distribution technology to companies worldwide. In China, internet connection quality is poor in some areas, especially in the countryside. Agora has been refining technologies that enable stable communications even under such conditions. Their capabilities have been recognized, and they continue to be employed by a variety of companies around the world, including in the U.S. and Japan.

Conclusion

The spectacular development of Chinese IT occurred at the intersection of three major shifts in mobile internet, venture capital, and policy. Analyzing this development, we can see that it has created a foundation that makes it easier for startups, small and medium-sized enterprises, and individuals to thrive.

However, this situation is now about to take a major turn. IT services, which had a breakthrough in 2014, peaked in 2017. They have since been in a state of stagnation, with no major hit businesses to rival mobile payment or ride-hailing apps. In addition, 2021 saw notable moves to regulate IT companies, such as administrative fines imposed on Alibaba for violating antitrust laws and an investigation into ride-hailing app Didi Chuxing for suspected cybersecurity violations.

A source in the Chinese venture capital industry suggests that this may be due to the government's desire for innovation at a higher technological level, such as semiconductors and biotechnology, rather than in consumer-oriented IT services. As if to confirm this point, the phrase "mass entrepreneurship and innovation," which featured prominently in the 13th Five-Year Plan, has disappeared in the 14th Five-Year Plan. Innovation is mainly driven by large companies and research institutions such as universities, while SMEs are positioned as providers of technology through industry–academia partnerships and other initiatives.

Chinese IT, which has achieved innovations that have astonished the world through the experimental

endeavors of countless players (whose experiments have been at times bizarre) is once again at a turning point.

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7 The Expansion of Chinese Firms into Southeast Asia and Its Impact on Local Industry and Technology: Characteristics of Chinese-Style Multinational Enterprises

Zhijia Yuan

Foreword

At the 4th Session of the 13th National People's Congress held in March 2021, the Outline of the 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives to 2035 were adopted. Regarding foreign economic relations, although it refers to "domestic-international dual circulation," it states that "We will coordinate and promote the construction of a strong domestic market and the construction of a trade powerhouse...form a powerful gravitational field to attract global resources and factors of production, promote the coordinated development of domestic and foreign demand, imports and exports, and the introduction of foreign capital and foreign investment" (Part 4, Chapter 13). In July, in conjunction with the 14th Five-Year Plan, China's Ministry of Commerce released the 14th Five-Year Plan (2021-2025) for Commerce. Regarding foreign direct investment and economic cooperation, the Plan supports the participation of enterprises in the restructuring of global industrial chains and supply chains, promotes cooperation between domestic and foreign enterprises, and promotes the overseas expansion of Chinese products, services, technologies, brands, and standards. The plan calls for promoting the specialization of overseas Chinese-invested enterprises' chambers of commerce and associations, and helping to improve service standards.

The task of this chapter is to examine the impact of Chinese firms' overseas expansion on the countries/regions invested in under the Dual Circulation Strategy. Specifically, in analyzing regional impacts on industry and technology, we will take Chinese consumer electronics and automakers as examples. Such firms have been actively making direct investments in recent years, mainly in Southeast Asia.

7.1 The Importance and Current Situation of Chinese Firms' Direct Investment in Southeast Asia during the Period of the Dual Circulation Strategy

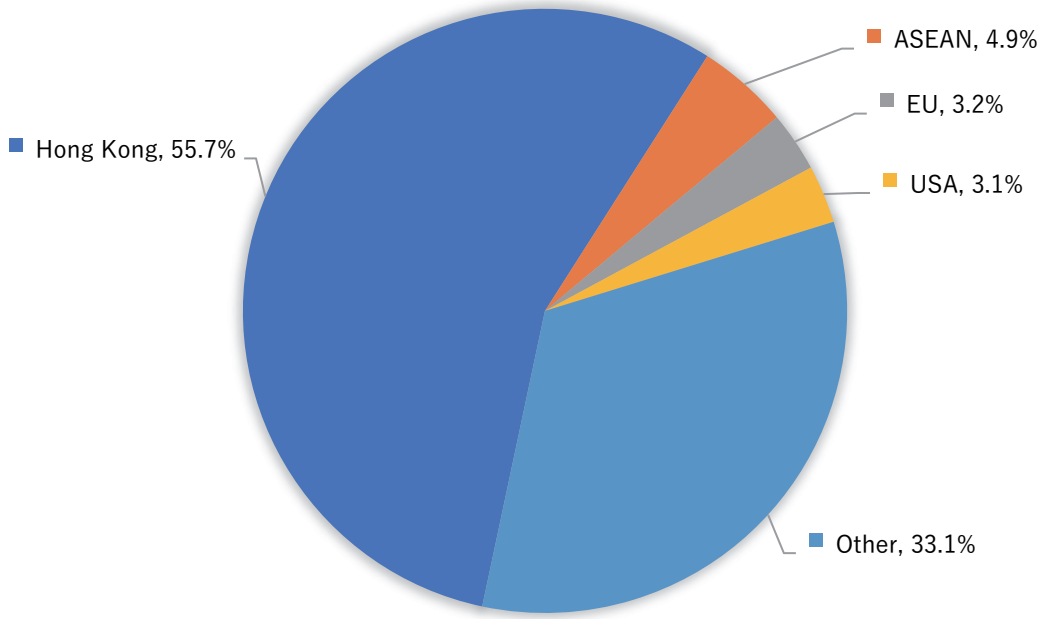
The expansion of Chinese companies into Southeast Asia during the period of the 14th Five-Year Plan has special significance. To date, excluding investment in Asia, there have been years in which a relatively

large share of China's outward foreign direct investment (FDI) has been directed toward the EU and North America. In particular, Western governments have gradually become wary of Chinese companies that have launched aggressive moves to acquire, and use as strategic assets, Western companies that had fallen into financial difficulties due to the financial crisis and market slump. Furthermore, the U.S.-China trade confrontation that broke out in 2018 has spilled over into Chinese firms' investments in the U.S. Under the Foreign Investment Risk Review Modernization Act (FIRRMA; enacted in August 2018), the U.S. government strengthened the authority of the Committee on Foreign Investment in the United States (CFIUS) and tightened the screening of investments into the U.S. for security purposes. Similarly, in Europe, there has been a trend toward tightening regulations on inward investment, as Chinese companies have increased their acquisitions of airports, ports, and high-tech companies (Fukuchi, 2020). As a result, direct investment by Chinese firms in major Western countries has slowed rapidly.

On the other hand, Chinese companies have continued to actively invest in Southeast Asia regardless of the course of the U.S.-China conflict. Various background factors include the improving international competitiveness of Chinese companies, the Chinese government's active involvement in the development of overseas infrastructure and support for Chinese companies' expansion overseas, and China's slowing growth and rising labor costs. The pivot toward Southeast Asia as a production base and market is a relatively new phenomenon in China's outward FDI to date. However, as noted at the beginning of this chapter, Chinese companies are bound to increase their presence in Southeast Asia during the period of the Chinese government's Dual Circulation Strategy.

What is the current situation of direct investment by Chinese companies in Southeast Asia? In this section, we will review this point on the basis of official Chinese government statistics. The *2020 Statistical Bulletin of Outbound Direct Investment*, published by the Ministry of Commerce, the Chinese government's lead agency for outward FDI, summarizes outward FDI in Southeast Asia as follows. By the end of 2020, the flow of FDI by Chinese enterprises in Southeast Asia was USD 10.663 billion, accounting for 10.4% of outward FDI by Chinese enterprises in that year. Outstanding direct investment in Southeast Asia totaled USD 127.613 billion, or 4.9% of total outward FDI by Chinese companies. In addition, the number of local legal entities established by Chinese companies in Southeast Asian countries is counted at about 6,000, employing about 550,000 local workers (*Statistical Bulletin*, p. 34).

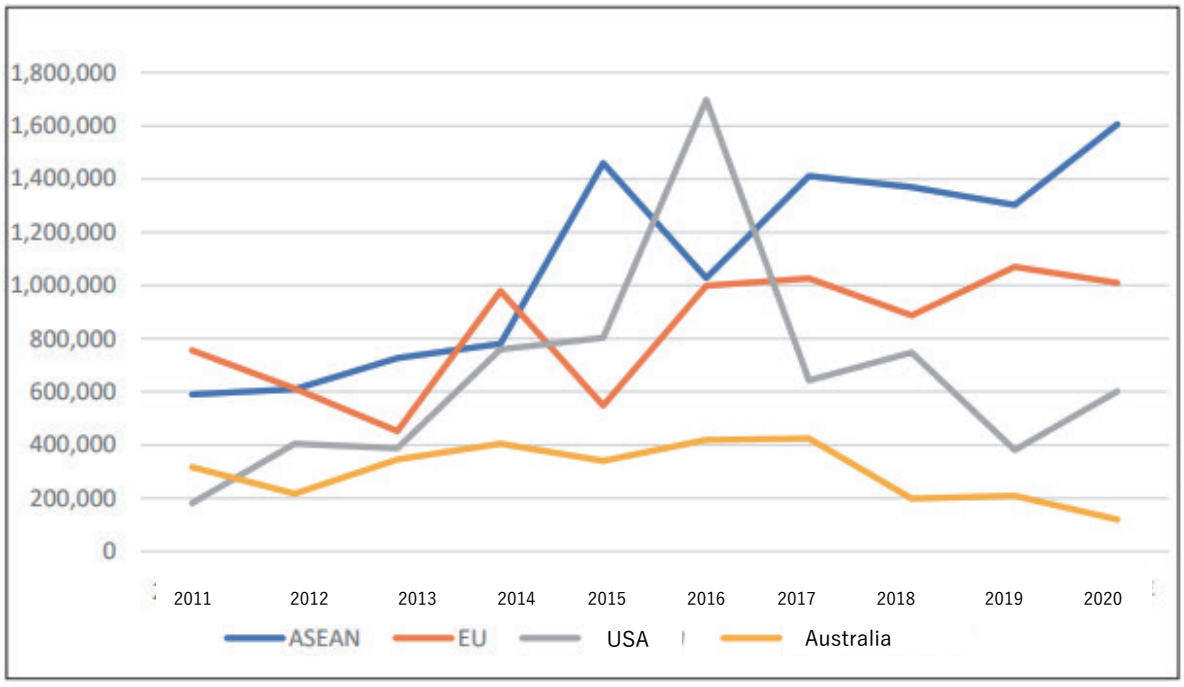
Southeast Asia had become a prominent presence in China's total outward FDI in 2020. First, as (Figure 7-1) shows, looking at the stock distribution of Chinese outward FDI as of the end of 2020, Southeast Asia (at 4.9%) was the largest of the major regions other than Hong Kong, surpassing the EU (3.2%) and the U.S. (3.1%).



Source: *2020 Statistical Bulletin of Outbound Direct Investment* (Ministry of Commerce et al.)

Figure 7-2: China's FDI in Major Economies (2020, cumulative)

Furthermore, as Figure 7-2 shows, long-term trends indicate that since 2016, Chinese FDI in developed regions such as the EU, the U.S., and Australia has declined sharply or leveled off due to restrictions in these regions, while investment in Southeast Asia has grown steadily. If this trend continues, Southeast Asia will become an increasingly important destination for future Chinese outward FDI.



Source: *2020 Statistical Bulletin of Outbound Direct Investment* (Ministry of Commerce et al.)

Figure 7-2: China's Direct Investment to Major Regions (Flows, USD 10,000)

7.2 Chinese Firms' Expansion into Southeast Asia and Impact on Local Industry and Technology

This section analyzes the expansion of Chinese firms into Southeast Asia and its impact on local industry and technology. As explained in the previous section, the industrial sectors in which Chinese firms have entered the Southeast Asian market are diverse, making analysis of the impact on local industry as a whole somewhat difficult. For this reason, we will focus on the manufacturing sector, which has been rapidly expanding in recent years, and identify the characteristics of Chinese multinationals in the consumer electronics and automotive sectors.

7.2.1 The case of the consumer electronics industry

Chinese manufacturing companies entering Southeast Asia are active in many sectors, of which consumer electronics is one of the most important. Currently, leading Chinese consumer electronics companies (such as Haier, TCL, Skyworth, Midea, Konka, and Chunlan) have established local production bases in Southeast Asia. Behind the massive expansion of Chinese consumer electronics companies into Southeast Asia are: ① saturation of the domestic consumer electronics market; ② slowing domestic economic growth since 2012; ③ growth potential of the Southeast Asian consumer electronics market; and ④ rising income levels in Southeast Asian countries.

As is widely known, Japanese consumer electronics products have maintained an overwhelming brand power and high market share in the Southeast Asian market for many years, from the postwar period to the present. Since the 1990s, Japanese manufacturers have faced difficulties due to changes in the competitive environment, such as the rise of South Korean manufacturers, the emergence of mass consumer electronics retail channels, and stagnation of demand after widespread product adoption. However, Japanese companies have continued to demonstrate strong competitiveness and have performed well in the Southeast Asian consumer electronics market. Thus, while the consumer electronics industry in Southeast Asia is dominated by foreign-owned companies mainly from Japan and South Korea, it is difficult to find leading consumer electronics companies from the region. This has resulted in the technology for Southeast Asia's consumer electronics industry being mainly imported.

In this environment, Chinese companies began to expand into the Southeast Asian consumer electronics market after 2000. How are Chinese consumer electronics firms currently capturing market share in Southeast Asia, and what characteristics do they exhibit? This section analyzes the characteristics of local production, focusing on the cases of five Chinese companies (Skyworth, Midea, Changhong, TCL, and Haier) that have entered the Southeast Asian consumer electronics market (Table 7-1).

Table 7-1: Local Production by Five Chinese Companies in the Southeast Asian Consumer Electronics Market

	Countries into which they have expanded	Market entry methods	Market capture methods	Localization status	Methods to capture niche markets
Changhong	Indonesia	Joint venture with local Chinese companies, Changhong's share is 88%	Target the BOP market; own brand	High localization rate of materials and parts. Utilizing the power of local Chinese partners	Special models of energy-saving air conditioners, longer warranty period
Chunwei	Indonesia, Vietnam, the Philippines, Malaysia, Thailand	Acquisition of Toshiba's local factory (Indonesia)	Target the BOP and MOP markets; double brand	Leave local people to manage the local factory. Utilizing the local Chinese distribution network	Avoid high-end products from Japan and Korea, and focus on products in the middle and low-end segments. STB products, multimedia TVs
TCL	Thailand, Vietnam, Indonesia, the Philippines	Acquisition of a local foreign company (Vietnam, Thailand), joint venture with local Chinese capital (Indonesia, the Philippines)	Target the BOP market; own brand	Appointing local Chinese managers. Utilizing the local Chinese distribution network	Continuous introduction of previous generation models. Introduction of STB products
Midea	Vietnam, Thailand, Indonesia, the Philippines	Started with a joint venture with local Chinese capital	Target the BOP market; double brand	Appointing local people to managers, intentional minority	Specializing in the low-end segment
Haier	Thailand, Malaysia, Indonesia, the Philippines	Acquisition of the former Sanyo Electric local factory (Thailand)	Target the BOP and MOP markets; double brand	Local president (Malaysia), Japanese manager (Thailand)	Detergent-free washing machines (Malaysia), fragrance-type washing machines (Thailand)

Source: Field survey and company websites (prepared by the author)

The common features of these five Chinese consumer electronics companies' Southeast Asian expansion is that they entered the Southeast Asian market at the right time, (around the year 2000) and that they have tended to concentrate on countries with larger population sizes, potentially larger markets, and lower labor costs. The countries in question are Vietnam, Indonesia, the Philippines, and Thailand.

The first characteristic of Chinese firms' entry into the Southeast Asian consumer electronics market is the establishment of local operations by acquiring or purchasing the assets of existing local firms. The question is why Chinese firms avoid new business (greenfield) start-up methods. The reason is that acquiring a local company makes it possible to set up a local business in a short period of time. Chinese companies are entering the Southeast Asian consumer electronics market as latecomers, and speed of market entry is therefore crucial. Slower market entry negatively impacts local production because of

a variety of latecomer disadvantages: small market share, low awareness among local consumers, small production scale, underdeveloped sales networks and supplier chains, slow product differentiation, and the like.

The second characteristic is that they tend to go in "easy first, hard later" (i.e., they capture share in markets that are easier to access first, before progressing to markets with higher entry hurdles). As latecomers to outward FDI, Chinese firms have a relatively small number of firm-specific advantages, so it is rational for them to prioritize expansion into developing markets that are as backward as China's rather than into markets that are difficult to penetrate and highly competitive (i.e., developed markets). Thus, even when entering markets in the same region, Chinese multinationals tend to prioritize markets with lower entry hurdles.

The third characteristic is the full utilization of the strategic assets acquired in the local markets where the company has entered. In particular, the strategic asset of an acquired foreign company's brand is often used as a tool for Chinese companies to capture share in the Southeast Asian consumer electronics market. Chinese brands have low recognition in the Southeast Asian consumer electronics market. Thus, to capture share in this market, Chinese companies use the so-called "double brand strategy," in which they simultaneously use their own brand and the brand of a company they have acquired. Trying to increase market share by leveraging first-mover advantage in the market is a smart strategy for Chinese companies.

As for the fourth characteristic, Chinese consumer electronics companies have adopted different localization strategies than their Japanese and South Korean counterparts. From the very beginning of their entry into the Southeast Asian market, these companies pursue personnel localization as well as physical localization. The major background points are the lack of professional personnel with expertise in international management, the large number of Chinese and overseas Chinese residing in Southeast Asia, and the presence of foreign-owned companies. Chinese companies that have expanded into Southeast Asia have been pursuing localization from an early stage, but in terms of localizing personnel, the extent to which the people sent by the Chinese parent company understand the local conditions in Southeast Asia is an important point in regard to working locally. Personnel working without an understand the national norms, culture, religion, etc. of the overseas country will be perceived as lacking common sense by the locals around them, and major issues may ensue. In this regard, Chinese companies are skillfully overcoming their late-mover or ownership-specific disadvantages by utilizing local human resources or local overseas Chinese and ethnic Chinese.

The fifth characteristic is a strong tendency to adopt methods such as "detouring tactics." This involves avoiding areas in which the formidable Japanese and South Korean companies are strong (top of pyramid, i.e., high-income class), and first targeting the segments where they are weak (bottom of pyramid, i.e., low-income class or middle of pyramid, i.e., middle-income class). They can then enter market segments where the Japanese and South Korean companies excel, and, using heterogeneous competitive strategies, maximize their penetration of market segments and create product lineups that differ from those of their competitors. In other words, when Chinese firms first enter the market, they avoid the high-end market segments in which Japanese and South Korean firms excel, and aggressively develop low-end and niche markets. This reflects Chinese firms' lack of technological competitive advantage and local advantage.

As a final characteristic, technology acquired through alliances and joint ventures with, or acquisitions of, foreign firms is often re-transferred to the parent company or its subsidiaries. This phenomenon is known as "reverse technology transfer."

Thus, the characteristics of Chinese firms' entry into overseas markets are clearly different from those of Japanese firms. Two points in particular are quite different from the pattern observed with multinationals from Japan and other developed countries: (1) the acquisition of technological advantages in the company's core competencies after overseas expansion, and (2) the re-transfer of strategic assets, especially technological assets acquired from overseas firms, to overseas subsidiaries.

7.2.2 The automotive industry

In this section, we focus our analysis on the expansion of Chinese automakers into Southeast Asia. As is well known, the Chinese automobile market is already the largest in the world, about five times the size of the Japanese market. Why, then, are Chinese automakers entering the Southeast Asian market? Until now, the growth of the global automobile market has been driven by emerging economies, particularly China, but this market has been declining due to the slowdown in growth of the Chinese market and the sluggish automobile markets in other emerging economies (such as Russia and Brazil). Meanwhile, new growth markets are taking the lead. One of these is Southeast Asia. The 10 Southeast Asian countries constitute economies with a total population of 600 million and a total GDP of USD 2.4 trillion, with an average annual growth rate of over 5%. In addition, the region's overall car ownership rate is low, leaving a good deal of room for expansion in the automobile market.

The Southeast Asian automobile market is characterized by the strong presence of Japanese firms. Due to the high market share of Japanese finished vehicle manufacturers and the growth potential of each country's market, the Southeast Asian automobile market has attracted the attention and expectations of the Japanese automotive industry. In the Southeast Asian automotive industry, Japanese automakers have built a dominant competitive position and have spent long years building industrial networks. They enjoy extremely high market share in the region (90% in Thailand and Indonesia, 80% in the Philippines, 50% in Vietnam, and 40% in Malaysia). Japanese manufacturers have been highly concentrated in Thailand as their production base. This holds good not only for finished automobile manufacturers but also parts manufacturers. By contrast, non-Japanese manufacturers have had little presence in Southeast Asia to date.

The key factors behind the dominance of Japanese manufacturers and Japanese automobiles in Southeast Asia are ① the active development of unique Southeast Asian models by Japanese manufacturers and ② the formation of a concentration of Japanese suppliers as well as the local expansion of assembly plants (Ishikawa, 2017). Thus, in the Southeast Asian automotive industry, Japanese firms are both the prescribers of industrial technology and providers of technology.

Since 2010, however, Chinese automakers have been aggressively moving into the Southeast Asian market, a stronghold of Japanese automakers. Leading the way are Geely Automobile, which acquired Malaysian national car manufacturer Proton, and SAIC Motor, which entered the market in partnership with Thailand's largest conglomerate, the Charoen Pokphand (CP) Group. The manner in which SAIC Motor and Geely Automobile entered the market is clearly different from how Chinese automakers did so

in the past. SAIC and Geely have deployed the latest advanced safety systems and IT technologies, sleek designs, and slightly lower prices than their competitors. This is due to the fact that Chinese automakers have raised the level of their own-brand car design and technology by absorbing technology and know-how from foreign manufacturers (Okazaki and Yamamoto, 2018). In addition, Chinese manufacturers are shifting to a strategy of full-scale production at factories they themselves have set up, along with dealer development and brand-building under the leadership of the Chinese headquarters. This is in contrast to the previous situation, where production was outsourced to local partners and sales and marketing were almost entirely outsourced. This section describes the characteristics of five Chinese automakers that have entered Southeast Asia, focusing on their current situation, based on information obtained independently by the author (see Table 7-2).

Table 7-2: Five Chinese Automakers in ASEAN

	SAIC	Geely Automobile	Great Wall Motor Company	Wuling Motors	Foton Motors
Capital ownership of investor	State-owned enterprise	Private enterprise	Private enterprise	State-owned enterprise	State-owned enterprise
Destination	Thailand	Malaysia	Thailand	Indonesia	Thailand
Time of entry	2012	2017	2020	2015	2019
Method of entry	Joint venture with CP Group	Equity participation in Proton	Acquisition of local subsidiary of US GM	Joint venture with GM	Joint venture with CP Group
Investment amount	10 billion baht	1.2 billion RMB	22.6 billion baht	700 million USD	300 million baht
Local business content	Automobile production and sales	Automobile production and sales	Production and sales of automobiles and engines	Automobile production and sales	Automobile production and sales
Local production content	Sedans, SUVs, EVs	SUVs, EVs	Sedans, SUVs, EVs	Low-cost MPVs, SUVs, EV compact cars	EV trucks
Production capacity	100,000 units/ year	250,000 units/ year	80,000 units/ year	120,000 units/ year	First year, 450 units
Actual production scale	Approx. 30,000 units (2019)	109,000 units (2020)	Mass production to start in 2022	25,000 units (2019)	Unknown
Number of employees	Approx. 1,100 employees	Approx. 1,840 employees	Approx. 3,400 employees	Approx. 3,000 employees	Unknown

Source: Company websites and news reports (prepared by the author)

The first characteristic is the method of market entry through M&As, similar to Chinese consumer electronics companies. The cases of Great Wall Motor, which invested in Thailand, and Geely Automobile,

which entered Malaysia, are typical examples of cross-border M&A in Southeast Asia. Great Wall Motor's method of market entry into Thailand in 2020 was through the acquisition of the Thai subsidiary of General Motors (GM), a U.S. company that had withdrawn from the business there. The aim of the acquisition was the valuable strategic assets that GM had built up during its long period of local production in Thailand. These assets included its supplier network, sales network, and trained human resources. For Great Wall Motor to build these strategic assets from scratch by itself would have required substantial costs. By acquiring GM's entire Thai operation, Great Wall Motor was able to quickly establish a local production system in Thailand.

Geely Automobile, which entered the Malaysian automobile market, demonstrated the same approach. In 2017, Geely Automobile started a joint venture with Proton, a former state-owned Malaysian automaker, in the form of an equity participation. After the joint venture began, Geely Automobile transferred various technologies from its subsidiary Volvo to modify Proton's vehicle models, and also dispatched a CEO to manage profits, revamping Proton. With these major modifications, Geely Automobile now ranks third in the Malaysian market, behind domestic manufacturer Perodua and Honda.

Given the domination of Japanese companies in the Southeast Asian market, it is extremely difficult for new entrants to increase their market share. However, Geely Automobile's investment in Proton, an established and powerful company, has certainly had a significant effect on its share of the Malaysian market, surpassing Toyota's at a stroke. M&As and joint ventures with local capital have many advantages, including the ability to quickly launch overseas operations, achieve low-cost market entry, and access to the technology, brand, management personnel, and other resources of an existing company. For Chinese automakers with little experience in FDI and few competitive advantages, the strategy of trying to establish dominance in overseas markets by acquiring existing strategic assets in Southeast Asia is highly significant.

The second characteristic is that companies are expanding overseas by acquiring special advantages after the fact, rather than possessing them in advance (Yuan, 2021). SAIC Motor, having entered Thailand, has outlined a technology and brand establishment route that involved acquiring British company Rover, acquiring the MG brand, and introducing MG models onto the Thai market. Similarly, Geely Automobile, which entered the Malaysian market, followed a similar process [Volvo acquisition → new platform (compact modular architecture) based on Volvo technology → development of new models → launch in Malaysian market → increase in local market share]. This has been possible because Chinese automakers have raised the level of their own-brand car design and technology by absorbing technology and know-how from foreign manufacturers. Such reverse technology transfer strategies have become a method often employed by Chinese companies to expand into Southeast Asia.

The third characteristic is the full use of "irregular competitive advantage." Yuan (2014) focused on "regular competitive advantage" and "irregular competitive advantage" in the case of Chinese firms' direct investment in Southeast Asia. The former refers to the same things that Hymer called "advantages," such as technology, brand, and know-how, while the latter refers to social capital (use of Chinese and overseas Chinese networks), adaptability to local business practices, connections, and informal business transactions. Chinese firms rely primarily on the latter to compete with leading Japanese and South Korean firms in Southeast Asia.

For example, the use of overseas Chinese capital and obtaining government approvals are typical examples. The main reason why SAIC Motor's expansion into Thailand has generally been on track is again the full support of the CP Group, a Chinese conglomerate. In Thailand, the CP Group has built a strong, collusive relationship with the government, and so the Thai government did its utmost to support SAIC Motor when it launched operations in-country. In addition, the CP Group's long-established distribution network, parts and materials supply network, and trading network were made freely available to SAIC Motor.

Another interesting example is Geely Automobile's use of the influence of leading Malaysian politicians after it expanded into Malaysia. As mentioned above, Geely Automobile's method of entering the Malaysian market was through an equity participation in a local company, Proton. Proton was never an ordinary private company, but rather an entity established in 1985 under national policy, with government backing under then Prime Minister Mahathir's domestic automobile initiative of the 1980s. The Malaysian government, and Mahathir, have been deeply involved with Proton from its foundation to the present. Geely Automobile invested in Proton on favorable terms in 2017, leveraging Mahathir's powerful personal network. Therefore, even after the acquisition of Proton by Geely Automobile, Mahathir remained deeply involved in the restructuring of Proton's management throughout. From the perspective of developed countries, these corporate actions and methods may seem dubious and unreasonable, but in the socially and economically immature markets of developing countries, they are, if anything, quite rational.

The pursuit of localization from the outset is the fourth characteristic of most Chinese automakers entering Southeast Asia. SAIC Motor and Great Wall Motor, which entered the Thai market, are typical examples. The key to SAIC's strategy in the Southeast Asian market is the "threefold" strategy of "localization of personnel, localization of markets, and localization of services." Looking at "localization of personnel," when SAIC Motor first entered the Thai market, it chose the CP Group as a strong joint-venture partner. This was due to the CP Group's many location-specific advantages. In other words, the CP Group has many local resources that were applicable to the Thai market, such as local management personnel, existing human networks, and lines of connection to the government. (This last is especially important in the case of Asian markets.) Therefore, it appears that SAIC Motor adopted a strategy of trying to make up for its own disadvantage by taking advantage of the CP Group's locational advantage. Currently, the management team of SAIC Motor's local subsidiary in Thailand includes many local personnel from the CP Group.

Great Wall Motors' entry into Thailand also pursued localization from the start. In terms of personnel localization, a Thai national has now been selected as the CEO of Great Wall Motor's Thai subsidiary. In terms of physical localization, Great Wall Motor has set the local content (domestic production rate) of production in Thailand at 80%. This thoroughgoing pursuit of personnel and material localization by both companies from the outset of their entry into the market is a phenomenon that defies common logic. However, this approach has by no means been limited to the Southeast Asian market; it has appeared in many overseas markets. Compared to multinationals in developed countries, Chinese firms, as newcomers in overseas markets, have many latecomer disadvantages. These include low recognition in local markets, low market share, shallow local management experience, lack of accumulated human resources, inadequate sales networks, and underdeveloped suppliers. One of the fastest ways to compensate for these

disadvantages is to innovatively combine existing local resources to a company's strengths.

The fifth characteristic is the introduction of the latest products by Chinese firms into the local market. As Table 7-2 shows, these five Chinese companies that have entered the Southeast Asian automotive market have, without exception, introduced state-of-the-art electric vehicles (EVs) to the local market. With gasoline-powered vehicles, Chinese firms have extremely few opportunities to enter overseas automobile markets, because they lag far behind their developed-country counterparts in terms of technology. Since the 21st century, however, the automotive industry has been rapidly shifting from gasoline-powered vehicles to EVs. Chinese companies, which do not have many good technological assets related to gasoline-powered vehicles to begin with, are concentrating their energy into the EV field, so as to bridge the technological gap with Japanese companies. At the same time, they are bringing their latest technologies to the Southeast Asian market.

7.3 Summary: Impact of Chinese Companies' Expansion into Southeast Asia on Industry and Technology in General

This chapter has examined the expansion of Chinese firms into Southeast Asia and its impact on local industry and technology, focusing on the consumer electronics and automotive industry sectors. Finally, we will summarize the key points found by the analysis so far.

First, the industrial structure of Southeast Asia is beginning to change to some extent. In industrial areas (e.g., consumer electronics) where Japanese and South Korean firms (the market frontrunners) have been shrinking or withdrawing, Chinese firms (the latecomers) are quickly moving into the market. Thus, Chinese companies are beginning to take the lead in individual markets. If this situation becomes more widespread in the future, the industrial dominance of Japanese and South Korean firms in Southeast Asian markets may gradually erode.

Second, Chinese firms may seize the opportunity of industrial and technological paradigm shifts and catch up rapidly in industries where Japanese firms have been absolutely dominant in Southeast Asia to date. As previously mentioned, the shift from gasoline-powered vehicles to EVs provides an excellent industrial catch-up opportunity for Chinese companies operating in Southeast Asia. If this industrial and technological paradigm shift accelerates in the Southeast Asian market in the future, it is not impossible that the dominance of the automobile market established by Japanese firms will shift to inferiority.

Third, some Chinese companies have established technological know-how (e.g., small EVs, commercial EVs, etc.) to make cheap, high-volume, good-quality products, and Chinese companies will use this know-how as a weapon to bring these products onto the Southeast Asian market. SAIC-GM-Wuling Automobile (SGMW), which is expanding into Indonesia, may be a typical example. SGMW, which has partnered with a Japanese company, is exporting its EV products to the Japanese market as of 2022, so such advantages will likely pose a threat to Japanese companies in the Southeast Asian market in the future.

Fourth, local Southeast Asian firms (especially conglomerates involving Chinese and overseas Chinese firms) have shown a willingness to promote cooperation with Chinese firms that are increasing their financial and technological capabilities, and it is highly likely that the cooperative relationship between the two sides will further develop. In particular, Chinese/overseas-Chinese conglomerates are a unique

"irregular competitive advantage" for Chinese companies entering Southeast Asia. If Chinese firms take advantage of this, changes in the technological and industrial composition of the Southeast Asian market could well accelerate.

Fifth, the expansion of Chinese companies into Southeast Asia will also have a significant impact on supply chains in local markets. Chinese companies may also take advantage of the Central America Free Trade Agreement and Regional Comprehensive Economic Partnership, which are currently tariff-free, to achieve lower costs by bringing in large quantities of products and parts produced in China. In particular, Chinese firms entering countries such as Thailand and Vietnam, which are regionally adjacent to China, may take advantage of the low cost of procuring parts and materials from mainland China to establish a local market advantage.

Conclusion

Finally, based on Table 7-3, we will look at the prospects for changes in the strengths of Chinese firms in some Southeast Asian industries (i.e., the technological and market superiority of Chinese firms relative to Japanese firms). The table highlights some of industry sectors other than gasoline-powered automobiles and consumer electronics.

Table 7-3: Strengths and Weaknesses of Chinese Firms in Major Southeast Asian Industries (Technological and market superiority of Chinese firms compared to Japanese firms)

Industrial sector	Changes in superiority
Automobiles (gasoline)	× → △ (Partial)
Home appliances	× → △ → ○
Next-generation telecommunications	△ → ○
Infrastructure	△ → ○
Construction	△ → ○
Rail	△ → ○
Electronic vehicles (EVs)	△ → ○

Explanation: ○ = Chinese companies have an advantage in the market compared to Japanese companies; △ = Chinese companies and Japanese companies are in a competitive market or Chinese companies have been rapidly increasing their market share in recent years; × = Chinese companies have a lower market share compared to Japanese companies.

Source: Prepared by the author

Chinese firms, once far behind Japanese firms technologically, are not only catching up with them in some industrial sectors, but are also showing signs of overtaking them. In particular, Chinese companies have already taken the lead in some next-generation industries (EVs, next-generation communications, etc.). If this trend continues to grow, it would not be surprising to see a scenario in which Chinese companies take the lead in industry and technology in Southeast Asia.

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8 The East Asian Trade Order and China's Dual Circulation Strategy: Implications for ASEAN

Koichi Ishikawa

Foreword

In East Asia, economic integration has been gaining momentum since the beginning of the 21st century. At the end of the 20th century, East Asia had only two economic integration pacts, the Association of Southeast Asian Nations (ASEAN) Free Trade Area (AFTA) and the Australia–New Zealand Closer Economic Relations Trade Agreement (CER; a free trade agreement (FTA) between Australia and New Zealand). Today, however, the number of intra-Asian economic integration pacts alone has increased to about 60. A distinctive feature of East Asian economic integration has been the creation of an FTA network centered on ASEAN. AFTA and the ASEAN Economic Community (AEC) having been realized, the ASEAN+1 FTAs between ASEAN and Japan, China, South Korea, India, and Australia/NZ were formed by 2010. Subsequently, the creation of a broad-based, comprehensive FTA, covering a wide range of sectors with the participation of many East Asian countries, became a policy agenda item. This resulted in the conclusion of the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) in 2018 and the Regional Comprehensive Economic Partnership Agreement (RCEP) in 2020. Progress in economic integration has liberalized and facilitated the movement of trade, investment, services, and people, and companies have built and optimized their supply chains in East Asia.

However, since 2018, measures have begun to be taken in reverse to the trend toward liberalization of trade and investment. These measures involve tightening regulations on trade and investment for the purpose of economic security. The forerunner in this regard was the imposition of tariffs on imports of steel and aluminum products for national security reasons under Section 232 of the U.S. Trade Expansion Act of 1962. The tariff rates imposed were 25% on steel and 10% on aluminum. Subsequently, the U.S. strengthened export controls and screening of U.S. investment in emerging technologies through the FY2019 National Defense Authorization Act (NDAA), placing Huawei and other Chinese companies on the Entity List and restricting their exports. Trade and investment restrictions targeting China were tightened, as were controls on students and researchers from China.

As a countermeasure, China enacted an Export Control Law in 2020 and strengthened trade restrictions, including the creation of an Entity List. The Export Control Act also covers re-exports by companies in third countries, and trade controls based on economic security also affect companies in third countries, including Japanese firms. In addition, the COVID-19 pandemic disrupted the supply chain for essential goods such as medical supplies and automotive parts, leading companies to focus not only on building and optimizing their supply chains, but also on strengthening and managing them. The Japanese and other

major governments have begun to implement policies to support supply-chain diversification, reshoring, domestic production of semiconductors and other products, R&D, and other supply-chain activities.

The purpose of this chapter is to examine ASEAN's response to China's Dual Circulation Strategy in the context of two opposing trends in the East Asian trade order: liberalization and regulation.

8.1 Current Situation of Economic Integration in East Asia

8.1.1 From bilateral FTAs to wide-area FTAs

Economic integration in East Asia has progressed rapidly in the 21st century[45]. ASEAN led the way in East Asian economic integration. ASEAN began forming the AFTA in 1993, reducing tariffs among the ASEAN-6 member countries to a maximum of 5% in 2003, and eliminating them in 2010. ("ASEAN-6" refers to Brunei, Indonesia, Malaysia, the Philippines, Singapore, and Thailand.) Four new member countries (Cambodia, Laos, Myanmar, and Vietnam) subsequently joined the AFTA, and intra-ASEAN tariffs were eliminated in 2015 except for some items (with a tariff rate equivalent to 6%). Tariffs on these remaining items were eliminated in 2018. ASEAN successively concluded FTAs with major East Asian countries; by 2010, it had concluded five FTAs (called ASEAN+1 FTAs) with China, South Korea, Japan, Australia/New Zealand, and India. While a network of FTAs was formed among major countries, especially those in ASEAN, no bilateral FTAs were concluded between FTA partners such as Japan and China, Japan and South Korea, China and India, and Australia and India.

The conclusion of a broad-based and comprehensive FTA involving major East Asian countries therefore emerged as a new challenge. The reasons for this are as follows: ① the administrative work and cost burdens on companies using FTAs have increased due to differences in liberalized products, liberalization schedules, target sectors, rules of origin, etc.; ② for example, when exporting parts from Japan to ASEAN and processing them into products for export to Australia, the rules of origin may prevent the use of an FTA for exports to Australia; ③ broad-based multilateral FTAs have greater economic benefits than bilateral FTAs; and ④ the development of corporate activities such as trade in services, e-commerce, and the formation of multinational supply chains has made it necessary to incorporate new sectors into FTAs. Item ② above can be resolved by concluding a wide-area FTA that stipulates cumulative rules of origin in East Asia. The comprehensive, wide-area FTAs that have been realized are the RCEP and CPTPP.

8.1.2 The RCEP and CPTPP

Negotiations for the RCEP began in 2013 among 16 countries (the 10 ASEAN countries, Japan, China, South Korea, Australia, New Zealand, and India). The agreement was signed in November 2020 by 15 countries, India having withdrawn in the final stage. The RCEP is an FTA that integrates the five ASEAN+1 FTAs. It is the world's largest FTA, with a global share of about 30% of population, GDP, and trade. In all, the RCEP is a comprehensive agreement in 20 chapters covering a wide range of areas, including e-commerce. It does not, however, include state-owned enterprises, the environment, or labor;

[45] See Shimizu (2021) for the development of East Asian economic integration leading to the RCEP and CPTPP.

these are included in the CPTPP.

The liberalization rate (tariff elimination rate) is 91%, lower than the CPTPP's 99.3% (95% in Japan), and the rules are of lower quality than those of the CPTPP. The RCEP is characterized by taking into account the economic development stage and development needs of developing countries (especially the "CLMV" countries, consisting of Cambodia, Laos, Myanmar, and Vietnam). As a result, there are many areas where transitional periods and reviews are stipulated, and mechanisms for quality improvement are woven into the system. The RCEP's level of liberalization and rules is positioned between the ASEAN+1 FTAs and the CPTPP (Table 8-1). From the perspective of Japan, the RCEP creates a Japan-China FTA and a Japan-South Korea FTA. Although the RCEP is often viewed as a China-led FTA, the agreement was proposed by ASEAN and negotiated in ASEAN-centric terms. As of November 1, 11 countries had completed their national procedures, and the agreement entered into force in January 2022.

The withdrawal of the United States in January 2017 made it impossible for the Trans-Pacific Partnership (TPP) to come into effect. The remaining 11 countries therefore intensively negotiated the CPTPP, reaching an agreement in November 2017. It was signed in March 2018, and came into effect in December of that year. Although 22 items were frozen (application suspended), the remaining provisions of all 30 chapters remain unchanged, and the TPP's characteristics of a 21st-century FTA with a high level of liberalization and high-quality rules, including new rules, remain unchanged. The items frozen were mainly those strongly insisted on by the U.S. and opposed by developing countries, but accepted in return for market access to the U.S. Intellectual property accounted for 11 items, or half of the total.

The CPTPP's tariff elimination rate is 99% to 100% (95% for Japan), and its major rules include: ① expedited customs clearance; ② Investor–state dispute settlement (ISDS) procedures; ③ free cross-border data flows, prohibition of requirements to install computer-related equipment, etc., and prohibition of requirements to disclose source code, etc. ④ prohibition of non-commercial assistance to state-owned enterprises, ⑤ rendering of copyright violation an offense not requiring a formal complaint in order to prosecute, and ⑥ adoption and maintenance of fundamental labor rights in member countries' domestic laws. Of these, ③, ④, and ⑥ are rules with China in mind. Other rules with China in mind include ① technical barriers to trade (TBT): submission of views of stakeholders from other contracting parties; ② investment: country-specific provisions at the initial stage; ③ prohibition of performance requirements beyond the Agreement on Trade-Related Investment Measures (TRIMs Agreement); and ④ prohibition of government procurement measures that would reduce the effectiveness of procurement. It should be noted that although the CPTPP aimed for a high degree of liberalization, many practical compromises were made, and exceptions were made upon its conclusion[46].

China and Taiwan applied for CPTPP membership on September 16 and 22, 2021, respectively. As mentioned above, the CPTPP has rules with China in mind and the hurdles for China to join are high. However, it is necessary to consider that ① some of the hurdles have been overcome by China's joining the RCEP; ② many exceptions are allowed in the CPTPP; and ③ China will make drastic concessions

[46] For example, while the tariff elimination rate for CPTPP parties is 99% to 100%, Japan is an exception for five items, including rice, wheat, and dairy products, and its tariff elimination rate is 95%.

in the FTA negotiations. The biggest issue is likely to be discipline on state-owned enterprises, with the main point of contention being whether to allow exceptions. Discipline on state-owned enterprises is a fundamental provision for a free and fair market economy, and CPTPP parties should negotiate without compromise.

Table 8-1: Comparison of Key Provisions of the RCEP and CPTPP

	RCEP	CPTPP
Percentage of trade liberalization of goods	91% (Japan: 88% compared to ASEAN, Australia, and NZ; China: 86%; South Korea: 81%)	99.3% (95% for Japan, 99% or 100% in other countries)
Rules of origin	Only the cumulation of physical goods applies	Fully cumulative system (goods + production process), 3-process standards for textiles
Trade in services	Positive and negative list system depending on the country; discussion of conversion to negative list within 3 years	Negative list method
Investment	Country-specific provisions at the initial stage; prohibition of requests for specific measures (royalty regulations, technology transfer requirements) broader than the TRIMS Agreement; ISDS to be discussed within 2 years of entry into force	Country-specific provisions at the initial stage, prohibition of specific measure requirements broader than the RCEP; ISDS
E-commerce	Mandatory free flow of data; prohibition of data localization requirements	Mandatory free flow of data; prohibition of data localization requirements; prohibition of source code disclosure requirements
Government procurement	Transparency of laws and procedures related to government procurement; cooperation, etc.	Open government procurement
State-owned enterprises	No stipulations	Prohibition of non-commercial assistance to state-owned enterprises, etc.
Labor	No stipulations	Adoption and maintenance of basic principles and rights in regard to labor
Environment	No stipulations	Participation in international environmental agreements; prohibition of fishing subsidies

Source: The RCEP Agreement and CPTPP Agreement (prepared by the author)

8.2 Economic Security

8.2.1 Trade restrictions for security purposes

The World Trade Organization (WTO) rules provide for security exceptions in General Agreement on Tariffs and Trade (GATT) Article 21, which states that a country may take measures it deems necessary for the protection of its vital national security interests. Security exceptions are also provided for in

General Agreement on Trade in Services (GATS) Article 14, and Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement) Article 73. The FTA also has a security exception provision, and the CPTPP has a similar provision in Article 29.2. Traditionally, WTO members have been cautious about invoking the security exception, but in 2019 the Trump administration imposed tariffs on steel and aluminum on security grounds under Section 232 of the Trade Expansion Act. The Trump administration has broken this tacit understanding, and since then, an increasing number of countries have been invoking security exceptions[47].

During the Cold War between the U.S. and the Soviet Union, trade with the Communist bloc was controlled by the Coordinating Committee for Multilateral Export Controls (CoCom) to prevent outflows of technology related to weapons development. After the Cold War ended, CoCom was replaced by the Wassenaar Arrangement. International export control regimes for weapons of mass destruction etc. include the Wassenaar Arrangement (conventional weapons and related general-purpose items), the Australia Group (chemical and biological weapons), the Nuclear Suppliers Group, the Zangger Committee (exports to non-nuclear weapons states), and the Missile Technology Control Regime. These export control regimes, the Wassenaar Arrangement included, are not legally binding; participating countries implement export controls for the agreed listed items in accordance with their national laws and regulations.

The U.S.-China confrontation, which began with trade friction, escalated from a contest for technological hegemony to a confrontation over security when the U.S. imposed additional tariffs in July 2018 as sanctions for intellectual property rights violations under Section 301 of the Trade Act of 1974, and China imposed retaliatory tariffs. The U.S. and China reached a first-phase agreement in January 2020, but most of the additional tariffs remain in place. Since 2019, U.S. exports to China have been restricted, screening of Chinese companies' investments in the U.S. tightened, and government procurement of Chinese-made products and technology banned. In 2020, the restrictions on China were expanded and strengthened[48].

As a reason for this strengthening and expansion of security trade controls, Kazuto Suzuki points out that emerging technologies that have the potential to alter the security order if converted to military use are now subject to security controls[49]. He then states that emerging technologies are developed as general-purpose technologies in the private sector, developed and manufactured using components and products from various countries in global supply chains, and often created in collaboration with researchers and students from other countries. Therefore, he argues that trade management of emerging technologies also requires management of supply chains and movements of people, including researchers.

8.2.2 Developments in U.S. and Chinese economic and security policies

U.S. controls for economic-security purposes on trade and investment with, and government procurement from, China were implemented through the FY2019 NDAA, which was enacted in August 2018 (Table 8-2)[50]. Export controls for emerging and foundational technologies are required by the Export

[47] Mitsuo Matsushita (2021), p. 21.
[48] Keiichi Umada (2021) pp. 51-55.
[49] Kazuto Suzuki (2021), pp. 36-43.
[50] This section draws on Hideo Ohashi (2020), pp. 127-134.

Control Reform Act of 2018 (ECRA),under which such exports require approval from the Department of Commerce's Bureau of Industry and Security (BIS); re-exports from third countries are also covered and require BIS approval. The emerging technologies designated by ECRA are: ① biotechnology, ② artificial intelligence and machine learning technology, ③ positioning technology, ④ microprocessor technology, ⑤ advanced computing technology, ⑥ data analysis technology, ⑦ quantum information and sensing technology, ⑧ logistics technology, ⑨ 3D printing technology, ⑩ robotics, ⑪ brain-computer interface technology, ⑫ supersonic technology, ⑬ advanced materials, and ⑭ advanced surveillance technology.

The authority of CFIUS to regulate Chinese companies' investment in the United States was strengthened by FIRRMA. The areas subject to investment restrictions were expanded to include the emerging and basic technologies under ECRA, along with regulations based on arms and international export regimes, and the scope for screening was tightened. For government procurement, in August 2019, NDAA Section 889 prohibited U.S. government agencies from doing business with five Chinese companies, including Huawei and ZTE.

The tightening of restrictions on China has continued since 2019 to the present (Table 8-2). In May 2019, 68 companies, including Huawei, were placed on the Entity List under the Export Administration Regulations, restricting exports from the U.S. Regarding restrictions on the movement of people, in June 2018, the State Department reduced the visa term for Chinese graduate students studying priority areas under the "Made in China 2025" policy from five years to one year. In May and August 2020, the re-export of Huawei products was exempted if they contained less than 25% U.S. parts and technology, but this has since been expanded to include a ban on the export of semiconductors that use U.S. parts, technology, or software. Since the Biden administration came to power, measures to strengthen the supply chain for semiconductors and other products have been put in place.

Table 8-2: U.S. Measures for Economic Security

August 2018: passage of the FY2019 NDAA; (1) export controls under ECRA; (2) strengthening of FIRRMA regarding investment controls in the U.S.; and (3) ban on government procurement under NDAA Section 889
May and August 2019: Huawei and other Chinese companies placed on the Entity List
August: Government procurement of Huawei products banned
May and August 2020: Extension of direct product regulation to Huawei
July: Eleven companies, including textile companies, placed on the Entity List for complicity in human rights violations in the Xinjiang Uighur Autonomous Region
August: Announcement of the "Clean Network" initiative, intended to eliminate Chinese companies from the U.S. telecommunications network
August: Placement of 24 infrastructure-related companies on the Entity List for illegal activities in the South China Sea
December: Placement of 60 Chinese entities on the Entity List; these include major firms such as the semiconductor manufacturer Semiconductor Manufacturing International Corporation, China Communications Construction Company Limited and the drone manufacturer DJI.

January 2021: FY2021 NDAA; introduction of subsidies of up to approximately JPY 330 billion per case to support the location of semiconductor factories and the introduction of equipment; establishment of a Multilateral Semiconductors Security Fund, subject to pledges by participating countries; CHIPS Act (a USD 50 billion U.S. semiconductor manufacturing assistance act)

February: Presidential Executive Order on America's Supply Chains

April: Seven supercomputer-related institutions added to the Entity List

November: Seven companies related to quantum technology, electronic components, and semiconductors added to the Entity List

Source: Ohashi (2021) and Japan External Trade Organization (JETRO) data (prepared by the author)

In response to the U.S. tightening of trade and investment restrictions targeting China, China has begun to introduce similar trade and investment restrictions (Table 8-3). In August 2020, the Catalog of technologies the export of which is prohibited or restricted (Foreign Trade Law) was significantly expanded to include 44 items, including AI technology, 3D printer technology, and biopharmaceutical manufacturing technology. In December, the Export Control Law was enacted; it allows exports to specified companies to be prohibited, and also provides for re-export restrictions and retaliation clauses. In January 2021, Order No. 1/2021 on the Rules on Counteracting Unjustified Extraterritorial Applications of Foreign Legislation and Other Measures (National Security Law, Export Control Law) was promulgated and enforced. These rules allow for claims for damages against foreign companies that have caused damage to Chinese firms following the improper extraterritorial application of foreign laws and measures (U.S. sanctions against China). In the area of foreign investment regulations, the Measures for Security Review of Foreign Investment were enacted in January to tighten the screening of foreign investments in infrastructure and technology related to national security, and in important agricultural products.

Table 8-3: China's Measures for Economic Security

August 2020: The Catalog of technologies the export of which is prohibited or restricted (Foreign Trade Act) was significantly expanded: 44 items were added, including AI technology, 3D printer technology, and biopharmaceutical manufacturing technology.

September: Unreliable Entity List: foreign entities on the list are restricted or prohibited from trade and investment activities and entry into China.

December: Enactment of the Export Control Law: A basic law consisting of 49 articles that comprehensively regulates export control New measures such as retaliatory measures, re-export controls, and deemed export controls included

January 2021: The "Regulation on the Administration of Commercial Cryptography" (Cryptography Law, Export Control Law) goes into effect, adding cryptography-related products to the list of export control targets.

January: The Rules on Counteracting Unjustified Extraterritorial Applications of Foreign Legislation and Other Measures (National Security Law, Export Control Law) promulgated and enforced, allowing claims to be filed against parties that have caused damage to Chinese citizens, corporations, and other entities due to the improper extraterritorial application of foreign laws and measures

January: The Measures for Security Review of Foreign Investment strengthen screening of foreign companies' investment in military industries, important agricultural products related to national security, infrastructure, technology, etc.

January: Public comments taken on the "Rare Earth Management Regulation" : strengthened management of mining, smelting separation, distribution, import/export, and stockpiling of rare earth

June: The Law on Countering Foreign Sanctions, providing that if a foreign country interferes in China's internal affairs by imposing discriminatory restrictive measures on Chinese citizens and organizations, China has the right to take appropriate countermeasures

Source: Ohashi (2021) and JETRO data (prepared by the author)

8.2.3 Supply-chain resilience

During the period of economic integration, companies built and expanded supply chains, optimizing them through FTAs. However, with the COVID-19 pandemic and the strengthening of trade and investment controls on the part of the U.S. and China in order to ensure economic security, strengthening supply chain resilience became an issue. Both companies and governments worldwide began to work on strengthening their supply chains. Specifically, the relevant stakeholders' aim is to correct excessive reliance on specific countries for the procurement and production of important products and parts such as semiconductors, and measures are being implemented such as: ① diversifying supply chains; ② transferring procurement sources to domestic sources and domestic production; ③ arranging supports for R&D and domestic production; and ④ engaging in cooperation with allied and like-minded countries.

In Japan, various projects are being implemented, including the ASEAN-Japan Economic Resilience Action Plan (building resilient supply chains), the Program for Promoting Investment in Japan to Strengthen Supply Chains, and the Support Program to Strengthen Overseas Supply Chains (strengthening Japan-ASEAN supply chains: automobiles, electrical machinery, medical equipment, rare metals, etc.). In October 2021, Taiwan Semiconductor Manufacturing Company Limited (TSMC) and Sony announced that they will build a semiconductor plant in Kumamoto Prefecture with an investment of JPY 800 billion. The Japanese government declared that it would establish a fund to provide JPY 400 billion in subsidies.

The U.S. announced the following supply-chain enhancement measures in June 2021[51]. ① Addressing supply-chain vulnerabilities for critical products (supporting domestic manufacturing of critical pharmaceuticals, ensuring a domestic supply chain for advanced batteries, investing in sustainable production and processing of critical minerals, collaborating with industry, allies, etc. to address the semiconductor shortage); ② Building a fair and sustainable industrial base (investing in sustainable supply chains; investing USD 4 billion in the food-supply chain, etc.); ③ A long-term strategy for strengthening supply chains (a. Rebuilding production and innovation capabilities: recommending that Congress secure a budget of at least USD 50 billion for domestic manufacturing and research and development of critical semiconductors, and recommending the creation of a new USD 50 billion supply-chain resilience program

[51] The White House (2021).

at the Department of Commerce; b. Strengthening international trade rules: formulating a comprehensive trade strategy to strengthen supply chains and support U.S. competitiveness; c. collaborating with allies and like-minded nations to reduce vulnerabilities in the global supply chain (such as the Quad and G7, which will be discussed later). TSMC announced in May 2020 that it would build a semiconductor plant in Arizona with an investment of USD 15 billion, and that the U.S. government would subsidize the project to a significant extent[52].

Unlike the Trump administration, the Biden administration intends to compete with China through coordination and cooperation with allies and partners. The issue of strengthening supply chains is beginning to be addressed within the Quad (Japan-U.S.-Australia-India) framework. President Biden convened a Quad Summit in March 2021, calling for unity in a common vision for a free and open Indo-Pacific, and launched the Quad Critical and Emerging Technology Working Group[53]. In September, a face-to-face Quad Summit was held, and in the Critical and Emerging Technologies area, the Semiconductor Supply Chain Initiative was launched. Quad, which stands for "Quadrilateral Security Dialogue," was originally a security framework. Under the Biden administration, however, it has become a framework for addressing supply chain, climate change, and COVID-19 control. Security cooperation is now being also promoted by the AUKUS grouping (Australia, the U.K., and the U.S.).

8.3 The Dual Circulation Strategy and Its Impact on ASEAN

8.3.1 U.S.-China conflict and ASEAN

In the face of escalating U.S.-China confrontation, the basic stance of ASEAN and its member countries is to avoid choosing sides. This is because ASEAN and its member countries have close diplomatic and economic ties with both the U.S. and China. In terms of relations with China, all 10 ASEAN countries have joined the Asian Infrastructure Investment Bank and the Belt and Road Initiative, and ASEAN has an FTA with China (the ASEAN-China Free Trade Area (ACFTA)). Also, China is the largest trading partner for eight of the ASEAN countries. At the ASEAN-China Summit in November 2021, diplomatic relations were upgraded from a strategic partnership to a "comprehensive strategic partnership." However, stances toward China vary from country to country. Cambodia and Laos have such close ties with the country that they can be called pro-China, while Vietnam, which is embroiled in fierce territorial disputes with China in the South China Sea, maintains its distance. Vietnam is the only ASEAN country that has excluded Huawei 5G equipment and devices.

ASEAN and the U.S. have a strategic partnership and a broad-based action plans (including the area of security). Thailand and the Philippines are U.S. allies, while the U.S. has a strategic partnership with Singapore and comprehensive partnership relationships with Malaysia, Indonesia, and Vietnam. The United States is ASEAN's second-largest trading partner (USD 308 billion as of 2020) and largest investor (USD 34.7 billion as of 2020).

[52] Ota (2021), p. 27.
[53] See Ishikawa (2021) for the Quad Summit.

In response to the Free and Open Indo-Pacific Plan, promoted by the United States and Japan and opposed by China as "containment," ASEAN released the ASEAN Outlook on the Indo-Pacific (AOIP) in 2019[54]. The AOIP is a concept that ① emphasizes dialog and cooperation based on the principles of ASEAN-centricity and inclusion, and ② proceeds through existing ASEAN-led mechanisms, with an emphasis on economic cooperation. The concept does not exclude China and emphasizes dialog and cooperation rather than confrontation. The U.S. and Japan have announced their support for the four cooperation areas of the AOIP (maritime cooperation, connectivity, Sustainable Development Goals (SDGs), and economic cooperation).

8.3.2 Closer ASEAN-China economic relations

China is ASEAN's largest trading partner (USD 516.9 billion, 2020), ranking first in eight of the 10 member countries. China's share of ASEAN exports/imports increased from 7.3% of exports and 11.4% of imports in 2005 to 16.1% of exports and 22.3% of imports in 2020. The dependence of the "CLM" countries (Cambodia, Laos, and Myanmar) on China is also evident. The share of Laos and Myanmar's exports going to China increased from 4.3% to 26.2% and from 3.9% to 26.2% of total exports, respectively. The share of total imports to Cambodia and Myanmar from China also increased significantly, from 16.6% to 40.3%, and from 15.8% to 35.4%, respectively. ASEAN's share of China's trade also rose, from 7.3% of exports and 11.4% of imports in 2005 to 14.8% of exports and 14.6% of imports in 2020.

In terms of investment, China was the fifth-largest investor in ASEAN (2000), with a 7.6% share. In terms of movement of people, China ranked first in Vietnam and Thailand per number of travelers to ASEAN and second in the other countries (2017), making it an important source of inbound tourism. Because of this growing economic relationship, the 2021 ASEAN Expert Panel Survey found that China was by far the most economically influential country in Southeast Asia, with 76.3% of respondents choosing it, compared to the United States at 7.4% and Japan at 4.4%[55].

China was the first country to conclude an FTA with ASEAN (ACFTA). Japan worked on an FTA with ASEAN on a bilateral basis, starting with an FTA with Singapore, while China negotiated an FTA with ASEAN as a whole. ACFTA has expanded from trade in goods to services and investment (Table 8-4). Memoranda of Understanding on Sanitary and Phytosanitary Measures (SPS) and Technical Barriers to Trade (TBT) have also been signed, making the ACFTA an agreement covering a wider range of areas than the original agreement on trade in goods. ACFTA is also used by Japanese companies operating in ASEAN, and according to a JETRO survey, the utilization rate in 2020 was 50.8% for exports and 45.8% for imports, suggesting that it is contributing to the expansion of trade between China and ASEAN[56].

The framework for economic cooperation between ASEAN and China is extremely broad, including not only FTAs but also information and communications technology (ICT), tourism, transportation, and science and technology (Table 8-4). ASEAN is implementing the Master Plan on ASEAN Connectivity (MPAC) to develop the region's transportation infrastructure, and it adopted the ASEAN-China Joint Statement on

[54] ASEAN (2019).
[55] Sharon Seah et al. (2021).
[56] Sukegawa (2021) provides a detailed analysis of ACFTA.

Synergising the Master Plan on ASEAN Connectivity (MPAC) 2025 and the Belt and Road Initiative (BRI) in November 2017. On a member-country basis, many countries are incorporating BRI into their own infrastructure development plans and promoting its development.

Table 8-4: Institutional Framework for ASEAN-China Economic Partnership and Cooperation

ASEAN-China Economic Partnership Framework
① November 2002: Framework Agreement on Comprehensive Economic Cooperation between ASEAN and China (for the establishment of ACFTA)
② November 2004: Agreement on Trade in Goods of the Framework Agreement on Comprehensive Economic Co-operation between the Association of Southeast Asian Nations and the People's Republic of China signed, entered into force July 2005
③ January 2007: Agreement on Trade in Services of the Framework Agreement on Comprehensive Economic Cooperation between the Association of Southeast Asian Nations and the People's Republic of China signed, entered into force July 2007
④ August 2009: Agreement on Investment of the Framework Agreement on Comprehensive Economic Cooperation between the People's Republic of China and the Association of Southeast Asian Nations signed, entered into force in January 2010
⑤ November 2015: Protocol to Amend the Framework Agreement on Comprehensive Economic Cooperation and Certain Agreements thereunder between ASEAN and the People's Republic of China' (ACFTA Upgrading Protocol) signed
Examples of other economic partnership and cooperation frameworks
① November 2004: China-ASEAN Expo held in Nanning; it has since become a regular event.
② November 2013: Memorandum of Understanding between the Association of Southeast Asian Nations and the People's Republic of China on Cooperation in Information and Communications Technology
③ November 2016: Memorandum of Understanding between the Governments of the Member Countries of the Association of Southeast Asian Nations and the Government of the People's Republic of China on Transport Cooperation signed
④ November 2017: Joint Statement between ASEAN and China on Tourism Cooperation signed
⑤ November 2017: Adoption of the ASEAN-China Joint Statement on Synergising the Master Plan on ASEAN Connectivity (MPAC) 2025 and the Belt and Road Initiative (BRI)
⑥ November 2018: Joint Statement on ASEAN-China Science, Technology and Innovation Cooperation
⑦ November 2019: ASEAN-China Leaders' Statement on Smart City Cooperation Initiative

Source: Shigeya Sukegawa, "The ASEAN-China FTA 20 Years after Negotiations: China's Growing Economic Presence in the 30 Years since the Establishment of Dialogue Relations," prepared by the author.

8.3.3 Impact of the Dual Circulation Strategy on ASEAN

(1) Impact of "internal circulation"

Among the policies involved in "internal circulation," industrial upgrading policies (innovation, domestic production of core technologies, and strengthening supply chains) are aimed at moving away from dependence on the U.S. for emerging technologies. The U.S. and China are economically interdependent, and companies have established supply chains that include the U.S. and China. Policies aiming at economic security, mainly supply-chain resilience, are targeting emerging technologies such as semiconductors, and partial decoupling is underway.

In regard to China, specific policies for internal circulation include subsidies for semiconductors, but no tariff increases or import restrictions have been implemented as import substitution measures, and no trade policies are believed to have been taken that would affect trade or investment with ASEAN[57]. A shift to growth driven by domestic demand through consumption and investment could lead to an increase in Chinese imports as well as an increase in supply from the domestic market, which in turn could lead to an increase in exports from ASEAN. It should be noted that the policy of domestic production (import substitution) through internal circulation runs counter to the international division of labor based on comparative advantage, and is problematic in terms of economic rationality, as it may lead to increased costs.

(2) Impact of "external circulation"

China has concluded 18 bilateral FTAs, including those with ASEAN. The RCEP is in force as of January 1, 2022. The country applied for membership in the CPTPP in September 2021. Also, a China-Japan-South Korea FTA is under negotiation. China is a member of the RCEP, and if China is allowed to join the CPTPP, its trade in goods and services will be further liberalized. Its government procurement will be opened, investment liberalized and protected, cumulative rules of origin adopted, and trade facilitated. Such liberalization and facilitation of trade and investment, and the establishment of rules in China, are expected to expand its trade, investment, and other economic ties with other Asian countries, including ASEAN, and bring supply chains closer together.

U.S.-China trade friction has resulted in the transfer of production from China to Vietnam and other ASEAN countries (China's bases will be maintained under the strategy of China Plus One). ASEAN is positioned as an arena for U.S.-China confrontation, and the U.S., China, and Japan are stepping up their cooperation with ASEAN. For example, the U.S. and Japan are cooperating in infrastructure development through the Free and Open Indo-Pacific Plan, while China is cooperating in infrastructure development through the Belt and Road Initiative. ASEAN countries are linking the Master Plan on ASEAN Connectivity (MPAC) and national infrastructure development plans to the Belt and Road Initiative.

[57] The subsidies prohibited under the WTO's Agreement on Subsidies and Countervailing Measures are export subsidies and subsidies that encourage the use of domestic products; subsidies that damage the domestic industry of another country or cause significant harm to the interests of another country are subject to countervailing measures. R&D grants are subject to offsetting measures if they are of a specific nature.

Although the COVID-19 pandemic has forced adjustments to the Belt and Road Initiative, there has been no change in China's policy of promoting the Belt and Road Initiative in ASEAN. China is also cooperating with the smart city concept that ASEAN is focusing on. The country is also pursuing cooperation with ASEAN in a variety of other areas, and the Dual Circulation Strategy is not expected to negatively impact these cooperative efforts.

ASEAN countries are implementing development plans aimed at improving productivity and fostering new industries such as manufacturing through digitization, including Thailand 4.0, Making Indonesia 4.0, Shared Prosperity Vision (Malaysia), and Industrial Transformation Maps (Singapore)[58]. For example, Malaysia's Shared Prosperity Vision calls for Islamic financial hubs, digital economy, 4th Industrial Revolution (4IR), halal food hubs, and green growth, making the possibility of major impact from the Dual Circulation Strategy unlikely. However, on a corporate basis, it will be necessary to respond to restrictions on re-exports of products that use emerging technologies and that are subject to Chinese and American export control legislation.

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