



FY2022 International Economic Research Project
for Establishing an Integrated Domestic and
International Economic Growth Strategy
(Research on strategic trade, investment
diversification and global supply chain
transformation based on changes in the world
situation)

Research Summary

2023/03/31

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Research summary

1. Background, purpose and research overview
2. Industry considerations on supply chain disruption risk
3. Analysis of the actual supply chain diversification

Background, purpose and research overview

The purpose of this project is to clarify the characteristics of supply chains, disruption risk, directions and challenges of diversification for industries with particularly high risk of supply chain (SC) disruptions triggered by economic security and other factors.

Background and purpose	Back ground	■ In the manufacturing industry, the division of labor has been established on a global scale (global supply chain), and the upgrading of QCD (quality, cost and delivery) has been pursued. ■ On the other hand, China and the United States are confronting each other in various fields, such as economic security and trade, in the global market. As a result, the supply chain has been disrupted, including an increase in trade restrictions internationally. ■ Furthermore, due to the global epidemic of COVID-19 and the influence of the Russian-Ukrainian crisis, the flow of people and logistics has been restricted, and the trend of supply chain disruption has been increasing. ■ Companies, particularly those in the manufacturing industry, have been forced to rethink their supply chain strategies and have faced the challenge of building resilient supply chains to address various issues.
	Purpose	■ Based on the above issues surrounding the supply chain, this project will clarify the characteristics of supply chains, disruption risk, directions and challenges of diversification.
	Research overview	■ Evaluate potential disruption risk in each industry and identify industries with particularly high risk of disruptions by analyzing the characteristics of supply chains for each industry in the manufacturing industry. ■ With regard to the industries identified in the previous process, comprehensively summarize the characteristics of supply chains, disruption risk, directions and challenges of diversification based on interviews and literature reviews.

Note: QCD is a combination of quality, cost, and delivery, which are the three most important factors in the manufacturing industry.

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Supply chain disruption risk criteria

Based on the assumption of eight characteristics of supply chains with high risk of disruptions, we have established three-level risk assessment criteria for determining the level of risk for each of them.

Characteristics of supply chains with high risk of disruptions			Reference index/information	Risk criteria		
				High	Medium	Low
Market	①	【Sales in high-risk countries (political unrest, etc.)】 A certain level of market size exists even in high-risk countries.	• Ra io of local sales in emerging countries: Local sales in emerging countries ÷ (Domestic corporate sales + Overseas corporate sales)	Over 10% of ratio of sales in emerging countries	5% to less than 10% of ratio of sales in emerging countries	Less than 5% of ra io of sales in emerging countries
	②	【Manufacture and procurement of important products for economic security】 Products essential to the survival of people or on which the lives and activities of people are broadly based.	• Special important material for the Economic Security Promotion Bill • Core industries of he Foreign Exchange Act	Applicable to both bills and laws	Either one of the two applies	
Products	③	【Difficulty in development in own countries】 Relying on foreign companies in terms of technology due to differences in patents and development capabilities.	• Ra io of overseas dependence for technology transactions: Overpayments to foreign countries ÷ Technology transactions with foreign countries	Over 10% of ratio of overseas dependence	0% to less than 10% of ratio of overseas dependence	Less than 0% of ra io of overseas dependence (excess of receipt from overseas)/No data
	④	【Dependence on imports from specific countries】 Dependence on procurement from specific countries for reasons such as uneven distribution of resources.	• Import ratio by region • Total supply ratio by region (Import value ÷ Total import value + Domestic production value)	For imports from specific countries: more than 60% items	For imports from specific countries: 40% to less than 60% items	
Procurement	⑤	【A wide range of suppliers (highly dependent on suppliers)】 A large number of parts are required, or a large number of suppliers must be involved globally in a horizontal specialization industry.	• Value added ratio • Existence of cases of supply suspension caused by suppliers	Less than 30% of value added ratio or cases of supply suspension caused by suppliers can be confirmed more recently	30% to less than 40% of value added ratio	Over 40% of value added ratio
	⑥	【High geographic concentration (global monopolar concentration)】 Production bases are concentrated in terms of efficiency, such as the scale of investment.	• Export ratio at overseas bases (Overseas corporate exports ÷ Overseas corporate sales) • Overseas sales by region	Over 50% of export ratio at overseas bases, and some regions accounting for over 40% of overseas sales	Does not meet “High” or “Low” criteria	Less than 40% of export ratio at overseas bases, or no region accounting for more than 30% of overseas sales
Production	⑦	【Manufacturing in high-risk countries (political unrest, etc.)】 Low-cost labor costs, resources and materials are available locally.	• Ra io of production in emerging countries: Sales in emerging countries ÷ (Domestic corporate sales + Overseas corporate sales)	Over 20% of ratio of production in emerging countries	10% to less than 20% of ratio of production in emerging countries	Less than 10% of ra io of production in emerging countries
	⑧	【Labor-intensive manufacturing】 Relying on manual labor because automation is difficult or has no advantage over investment in automation.	• Labor cost ratio (Employer income ÷ Production)	Over 30% of labor cost ratio	15% to less than 30% of labor cost ratio	Less than 15% of labor cost ratio

Note: Emerging countries refer to countries other than North America, EU, or NIEs 3.

Source: Ministry of Economy, Trade and Industry, “51st Outline of the Basic Survey of Overseas Business Activities,” “2021 Basic Survey of Japanese Business Activities,” “White Paper on International Trade (2020),” Ministry of Economy, Trade and Industry, Agency for Natural Resources and Energy, “Japan’s New International Resource Strategy,” ③ Strategies for Securing Rare Metals,” Ministry of Internal Affairs and Communications, “2015 Input-Output Table,” Cabinet Office, “2020 SNA Input-Output Table,” Ministry of Finance, “Financial Statements Statistics of Corporations by Industry (2021).”

Industry considerations on supply chain disruption risk(1/2)

Evaluation criteria

- | | |
|---|--|
| ① Sales in high-risk countries | ⑤ A wide range of suppliers |
| ② Important products for economic security | ⑥ High geographic concentration |
| ③ Difficulty in development in own countries | ⑦ Manufacturing in high-risk countries |
| ④ Dependence on imports from specific countries | ⑧ Labor-intensive manufacturing |

As a result of analyzing the high risk of disruptions by industry, we selected "Motor vehicles parts (transportation machinery)" and "Medicines", which have many characteristics of supply chains with high risk of disruptions, as the targets of the survey.

Industrial classification (large)	Industrial classification (medium)	Risk criteria								Number of "High"	Survey target
		①	②	③	④	⑤	⑥	⑦	⑧		
Mining, quarrying of stone and gravel	Mining, quarrying of stone and gravel	Low	Medium	Low	Low	Low	Low	High	Medium	1	
Construction	Construction	Low	Low	Low	Low	Low	Low	Low	High	1	
Food, beverage, tobacco and feed manufacturing	Food, beverage, tobacco, feed and organic fertilizer manufacturing	Low	Medium	Low	Medium	Medium	Low	Low	Medium	0	
Manufacture of textile products	Silk reeling, spinning, chemical fibers and twisting and bulky yarns manufacturing, woven fabrics, knit fabrics, etc.	Low	Low	Low	High	Low	Medium	Medium	High	2	
Manufacture of lumber and wood products, pulp, paper, paper products	Manufacture of lumber and wood products, pulp, paper, paper products	Low	Low	Low	High	Low	Low	Low	Medium	1	
Manufacture of chemical and allied products	Manufacture of chemical fertilizer, industrial inorganic chemical products, industrial organic chemical products	Low	Medium	Low	Medium	Low				0	
	Medicines	Low	High	Low	High	High	Low	Low	Low	3	O
Manufacture of petroleum and coal products	Petroleum refining, miscellaneous petroleum and coal products	Low	Low	Low	High	Low	Low	Low		1	
Manufacture of ceramic, stone and clay products	Glass and its products, cement and its products, miscellaneous ceramic, stone and clay products	Low	Low	Low	Low	Low	Medium	Low	Medium	0	
Manufacture of iron and steel	Manufacture of pig iron, crude iron, steel materials, cast and forged products, and miscellaneous iron and steel products	Medium	Low	Low	High	High	Low	Medium	Low	2	
Manufacture of non-ferrous metals and products	Smelting and refining of non-ferrous metals, miscellaneous smelting and refining of non-ferrous metals	Medium	Low	Low	High	High	Medium	Medium	Low	2	

Medicines are selected on the basis of market size, compound annual growth rate(CAGR) and need for stable supply

Industry considerations on supply chain disruption risk(2/2)

(continued)

Evaluation criteria

- | | |
|---|--|
| ① Sales in high-risk countries | ⑤ A wide range of suppliers |
| ② Important products for economic security | ⑥ High geographic concentration |
| ③ Difficulty in development in own countries | ⑦ Manufacturing in high-risk countries |
| ④ Dependence on imports from specific countries | ⑧ Labor-intensive manufacturing |

Industrial classification (large)	Industrial classification (medium)	Risk criteria								Number of "High"	Survey target
		①	②	③	④	⑤	⑥	⑦	⑧		
Manufacture of fabricated metal products	Manufacture of fabricated metal products	Low	Low	Low	Low	Low	Low	Low	High	1	
Manufacture of general-purpose machinery	General inductor machinery and equipment, miscellaneous general-purpose machinery and machine parts	High	Low	Low	Low	Low	Medium	Medium	Medium	1	
Manufacture of production machinery	Agricultural machinery and equipment, machinery and equipment for construction and mining, daily lives industry machinery, basic material industry machinery, and metalworking machinery and its equipment	Low	Medium	Low	Low	High	Low	Low	High	2	
Manufacture of business-oriented machinery	Office machines, service industry and amusement machines, miscellaneous business-oriented machinery	Low	Medium	High	Low	Low	Medium	Medium	Medium	1	
Manufacture of electrical machinery, equipment and supplies	Industrial electrical apparatus, household electric appliances, electronic equipment, and miscellaneous electrical machinery equipment and supplies	Low	Medium	Low	Low	Low	Medium	Low	Medium	0	
Manufacture of information and communication electronics equipment, electronic parts, devices and electronic circuits	Communication equipment and related products	Medium	Low	High	High	Medium	Medium	Medium	Medium	2	
	Image and audio equipment, electronic data processing machines, digital and hybrid computer, and peripheral equipment		Low	Low		Medium			Medium	1	
	Electronic parts, devices and electronic circuits		Medium	Low		Medium			Medium	1	
Manufacture of transportation equipment	Motor vehicles, motor vehicles bodies and trailers, motor vehicles parts and accessories, and miscellaneous transportation equipment	High	Medium	Low	High	High	Low	High	Low	4	O

- Motor vehicles parts are targeted because there are many cases of disruptions due to the suspension of parts supply in the automobile industry, which is the main industry of transportation machinery.
- We selected important parts from the viewpoint of shipment value, market share of Japanese auto manufacturers, and EV's critical components.

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① Motor vehicles parts

SC vulnerability

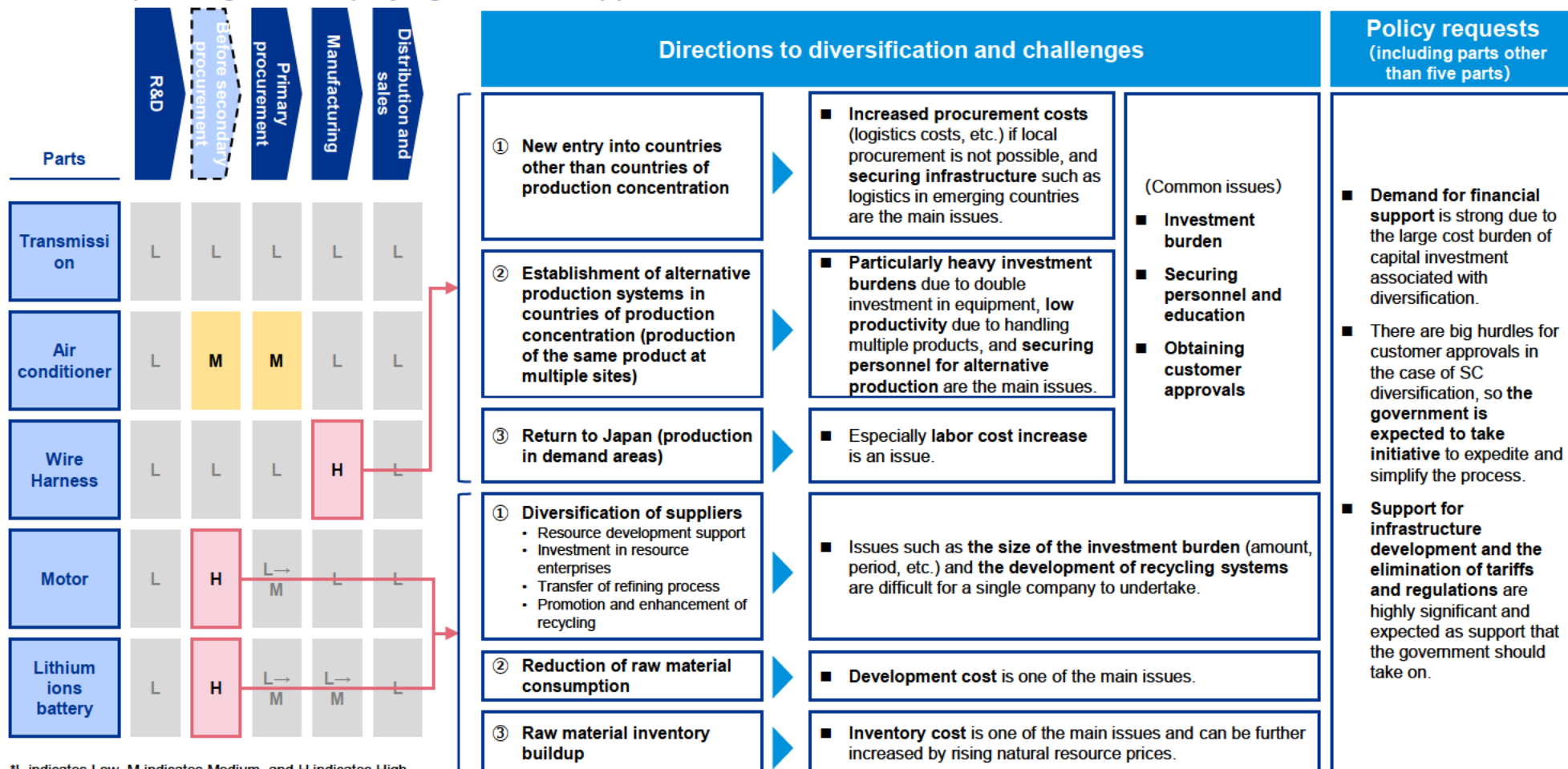
The vulnerability of labor-intensive parts and parts using raw materials such as rare earths and rare metals that are procured from specific countries is increasing.

Parts	R&D	Procurement (before secondary procurement)	Procurement (primary procurement)	Manufacturing	Distribution and sales
Transmission	Major R&D activities are conducted in Japan. Risk is low due to the low degree of dependence on foreign countries.	Aluminum raw materials are dependent on overseas suppliers, but the risk is low due to diversified procurement from multiple countries. Low	Risk is low because major components (processed aluminum products, etc.) are mainly manufactured and exported in Japan, and the degree of dependence on foreign countries is low. Low	Although production is concentrated in the region and unevenly located, Japan is the center of manufacturing, and the degree of dependence on foreign countries is low. Low	The main customers are Japanese, European and U.S. OEMs, therefore the dependence on high-risk countries is low. In addition, sales to OEMs in high-risk countries are mainly produced in demand areas, and the impact on other countries is limited.
Air conditioner		Suppliers of raw material (crude oil) are concentrated, but the risk is medium due to the stockpiling system, etc. Medium	Some parts, such as resin, are manufactured on a consolidated basis, and if a problem occurs in the supplier's country, it may affect other countries. Medium	Risk is low due to decentralization of manufacturing sites and production in demand areas, and the limited impact on other countries. Low	
Wire Harness		Risk is low because main materials used are common materials such as copper wire and resin, and it is easy to diversify procurement sources and substitute materials. Low	Risk is low because major components (electric wires, etc.) are mainly manufactured in-house or by Japanese manufacturers, and the degree of dependence on foreign countries is low. Low	Risk is high because of a large impact from cessation of human flow due to labor-intensive manufacturing, and the location in high-risk countries. High	
Motor		Risk is high because suppliers of raw materials (rare earths, etc.) are concentrated in specific countries and it is difficult to diversify suppliers and replace them. High	Major components (core, magnets, etc.) are procured mainly by Japanese manufacturers, and the degree of dependence on foreign countries is low. Therefore, the risk is low at present. (However, procurement from foreign manufacturers is increasing). Low→Medium	At present, the risk is low because manufacturing is mainly in Japan, which means that the degree of dependence on foreign countries is low. Low	
Lithium ions battery		Risk is high due to difficulties in diversifying suppliers and substituting raw materials (rare metals, graphite, etc.) because suppliers are concentrated in specific countries. High	Major components (cathode material, etc.) are procured mainly by Japanese manufacturers, and the degree of dependence on foreign countries is low. Therefore, the risk is low at present. (However, procurement from foreign manufacturers is increasing). Low→Medium	Risk is low due to production mainly in demand areas and the limited impact on other countries. (However, manufacturing by and dependence on foreign manufacturers is increasing). Low→Medium	

① Motor vehicles parts

Directions to diversification, challenges and policy requests

In the possible direction of multiple manufacturing function dispersion and diversification of procurement sources, the government is expected to take the lead in promoting diversification by providing financial support and expediting and simplifying customer approvals.



*L indicates Low, M indicates Medium, and H indicates High.

We consider the directions of diversification for products with "High" risk.

② Medicines

SC vulnerability, directions to diversification, challenges and policy requests

Due to dependence on high-risk countries for raw material and API procurement, the directions of SC diversification are shifting to new suppliers for some procurement and building up inventory of APIs. On the other hand, supplier search and various cost increases have become challenges, leading to policy requests.

	R&D	Procurement (before secondary procurement)	Procurement (primary procurement)	Manufacturing	Distribution and sales
Medicines	Risk is low because R&D bases are mostly located in the home country. Low	Risk is high because most of the raw material/API procurement depend on high-risk countries such as China and India for the purpose of cost control. High	Risk is medium due to a certain degree of country bias, though the production bases are mainly in developed countries because high GMP compliance is required. Medium	Risk is low because pharmaceutical wholesalers in each country are responsible and do not depend on specific regions/business operators. Low	

Directions to diversification and challenges

Policy requests

- Dual sourcing/Transfer of suppliers: Among the three patterns, B is realistic considering the investment burden.**
 - [A: Transfer of sites] Transfer of sites of existing suppliers to low-risk countries.
 - [B: Search for new suppliers] Shift some procurement to new suppliers based in low-risk countries.
 - [C: In-house production] In-house production of raw materials and APIs.

- In the direction B, in addition to searching for appropriate suppliers, the main issues are an **increase in personnel cost**, and an **increase in the unit purchase price due to a decrease in buying power**.

- Demand for financial support, such as subsidies, is high** due to an increase in the unit purchase price resulting from the transfer from China, which has a cost advantage.
- Other needs include **assistance in finding qualified suppliers** in terms of both quality and cost, and **initiatives to accelerate the application and approval process** for supplier transfers.

- API inventory buildup: Addressing supply chain disruptions by keeping supplier structure unchanged and building up API inventory.**

- An **increase in inventory storage costs**, and an **increase in disposal costs due to an increase in the disposal rate** are the main issues.

- Inventory buildup of finished goods: Addressing supply chain disruptions by increasing inventory of finished products.**

- An **increase in inventory storage costs** and an **increase in disposal costs due to an increase in the disposal rate** are the main issues.

- Decentralization of manufacturing sites: There are two patterns.**
 - [A: New CMO search] Some manufacturing is shifted to a new CMO based in a different region from the existing manufacturing area.
 - [B: Expansion of in-house manufacturing] In-house contracting of some outsourced parts of the manufacturing.

- In addition to **searching for appropriate CMOs**, the main issues are an **increase in manufacturing costs due to the rise in personnel costs** and the **decline in manufacturing efficiency**, and an **investment in in-house manufacturing**.

- (Medium risk means that the need to implement SC diversification is small, and therefore policy requests are limited.)

Note: CMO(Contract Manufacturing Organization) refers to a business entity contracted to manufacture pharmaceuticals. GMP(Good Manufacturing Practices) is a set of standards for manufacturing and quality control of pharmaceuticals.



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