Modality of the Post-coronavirus Supply Chain
—Should We Shift away from Our "Dependence on China"?—

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Summary

1. The Japanese government supports the return of production bases to Japan and the diversification of production bases from the viewpoint of economic security. However, Japanese companies operating in China are not necessarily positive about returning their production bases to Japan or transferring them to a third country. In the United States, there is a larger gap in this move between companies and the government than in Japan, and the government's measures to promote the return of production bases to the United States have not been progressing. Meanwhile in Europe, both the government and businesses are remaining calm, and people tend to regard that the U.S.-China conflict will have more of a negative impact on the supply chain than the novel coronavirus (COVID-19).

2. One of the reasons why the shift away from "dependence on China" has been slow is the so-called "lock-in effect," which refers to the situation where existing accumulation leads to new accumulation. This phenomenon is strong, as evidenced by the fact that China's exports have not declined despite the intensifying trade friction between the United States and China. While U.S. imports have shifted from China to other low-cost producers, the move is mostly a sham shift away from "dependence on China," with changes made only in the location of final loading ports. China's importance in the supply chain is rapidly increasing not only on the supply side but also on the demand side.

3. With the outbreak of the COVID-19 pandemic, the importance of infectious diseases as a risk that threatens the supply chain has increased. The virus can be regarded as the most serious risk, as it is different from conventional infectious diseases in that it greatly changes consumption behavior and that its "end" is unforeseeable. On the other hand, major changes in the supply chain itself over the past 30 years, including its rapid expansion, have also made the impact of COVID-19 more serious.

4. The shape of the supply chain in the era of COVID-19 is determined by three factors: 1) prolonged demand shocks; 2) China making progress in preventing the spread of COVID-19, and fast recovery of its production function, making impairment in the future unlikely; and 3) unlike natural disasters, infectious diseases do not involve the destruction of production facilities; therefore, recovery of the supply chain is fast in Asian countries, including China.

5. As factors that determine the shape of the supply chain change, so too does China's position in the supply chain. There is a centripetal force that keeps China at the center of the chain, but also a centrifugal force that keeps it away from the center. It is necessary for Japanese companies to carefully examine the modality of a "desirable supply chain," considering what they will lose if they choose to shift away from "dependence on China."

Introduction

As a result of the spread of the novel coronavirus (COVID-19) infection, major cities in Hubei Province, including Wuhan, were shut down, forcing manufacturers in China and other countries, including Japan, to halt production. The escalation of the U.S.-China rivalry combined with the outbreak of the COVID-19 pandemic led to heated debate, not only in Japan but also around the world, about a review of the global supply chain that spans multiple countries, especially the need to rectify excessive "dependence on China."

However, China plays an important role in the global supply chain—one that cannot be easily replaced. Is the presence of China in the supply chain a risk? Can we avoid the risk of disruption in the global supply chain by shifting away from our "dependence on China"? Is it really possible for us to shift away from our "dependence on China"? These issues need to be calmly examined in light of the shape of today's global supply chain and China's role in it.

According to a survey of about 2,900 global enterprises in 46 countries conducted by Ernst & Young (EY), a leading British accounting firm, between February and March 2020, 52% of the surveyed enterprises were already reorganizing their supply chains in the wake of the COVID-19 pandemic, with 40% of them feeling a need to do so (Ernst & Young [2020]). The issue of what kind of supply chain is desirable is an important consideration for all companies in the chain.

Regarding the post-coronavirus supply chain, another leading accounting firm presented a proposal on improvement items from the perspective of business administration, including an overall picture of the supply chain, including secondary and tertiary suppliers, identifying risks, increasing shock resistance by increasing inventories, and simplifying the supply chain through the commonization of components (PwC [2020b]). As Honda and General Motors (GM) in the United States announced plans to standardize engines and bodies(1), the corporate sector has moved quickly.

This paper does not focus on such technical issues, but rather on issues related to mid- and long-term strategies for how China should be positioned in the global supply chain. Will the views of the media and experts, or the result of the survey on the post-coronavirus supply chain and China's role in that chain reflect the new reality? To scrutinize this question, it is essential to understand the factors that have shaped today's supply chain and the risks that threaten it.

Given the foregoing, the movement towards shifting away from "dependence on China" in Japan and Western countries will be examined first (1) in this paper. Next, the role that China plays in the global supply chain will be considered (2), while discussing what variables will affect the future supply chain (3). Finally, based on the understanding that there is a centripetal force that keeps China at the center of the supply chain, as well as a centrifugal force that keeps China away from the center of the supply chain (4), the need to develop a "desirable supply chain" will be explored.

1. Difference between governments and corporations with regard to the attitude toward shifting away from "dependence on China"

In the wake of the COVID-19 outbreak, distrust of China by the international community, especially by Western countries, has increased dramatically. China's series of actions, such as "mask diplomacy" which appeared to cover up the delay in the initial response, deepened the U.S.-China conflict and accelerated the movement toward reconsidering excessive dependence on China in the supply chain. The following summarizes the movement of shifting away from "dependence on China" by governments and companies in major countries.

(1) Japan: Companies are cautious about shifting away from "dependence on China"

In April, the Japanese government announced an "emergency economic package in response to COVID-19," stating that from the viewpoint of economic security, it would support the return of production bases to Japan and diversification of supply chains damaged by the spread of COVID-19 (Cabinet Office [2020]). Specifically with China in mind, the Japanese government allocated a total budget of 243.5 billion yen to "subsidize the return of production bases to Japan for products and materials that are highly dependent on a single country" and "support the diversification of production facilities in ASEAN countries, etc."

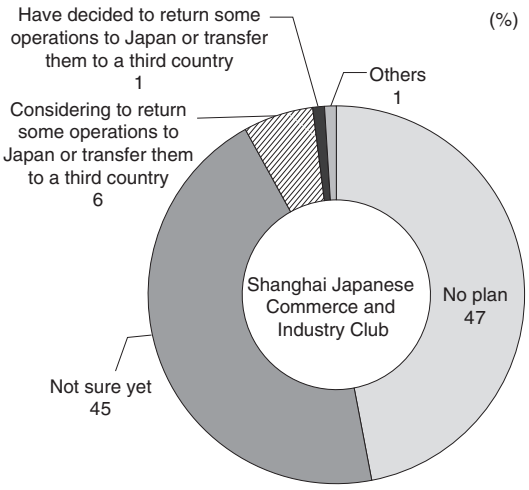
In mid-July, 57 projects were selected from among the public applications for projects to support the return of production bases to Japan. Many of the projects were related to nonwoven masks and medical supplies, while only a limited number of projects were related to the supply chains for automobiles and electrical and electronics industries[(2)]. On the other hand, 30 projects, such as medical gown production, were selected among those related to the diversification of production facilities in ASEAN countries. As a destination for diversification, Vietnam was the largest, with 15 projects. Again, only a small number of projects were related to supply chains for automobiles and electrical and electronics industries[(3)].

In order to prevent disruption of the supply chain from affecting stable supplies, the government requested that production concentrated in China be distributed to the domestic market or ASEAN countries. However, this does not presuppose a reduction or rearrangement of production capacity at production bases in China, but it is intended to provide funds for the development of production bases in Japan or ASEAN countries in order to ensure the smooth supply of products and materials with a high concentration of production bases or products and materials that are important for people to live healthy lives[(4)].

In Japan, there has been a flood of applications for the above-mentioned subsidy projects, and media reports indicate that many companies are actively returning their production bases to Japan or diversifying them[(5)]. However, it should be noted that not all of these companies will end up withdrawing from China. If the Japanese government uses subsidies to induce Japanese companies to reduce or consolidate their production bases in China, Japan's relations with China will inevitably deteriorate. More realistically, however much the shift away from "dependence on China" is called for in Japan, many Japanese companies with production bases in China are faced with the pressing problem that they cannot simply close their bases in China due to China's importance as a market or production base.

According to a survey of member companies conducted by the Shanghai Japanese Commerce and Industry Club in mid-February, when the rise in COVID-19 outbreaks was at its peak, only 7% of companies were "considering" and only 1% had already "decided" to return some of their operations to Japan or transfer them to a third country (Fig. 1). The fact that Japanese companies that

Fig. 1 Possibility of Returning Some Operations to Japan and Transferring Them to a Third Country



Notes: 618 valid responses; the survey was conducted between February 10 and 12.
Source: Prepared by The Japan Research Institute, Limited based on materials from the Shanghai Japanese Commerce and Industry Club

have expanded into China are not willing to return their production bases to Japan or transfer them to a third country was also apparent from a survey conducted by the Japan External Trade Organization (JETRO) around the same time targeting Japanese companies that had expanded into South China, such as Guangdong and Fujian (Fig. 2).

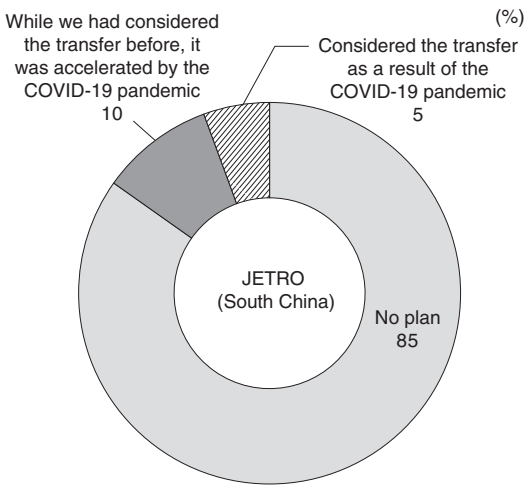
It is also apparent from a survey conducted by Nikkei Inc. that Japanese companies are not active in the shift away from "dependence on China." According to the online questionnaire survey conducted during the period between the end of March and the middle of April, 10.7% of companies answered that they would "distribute production bases concentrated in China to other countries," which is much lower than the 29.2% of those that selected "Secure multiple procurement routes" (Fig. 3).

Although diversification of suppliers is one of the measures for risk management of supply chain disruption, few Japanese companies seem to consider Japan as a candidate for diversification or returning their production bases there. According to a survey (with 116 effective responses) conducted by Nikkei Inc. from mid-July to late July, when the rise in COVID-19 outbreaks in Asia started to settle down, 28.4% of companies surveyed said they were "taking concrete actions based on agreed-upon countermeasures" and 43.1% said they were "considering countermeasures." However, with regard to returning production bases to Japan, only 2.9% of companies surveyed stated they "have been considering it" and 7.8% stated they "may consider it."[6]

(2) America: Forceful measures to encourage the return of production bases to the United States turned out to be unsuccessful

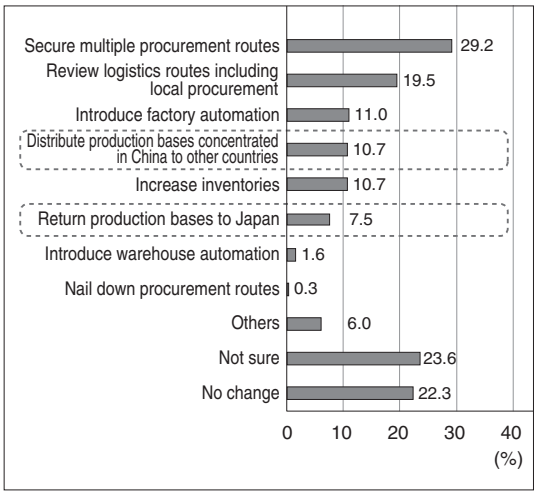
The United States has a clearer policy than Japan in terms of the government's efforts to shift away from "dependence on China." The Trump administration has put pressure on U.S. businesses

Fig. 2 Possibility of Returning Local Operations to Japan and Transferring Them to a Third Country



Notes: 457 valid responses; the survey was conducted between February 24 and 28.
Source: Prepared by The Japan Research Institute, Limited based on materials from the Japan External Trade Organization (JETRO)

Fig. 3 How Will the COVID-19 Crisis Change the Development of Supply Chains and Workstyles in The Manufacturing Industry?



Notes: 318 valid responses; multiple answers allowed.
Source: Prepared by The Japan Research Institute, Limited based on "Restructuring of supply chains as seen from our own research, with a shift from concentration in China to diversification including domestic bases," Nikkei XTECH (May 14 edition)

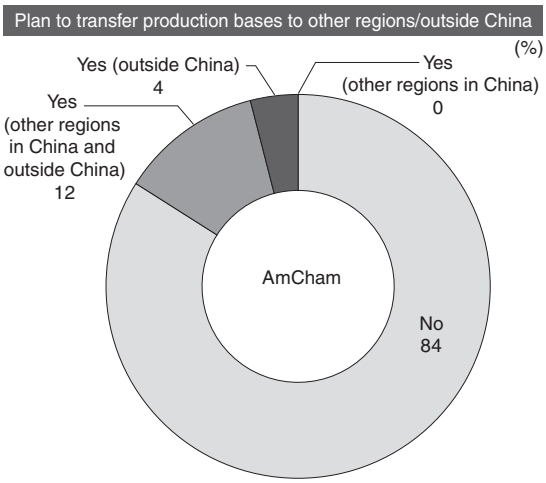
in China by imposing tariffs on imports from China, and has promoted the return of the manufacturing industry to the United States. This policy has been further reinforced in response to the outbreak of the COVID-19 pandemic and in the run-up to the U.S. presidential election in November.

The first step was to increase domestic pharmaceutical production capacity. In May, the Biomedical Advanced Research and Development Authority (BARDA), a U.S. Department of Health and Human Services (HHS) that is in charge of emergency medical response measures, awarded a 350-million-dollar contract to Phlow Corporation based in Virginia for the production of generic drugs for stockpiling in order to compensate for scarce drugs[7]. The United States is said to depend on imports for about 80% of its active pharmaceutical ingredients from countries such as India and China. The U.S. government plans to allocate more money to pharmaceutical manufacturing to improve its ability to defend itself against infectious diseases.

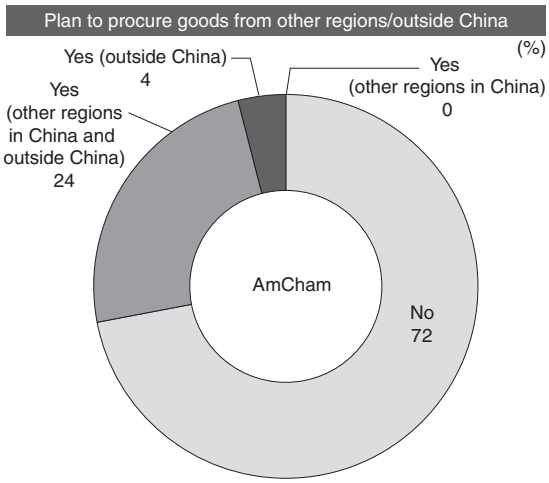
President Trump's push for the return of production bases to the United States is likely to go beyond medical products to encompass the entire manufacturing industry. In May, President Trump indicated the possibility of levying new taxes on American companies with overseas production bases in an effort to promote the return of the manufacturing industry to the United States[8]. In August, however, President Trump said he would tax American companies that move jobs out of the country, but give tax credits to companies that move jobs from China to the United States[9]. The inclusion of tax exemptions as a "carrot," which the Trump administration did not recognize as being necessary as of May, and the designation of China by name suggest that President Trump is trying to increase the driving force for his policy and support for his administration.

But it seems unlikely that American companies will be sensitive to such policies. According to a survey conducted by PricewaterhouseCoopers (PwC) in early March jointly with the American Chamber of Commerce (AmCham) in China, which consists of American companies that have expanded into China, 84% of respondents selected "No" when asked about plans to move production bases and supply chains in China to other regions or outside China in response to the spread of the novel coronavirus infection (Fig. 4). In addition, 72% of respondents selected "No" when asked

Fig. 4 Impact on Production Bases and Supply Chains in China



Notes: 25 valid responses; the survey was conducted between March 6 and 13.
Source: Prepared by The Japan Research Institute, Limited based on PwC, AmCham China and AMCHAM SHANGHAI [2020]



Notes: 25 valid responses; the survey was conducted between March 6 and 13.
Source: Prepared by The Japan Research Institute, Limited based on PwC, AmCham China and AMCHAM SHANGHAI [2020]

about plans to procure goods from production bases and supply chains in other regions in China or outside China altogether (Fig. 4).

The survey is unreliable however, with only 25 valid responses despite more than 2,000 corporate members, because there is a risk that the results could be used by either the U.S. or Chinese government. However, according to a survey of supply chain managers at 260 global companies conducted by U.S. research firm Gartner in February and March, 67% of companies selected "No" when asked about plans to move their production bases outside China and plans to switch to procurement bases outside China over the next three years (Hippold [2020]). Given the above, the results of the aforementioned survey are not necessary off-point.

China's position in the supply chain will not be significantly undermined even in the United States. Thomas Donohue, President of the U.S. Chamber of Commerce, warned in May that excessive moves to "exclude China" could seriously affect the U.S. economy even amid the worsening U.S. sentiment toward China[10]. There is a huge gap between the Trump administration, which is trying to bring manufacturing back to the country, and companies that emphasize China's role in the supply chain.

Many experts are skeptical about the Trump administration's policy of encouraging manufacturers to return to the domestic market with the aim of creating jobs. Corporate tax reform in 2017 introduced a so-called repatriation tax break to encourage the return of profits accumulated overseas by U.S. companies back to the country, which was expected to boost capital expenditures, but the majority of such profits were used to purchase treasury stock and increase dividends[11].

Under the United States-Mexico-Canada Agreement (USMCA), which replaced the North American Free Trade Agreement (NAFTA) and took effect in July, the Trump administration tried to encourage the return of production bases to the country by requiring more than 40% of parts per passenger car to be made in factories that pay more than 16 dollars an hour to their employees in order to make tariffs zero. With manufacturers avoiding the return of their production bases to the United States by raising hourly wages in Mexico, President Trump's strong-arm measures to encourage the return of manufacturing to the United States have not been successful[12].

(3) Europe: Concern is more about the U.S.-China Conflict than the COVID-19 pandemic

The demand for supply chain review as a result of the COVID-19 outbreak has also heightened in Europe. As symbolized by the fact that France depends on imports from China for about 40% of its active pharmaceutical ingredients, there has been a growing debate in European countries over the need to review their dependence on China for pharmaceuticals and medical masks and establish a system to ensure stable domestic supplies[13].

As a result, Sanofi S.A., a major French pharmaceutical and biotechnology company, announced plans to build a new drug substance manufacturing plant in France[14], which marked the commencement of the return of production bases from abroad in the medical field. The movement to return production bases to the domestic market has spread to the manufacturing industry, and in France, Group PSA announced that it would increase production of electric vehicles (EVs)[15] in response to the French government's decision to support the automobile industry on the condition of returning production bases to France.

However, Germany, which succeeded in curbing the spread of COVID-19, is relatively unaffected by the pandemic. But Germany is highly dependent on China, and there has been little movement toward the return of production bases to the country, which indicates that there is a large gap in movement among European countries. With sporting goods maker Adidas returning its factories home from Asia in response to the "Industry 4.0," which uses digital information to upgrade manufacturing processes, but shutting down these same factories within three years and returning them back to Asia[16], Germany has learned from

experience that it is not easy to return manufacturing bases from abroad. Looking at Europe as a whole, the movement of each government toward the shift away from "dependency on China" has been considerably weaker than that of the United States.

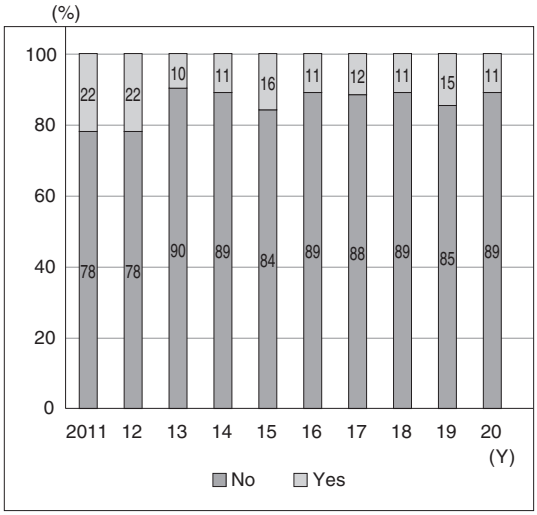
European firms' commitment to China was unshaken by the spread of the COVID-19 pandemic. In a survey conducted by the European Union Chamber of Commerce in China from January to February, when respondents were asked whether they plan to shift investment from China to other countries, 89% answered "No," up from 85% in the previous year (Fig. 5). The European Union Chamber of Commerce in China conducted an additional survey to determine the impact of the further spread of COVID-19 on the business plans of European firms. As a result, it was found that only 12% of respondents were "expanding assembly and procurement bases in third countries," and only 4% were planning to "transfer production bases to third countries" (Fig. 6), showing little change in China's position.

Jörg Wuttke, President of the European Union Chamber of Commerce in China, said that China stands out in terms of industrial agglomeration, human resources, technology, and infrastructure, and that no other country can replace its supply chain[17]. He also indicated that, for European companies, the impact of the U.S.-China rivalry in the high-tech sector, symbolized by Huawei, is more serious than the spread of COVID-19[18].

2. Why is China at the heart of the supply chain?

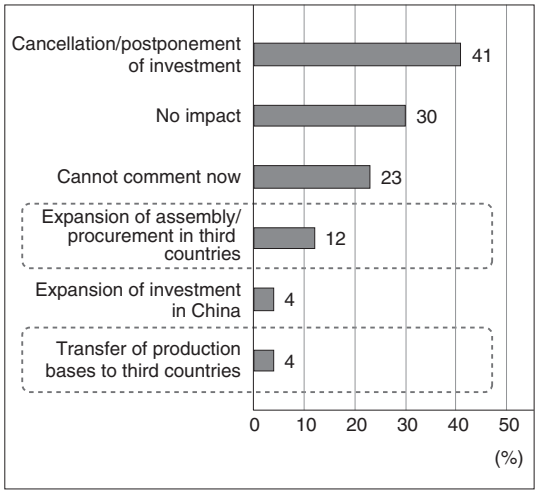
In major developed countries and regions, there is a considerable gap in the degree of movement toward shifting away from "dependency on China" between the government and companies, excluding the case of medical and pharmaceutical products, with the situation reflecting the saying, "We have piped unto you, and ye have not

Fig. 5 Is There a Plan to Shift Investment from China to Other Countries?



Notes: 626 valid responses in 2020; the survey was conducted between January and February 2020.
Source: Prepared by The Japan Research Institute, Limited based on European Chamber and Roland Berger [2020]

Fig. 6 Impact of the Spread of COVID-19 on Business Strategies



Notes: 294 valid responses; the survey was conducted in March 2020; multiple answers allowed.
Source: Same as fig. 5

danced." Why can't companies leave China? Let's reconsider China's role in the global supply chain.

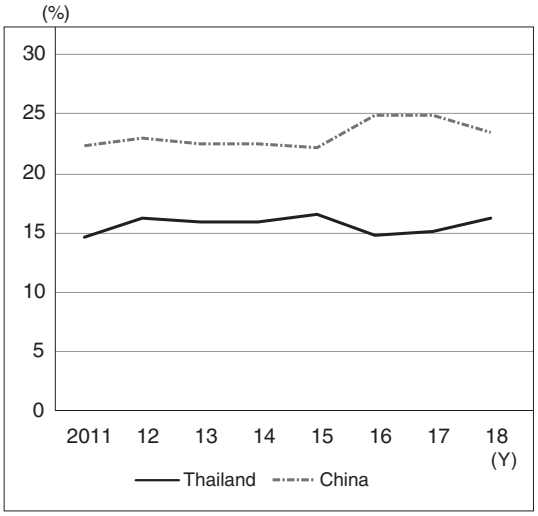
(1) Powerful lock-in effect

One of the reasons why companies cannot leave China is the "lock-in effect." The greater the proximity of people and businesses to large cities makes it easier to access ideas as well as goods and services markets. Proximity makes it easier for companies to recruit people with the skills they need, while reducing the risk of unemployment for those workers. It also increases the ripple effect of knowledge and benefits for both companies and engineers. This process in which "accumulation leads to new accumulation" is called the "lock-in effect" or "positive feedback" (Miura [2014]), which has served as a driver to keep China at the center of the global supply chain.

The "lock-in effect" is unexpectedly strong. For example, Thailand was severely affected by the 2011 floods. Disaster-stricken U.S. Western Digital (WD) shifted part of its production of hard disk drive (HDD) parts to Malaysia[19], which indicated that the accumulation in Thailand, which accounts for 40% of the world's HDD production[20], was expected to decline. However, Thailand's share of global HDD exports has remained largely unchanged (Fig. 7), and there is still a substantial concentration of HDD industries in Thailand.

When the risk of supply chain disruption in a country becomes apparent, there is a growing argument that the risks in that country or region should be reassessed and that the role of the region in the chain should be reduced if it is difficult to respond to such risk. But these discussions are often triggered by panic after a major disaster, so they tend to heat up easily and cool down quickly. Similar discussions took place at the time of the Great East Japan Earthquake in 2011, but the proportions that Iwate, Miyagi, and Fukushima prefectures make up in the supply chain in the pre- and post-earthquake periods changed little in the manufacturing industry as well as in the retail, wholesale and construction industries (Cabinet Office [2012]).

Fig. 7 Thailand's and China's Share of Global HDD Exports

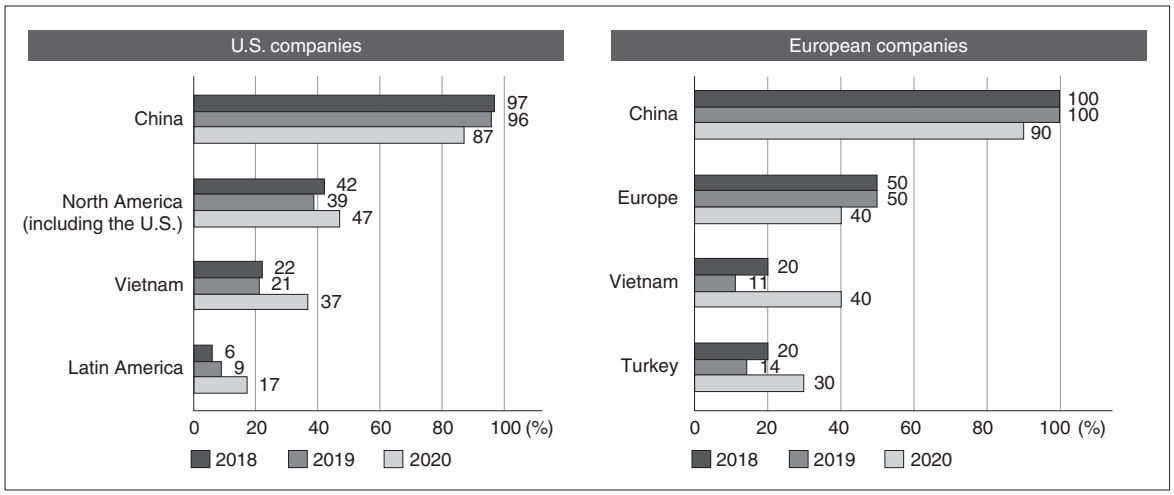


Notes: The hard drive is HS8471701 (including optical drives and magnetic drives). Figures for 2019 are excluded due to a lack of data for China.
Source: Prepared by The Japan Research Institute, Limited based on UN COMTRADE

The same is true for the spread of COVID-19. According to a survey of U.S. and European companies conducted in July by QIMA, a Hong Kong-based company that provides quality control and supply chain auditing programs to companies, China's position in the top three supplier countries and regions for U.S. and European companies has barely retreated even after the outbreak of COVID-19 (Fig. 8). In order to improve supply chain resilience, U.S. companies are expanding their procurement sources to Vietnam and Latin America, and European companies to Vietnam and Turkey, but they are not actively working on the shift away from their "dependency on China."

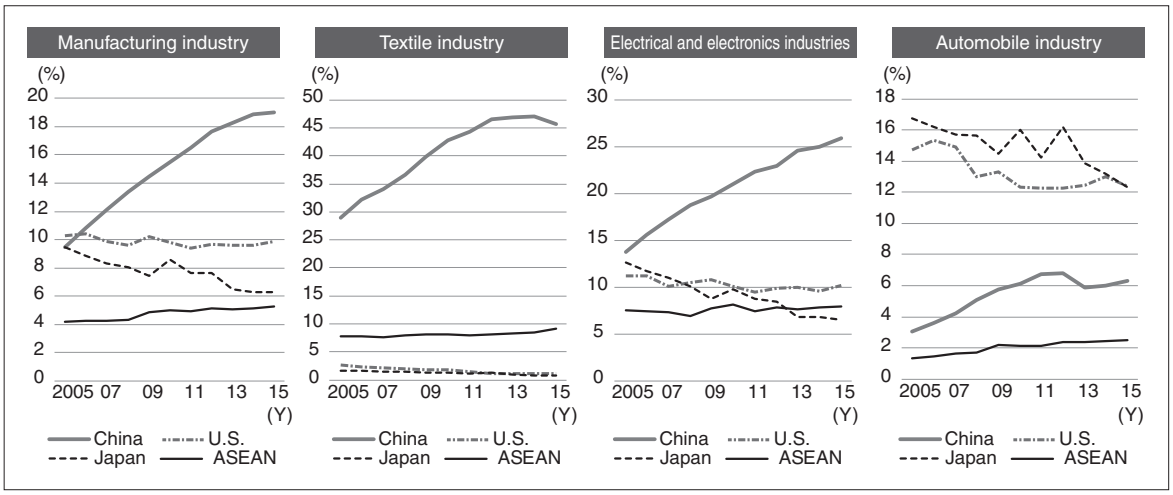
China's position in the global supply chain has not changed due to its growing concentration of industries. According to the Trade in Value Added (TiVA) statistics announced by the Organisation for Economic Co-operation and Development (OECD), China's share of value-added exports in the global manufacturing sector rose from a mere 9.4% in 2005 to 19.0% in 2015, with a marked rise in the textile, electrical and electronics industries (Fig. 9).

Fig. 8 Top Three Supplier Countries/Regions for the U.S. and European Countries



Notes: 200 valid responses; the 2020 survey was conducted in July 2020.
Source: Prepared by The Japan Research Institute, Limited based on QIMA [2020]

Fig. 9 Changes in Japan's, the United States' and China's Share of Global Value-added Exports



Source: Prepared by The Japan Research Institute, Limited based on OECD, TIVA, December 2018

Since imported parts and raw materials are not included in value-added exports, it can be seen that the Chinese manufacturing industry has gained power not only in labor-intensive industries but also in capital and technology-intensive industries through the attraction of foreign capital and government-led industrial policies. As a result, manufacturing industry's value-added exports of China, which were on par with those of the United States in 2005, almost doubled in 2015 (Left graph of Fig. 9).

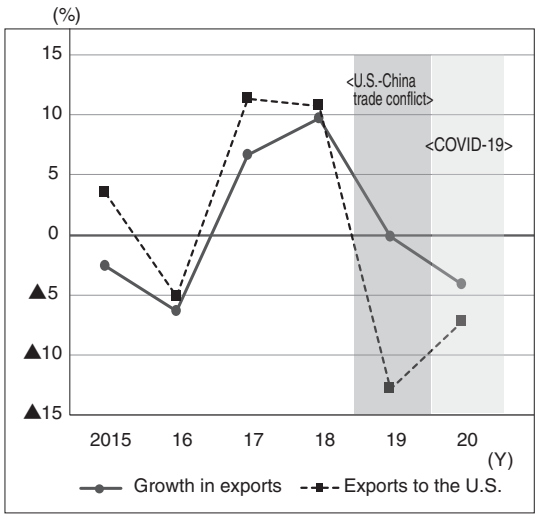
(2) Sham shift away from "dependence on China"

The strong lock-in effect is evident from the fact that China's exports have not declined despite the intensifying trade friction between the United

States and China. China's exports to the United States in 2019 and during the January-July 2020 period fell 12.9% year-on-year and 7.2% year-on-year, respectively, indicating a sluggish trend (Fig. 10). Although sluggish exports to the United States should result in stagnation of exports as a whole, China's exports in 2019 and during the January-July 2020 period decreased by only 0.1% year-on-year and 4.1% year-on-year, respectively, indicating that the impact of trade friction has been minimized.

The decline in exports to the United States, China's largest export partner, is not reflected in exports as a whole because China's exports to Europe, Africa and Asia have been strong. In particular, China's exports to ASEAN countries during the January-July 2020 period were brisk, up 20.3% from the same period of the previous year. This is not only the result of Chinese companies making entries into ASEAN markets through foreign direct investment, but also the result of shifting the final assembly process to ASEAN countries such as Vietnam in order to avoid tariffs imposed by the United States. In other words, it is highly likely that some of China's exports to the United States go through ASEAN countries.

Fig. 10 Growth in China's Exports and Exports to the United States



Notes: Figures for 2020 are based on exports during the January-July period; the original source is "Trade Statistics" by the General Administration of Customs of China.
Source: Prepared by The Japan Research Institute, Limited based on CEIC

According to U.S. import statistics, while imports from China decreased in 2019, those from emerging Asian countries other than China increased, replacing about 40% of imports from China by simple calculation. Fig. 11 plots the year-on-year growth rate of U.S. imports from major Asian countries and regions on the horizontal axis and the following year's growth rate on the vertical axis. Those above the dotted line mean that imports from the relevant countries/regions increased. The size of the bubble represents the size of the increase or decrease in imports (dark color indicates a decrease and light color indicates an increase). In 2019, U.S. imports from China decreased by 16.2%, or 87.6 billion dollars, compared to the previous year, while those from Vietnam increased by 35.5%, or 17.5 billion dollars, and those from Taiwan increased by 18.6%, or 8.5 billion dollars (Left graph of Fig. 11).

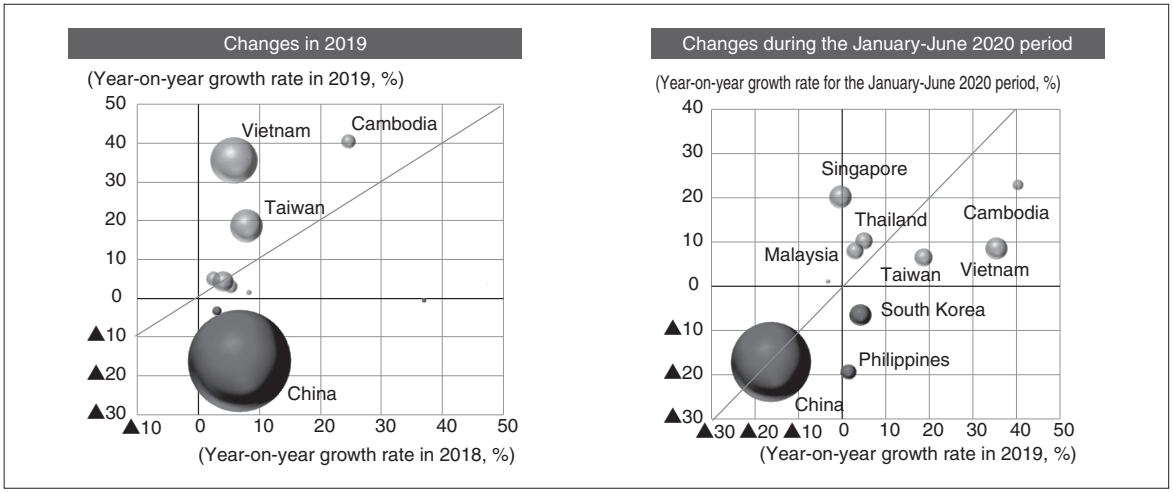
Of course, not all of them can be regarded as replacements for exports from China, but it is safe to say that imports from Vietnam (See Fig. 11 above), which is the most likely candidate in transferring production bases from China, and from Taiwan, which has been returning its production bases from China, are increasing remarkably (Miura [2019a]). This indicates that the United States has begun to shift its imports from China to those from Vietnam and Taiwan.

A.T. Kearney, a U.S. consulting firm, cites the decline in imports from China and the rise in imports from low-cost producers other than China as evidence that the U.S. supply chain has begun to shift away from its "dependency on China" (Kearney [2020]). But this is clearly premature. Both Vietnam and Taiwan, which have increased their exports to the United States, are highly dependent on China, and their exports include many raw materials and parts imported from China. In other words, only the final loading port of containers has changed from China to Vietnam or Taiwan, but if we trace the origin of the added value of the products in the containers, it is thought that the origin of the majority of items is still China.

This is supported by TiVA. The value added by China, which is included in Vietnam's exports to the United States, increased significantly in the manufacturing sector as a whole from 6.7% in 2005 to 17.1% in 2015. This shows that Vietnam's export sector has achieved growth by importing raw materials and parts from China. In 2020, China accounted for 19.4% of raw materials and parts in the textile industry and 20.9% of those in the electrical and electronics industries. Without China, Vietnam's exports would not be possible (Fig. 12).

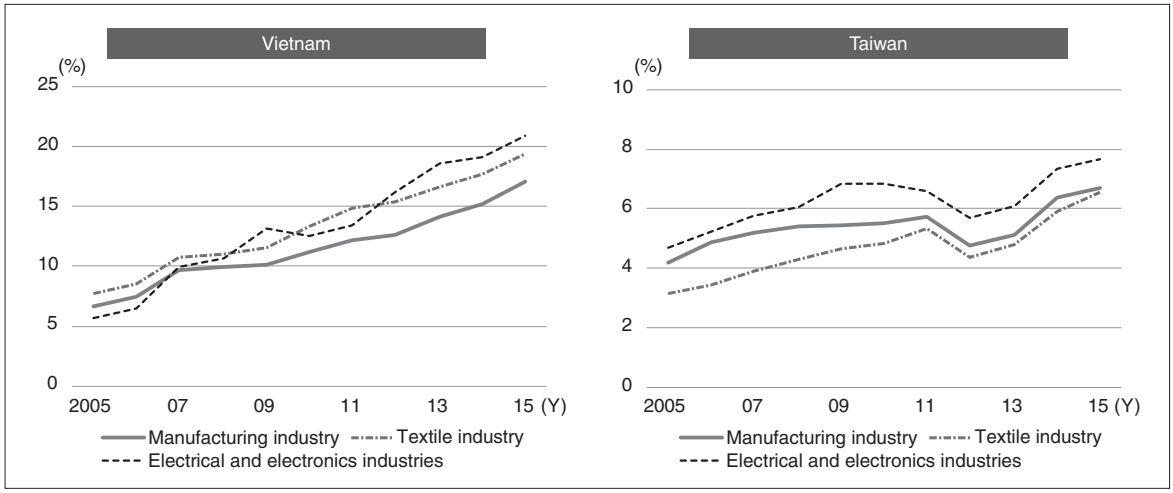
Taiwan, which has a higher labor cost than China, has used China as the final export base for its exports to the United States. Although its ratio of value added by China in exports is not as high as that of Vietnam, China's ratio in the electrical and electronics industries should have risen following Taiwan's policy of returning production bases to home, which started in 2019. The shift of U.S.

Fig. 11 Changes in U.S. Imports from Major Asian Countries and Regions



Notes: The size of the bubble represents the size of the year-on-year increase or decrease in imports; the dark color indicates a decrease in imports.
Source: Prepared by The Japan Research Institute, Limited based on CEIC (the original source is import statistics by the United States Census Bureau (USCB))

Fig. 12 Ratio of Value Added by China in Exports to the United States



Source: Prepared by The Japan Research Institute, Limited based on OECD, TIVA, December 2018

imports from China to other low-cost producing countries does not mean a major change in the shape of the supply chain centered around China. Instead, we should pay attention to the fact it is a sham shift away from "dependency on China" that is largely due to changing the location of the final loading ports for container ships bound for the United States.

On the other hand, the right graph of Fig. 11 shows that, compared to the left graph, the outbreak of COVID-19 has not been the driving force for distributing production bases concentrated in China to other countries and regions. U.S. imports from China during the January-June 2020 period fell 17.1% year-on-year, which was a similar level of decline as the 16.2% year-on-year decline in 2019. On the contrary, U.S. imports from Vietnam increased 8.5% year-on-year during the January-June 2020 period, compared with a 35.5% year-on-year increase in 2019, and those from Taiwan increased 6.4% year-on-year during the January-June 2020 period, compared with a 18.6% year-on-year increase in 2019, indicating that the increase in imports has slowed down significantly. This means that the movement to transfer production bases in China to Vietnam and Taiwan has slowed, or that the COVID-19 outbreak has not had as much of an impact on the supply chain with the United States as the final consumption destination as tariff hikes have.

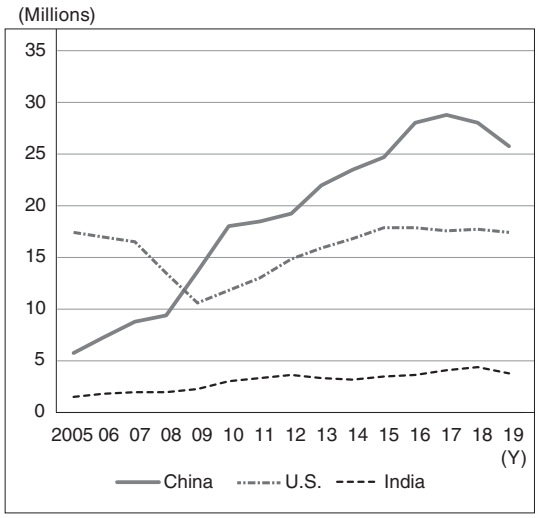
(3) China's market presence

The importance of China in the global supply chain is rapidly increasing not only from the supply side but also from the demand side. One of the roles of the supply chain is to efficiently approach promising markets; and the larger the market, the denser the supply chain that forms in or around the consuming area. There is no doubt that China, as "the world's factory," is a major producer, but at the same time it is also a major consumer, so the shift away from "dependency on China" has not progressed.

For example, the number of new vehicles sold in China in 2019 totaled 25.77 million, which is 1.5 times larger than the U.S. market of 17.48 million (Fig. 13). Although the market has been sluggish since peaking in 2017, China is the world's most important market for automakers given its low penetration rate and high growth potential compared to developed countries. In 2019, VW, which has the largest share in the Chinese automobile market, sold 4.23 million vehicles[21], accounting for 38.6% of the company's worldwide sales (10.97 million units), far exceeding its home country total of 1.36 million vehicles or 12.4% of total sales. The shift away from "dependency on China" is an impossible choice for the company.

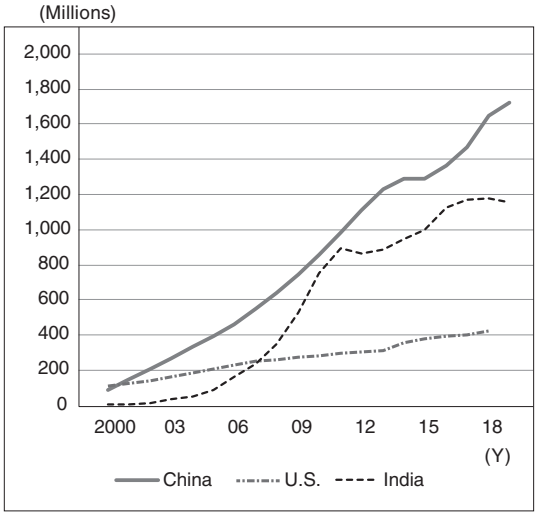
The Chinese market is also important in terms of the number of smartphone subscribers (Fig. 14). Although the Indian market is also important in terms of growth potential, the shift away from "dependency on China" cannot easily progress for smartphones due to geographical constraints on the supply side, where the supply chain has been expanded globally and where the industrial clusters supporting it are concentrated in China, Japan, Taiwan, South Korea, and ASEAN

Fig. 13 Number of New Vehicle Sales in the United States and China



Notes: The original source is the International Organization of Motor Vehicle Manufacturers (OICA); including commercial vehicles.
Source: Prepared by The Japan Research Institute, Limited based on CEIC

Fig. 14 Number of Smartphone Subscribers in the United States and China



Notes: The original source is the International Telecommunication Union (ITU): smartphones include feature phones.
Source: Prepared by The Japan Research Institute, Limited based on CEIC

countries. China's share of global automobile production is only 30% because the auto industry has regional supply chains in Asia, Europe, and North America, but China's share of global smartphone production exceeds 50%.

For Japanese companies that faced a rapid appreciation of the yen due to the Plaza Accord of 1985, one of the objectives of their overseas expansion was to secure "cheap labor." In recent years, however, Japanese companies have placed the greatest emphasis on the size of the markets and future growth potential of the countries in which they expand their businesses. According to a yearly survey conducted by the Japan Bank for International Cooperation (JBIC), the "Survey Report on Overseas Business Operations by Japanese Manufacturing Companies," China overwhelmed other countries and regions with regard to the aforementioned points and had been ranked first as a "promising market from a medium- to long-term perspective" until 2011. Although China has increasingly ceded its No. 1 spot to India due to a significant decline in its reputation for "cheap labor," China still dominates in terms of market size and future growth potential (Fig. 15). VW is not the only company that finds it impossible to move away from China.

3. Increased risk of disruption due to supply chain expansion

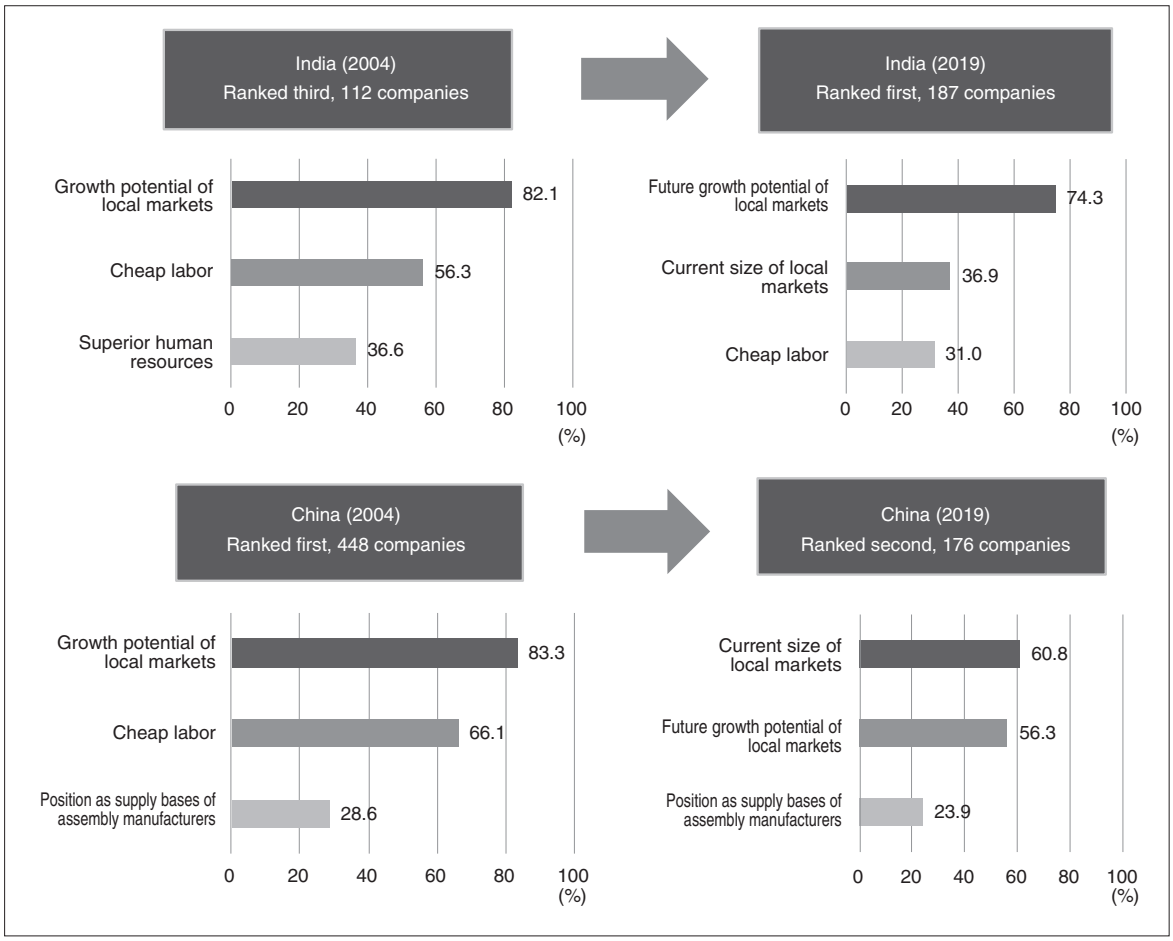
The outbreak of COVID-19 exposed vulnerability in the supply chain, and how to prepare against risks that threaten the chain has become an urgent issue that must be addressed immediately. However, there are a wide range of risks, and the effects of such risks also vary. The following sections summarize the overall picture regarding risks, and point out that both the nature of the risks and the supply chain have changed significantly, amplifying the impact of the spread of the virus. What will influence the supply chain in the era of COVID-19 as a result of the spread of the virus will then be considered.

(1) Changing nature of risks: frequency and duration

Companies connected to a global supply chain that spans multiple countries, such as automobile and smartphone manufacturers, are forced to think about what kind of supply chain would be desirable to continue their business, because a dysfunctional supply chain makes it difficult to predict business performance. Although the number of new COVID-19 cases and deaths in Asia is relatively small, the arrival of a "second wave" in which infections spread again during the winter, and a possible delay in the development of vaccines and drugs are pressing issues that require immediate action.

In reviewing the supply chain, it is necessary to understand the overall risks that threaten the chain. These include not only infectious disease risks such as COVID-19, SARS, and Middle East respiratory syndrome (MERS), but also natural di-

Fig. 15 Changes in Top 3 Reasons Why Japanese Companies Regard China and India as "Promising Markets from a Medium- to Long-term Perspective"



Notes: Note: The ranking is based on orders nominated as a "promising country for business expansion from a medium- to long-term perspective" in the respective year; number of companies indicates the number of companies that specified "China" or "India."
Source: Prepared by The Japan Research Institute, Limited based on Japan Bank for International Cooperation (JBIC) [2004, 2019]

sasters such as earthquakes, typhoons, and floods; political risks such as wars, regional conflicts, and terrorism; and economic and social risks such as supplier failures, market changes, labor disputes, and institutional changes. The risks faced by companies vary considerably depending on where they are located. While Japan has lower political risks, natural disaster risk runs high.

Nevertheless, Japanese companies have faced a number of risks that threaten their supply chains, including anti-Japanese demonstrations following a visit to the Yasukuni Shrine by the then Prime Minister Koizumi (March 2005), restrictions on rare earth exports following the collision of a Chinese fishing boat off the Senkaku Islands (September 2010), and anti-Japanese demonstrations triggered by nationalization of the Senkaku Islands, which led to the destruction of factories of Japanese companies operating in China (September 2012). As these risks strongly reflect occasional Japan-China relations, it is not uncommon for one risk to induce another.

What are the risks involved in the supply chain? The World Economic Forum (WEF) surveyed 400 managers about what causes disruption in their supply chains. As the survey was conducted in 2011, it did not include cyberattacks, which have become an important risk factor in recent years.

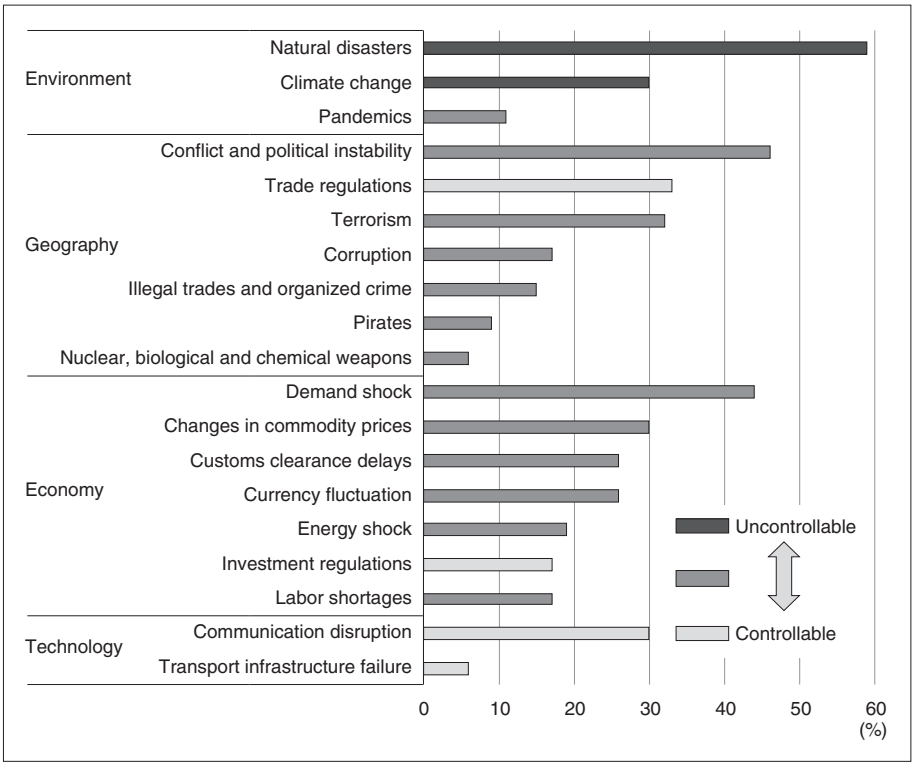
However, the survey did cover the risks of supply chain disruption, and clarified the degree to which companies place importance on each risk factor as well as the degree to which they consider them manageable (Fig. 16).

At the time of the survey, pandemics, meaning the explosive spread of infectious diseases, were not emphasized much. Infectious diseases such as SARS (2002-2003, 774 estimated deaths), MERS (2012-, 850 estimated deaths), and novel influenza (2009-2010, 151,700 to 575,400 estimated deaths), increased in the 2000s[22]. Even though the World Health Organization (WHO) declared a pandemic for a novel influenza, it did not spread around the world in a short period of time, so the current sense of crisis with COVID-19 was not prevalent. The outbreak of COVID-19 can be regarded as the worst pandemic since Spanish Influenza (1918-1919, 50 million estimated deaths) in terms of the worldwide spread of the virus.

With the global outbreak of COVID-19, companies have become increasingly wary of pandemics. According to a survey conducted by U.S. research firm Gartner in March, among "significant" risks associated with supply chains, the largest number (43%) of the surveyed enterprises cited "infectious diseases," followed by "cybersecurity" (28%), "trade wars" (25%), "war, terrorism and social unrest" (14%), "regulatory changes" (12%) and "natural disasters" (12%) (Fig. 17).

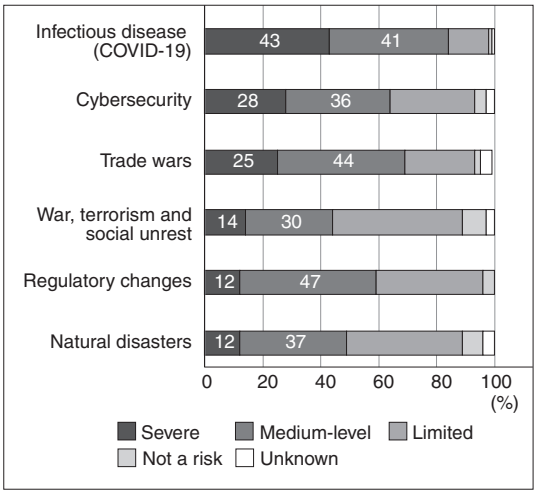
COVID-19 has had a far greater economic impact than conventional infectious diseases because of the following unique characteristics: 1) it has a low mortality rate, but is highly contagious and rapidly spread around the world; 2) it requires strict measures such as restrictions on outings and lockdowns in order to prevent the spread of infection; and 3) it can significantly change people's lifestyles and consumption behavior due to social distancing measures required for preventing its spread. It is natural that people have come to take the risk of infectious diseases seriously.

Fig. 16 Risks That Cause Supply Chain Disruptions



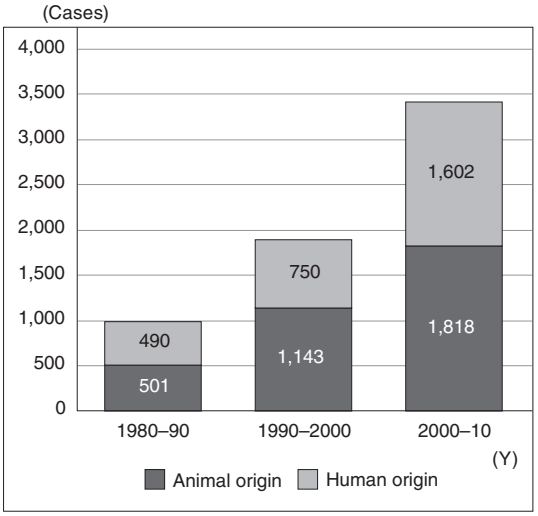
Source: Prepared based on the World Economic Forum [2020]

Fig. 17 Evaluation of Risks Involving Supply Chains



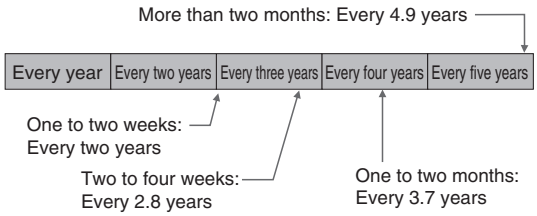
Notes: Only fundamental risks for which more than 10% of respondents selected "significant" are listed ("decline in supplier capacity" was considered to be a derivative risk). Due to rounding, some portions do not add up to 100. 136 valid responses.
Source: Prepared by The Japan Research Institute, Limited based on materials from Gartner

Fig. 18 Number of Infectious Disease Cases



Source: Prepared by The Japan Research Institute, Limited based on Smith, Goldberg, Rosenthal, Carlson, J. Chen, C. Chen and Ramachandran [2014]

Fig. 19 Duration and Frequency of Shutdown



Source: Prepared by The Japan Research Institute, Limited based on Lund, Manyika, Woetzel, Barriball, Krishnan, Alicke, Birshan, George, Smit, Swan and Hutzler [2020]

Risks can also be classified by a combination of frequency of occurrence and magnitude of impact. COVID-19, which is less common but has a greater impact, can be classified as “a black swan,” while financial crises, which are more common and have a greater impact, can be classified as “a grey rhinoceros.” Of note, it appears that the frequency of occurrence of some risks is clearly changing. Just as the frequency of floods and typhoons has increased due to climate change, the frequency of infectious diseases has also increased due to the promotion of development and increased movement of people (Fig. 18). As the frequency increases, the impact also increases, so floods, typhoons, and infectious diseases inevitably become important risk management issues.

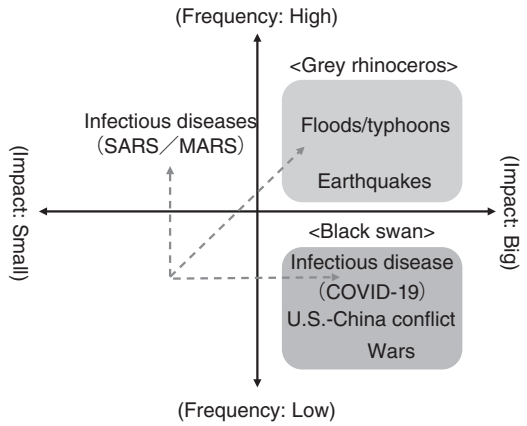
McKinsey analyzed the frequency and impact of recent risks that threatened the supply chain and found that the risk of disruptions in supply chain functions lasting about one to two weeks occur every 2 years, while those lasting about two to four weeks occur every 2.8 years, those lasting about one to two months occur every 3.7 years, and those lasting more than two months occur every 4.9 years (Fig. 19). Japanese companies have experienced not only the Great East Japan Earthquake and the severe floods in Thailand, but also various problems affecting their supply chains, such as export restrictions on rare earths due to worsening Japan-China relations, attacks on Japanese factories by rioters, and intentional delays in customs clearance procedures. If other risks, such as the hurricanes that occur every year in the Gulf

of Mexico and other foreign events such as forest fires and volcanic eruptions that affect air transport, are considered as well, the frequency of risks becomes higher than expected.

In addition, following the COVID-19 outbreak, it has become necessary to take into account the period of exposure to the risk or how long the effects will last. When looking at infectious diseases, it is necessary to distinguish infectious diseases with higher frequency but limited effects such as SARS and MERS, whose outbreaks can be controlled sooner or later as a result of implementing measures to prevent infection spread, from COVID-19, which is unlikely to have a high frequency but whose effects inevitably increase due to uncertainty in the amount of time required before infections are contained (Fig. 20). The situation continues to be unpredictable, as the number of new COVID-19 cases has been increasing in India and Latin America, and concerns over a second wave of COVID-19 are rising in the Northern Hemisphere ahead of the winter season. The effects of COVID-19 will continue unless vaccines or drugs are developed or the risk of infection is downgraded[23].

The Great East Japan Earthquake in March 2011 and the severe floods in Thailand that began in July of the same year are the two largest events that seriously damaged Japan's supply chain. In each case, there was a clear "end" to the disaster itself, and when the phase of lifesaving activities came to an end, manpower and physical resources focused on recovery. Currently (as of September 2020), the end of the COVID-19 pandemic is not predictable. In this regard, the COVID-19 outbreak can be categorized as the most serious risk that has affected the supply chain in recent years.

Fig. 20 Risk Classification by Impact and Frequency



Source: Prepared by The Japan Research Institute, Limited with some additions to DeAngelis [2018]

(2) Ripple effects increased due to supply chain expansion

Another factor that has made the impact of the COVID-19 pandemic more severe than ever is the dramatic expansion of the supply chain over the past 30 years. The fact that the supply chain itself has changed as much or even more than the nature of risks, such as regarding frequency and duration, should not be overlooked.

According to the Organisation for Economic Co-operation and Development (OECD), 70% of world trade is held by goods and services in the run-up to completion (OECD [2018]). The effects of supply chain disruption vary widely from industry to industry, ranging from subcontracting to the subcontracting of secondary and tertiary suppliers. Therefore, it is necessary to understand that companies belonging to the industry based on the global supply chain are exposed to risks regardless of whether they are aware of them or not.

As symbolized by automobiles and smartphones, the manufacturing industry has a longer supply chain than the agriculture, forestry, and fisheries industries and the service industry, often spanning multiple countries and regions. As a result, when a risk becomes apparent, the impact increases. Although companies have increased production efficiency by promoting production in suitable locations, this has made it impossible for companies linked to the supply chain to be immune from the risks in the countries and regions where their plants are located, even without being involved in direct transactions.

At the time of the Great East Japan Earthquake,

Renesas Electronics Corporation's Naka plant in Ibaraki Prefecture, which accounted for about 40% of the world market production of microcontrol units (MCU) for high-performance automobiles, also known as "microcomputers," was affected by the disaster. As a result, the operating rate of all automobile manufacturers fell to 40%, and it took two to five months for them to return to their pre-earthquake conditions (Saeki [2013]). The situation was reported as a domestic problem in Japan, but the impact spread around the world as production dropped in China, Thailand, Indonesia, Malaysia, the Philippines, and the United States where Japanese automakers have their production bases (Fujita, Hamaguchi, Sagara and Bianca [2013]).

The flooding in Thailand was similar in nature. The flooding had a severe impact on the Thai economy, but as automobile production bases were concentrated in the country, the impact spread around the world through the supply chain. Toyota Motor had to suspend operations at its production bases in Indonesia, Malaysia, the Philippines, Vietnam and other neighboring countries and was also forced to adjust production in Pakistan, North America and South Africa (Sukegawa [2013]). As Thailand is a hub for HDDs, the impact of the flooding also became evident in the electrical and electronics industries.

The floods depressed the supply of HDDs and reduced demand for central processing units (CPU) in personal computers, forcing Intel to revise downward its operating forecast for the October-December period[(24)]. The company has no production base in Thailand[(25)] and does not do business with HDD manufacturers, but it is indirectly linked to HDD manufacturers through the PC industry supply chain. If the primary effects are the closure of dealers and factories located in areas where the infection is spreading and a decrease in demand due to restrictions on outings, and the secondary effect is a plant shutdown in areas where the infection is not spreading due to supply chain disruption, this can be considered as a tertiary effect of supply chain disruption, which will more likely become apparent in industries involving a wide range of fields and a greater division of labor.

Companies connected to global supply chains are susceptible not only to natural disasters such as floods and earthquakes that occur frequently in various countries, but also to infectious diseases for which both their origin and effects on us are unknown, and even to the U.S.-China conflict, whose ending is also unpredictable. The degree of impact depends on the type of supply chain on which the industry is based, but the secondary and tertiary effects of supply chain disruptions can easily spill over to areas and businesses that at first glance seem unrelated, just as the supply of disinfectant solutions ran out due to disruption in imports of containers despite an attempt to increase production at domestic plants[(26)].

(3) Supply chains in the era of COVID-19

It is difficult to determine the impact of COVID-19 on companies in the global supply chain at this stage given the concerns over a second wave of COVID-19. However, because COVID-19 is characteristically different from the Great East Japan Earthquake and the flooding in Thailand in that it is hard to predict when the outbreak will settle down, it will have a different impact on the supply chain based on past risks, and this will be a factor in determining the shape of the supply chain in the COVID-19 era.

The first risk is that consumption will disappear rather than simply be postponed because the world will plunge into a simultaneous recession and uncertainty about the future will continue. Demand shocks are not only short-term but can also be long-term. According to the forecast for the world economy announced by the International Monetary Fund (IMF) in June, the world growth rate in 2020 will be minus 4.9%. The primary scenario is to recover to 5.4% in 2021, but if a second wave of COVID-19 occurs, growth will be zero (IMF [2020]).

With regard to the impact of COVID-19 on supply chains, attention tends to be focused on the

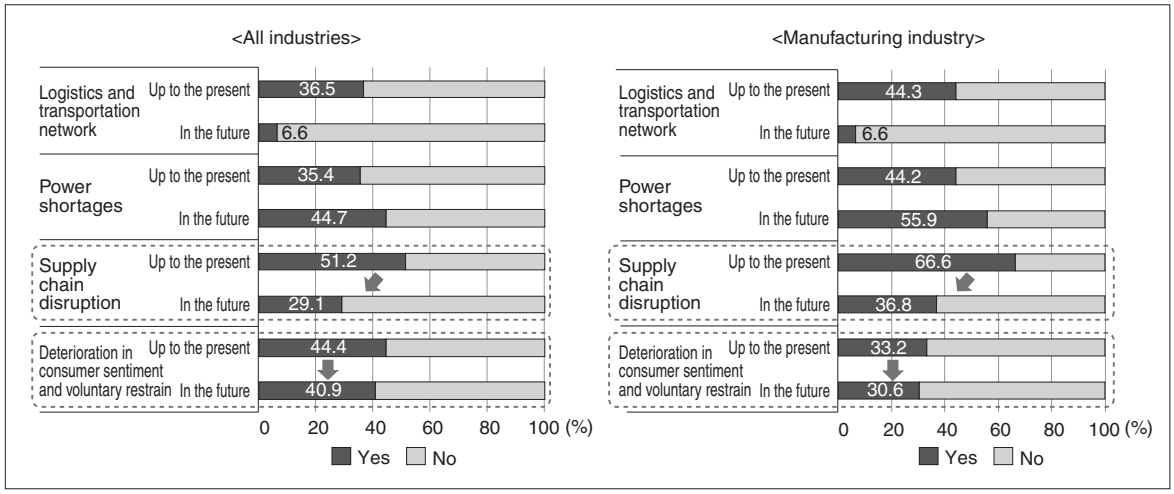
supply side of the problem, consisting of "difficulty in procuring parts" due to disruption, but the demand side of the problem, consisting of "loss of demand," is far more serious. Since the Great East Japan Earthquake and flooding in Thailand were localized disasters and the "loss of demand" did not occur on a global scale, we were able to proceed with restoration while keeping an eye on the path to normalization. The COVID-19 pandemic is similar to the crisis caused by the collapse of Lehman Brothers in that such a path is not visible.

The experience with the Great East Japan Earthquake shows that this problem will become more serious in the future. A survey conducted by the Development Bank of Japan (DBJ) in June, three months after the earthquake, asked companies about the impact of the earthquake on their business activities. With regard to the "supply chain disruption," while a high percentage of respondents (51.2%) selected "Yes" for supply chain disruption "up to the present (period up to the survey)," the percentage of those who selected "Yes" for supply chain disruption "in the future" fell to 29.1%. On the other hand, with regard to the "deterioration in consumer sentiment and voluntary restraint," while the percentage of those who selected "Yes" for "up to the present" was 44.4%, the percentage of those who selected "Yes" for "in the future" was 40.9%, showing little change (Fig. 21). The "supply chain disruption " will gradually disappear through the efforts of companies and the indirect support of business partners or the government that underpin such efforts, but in contrast, the measures that companies can take against the "deterioration in consumer sentiment and voluntary restraint" are limited.

Second, because the strength of infection prevention measures varies from country to country, the "source of infection" does not equal "countries where risks are likely to become apparent." When a supply chain risk emerges in a country, the question is usually whether the area should be removed from the chain. The rapid spread of COVID-19 in China during the initial outbreak, the government's decision to extend the Spring Festival holidays and to shut down factories, and our high dependence on China for masks and other medical-related necessities, have led to a growing consensus in Japan as well as Western countries that China's role in the supply chain should or will be reduced[27].

This tone is still dominant in Japan[28]. In March, however, the number of new COVID-19 cases in China declined rapidly, and China achieved remarkable results in preventing the further spread of the virus. China has managed to

Fig. 21 Impact of the Great East Japan Earthquake on Business Activities



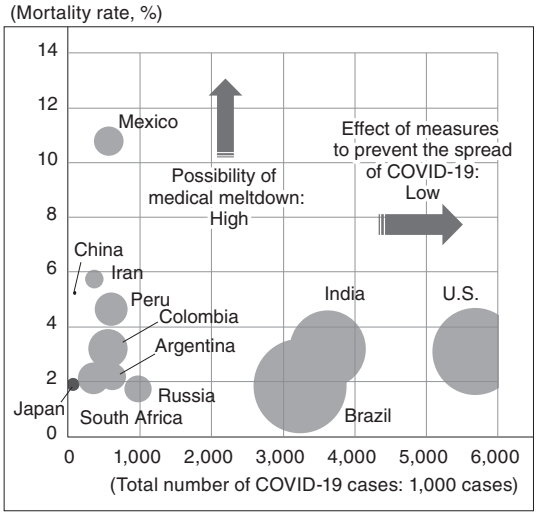
Notes: Impact items are excerpted; the survey was closed on July 1, 2011.
Source: Prepared by The Japan Research Institute, Limited based on the Development Bank of Japan (DBJ) [2011]

contain COVID-19 despite outbreaks in some areas after the first COVID-19 wave settled down. Based on these results, it can be concluded that China's production function is unlikely to become impaired by a second COVID-19 wave.

In fact, a series of events subsequently occurred that had not been anticipated. In April, Chinese automakers were forced to adjust production due to a delay in parts imports from Japan, Europe, and the United States, where the COVID-19 outbreak became serious[29]. In July, it was suspected that Ford's U.S. plants would be forced to suspend production due to a delay in the procurement of parts from Mexico[30].

According to Johns Hopkins University, as of the end of August, the 10 countries with the most severe COVID-19 outbreaks were Brazil, the United States, India, Mexico, Colombia, Argentina, Peru, South Africa, Iran, and Russia; China was no longer included in the list[31]. A comparison of 1) total number of COVID-19 cases, 2) mortality rate based on the total number of COVID-19 cases and the total number of deaths, and 3) number of new COVID-19 cases in August among these 10 countries as well as Japan and China, shows how well China has prevented the spread of COVID-19 (Fig. 22).

Fig. 22 Total Number of COVID-19 Cases, Number of Deaths and Number of New COVID-19 Cases in August



Notes: Aggregate data up to August 26. The size of the bubble represents the number of new infections in August.
Source: Prepared by The Japan Research Institute, Limited based on materials from the WHO

Third, recovery will be quicker than expected since the disruption of supply chains caused by the outbreak of COVID-19 did not entail physical damage to production facilities and transportation infrastructure as in the case of natural disasters. In China, with the exception of Hubei Province, the date for "Resumption of Work and Production," which signifies the resumption of business operations, was set for February 10. As a result of joint efforts between the public and private sectors to normalize business operations, the rate of reinstatement of SMEs rose from 28.2% at the end of February to 91.0% by mid-May (Miura [2020]). As early as April, automobile sales turned positive, rising 4.4% from a year earlier, thanks in part to the government's measures to stimulate demand. This demonstrated explicitly that the problem of supply chain disruption in China had been resolved.

The same was seen with smartphones. Taiwan's Hon Hai Precision Industry Co., Ltd., the world's largest electronics manufacturing service (EMS) provider and producer of Apple's iPhone, said 50% of its workers had returned to work in early March and that their operations would be normalized by the end of March[32]. Apple indicated in February that it would not likely be able to meet its January-March earnings forecast[33]. However, as the company was not forced to adjust production due to disruptions in its supply chain, Apple's sales for the January-March period increased 1.0% year-on-year and operating income increased 2.5% year-on-year, maintaining positive growth for both indicators[34].

The rapid spread of COVID-19 resulted in lockdowns all over the world, and it was thought that COVID-19 would have a serious impact on the supply chain. However, since in Asian countries the outbreak settled down sooner than in the United States and European countries, the effect of the economic downturn caused by the disruption in supply chains turned out to be much smaller than initially feared. Although there is no sign that the

debate over the modality of supply chains has subsided, there seems to be few cases where China and many other Asian countries have been forced to adjust their production due to supply chain disruptions, as many of these countries have been successful in both relaxing restrictions on movement and preventing the spread of the virus.

4. Centripetal and centrifugal forces of China

In line with the changes in factors that determine the shape of the supply chain in the era of COVID-19, such as loss of demand, China's position in the global supply chain will also change. There are two forces at work: the centripetal force that keeps China at the center of the supply chain and the centrifugal force that keeps China away from the center. Understanding this dynamic is essential to see how the movement toward the shift away from "dependency on China" will evolve.

(1) Positive both in supply and demand

According to the IMF's World Economic Outlook for June, China is expected to maintain a positive growth rate of 1.0% in 2020, while all developed countries will experience negative growth. In the January-March period, China's real GDP growth rate declined by 6.8% from the same period of the previous year, but in the April-June period, it had already increased by 3.2% over the same time frame. Some in China predict that 2020 will see growth that is 3-4%, higher than the IMF's forecast (Miura [2020]).

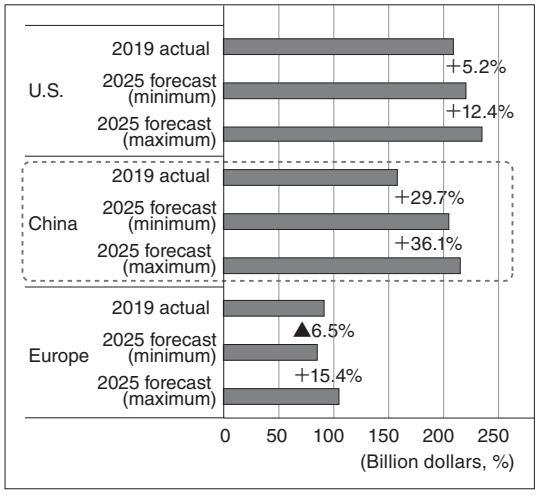
As China is not likely to implement any major stimulus measures, it is hard to say that China will lead the global economic recovery. However, China has become the only bright light in the global economy, which has been shrouded in uncertainty due to the loss of demand. The economic growth rate of Hubei Province, where the outbreak of COVID-19 started, declined 39.2% in the January-March quarter of 2020 from the same period of the previous year, but dropped only 0.6% in the April-June quarter over the same time frame, recovering to a point where positive growth can be expected in the latter half of the year[35].

Both investment and consumption are sluggish, so we cannot expect that China will return to its previous growth track. In addition, there are many problems that prevent us from being optimistic, such as the decline in investment efficiency, as the excessive debt problem is not likely to improve in the medium to long term. Nevertheless, it is a characteristic of China that the country has achieved rapid recovery unlike any other country in the world through well-coordinated measures to prevent the spread of COVID-19.

The China Automobile Manufacturers Association (CAAM) estimates that annual automobile sales in China for 2020 will fall 10% from the previous year to 23.19 million units[36]. Although 2020 is likely to be a very difficult year for the automobile industry, the decline in sales in China is expected to be small, as sales in the United States are expected to fall 23.9% year-on-year to 13.4 million units, and sales in Europe are expected to fall 25.7% year-on-year to 13.6 million units[37]. Although there will be many uncertain factors in the automobile market of each country and region in the future, depending on whether a second wave of COVID-19 occurs and whether COVID-19 vaccine development will be successful, McKinsey predicted that the market stagnation in Europe and America will be prolonged, but that market growth of about 30% can be expected in China (Fig. 23). Given the above, the negative effect of the loss of demand will affect China the least.

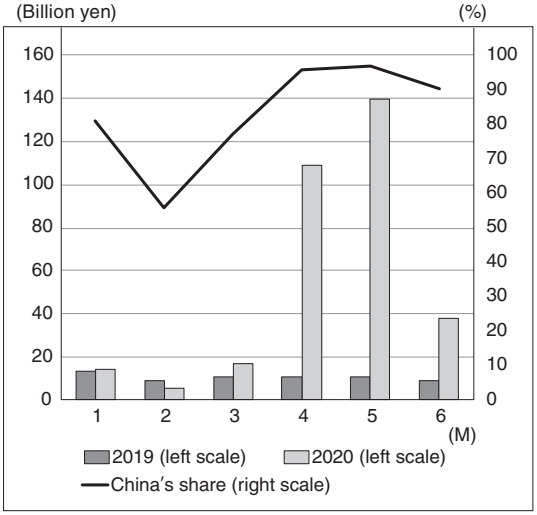
If the resilience of the manufacturing sector is added to the equation, China's centripetal force is expected to be higher than before the COVID-19 outbreak. China contributed toward solving supply shortages not only in the automobile industry and the electrical and electronics industries but also in the mask industry. In April and May 2020, Japan imported 10 times and 13 times more masks,

Fig. 23 Size of the Automobile Market in the United States/Europe and China in 2025 and Growth Rate Compared to 2019



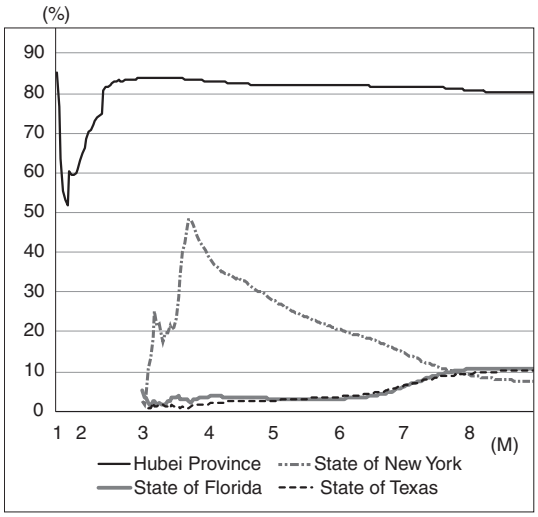
Notes: The "minimum" forecast is based on the worst-case scenario in which the COVID-19 pandemic continues for a long time, while the "maximum" forecast is based on the scenario where the COVID-19 outbreak settles down quickly.
Source: Prepared by The Japan Research Institute, Limited based on Brotschi, Christof, Dertouzos, Kemp and Vaze [2020]

Fig. 24 Changes in Japan's Mask Imports Between January and June 2020



Source: Prepared by The Japan Research Institute, Limited based on Trade Statistics from the Ministry of Finance

Fig. 25 Ratio of Major Regions (States and Provinces) in the Overall Number of COVID-19 Cases in the United States and China



Source: Prepared by The Japan Research Institute, Limited based on CEIC

respectively, than in the corresponding month of the previous year, the majority of which were imported from China (Fig. 24). This undoubtedly contributed to alleviation of the mask shortage. Although there have been instances in which China's overproduction of inferior masks incurred displeasure from many countries, no other country can boast of such flexible production capacity.

With the exception of some medical supplies, which require supply capacity to cope with an increase in demand in times of emergency, it is not rational to relocate production bases in China to another country or reduce procurement from Chinese companies in terms of both supply and demand. This is underpinned by the fact that the spread of COVID-19 in China is variable. A total of 80% of COVID-19 cases in China were concentrated in Hubei Province, while the number in coastal areas, such as Guangdong and Jiangsu provinces, where Japanese companies have production bases, was consistently low (Miura [2020]). This suggests that China succeeded in containing the virus, unlike the United States, where the largest affected regions spread from the State of New York to the States of Florida and Texas (Fig. 25).

Given the potential for virulent mutations of the

virus, the degree of impact of COVID-19 on the economy will depend on how quickly the spread of the virus can be controlled. China, which has succeeded in curbing the spread of COVID-19, appears to be well equipped to handle the supply chain.

(2) Expansion of investment in automation and labor-saving

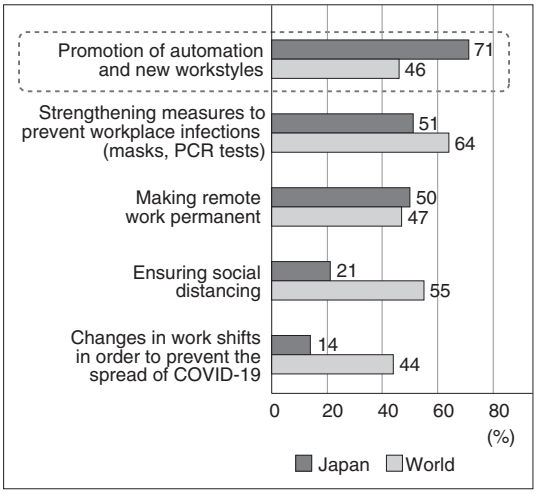
Another factor that enhances China's centripetal force is an expected increase in investment in automation and labor-saving. In the service industry, delivery robots and avatar robots are being introduced to prevent the spread of COVID-19, but even in the manufacturing industry, investment to avoid the "Three Cs (closed places, crowded places and close contact)" is required. While measures to prevent infection at manufacturing sites include wearing masks and strengthening disinfection, automation and labor-saving measures that reduce the number of people on-site are the most fundamental and effective.

According to a survey conducted in April by PricewaterhouseCoopers (PwC) on enterprises in various countries, including Japan, 64% of respondents selected "strengthening measures to prevent workplace infections," 47% selected "making remote work permanent," and 46% selected "promotion of automation and new workstyles" as challenges in preventing the spread of COVID-19 after the resumption of business operations. In contrast, for Japanese companies, since the manufacturing industry is dominant in Japan, the largest number of the companies (71%) selected "promotion of automation and new workstyles," followed by "strengthening measures to prevent workplace infections" (64%) and " making remote work permanent" (47%) (Fig. 26).

While each country is currently investing in automation and labor-saving solutions, China is expected to become the most active country in terms of automation and labor-saving efforts going toward the future as the largest market for industrial robots in the world. In China, the introduction of industrial robots has been actively promoted since 2010, and the movement was accelerated by the "Robotics Industry Development Plan (2016-2020)" in April 2016. The number of industrial robots introduced in Asia in 2018 totaled 280,000, which is 3.7 times larger than in Europe and 5.1 times larger than in the United States. Meanwhile, China introduced 150,000 robots, accounting for the majority of industrial robots introduced in Asia (Fig. 27).

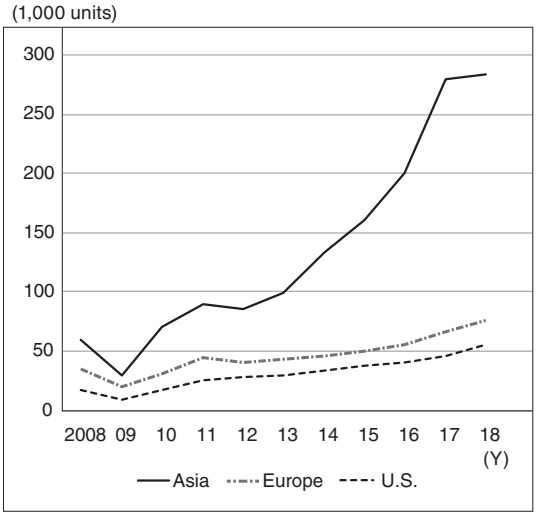
The IMF estimates that China will maintain a growth rate of 1.0% in 2020, while ASEAN5 will see negative growth of 2.0%, indicating that the gap between the two will widen in terms of the introduction of industrial robots and that China's advantage will grow. China offers strong incentives for investment in automation and labor-saving due to the rapid decline in the number of children and aging of the population due to its one-child policy, as well as soaring personnel costs caused by the depletion of the unskilled labor force flowing in from farming villages, known as the "Lewisian Turning Point." Another advantage of China is that country-wide efforts for automation and la-

Fig. 26 Challenges in Preventing the Spread of COVID-19 After the Resumption of Business Activities



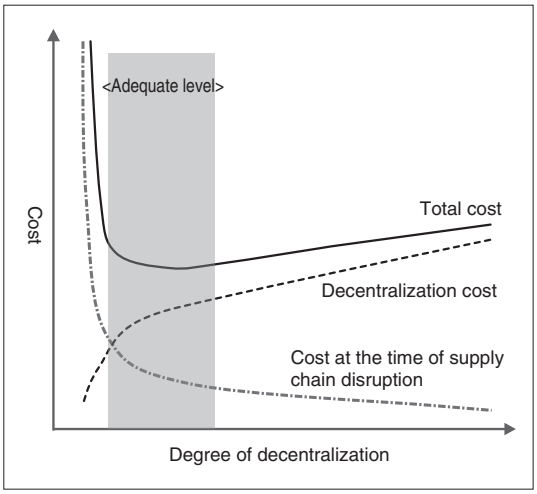
Notes: 871 valid responses (including 14 Japanese companies); only the top five items are listed.
Source: Prepared by The Japan Research Institute, Limited based on PwC [2020a]

Fig. 27 Number of Industrial Robots Introduced



Notes: Asia includes Australia.
Source: Prepared by The Japan Research Institute, Limited based on materials from the International Federation of Robotics

Fig. 28 Degree of Decentralization and Decentralization Cost



Source: Prepared by The Japan Research Institute, Limited based on Chopra and Sodhi [2014]

bor- saving are being made, which is expected to have an enormous effect.

(3) Increasing cost reduction pressure: decentralization vs. efficiency

Increased pressure on the supply chain to cut costs should also contribute to China's centripetal force. With the exception of some companies involved in telecommuting, nesting consumption, and the next-generation 5G communications standard, many companies had no choice but to see a decline in revenues and profits due to loss of demand[(38)], and this difficult business environment is expected to continue. Under these circumstances, companies are inevitably forced to move in the direction of improving the efficiency of their supply chains by eliminating waste.

The COVID-19 outbreak is believed to put increased pressure on companies to diversify their production bases to overcome supply chain vulnerabilities, which in other words means that they should shift away from their "dependency on China." However, this expectation is offset by the pressure to increase efficiency. If efficiency is to be emphasized, it is rational to increase dependence on China, which has large industrial clusters. China's position in the supply chain depends on how companies perceive the need for decentralization and enhanced efficiency.

Decentralization is not a decisive factor in solving supply chain problems because it means establishing new production bases outside of main production bases or increasing production capacity of non-main bases, which is inevitably costly. In order to reduce such a burden, some of the cost of decentralization is covered by subsidies as part of Japan's emergency economic package. It is also important to note that decentralization will result in the loss of "economies of scale." Decentralization certainly leads to lower total costs in the event of supply chain disruption, but as decent ralization costs increase, it is not wise to blindly promote decentralization (Fig. 28).

Even if decentralization is desirable, companies must carefully assess what level is adequate. In June 2019, Apple reportedly asked its major suppliers to shift 15- 30% of its Chinese production bases to overseas locations in response to escalating U.S.-China trade friction and rising labor costs

in China[39]. It can be assumed that this decision reflected a level that was adequate for the company.

The pressure for decentralization decreases as the supply chain recovers, while the pressure for enhanced efficiency remains high due to the loss of demand. Just as the Tohoku region's position in the supply chain did not change even after the Great East Japan Earthquake and Thailand's position did not change even after the flooding, it is quite possible that the shift away from "dependency on China" will not progress as much as expected even with the COVID-19 pandemic.

(4) U.S.-China conflict enters a new phase: high-tech businesses become the main battlefield

As a centrifugal force that keeps China away from the center of its supply chain, the U.S.-China conflict must be cited. The trade friction, which began in 2018 with the inauguration of the Trump administration, gradually intensified with the list of items subject to tariff hikes eventually expanding to cover most items. In January 2020, the two countries reached an agreement through concessions from China which agreed to increase imports of U.S. products by 1.5 times. Although retaliatory tariff rate hikes have been halted for the time being, the situation will remain unpredictable, as many experts say that China's imports from the United States will fall short of the promised level.

An additional factor contributing to the strong centrifugal force is that the main battlefield of the U.S.-China conflict has shifted from tariffs to a battle for supremacy in the high-tech field. The U.S. government has tightened its grip on China's Huawei Technologies, which leads the world in the next-generation 5G communications standard. In late 2018, the U.S. government prompted the arrest of Huawei's vice chairman by Canadian authorities on suspicion of covering up transactions with Iran, and in May 2019, the U.S. government placed Huawei and 114 related companies on the Entity List of the U.S. Department of Commerce's Bureau of Industry and Security (BIS), effectively banning exports of parts and services.

In May 2020, the Trump administration attempted to launch an encirclement campaign against Huawei by asking allied countries not to use Huawei's products on 5G base stations. At first, only a limited number of countries, including Japan and Australia, responded to the request, but as distrust of China grew over the initial response to the COVID-19 pandemic, the United Kingdom decided to eliminate Huawei's products, and the encirclement has gradually tightened since then.

In the same month, the U.S. government banned the export of semiconductors using U.S.-made manufacturing equipment to Huawei, which made it impossible for Huawei to procure semiconductors from Taiwan Semiconductor Manufacturing Company (TSMC), which manufactures semiconductors for Huawei. In September 2020, it was reported that China's Semiconductor Manufacturing International Corporation (SMIC), which is believed to be Huawei's supplier to replace TSMC, might be subject to new sanctions[40]. As a result, suddenly Huawei's 5G business has become increasingly uncertain.

The U.S.-China conflict is moving into a new phase in which more Chinese companies are becoming subject to sanctions. The U.S. Department of Commerce's BIS has added companies to the Entity List for human rights violations against ethnic minorities in the Xinjiang Uygur Autonomous Region, for their involvement in the procurement of military supplies, and for their involvement in the construction of internationally condemned military bases. Many of these are companies and organizations in the high-tech field, such as Hangzhou Hikvision Digital Technology, the world's largest surveillance video camera manufacturer, CloudMinds which is an artificial intelligence (AI) technology developer, and Harbin Institute of Technology (HIT), a prestigious science university (Table 1). U.S. wariness of Chinese tech companies is strong, which could result in another Huawei situation in the future.

It is also noteworthy that the methods of the sanctions have diversified. In June 2020, the U.S.

Table 1 Chinese Companies on the BIS Entity List and List of Military-related Companies by the U.S. Department of Defense (After October 2019)

Date	Number of companies	Type of sanctions	Reason	Company name (excerpt)
October 2019	28	Entity List	Involvement in human rights violations against ethnic minorities in the Xinjiang Uygur Autonomous Region	Hangzhou Hikvision Digital Technology (the world's largest surveillance video camera manufacturer)
May 2020	9	Entity List	Involvement in human rights violations against ethnic minorities in the Xinjiang Uygur Autonomous Region	CloudWalk Technology and SenseNets Technology (developers of face recognition software) and IntelliFusion (AI chip manufacturer)
	24	Entity List	Involvement in the procurement of military supplies	Qihoo 360 (security software developer) and CloudMinds (artificial intelligence (AI) technology developer)
June 2020	20	NDAA	Response to the military-civilian integration policy	Aviation Industry Corporation of China (AVIC), China Electronics Technology Group Corporation (CETC), China Mobile, China Telecom
July 2020	11	Entity List	Involvement in human rights violations against ethnic minorities in the Xinjiang Uygur Autonomous Region	OFILM Group (manufacturer of cameras and touch panels) and BGI (major genome analysis company)
	5	NDAA (exclusion from the list of government suppliers)	National security	Huawei, ZTE, Hangzhou Hikvision Digital Technology, Dahua Technology, Hytera Communications
August 2020	24	Entity List	Involvement in building bases in the South China Sea and militarizing them	China Communications Construction Company (CCCC) (state enterprise), Guangzhou Haige Communications Group (manufacturer of Global Positioning System (GPS)-related equipment)
	11	NDAA	Response to the military-civilian integration policy	China Three Gorges Corporation (operator of Three Gorges Dam) and Sinochem Group (major state-owned petrochemical company)

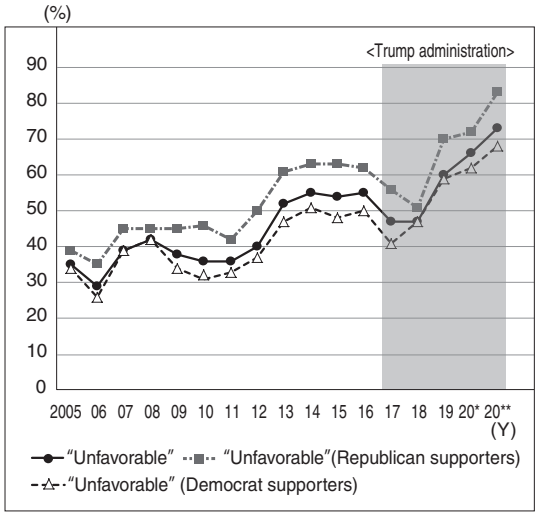
Source: Prepared by The Japan Research Institute, Limited based on materials from the U.S. Department of Commerce, Center for Information on Security Trade Control (CISTEC) [2020] and media reports

Department of Defense designated "companies owned or controlled by the Chinese military" pursuant to the National Defense Authorization Act (NDAA). Even if a company is included in the list compiled by the U.S. Department of Defense, it does not immediately become subject to sanctions as long as it is not included in the Entity List. However, the U.S. President can designate the company to become subject to financial sanctions under the International Emergency Economic Powers Act (IEEPA) of 1977[41]. In addition, the U.S. government has demanded that ByteDance, the parent company of Tik Tok, sell its Tik Tok's U.S. business due to concerns over data collection. This can be cited as an unprecedented sanction method. Since the United States and China are also at odds over the autonomy of Hong Kong, sanction methods are likely to become more diversified as the number of potential sources of conflict increases.

The tightening on Chinese high-tech companies, which is likely to continue after the presidential election, also adds to the aforementioned centrifugal force. According to a survey conducted by the Pew Research Center between June and July, the percentage of Americans who have "unfavorable" views of China reached a record high of 73% (Fig. 29). Because no big differences are seen between Republican and Democrat supporters, it is unlikely that U.S. policy toward China will soften no matter which candidate wins the presidential election in November. Biden's emphasis on cooperation with allied countries is likely to further increase the centrifugal force that keeps China away from the center of its supply chain.

The more Chinese companies the U.S. government targets for sanctions, the greater the impact. The ban on the export of semiconductors using U.S. manufacturing equipment to Huawei also affects Japanese companies that do business with TSMC. Huawei has the world's largest share in 5G base stations at 35.7%[42], and the world's sec-

Fig. 29 America's Rapidly Deteriorating Views of China



Notes: While the survey is normally conducted once a year in the spring, the survey was conducted twice in the spring (20*) and summer (20**) in 2020. "Unfavorable" indicates the total of "Somewhat unfavorable" and "Unfavorable."
Source: Prepared by The Japan Research Institute, Limited based on Silver, Devlin and Huang [2020]

ond largest share in smartphones at 17.8%, behind Samsung[43], and many companies engage in direct transactions with Huawei. The impact of strengthened sanctions on Japan's electronics industry is very large both directly and indirectly. Companies that do business with Chinese high-tech companies, either directly or indirectly, need to consider various scenarios to rectify their excessive "dependency on China."

Conclusion: Making Decisions by Not Being Influenced by "Atmosphere"

Companies linked to the global supply chain need to calmly understand why China is at the center of the supply chain, and carefully consider "desirable supply chains," taking into account the fact that factors influencing the shape of the supply chain in the era of COVID-19 have been changing due to transformation not only of the nature of risks that threaten the chain but also the supply chain itself, and that there is a centripetal force that keeps China at the center of the chain, as well as a centrifugal force that keeps it away from the center.

Meanwhile, the prevailing view around the world, including in Japan, is that the shape of the supply chain will change significantly due to the COVID-19 pandemic. In March, Foreign Policy, a specialized magazine on U.S. diplomacy, interviewed 12 intellectuals about the post-COVID-19 world order, and some of them mentioned globalization and the supply chain. All of them said that globalization, which has deepened through a win-win approach, will begin a "reverse rotation" and that the length of supply chains, which had been expanding, will also be shortened in order to overcome the problems of vulnerability, and that local production, local consumption, and the return of production bases to the domestic market, will increase [44].

The return of production bases from abroad has also been viewed positively in Japan. In September, the Japan Center for Economic Research and Nikkei Inc. conducted an online survey of 3,000 people working for listed companies. The survey results revealed that 59.6% of respondents supported the government's policy of promoting the return of production bases to the domestic market, and 41.2% of respondents think that China's importance as a production base will diminish[45].

However, when thinking of a "desirable supply chain," it is dangerous to be influenced by the "atmosphere" of the times. There are many people who predict changes in the supply chain following the COVID-19 outbreak, but they don't mention about why the supply chain has expanded or why China is at the center. According to a survey by the Japan Center for Economic Research, 68.9% of respondents said China's importance as a consumer market would not change, or would increase. The current debate about supply chain vulnerability is so simplistic that it lacks perspective on what would be lost if we choose to shift away from our "dependence on China."

There are many issues to consider before deciding to return our production bases from abroad. The "desirable supply chain" cannot be determined based on the dichotomy between whether or not to return production bases to the domestic

market. Instead, we should think about how much risk we can cope with by increasing inventories first. Then, we should review the role of production bases in the supply chain, realize double-tracking of the supply chain, and finally consider the return of production bases to the domestic market. Returning production bases from abroad and achieving the shift away from "dependence on China" as a result are laudable in terms of fulfilling the social responsibilities expected of companies, but they present difficult problems in terms of continuity.

Citing a local news report, the Chinese Communist Party's Global Times said in July that Germany's domestic mask production failed due to a series of business withdrawals by companies, leading to imports from China again[46]. Looking back at the time of the shortage, few people are opposed to the promotion of domestic production. However, it is not easy to continue production at a time when the supply-demand balance reverses to oversupply. Companies can receive subsidies at the start of production, but competition with Chinese products, which have become more price competitive, will continue.

Japan will not necessarily repeat the same mistakes as Germany, due to its advanced differentiation from Chinese products and meticulous preparation efforts by companies like IRIS OHYAMA. IRIS OHYAMA decided to produce masks in anticipation of global market competition with inexpensive Chinese products by 1) adding high value by using nonwoven fabrics developed in-house, 2) significantly reducing costs by automating labor-intensive packaging processes, and 3) starting production in the United States, France, and other countries[47]. However, many elements of concern remain, including that China Petrochemical Corporation (Sinopec), a state-owned enterprise under the direct control of the central government, has drastically increased the production capacity of nonwoven fabrics in China[48].

In considering the global supply chain, it is important not to be influenced by the transient "atmosphere" of the times. As a means of overcoming supply chain vulnerabilities, instead of simply shortening the supply chain, it can be utilized in a different way, that is, increasing the risk tolerance of the existing supply chain or enhancing resilience by double-tracking the supply chain. For many companies, "desirable supply chain" can never be achieved with a simple shift away from their "dependency on China."

End Notes

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