# Chapter 1 Deeper cross-border integration of the global economy

## Section 1 Increasing economic interdependence among economies

### The progress of globalization supported by the expansion of free trade

Globalization is supposed to generally mean that movements of capital and labor force will increase across borders and that economic relations will deepen as a result of transactions of goods and services through trade as well as rising investments overseas.[1] In terms of economics, globalization means the integration of markets through trade of products and services, the integration of direct investments and capital transactions, and movements of ideas across national borders.[2]

Globalization progressed thanks to a sharp decline in transportation costs, following the invention of the steam engine, with the separation of places of production and consumption (the first unbundling) boosting trade. Second, the development of ICT helped sharply reduce organization costs, prompting companies in developed countries to separate part of their production processes that were labor intensive in order to cut costs (the second unbundling). As a result, (A) trade of components, (B) the transfer of production facilities, key engineers and managers, training, technologies, and international investments, and (C) demand for services to help adjust the dispersion of production ensued, and a complex and diverse trade system which is not confined to traditional products transaction and which is characteristic of the 21st century is said to have emerged.[3]

In addition, if costs for transferring people lower, labor service can be physically separated from workers, possibly creating an impact that will go down in history (the third unbundling). For instance, "virtual immigration" will spread between developed and developing countries, in which workers in developing countries remotely use robots to provide security operations or to do household chores, or engineers in developed countries remotely repair capital equipment in developing countries. In such circumstances, it is pointed out that both merits and demerits from the second unbundling to manufacturing industries will be carried over to the service sector, possibly causing workers in wealthy nations to compete directly with workers in poorer countries in terms of wage.[4] Thus, under the current globalization not only goods but also people and knowledge have come to move freely in the world (Table II-1-1-1-1).

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1 Cabinet Office (2004), p. 149
2 Frankel (2006).
3 Baldwin (2018), Richard Baldwin (2012) "21st century trade and 21st century WTO" RIETI (https://www.rieti.go.jp/jp/special/p_a_w/014.html)
4 Baldwin (2018), p. 364

**Table II-1-1-1-1 Changes in globalization**

| | | World before globalization | First unbundling | Second unbundling | Third unbundling |
|---|---|---|---|---|---|
| Three costs for separation | Trade costs | High | Low | | |
| | Communication costs | High | | Low | |
| | Face-to-face costs | High | | | Low |
| Things for which movement is no longer restricted | | – | Goods | Ideas | People |
| International division of labor | | Self-sufficient | By industry<br>*Separation of production and consumption | By task<br>*Separation of production processes | By labor service |
| Era | | -1820 | 1820-1990 | 1990-present | Future |

Source: Created from Kimura (2018).[5]

## 1. Globalization of goods and services

### (1) Expansion of trade and economic development

It has been analyzed from both the macro and micro economic points of view that the trade of goods has merits such as growing of the economic pie, rising purchasing power as a result of imports, the rise in total factor productivity at the country level, and the improvement in productivity at the level of companies. Many researchers have found positive correlation between the volume of international trade and economic growth, according to the WTO.[6]

Reasons for conducting trade have been based on a number of academic theories. These include David Recardo's theory of comparative advantage derived from differences in production techniques, the Heckscher-Ohlin model, which attributes reasons to differences in production factor endowments,[7] Paul Krugman's new trade theory, which claims benefits for consumers through the economy of scale and the diversification of product types to be the reason for trade conducted between developed countries and within companies, leading to Marc Melitz's "new" new trade theory, which argues that only productive companies can conduct trade to which transportation and other costs can be added.

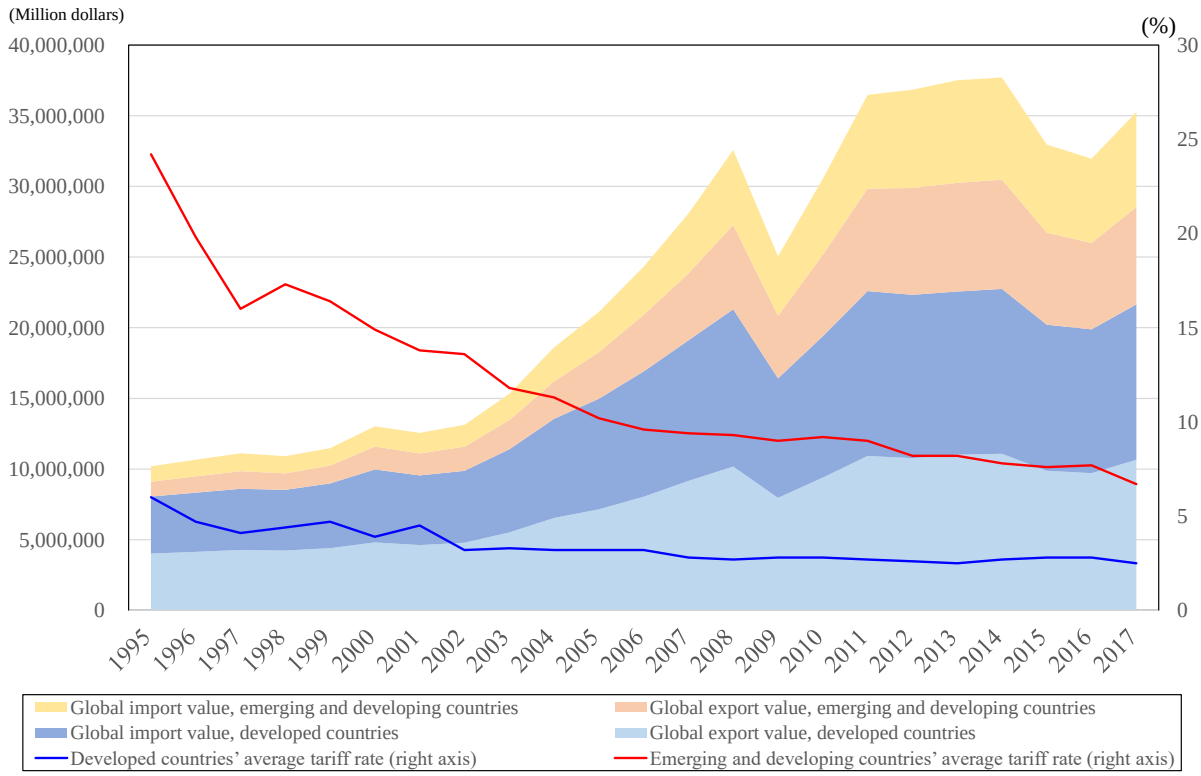
On the other hand, even if the motivation and needs for conducting trade exist, globalization including trade does not progress unless environments for free trade[8] are in place and the benefits from companies conducting trade and activities accompanying globalization in a wider sense of the word are greater than the costs involved. Therefore, unless trade costs are reduced, countries around

5 Kimura (2018), p. 8-14
6 Ministry of Economy, Trade and Industry (2017), p. 176-179
7 Each nation imports and exports goods which are produced through the intensive use of production elements that have comparative advantage in terms of labor, capital, technological strength, etc.
8 Free trade generally means that countries do not restrict trade.

the world may fail to capture opportunities for growth that would otherwise be derived from trade and globalization.

Tariffs are one of the traditional means for restricting trade. The impact tariffs have on the trade balance of respective countries is small in terms of the macro economy, and the continuous reduction of tariffs over a long period at a large scale helps adjust companies' internal and external direct investments and their production structure, with the possibility of generating international division of labor, including companies' participation in the global value chain (GVC).[9] Tariff rates have been falling in both developed, and emerging and developing countries since 1995, when the WTO was established, with the average tariff rate for emerging and developing nations having fallen to 6.7% in 2017 from 24.2% in 1995. During this period, the global economy has grown in tandem with the development of free trade, with the value of global trade having increased by a factor of some 3.5 times and nominal GDP of the world up by 2.6 times (Figure II-1-1-1-2).

**Figure II-1-1-1-2 Changes in the value of global trade and the tariff rates**



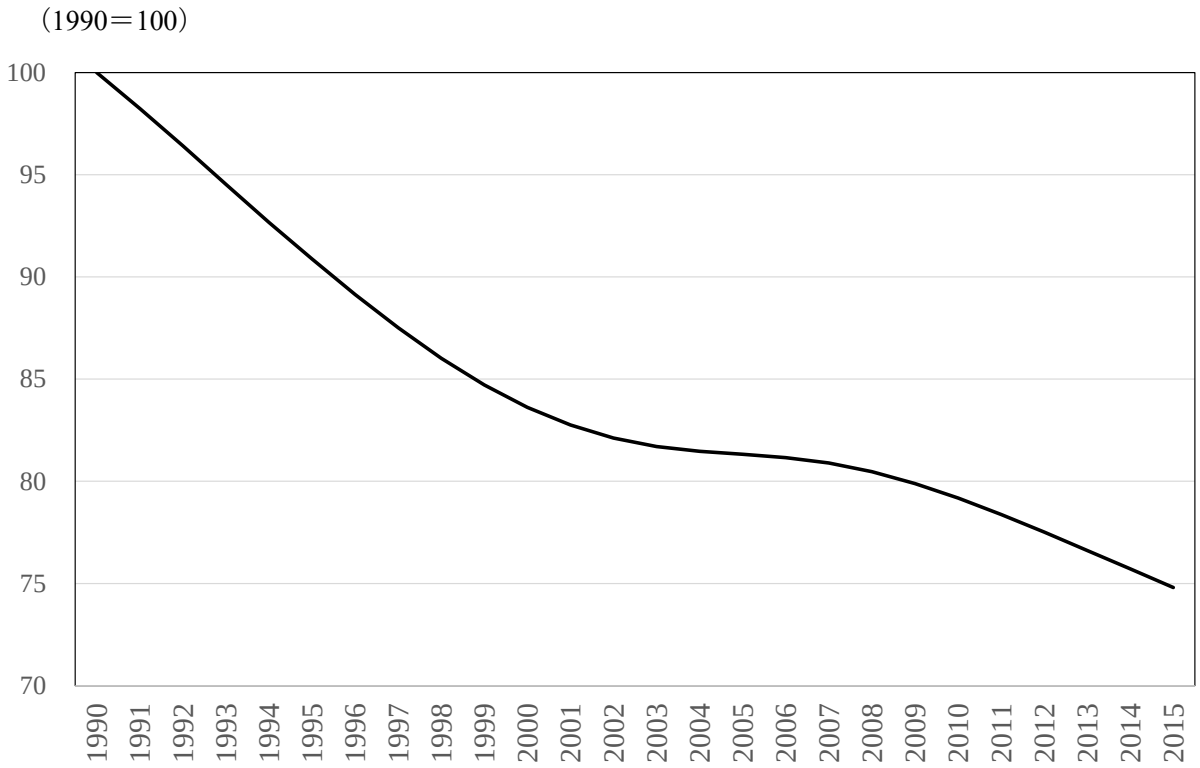

Source: IMF DOTS, WDI of the World Bank.

In addition to trade tariffs, cases that hinder global activities including free trade among companies have been seen increasing in recent years. These include non-tariff barriers, such as technological standards for which it is not easy to determine by their appearance whether or not they are fair and necessary trade restricting measures, and the introduction of investment regulations.[10]

9 International Monetary Fund (IMF) (2019), p. 115-116.
10 See II-2-4.

Transportation costs, an essential element for trade, were seen to fall sharply between 1990 and 2015 (Figure II-1-1-1-3).

**Figure II-1-1-1-3　Changes in the world's international transport cost index (1990 = 100)**




Source: Yvan Guillemette and David Turner (2018) "*The Long View: Scenarios for the World Economy to 2060*" OECD Economic Policy Paper July 2018 No. 22.

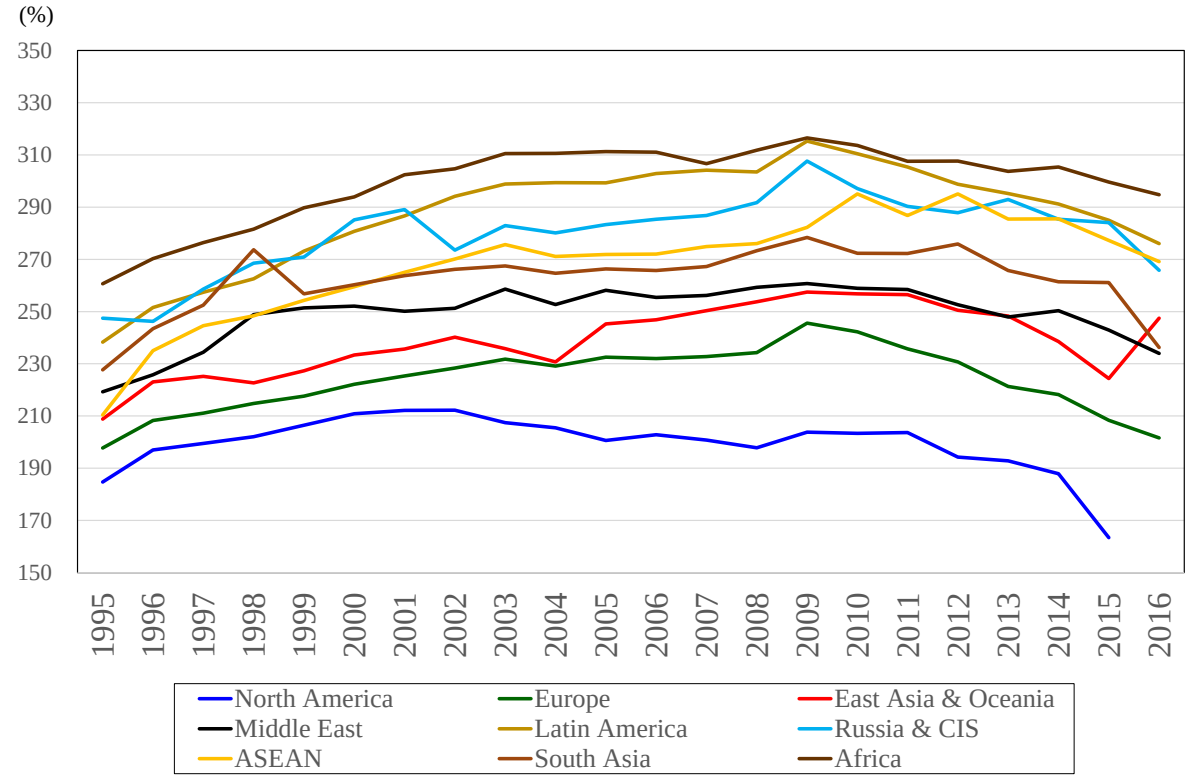
The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) estimates trade costs including tariffs and transportation costs,[11] and the time series analysis is shown below.

According to it, trade costs differ, depending on the combination of different regions.

Changes in trade costs by importing regions show that trade costs for each region have been falling since 2009 in general, while trade costs for Africa, Latin America, and Russia and the Commonwealth of Independent States (CIS) remain high, implying that the reduction in costs in these regions will help further expand trade (Figure II-1-1-1-4).

11 ESCAP (2017).

**Figure II-1-1-1-4 Changes in trade cost index for different importing regions**

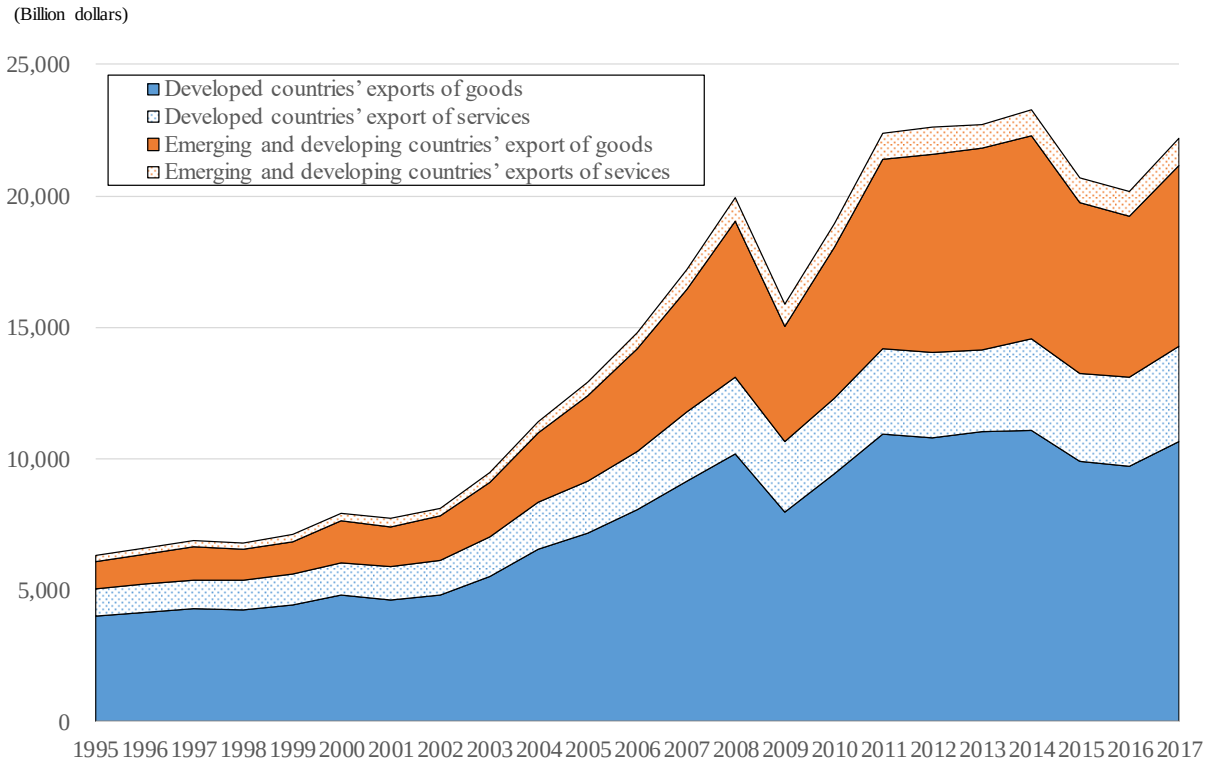



Notes: Calculated by simply averaging trade costs for the manufacturing industry of importing nations. These trade costs include factors such as import tariffs, transportation costs, and languages.
Source: ESCAP-World Bank Trade Cost Database.

Let us look at changes in the export value of goods and services in the world since 1995, when the WTO was founded, helping free trade progress. The values of goods and services have increased in both developed, and emerging and developing countries, with the export value of goods from emerging and developing countries rising sharply.

Although smaller in value than exports of goods, the export of services has also been steadily increasing in both developed, and emerging and developing countries, recording 3.8 times as much in 2017 as the value reported in 1995. If the overall value of service trade appears to be not growing in emerging and developing nations, it is because less data are available for service trade than for goods trade, with many numbers missing at present. When we highlight the export of services in Brazil, Russia, India, China, and South Africa (BRICS), the export value in 2017 ballooned to 14.7 times the value posted in 1995, indicating that exports of services have also been expanding in emerging and developing nations (Figure II-1-1-1-5).

**Figure II-1-1-1-5 Changes in the export value of goods and services in the world**



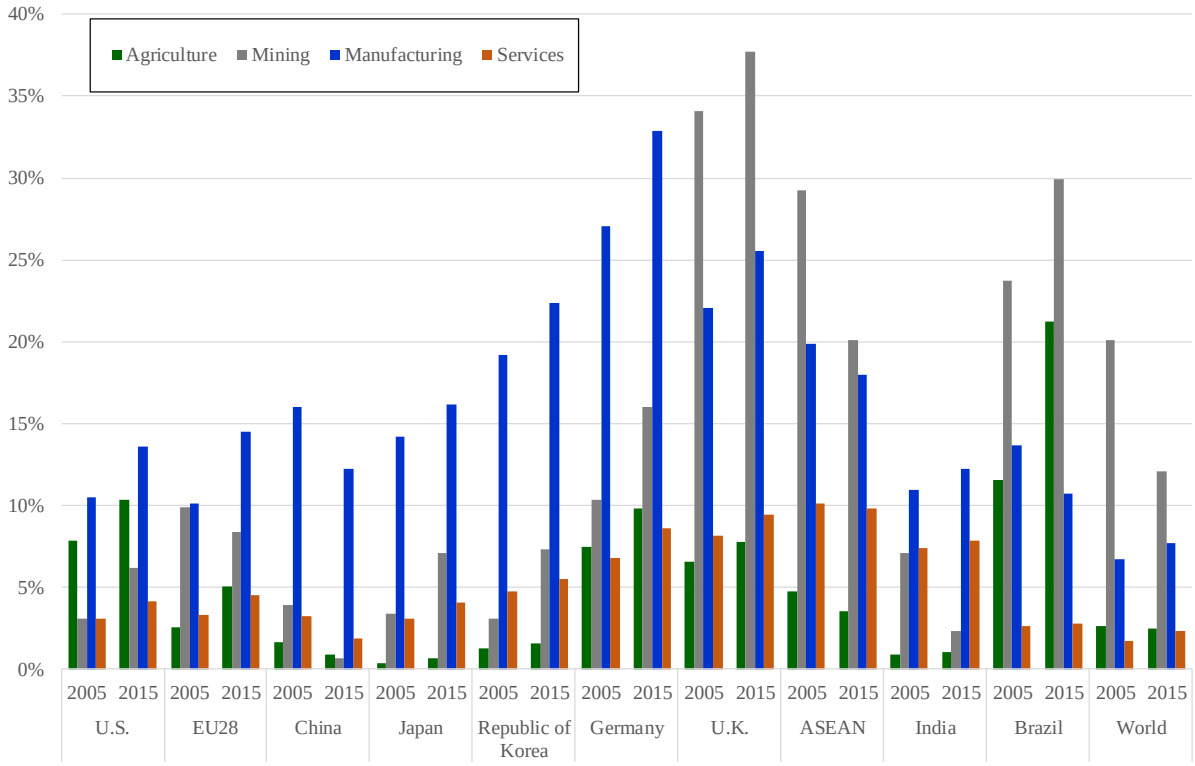

Notes: The export values of services since 2013 for China, India, Brazil, and Indonesia are taken from the Balance of Payments (BOP) statistics, as no data are available for those nations in the Extended Balance of Payments Services classification (EBOPS2010). Please note the numbers for emerging and developing nations for the same period are for reference only, as many numerical values are missing.

Source: Goods from IMF DOTS, figures for services are taken from OECD-WTO Balanced Trade in Services (BaTIS) for 1995-2012 and OECD ITSS EBOPS 2010 (OPS2010) for 2013-2017.

Next, let us look at the Organization of Economic Cooperation and Development (OECD) trade in value added data (TiVA), which are calculated by the OECD on the basis of the international input-output table, to see how important trade is to the domestic economies of major countries and regions. While traditional trade statistics cover the transactions of products (goods), trade in value added estimates how much value is added in a country until a product or service is created.[12] The ratio of value-added exports to each nation's GDP increased between 2005 and 2015, except for some countries, with exports becoming an indispensable part for each nation's economic growth (Figure II-1-1-1-6).

12 Inomata (2014) and Hirota (2017).

**Figure II-1-1-1-6 Ratio of value-added exports (by industry) to major nations' GDP**




Source: OECD TiVA.

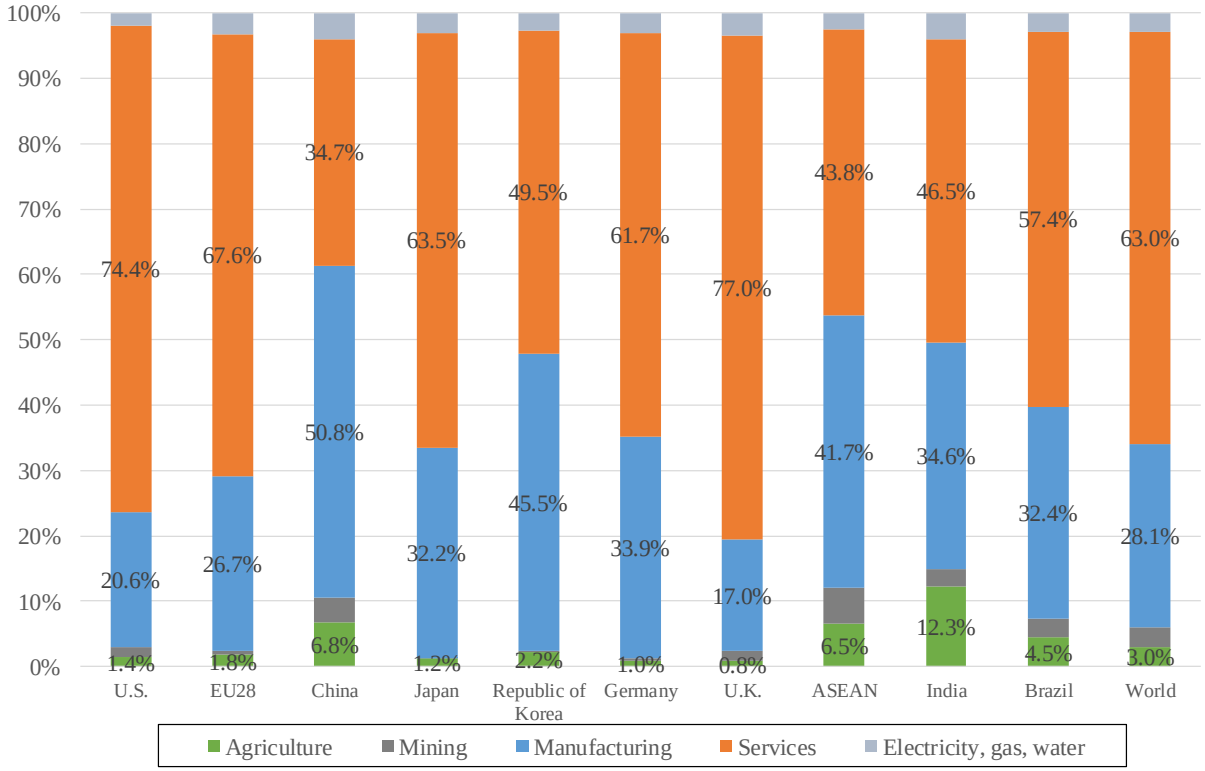
Countries and regions with large domestic and inter-regional markets, such as the United States, the European Union (EU28), China, and India, tend to have a lower ratio of value-added exports to output, but the percentage of value-added exports to output exceeds 10% in the manufacturing industries, indicating that ties to the global markets are essential to maintain domestic production and employment to stimulate consumption.

Germany and the United Kingdom have a higher ratio of value-added exports than other major countries and regions, because trade within the EU accounts for a higher percentage in these two countries. Looking at the ratio of value-added exports to production in the EU28, the ratio for the manufacturing sector is almost the same as that in the United States, implying that products manufactured in each country are consumed within the regional market.

Additionally, the ratio of value-added exports to global production tends to be lower than in major countries, except for mining, a fact that indicates that many countries produce and consume only domestically without exporting and it is assumed that there is room for growth of cross-border trade.

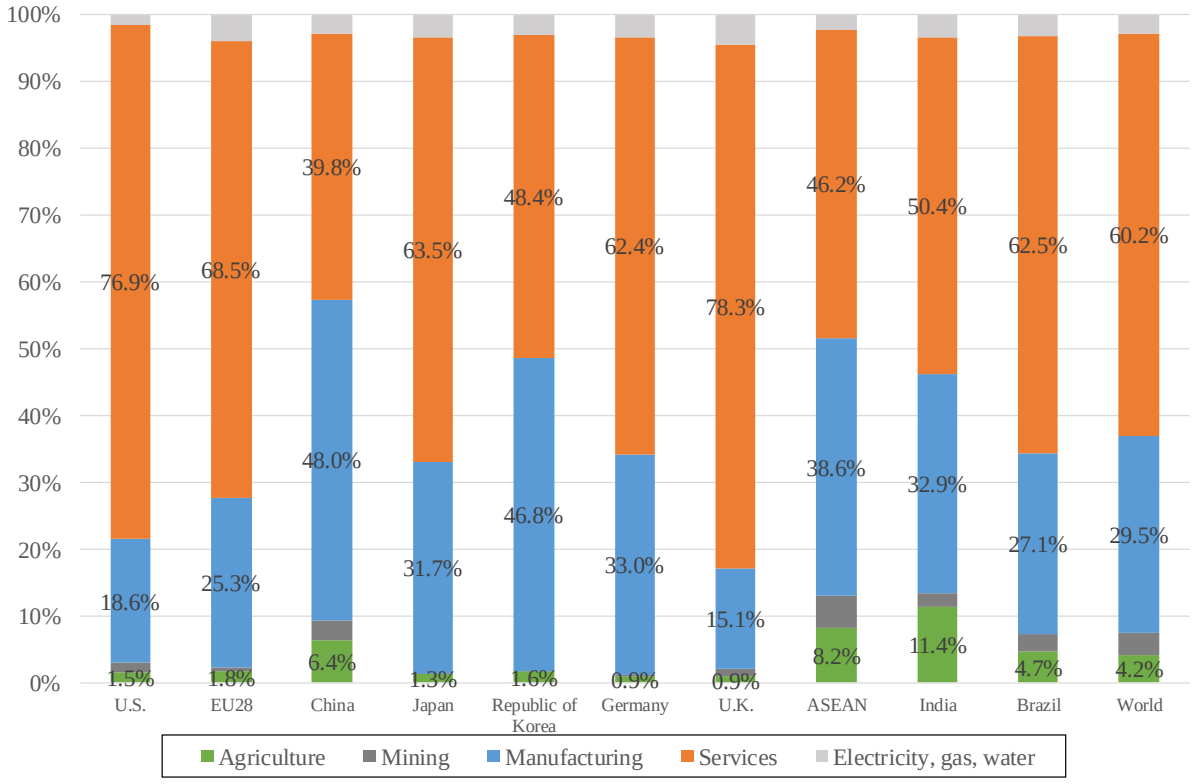
Looking at the percentage of domestic production by industry in major countries, the manufacturing sector accounted for some 50% of domestic production in 2005 and 2015 in China. Although domestic production is becoming less dependent on exports in recent years, with the percentage of value-added exports to production declining to 12.2% in 2015 from 16.0% in 2005, more than 10% of domestic production is directed towards consumption overseas, indicating the significant impact of trade on the domestic economy (Figures II-1-1-1-7 and II-1-1-1-8).

**Figure II-1-1-1-7 Changes in industrial structure of major nations (2005)**




Source: OECD TiVA.

**Figure II-1-1-1-8 Changes in industrial structure of major nations (2015)**




Source: OECD TiVA.

In ROK, where the ratio of the manufacturing sector in the domestic industry has been the second highest after China, the ratio of value-added exports to production was 19.2% in 2005 and 22.4% in 2015, implying that the country's domestic economy is more dependent on manufacturing exports than is China. Similarly, the ratio of value-added exports to production in Japan rose to 16.1% in 2015 from 14.2% in 2005, indicating greater importance of external demand. Some EU member countries, such as Germany and the United Kingdom, have a higher ratio of value-added exports presumably due to active trade within the EU market.

The ratio of value-added exports to domestic production was higher in 2015 than in 2005 in the United States, the EU, Japan, ROK, the Association of Southeast Asian Nations (ASEAN), and India, a sign of closer ties with overseas markets.

Next, we will look at how major trade countries have changed by highlighting trade between major nations that accounts for a large percentage in global trade.[13] Bilateral trades (the total of exports and imports) accounting for more than 0.1% of global trade (the total of exports and imports) are displayed on the map.

In 2000, the United States had bilateral trade accounting for more than 0.1% of global trade with 25 nations (of which, 15 were developed countries and 10 were emerging and developing countries), Germany had such trade with 19 countries (of which, 14 were developed nations and 5 were emerging and developing countries), Japan with 16 nations (of which, 10 were developed nations and 6 were emerging and developing countries), and China with six countries (of which, 5 were developed nations and 1 was emerging and developing country). Saudi Arabia was China's non-developed trade partner, presumably with a focus on trade in natural resources. As of 2000, the United States, Germany, and Japan were main hubs of global trade.

Trade involving a huge amount of money was conducted between 55 pairs[14] of developed nations and 25 pairs of developed, and emerging and developing countries in global trade, compared to the only two pairs of emerging and developing nations, namely China and Saudi Arabia, and Brazil and Argentina (Figure II-1-1-1-9).

13 Kato and Naganuma (2013).
14 Calculated while excluding Hong Kong, as in the map.

**Figure II-1-1-1-9 Bilateral trade accounting for over 0.1% of the value of global trade (2000)**


Notes: 1. A country in a blue circle is a developed country, while that in a red circle is an emerging/developing country. A red filled circle represents bilateral trade that accounts for over 0.1% of global trade and whose value exceeds 1 trillion dollars in total. A blue filled circle represents bilateral trade whose value exceeds 500 billion dollars in total and a green filled circle represents bilateral trade whose value exceeds 100 billion dollars. Blue lines represent ties between developed nations, red lines represent ties between emerging/developing countries, and green lines signify ties between developed, and emerging/developing nations. Lines between two nations represent the total trade amount of over 200 billion dollars > over 100 billion dollars > over 50 billion dollars > below 50 billion dollars according to line thickness.

2. Excludes trade between Hong Kong and other nations.

Source: IMF DOTS.

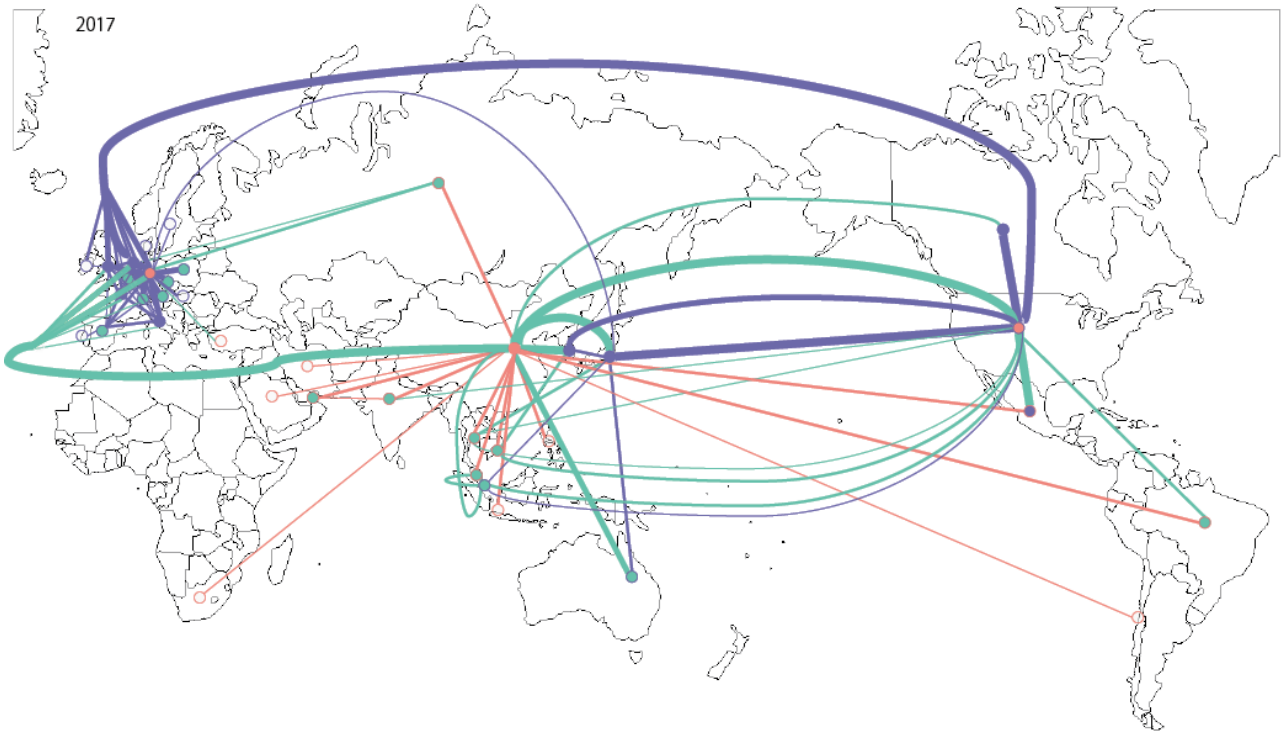
Trade hub countries underwent significant changes between 2000 and 2017. China had bilateral trade accounting for more than 0.1% of global trade with 25 nations (of which, 12 were developed countries and 13 were emerging/developing countries), the United States had such trade with 19 countries (of which, 12 were developed nations and 7 were emerging/developing countries), Germany with 18 nations (of which, 14 were developed nations and 4 were emerging/developing countries), and Japan with seven countries (of which, 5 were developed nations and 2 were emerging/developing countries), with China surpassing the United States and conducting large-scale trade with the highest number of countries. While China increased the number of large trade partners among both developed and emerging/developing nations, the United States, Germany, and Japan saw little change in their trade structure in terms of the number of trade partners, primarily in the developed camp. Trade involving a huge amount of money was conducted between 41 pairs of developed nations and 25 pairs of developed, and emerging and developing countries, and 14 pairs of emerging/developing countries, highlighting a higher percentage of trade between emerging/developing nations at the expense of falling trade between

developed nations.

China was involved in 5 out of 25 pairs of trade between developed and emerging/developing nations in 2000 and 12 out of 25 such pairs in 2017. Vietnam, which was not listed in 2000, came to account for more than 0.1% of global trade through trade with the United States and ROK. No major change was seen in other pairs between developed and emerging/developing nations.

As of 2017, it was observed that trade networks with China serving as a hub (red lines in the map) were being formed between emerging/developing nations featuring the ASEAN countries, India, and Latin America (Figure II-1-1-1-10).

**Figure II-1-1-1-10 Bilateral trade accounting for over 0.1% of the value of global trade (2017)**




Notes: 1. A country in a blue circle is a developed country, while that in a red circle is an emerging/developing country. A red filled circle represents bilateral trade that accounts for over 0.1% of global trade and whose value exceeds 1 trillion dollars in total. A blue filled circle represents bilateral trade whose value exceeds 500 billion dollars in total and a green filled circle represents bilateral trade whose value exceeds 100 billion dollars. Blue lines represent ties between developed nations, red lines represent ties between emerging/developing countries, and green lines signify ties between developed, and emerging/developing nations. Lines between two nations represent the total trade amount of over 200 billion dollars > over 100 billion dollars > over 50 billion dollars > below 50 billion dollars according to line thickness.

2. Excludes trade between Hong Kong and other nations.

Source: IMF DOTS.

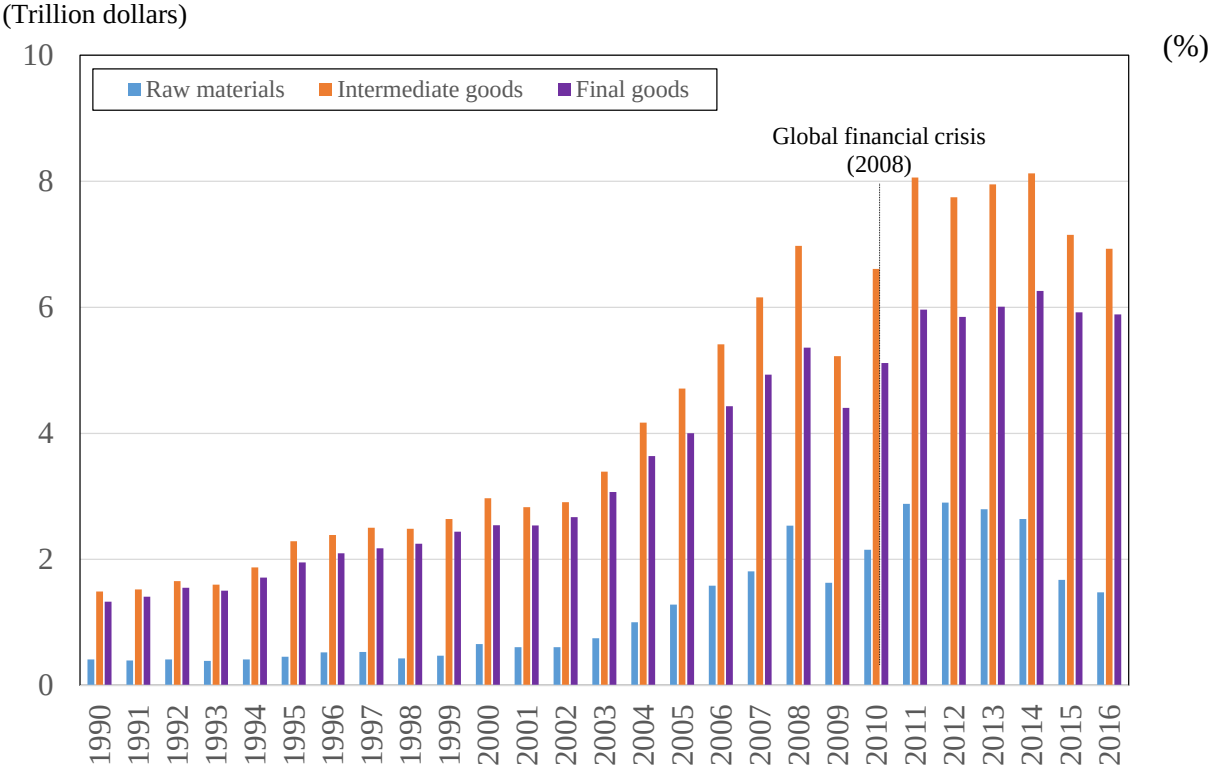
**(2) Deepening of global value chains (GVCs)**

As has been seen, lower tariffs and other trade liberalization measures have helped increase the value of global trade. During this process, we can see not only a quantitative expansion but also a change in trade structure especially towards intermediate goods, with international division of production (Figure

II-1-1-1-11).

**Figure II-1-1-1-11　Changes in global exports by type of goods**

(Trillion dollars)




Source: RIETI-TID.

A decrease in trade costs, as a result of trade liberalization, made it possible to set production bases in different countries, dividing a series of production process. Under a simple model of international division of production, high value-added intermediate goods, such as key components, are produced in capital/technology intensive countries (Figure II-1-1-1-12). These intermediate goods are exported to labor intensive countries for assembly, thereby optimizing the manufacturing process. Final products are shipped to places of consumption. If the countries of assembly do not hold sufficiently large and appropriate markets, the final products may be exported to the other countries, such as countries of intermediate goods or third countries with large markets. This trade pattern of exporting to third countries is called "triangular trade." As division of production becomes more complex, intermediate goods are shipped from one production base to another, expanding trade of intermediate goods.[15]

15 Such links of international production and the accompanying flow of goods and services are called global value chains (GVCs) or global supply chains (GSCs). There is not a clear distinction between the two terms. Global value chains are often used to broadly represent the entire processes of planning, research and development, sales, and maintenance in the so-called smiling curve, while global supply chains are often used to emphasize the supply networks of materials in the manufacturing process. In this document, while we focus on the flow of goods in the production process, we extensively analyze various parts including service portions incorporated into goods, as we do with trade in value added to be discussed below, and so we use the term "global value chains," abbreviated as "GVCs," here.

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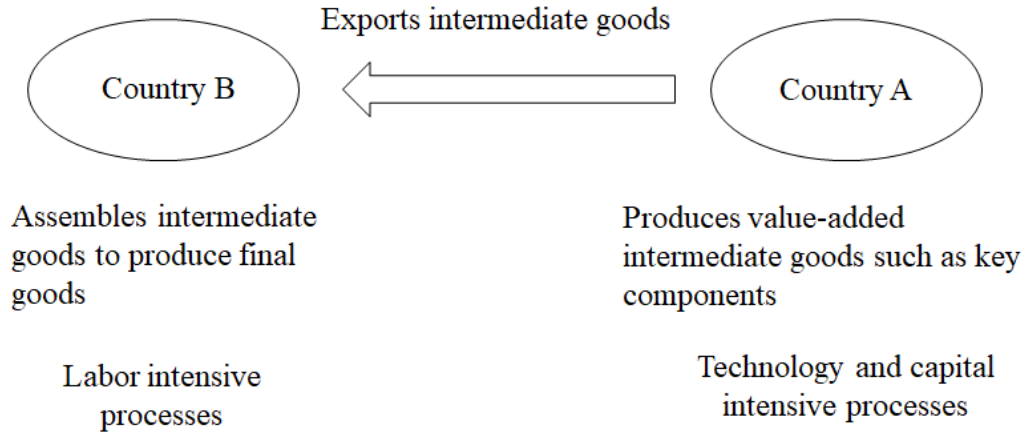
**Figure II-1-1-1-12　A model of international division of production**



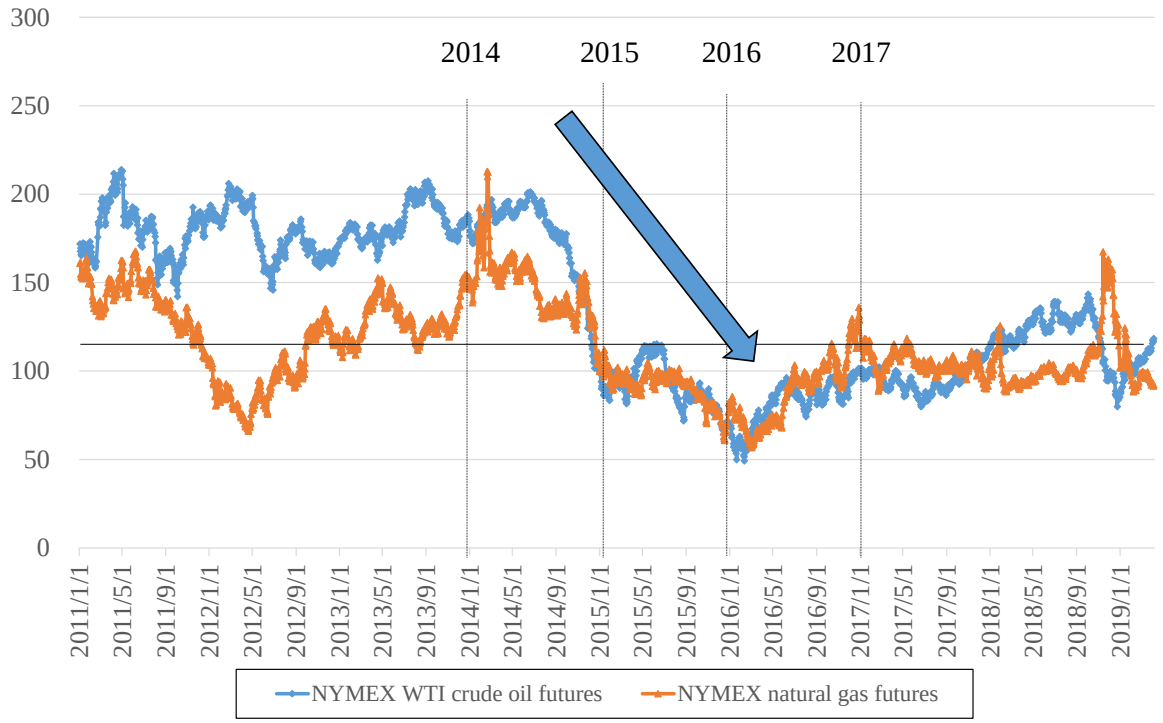

Links of international production activities mean that various countries cooperate with each other in completing a product. Production activities in each country are complementary to each other, causing each country to deepen mutual economic relations. If a problem occurs somewhere along the links of international production activities, that could affect not just one country but the entire system.

It has been pointed out that the growth of the value of trade including intermediate goods has been stagnant in the 2010's. Intermediate goods appear to have declined sharply compared with final goods, especially in 2015 and 2016.

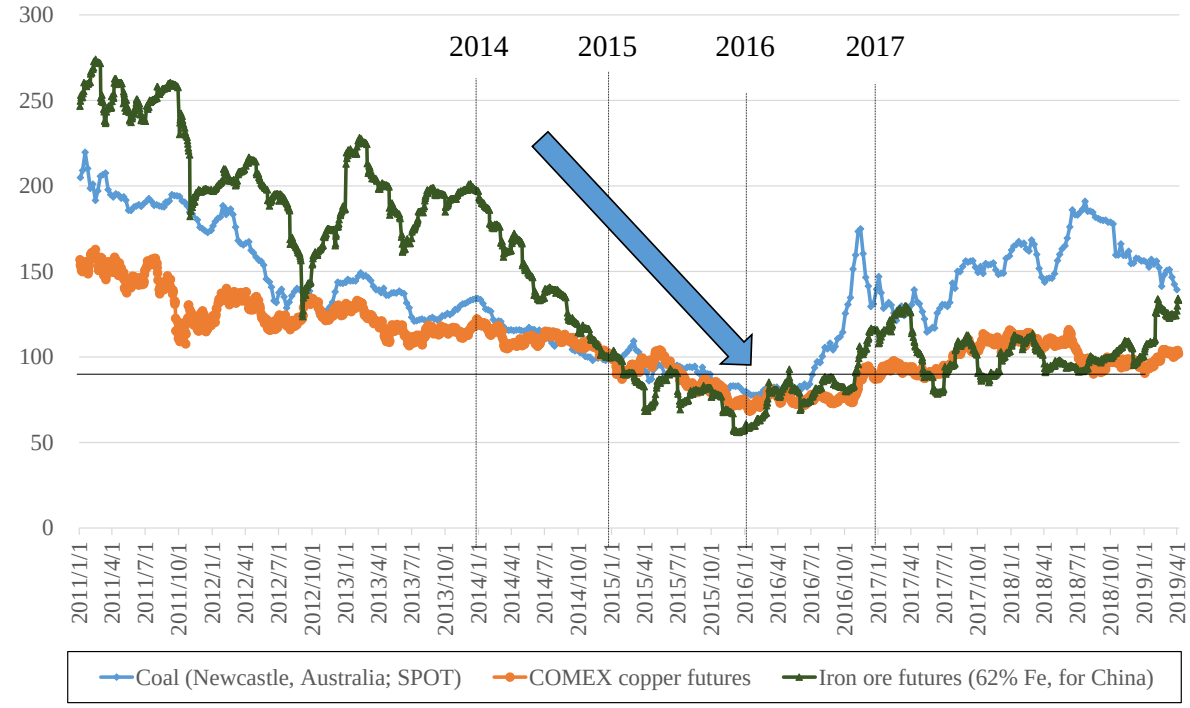
We think that the trade value of intermediate goods will increase as international division of production expands structurally. For instance, when production bases are transferred abroad through direct investments, exports of intermediate goods to new production bases will increase. If a number of companies increasingly transfer overseas, trade in intermediate goods will further expand accordingly. On the other hand, if intermediate goods come to be manufactured locally thanks to the entry of part suppliers or the improvement in the technological standards of local producers over years, exports of intermediate goods from the home country may decline. For instance, as seen below, the value of procurement from Japan has been more or less unchanged in recent years, as Japanese manufacturing companies have expanded local procurement in the ASEAN countries (See Chapter 3, Section 3). Intermediate goods do not necessarily increase faster than final goods, as such balance affects changes in the export amount of intermediate goods. In any way, the export amount of intermediate goods remains high and free trade among countries is still important. As for 2015 and 2016, in addition to such structural factors, a special factor of falling prices of natural resources may have had an impact. Both materials and intermediate goods declined in both years, while crude oil and other resource prices began to fall after peaking in the first part of 2014 (Figure II-1-1-1-13). Looking at the trade value of raw materials and intermediate goods by major sector, we find a sharp decline in oil and coal, the sectors vulnerable to resource prices, as well as a decrease in chemicals and steel. In contrast, intermediate goods (machine components), such as electrical machinery and transportation machinery, did not necessarily decrease (Figure II-1-1-1-14).

**Figure II-1-1-1-13 Changes in resource prices**

(Jan. 1, 2015 = 100)

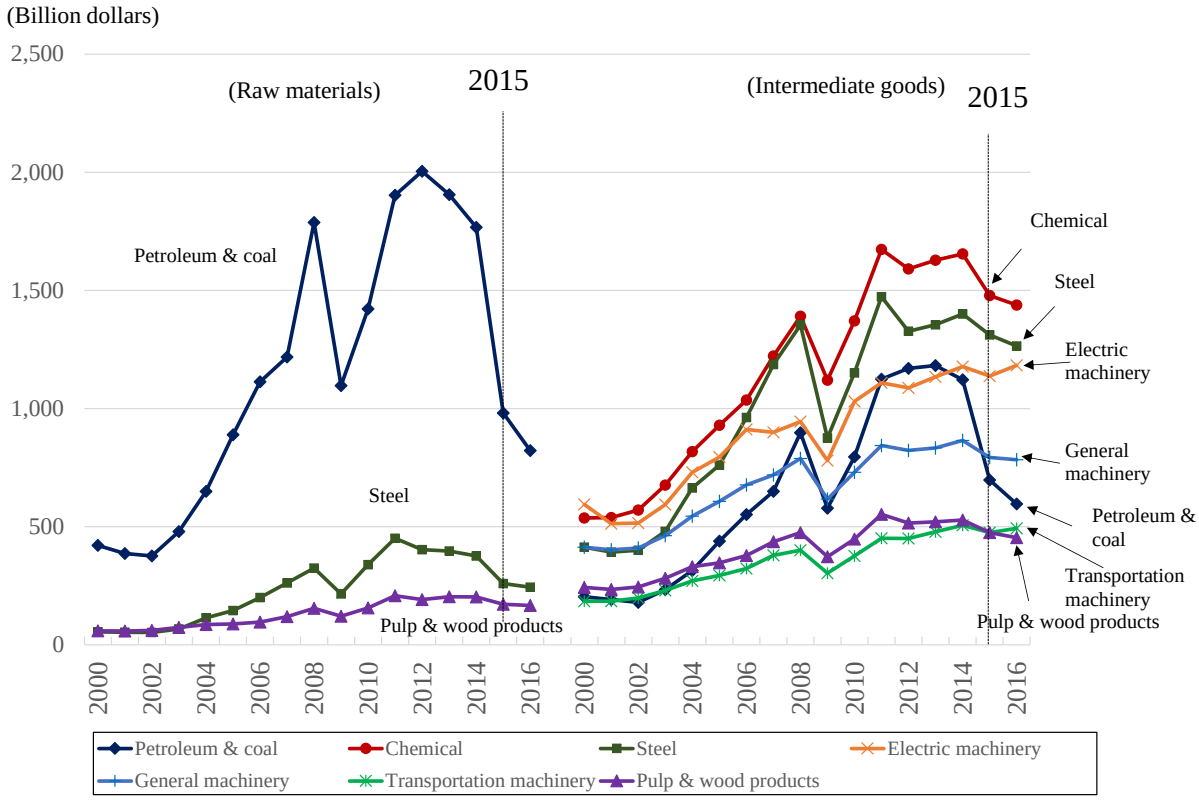



(Jan. 1, 2015 = 100)




Source: Thomson Reuters.

**Figure II-1-1-1-14 Breakdown of exports of raw materials and intermediate goods by major sector**

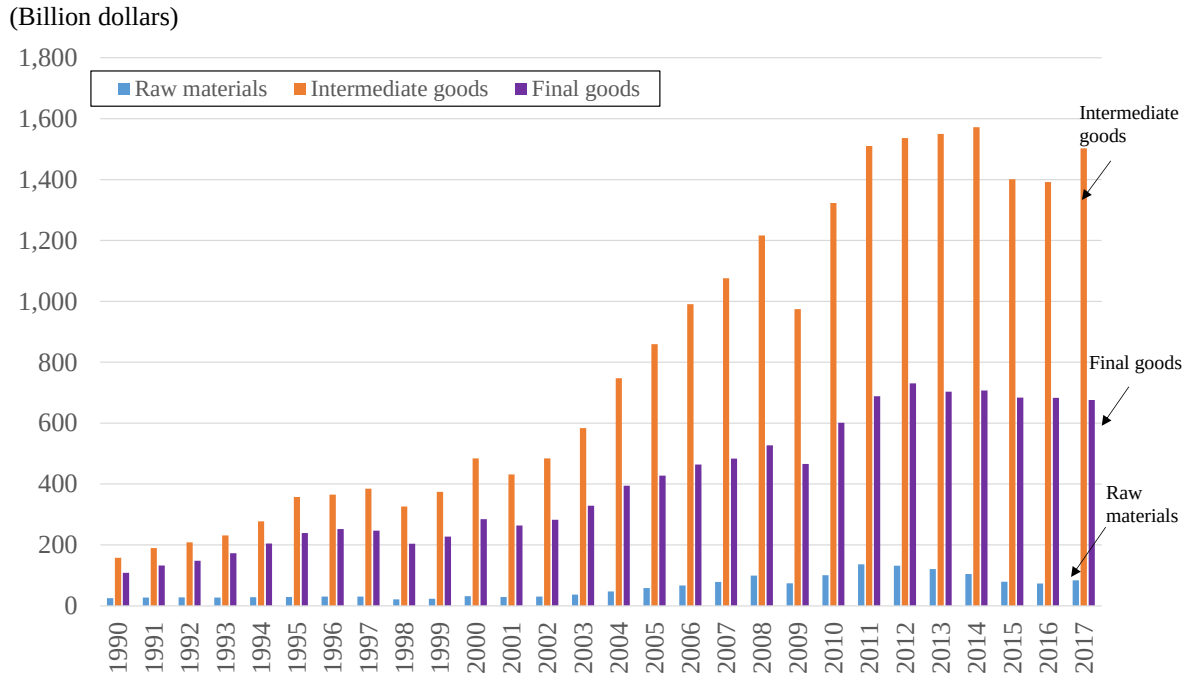



Notes: "Raw materials" refer to primary goods, such as crude oil, iron ore, and timber. "Intermediate goods" refer to products produced by processing primary goods, such as refined oil, crude steel, and pulp.
Source: RIETI-TID.

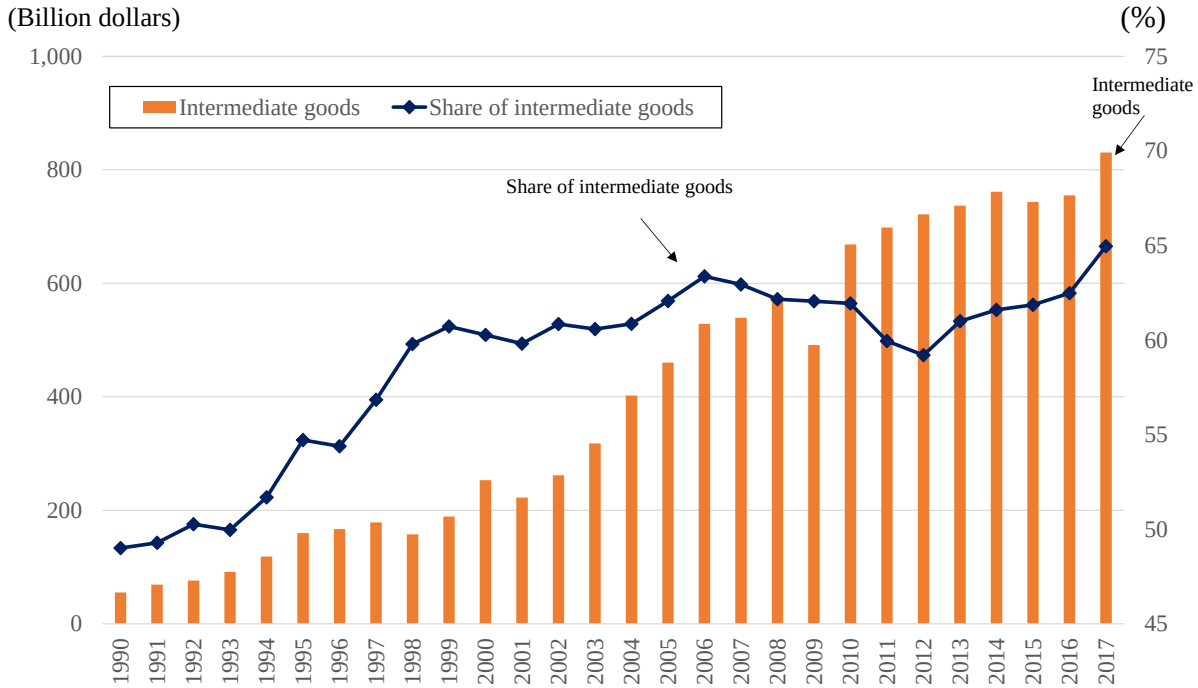
Across the world, East Asia including Japan is pointed as the most developed area for international division of production with a large share of intermediate goods, especially of the machine industry, in intra-regional trade in East Asia (Figure II-1-1-1-15).

**Figure II-1-1-1-15　Changes in intra-regional exports in East Asia**

(All industries)




(Machinery industry)



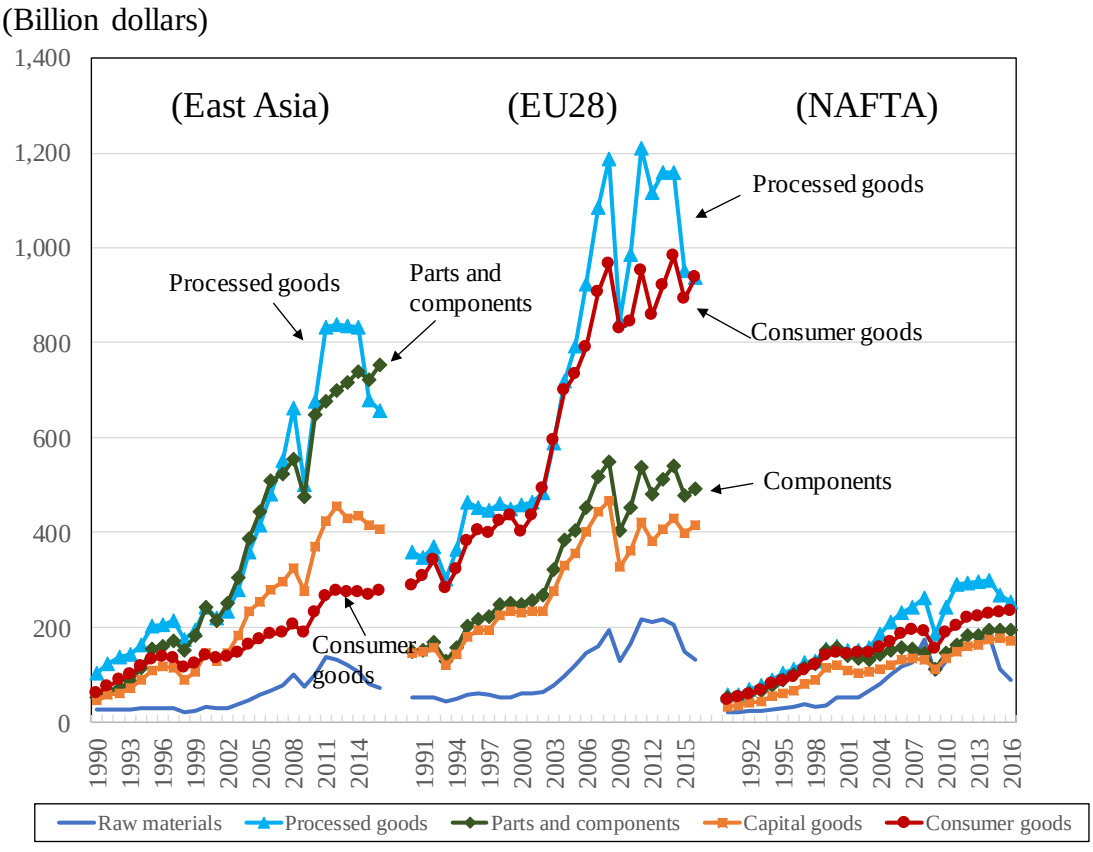

Notes:　Data compiled for general machinery, electrical machinery, household appliances, transportation machinery, and precision machinery.

Source:　RIETI-TID.

Characterized by two types of countries – developed countries with abundant capital and advanced technologies, and emerging countries with low-cost labor, East Asia offered beneficial conditions for development of international division of production. In the above-mentioned model, Japan and the Republic of Korea (ROK) manufacture key parts and other intermediate goods, while assembly is carried out in China and the ASEAN countries. Final products are sold locally, exported back to Japan and the ROK, and exported to the United States and Europe. Exports to the United States and Europe represent the so-called triangular trade.

If we compare the inter-regional trade of East Asia with that of other regions, it is obvious that the share of intermediate goods, parts and components in particular, is high (Figure II-1-1-1-16). Even though international division of production has been observed in other regions, East Asia has pursued international division of production within the region most clearly. In particular, China has expanded its exports to such a degree as to become known as "the factory of the world."

**Figure II-1-1-1-16　Inter-regional trade of major regions**




Source: RIETI-TID.

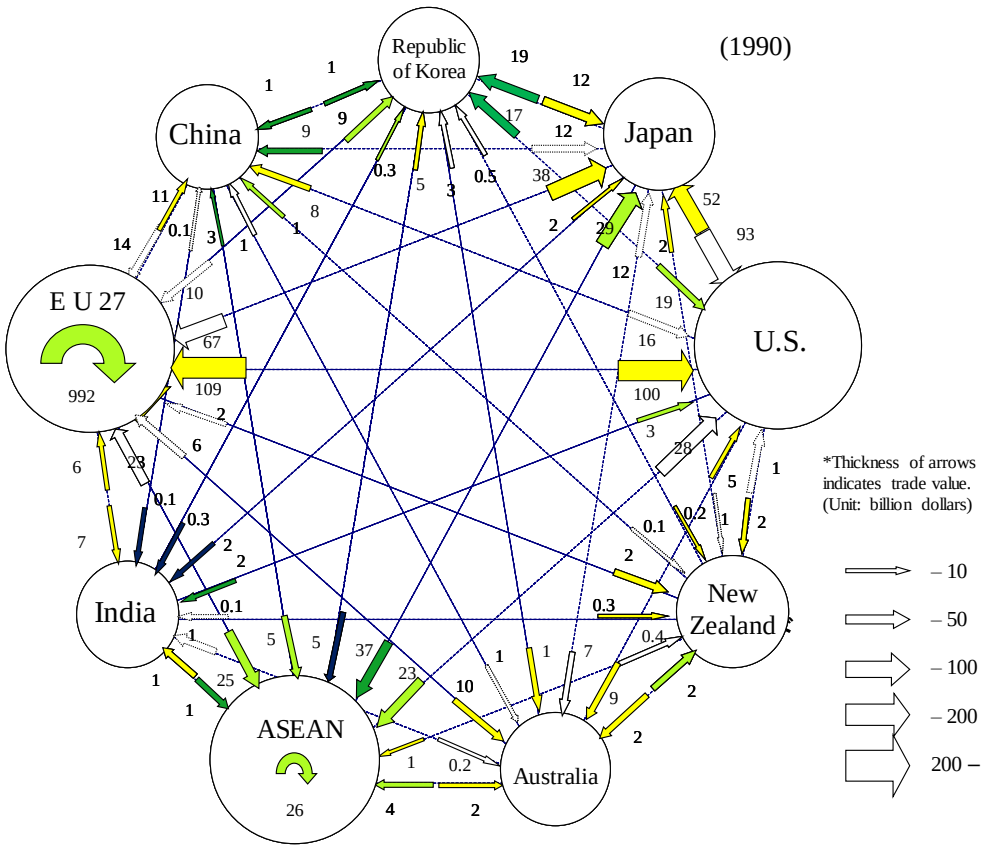
In East Asia, the trade structure in terms of composition by goods differs for intra-regional trade and external trade, especially for developed countries such as the United States and Europe. Intermediate goods (machinery parts, processed goods such as steel and chemicals) were main items in intra-regional trade. Among final goods, the trade value of capital goods (machine tools, construction machinery, and

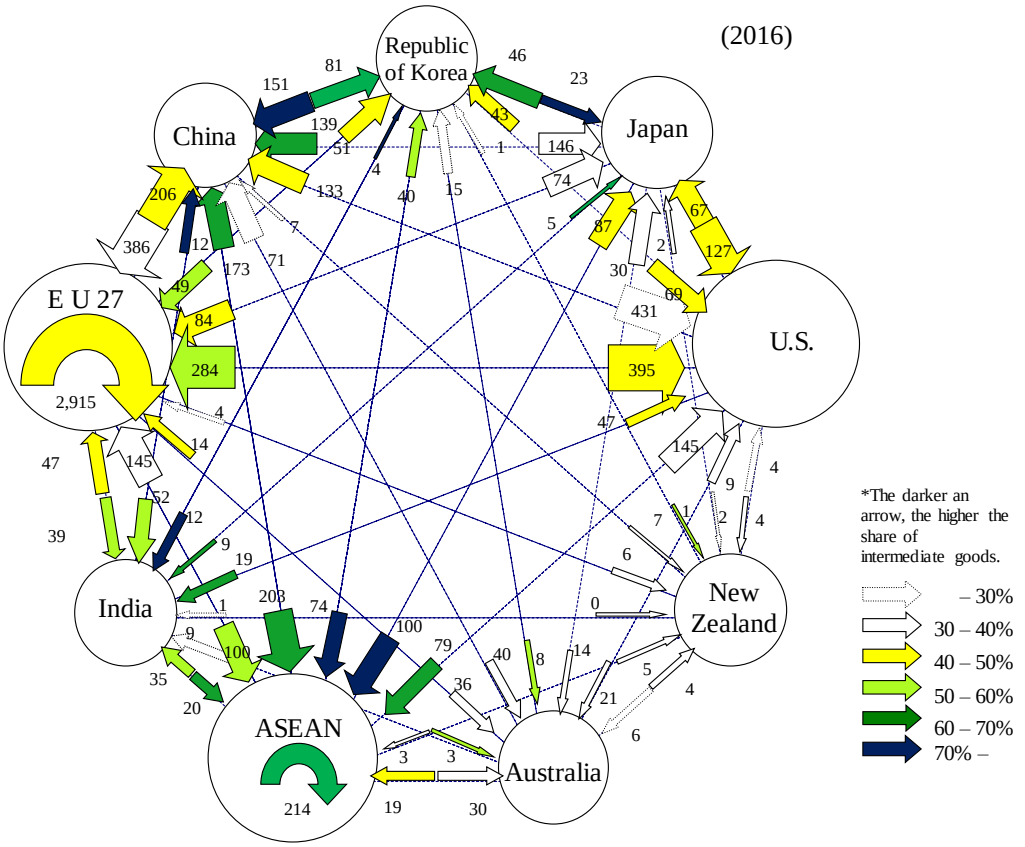
personal computers) is larger than that for consumer goods, highlighting that trade is geared more for production. In contrast, final goods assembled within the region account for a higher share in exports outside the region. Within the East Asia region, the share of exports of final goods is high in Japan and the ROK.

The trade flows between East Asia and the major regions in the world are mapped in Figure II-1-1-1-17. The arrows represent the trade flows. The larger an arrow, the larger the trade value, and the darker a color, the higher the share of intermediate goods.

Comparing 2016 with 1990, we found that there was not much trade of intermediate goods in Asia in 1990, but by 2016, the arrows became larger and darker in color, indicating expanding trade of intermediate goods. Within Asia, intermediate goods are exported from Japan and the ROK to China and the ASEAN countries, and intermediate goods are also exported within the ASEAN countries and between China and the ASEAN countries. On the other hand, China and the ASEAN countries export mainly final goods to the United States and Europe. Their exports of final products assembled using imported intermediate goods to third countries, indicates the existence of triangular trade. In Asia, many countries take an active part in GVCs and have established more complex inter-dependencies.

**Figure II-1-1-1-17　Global flow of trade**






Source: RIETI-TI.

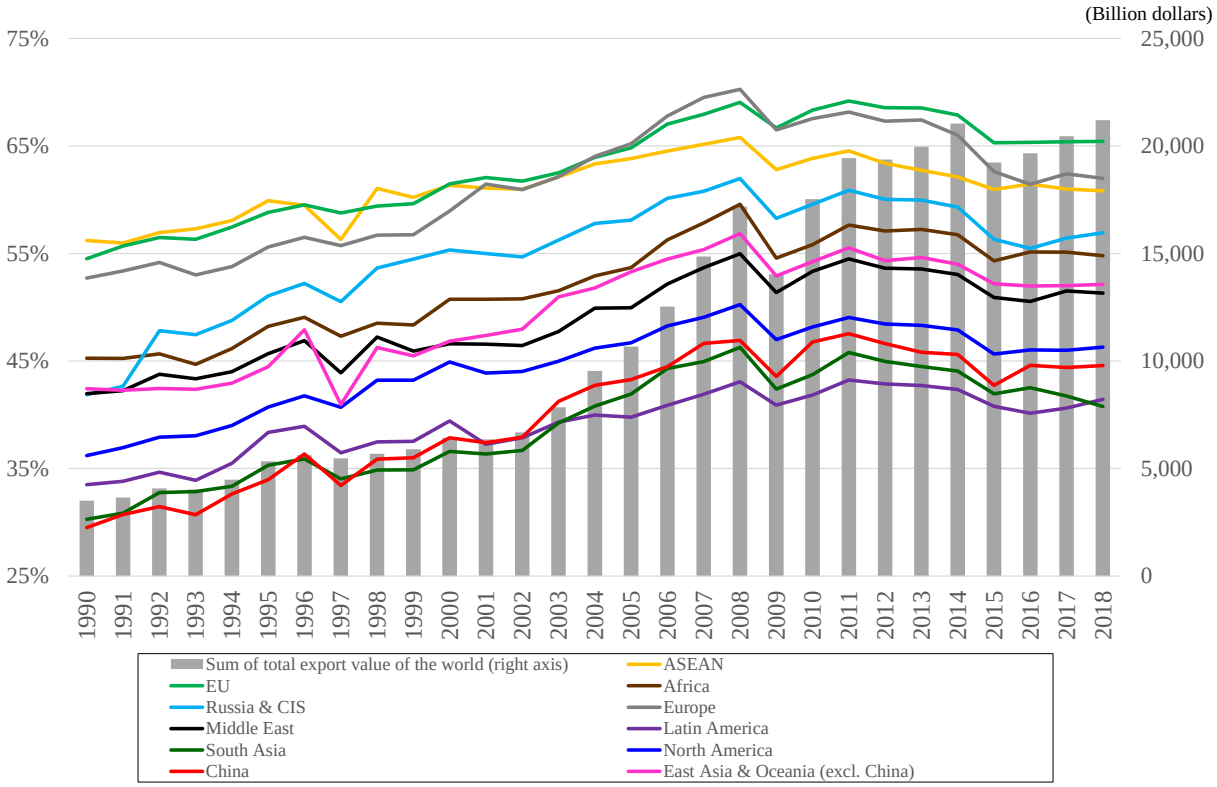
**(3) Upcoming globalization**

Opinions differ as to whether or not the GVC will expand further in the world in the future. One view argues that billions of low-cost workers in the world wish to join in the GVC, many governments are making efforts to join in the GVC, manufacturing work will continue to pour into low-cost developing countries from high-wage developed nations, and such developing countries as recipients of such flow will continue to increase.[16] Another view claims that the GVC of the general machinery industry in East Asia will continue to grow in the future, as parts trade for the general machinery industry in East Asia via the GVC has been revived in the regional trade, even though global trade has remained virtually unchanged since 2011 after recovering from the global financial crisis.[17]

On the other hand, some claim that the pace at which the GVC is expanding has slowed after peaking in 2011, weighed down by rising labor costs in Asia, digitization, automation, and service-oriented strategies of companies.[18] In line with the slowdown of the increase of the total export value of the world, the ratio of GVC-related exports to total exports seems to be stagnating (Figure II-1-1-1-18).

16 Baldwin (2018), p 358
17 Obashi, A. and Kimura, K (2018) and Obashi (2018), pp 22-47.
18 OECD (2018).

**Figure II-1-1-1-18 Ratio of GVC-related exports to total exports**




Notes: GVC exports refer to foreign value-added included in total exports of a nation or a region and value added of a nation or a region exported from foreign countries. As these use foreign value-added domestically for export and foreign countries use the home country's value-added for export, the size of this value and its growth rate is assumed to indicate the involvement in GVC.
Source: UNCTAD-Eora GVC Database.

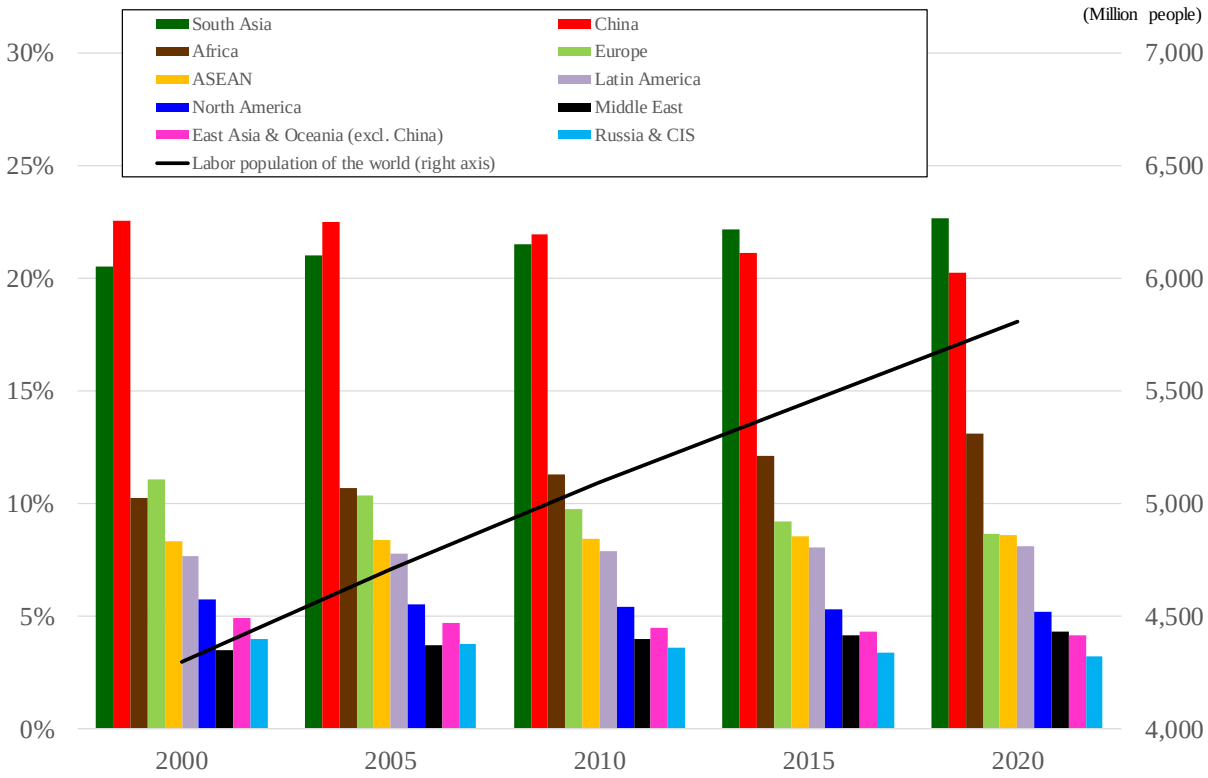
The GVC has expanded in emerging/developing economies mainly because companies have transferred part of their production processes to developing countries where cheap labor is available. The theory that division of labor between processes will depend on the size of overall benefits to be gained after the comparison of costs companies can save and cost that will newly increase (costs for transportation, investment, and training of human resources) may be insightful to determine whether further globalization will occur among companies, amid the slowdown of the sharp increase in the trade value of the world since 2000.

Wages are currently rising in China and may hinder the GVC, but it may raise the possibility of the GVC spreading to lagging developing countries where wages are still low. If new technologies are introduced into production processes and it is no longer necessary to consider cost advantage to be captured in developing nations, production bases may be re-established in the home country, where transportation costs are not needed. Other factors that may affect the formation of the GVC include rising transportation costs due to the sharp increase in resource prices, the implementation of regulations in various countries, and the occurrence of disasters.[19] Looking at the regional distribution of the working age population of the world, we see that the percentage is higher in South Asia, China, and Africa, possibly prompting industries requiring many workers to deploy the GVC in these regions

19 Kuroiwa (2019).

(Figure II-1-1-1-19).

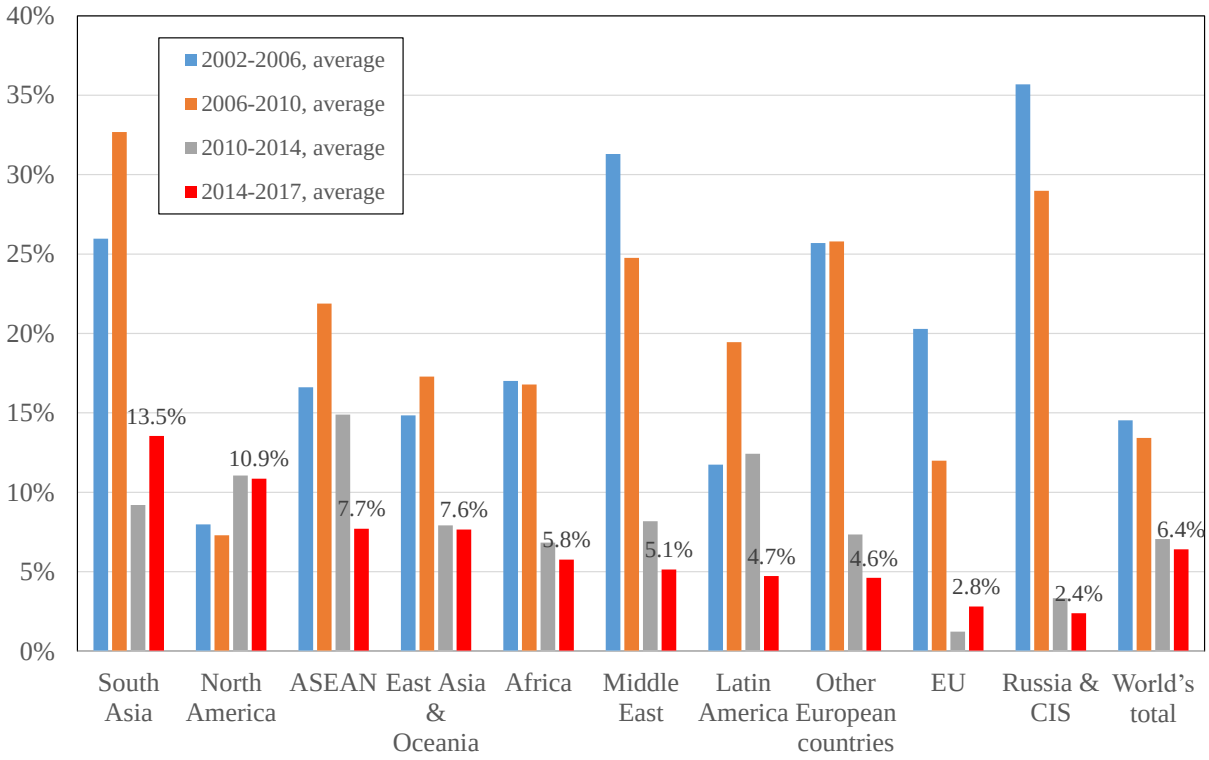
**Figure II-1-1-1-19　Share of region or countries in the working age population of the world**




Source: The International Labor Organization (ILO) Employment-to-population ratio, Nov 2018.

The spread of the GVC will be observed to some extent by looking at the trends of foreign direct investments, mergers and acquisitions. Admitting that not all direct investments lead to the GVC of companies, the growth of the outstanding inward direct investment of the world slowed down in most regions after 2010 as compared with the early 2000's, indicating that the GVC has stagnated after peaking in 2011, as claimed by the OECD. On the other hand, South Asia posted a ratio higher than that of world total, followed by North America, the ASEAN countries, East Asia, and the Pacific. In addition, since the percentage of outstanding inward direct investment to nominal GDP is lower in South Asia than in other regions despite its size, the South Asia region may be more significantly involved in the GVC by expanding ties with foreign companies through rising inward direct investments (Figure II-1-1-1-20).

**Figure II-1-1-1-20 Growth rate of outstanding inward direct investment by region**




Notes: Calculated growth rates of 2002-2006, 2006-2010, 2010-2014, and 2014-2017 by simply averaging each year's year-on-year growth rate for these periods.

Source: UNCTAD (2018).

**Column 5　Consideration on trade in value added**

It is pointed out that since the GVCs, based on international division of production, has developed, the real conditions cannot be captured only on the basis of trade statistics.[20] In this section, we will consider analyzing the GVCs from a different perspective by utilizing the OECD TiVA database.

By using the OECD TiVA database, we can analyze what was difficult to capture in the conventional trade statistics. We have already looked at the ratio of value added exports in domestic production in this Chapter. In addition to this, (A) it is also possible to divide the value added included in each country's imports and exports by originating country; (B) if the value-added by originating country is known in bilateral trade between certain countries, it is possible to roughly estimate the value added for each originating country, which will be affected in case a trade restricting measure is introduced between the two countries;[21] (C) it is possible to analyze places of final demand for a country's value-added exports; and (D) combining these above, it is possible to draw up the overall picture of routes of value-added exports, countries of final demand, and the type of final demand (whether it is final consumption or capital formation) of each country. In Section 2 of this Chapter, we will examine the possible effects of trade restricting measures between the United States and China, using (A) and (B). In Chapter 3, Section 2, we will examine the GVCs around Japan, using (C) and (D).

In this Column, we will reexamine how to interpret value-added statistics before starting to analyze each section. For example, exports from Japan to the United States amount to 137 billion dollars in 2015 under the traditional statistical method.[22] However, Japanese exports may include intermediate goods imported from another country. The value added originating Japan and value added of another country can be separated under the OECD TiVA database. According to it, value added produced in Japan totals 120.1 billion dollars (value added worth 16.9 billion dollars was created abroad) of Japan's exports to the United States.

On the other hand, if Japanese companies export to their overseas affiliates, etc., intermediate goods, which are then processed or assembled, and exported to the United States in international division of production, Japan's value added is exported to the United States via a third country. Many of Japanese manufacturing affiliates conduct businesses in Asia, with Japan's value added worth 91.3 billion dollars exported to China, 83.9 billion dollars to the ASEAN countries, 40.1 billion dollars to ROK, and 31

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20 Data of Japan's foreign subsidiaries (based on Basic Survey on Overseas Business Activities) can be used to analyze procurements from Japan as well as sales by buyer country, but the performance of foreign companies importing intermediate goods from Japan falls outside the scope of the analysis. It has already been noted that about half of exports from Japanese manufacturers go to companies that do not have any capital relationship. In that sense, it is possible to analyze supplementary international ties regardless of the nationalities of companies by highlighting value added produced in Japan and examining how it moves internationally. However, in that case, it should be noted that value added produced by Japanese companies' foreign subsidiaries is regarded as value added of the country where the foreign subsidiaries are based.

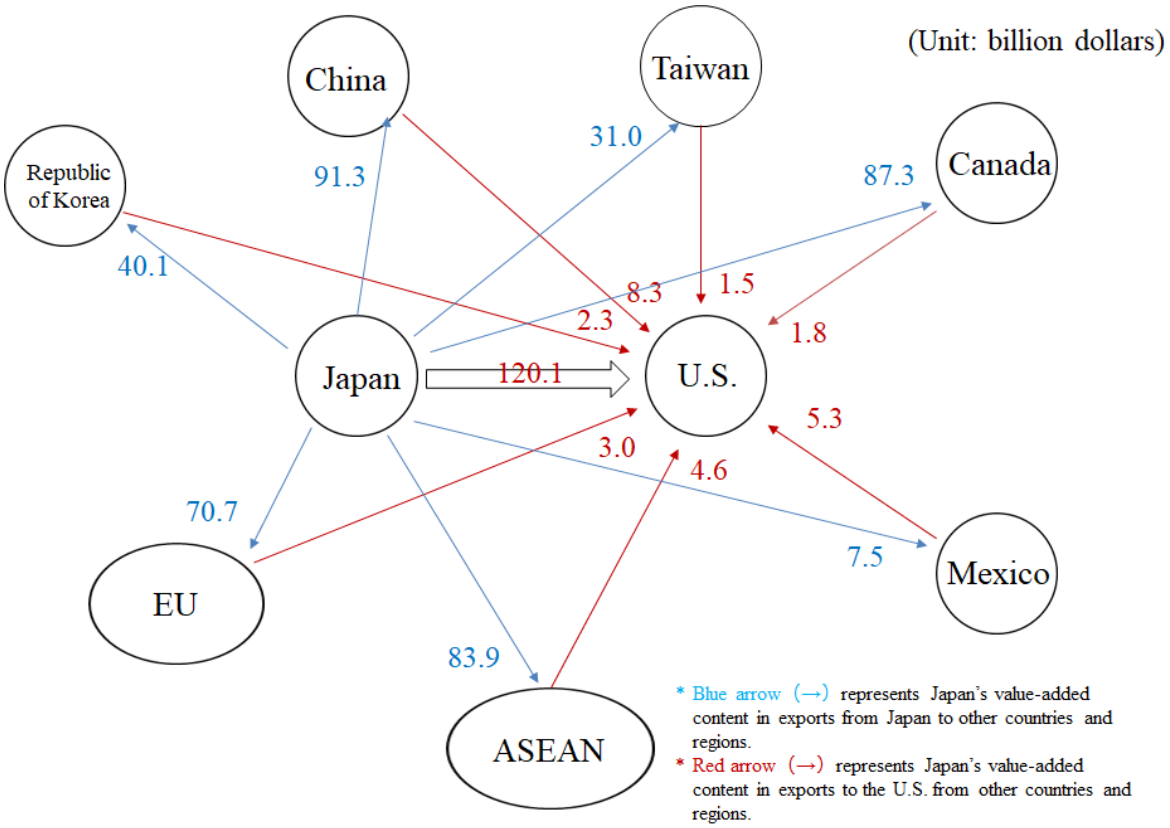
21 OECD TiVA is the result of estimates made with certain assumptions on the basis of the international input-output table and it should be treated just as a barometer.

22 Since the OECD TiVA database covers services as well as goods, its figures are larger than customs statistics which only cover goods.

billion dollars to Taiwan[23] (Figure Column 5-1). Japan's value-added is also included in exports from these countries to the United States, with the value from China estimated at 8.3 billion dollars, that from the ASEAN at 4.6 billion dollars, that from the ROK at 2.3 billion dollars, and that from Taiwan at 1.5 billion dollars. Similarly, Japan's value-added is exported to the United States via Mexico and Canada, the two countries adjacent to the United States, and the EU.

Since more goods and services of a host country are used in production activities, in the case of exports via a third country, the volume of Japan's value added accounts for a lower share in exports, compared with cases of direct exports. For instance, Japan's value added accounts for 86.8% of Japan's exports to the world, while Japan's value added accounts for 1.6% of China's, 3.3% of the ASEAN's, 2.9% of Republic of Korea's, and 4.1% of Taiwan's exports to the world.

**Figure Column 5-1 Japan's value added exports to the United States and major third countries/regions (2015)**




Source: OECD TiVA.

To summarize, the United States' imports from Japan total 137 billion dollars under the traditional statistics, of which Japan's value added amounts to 120.1 billion dollars (Figure Column 5-2). This is the direct import from Japan, and Japan's value added through indirect import via a third country comes to 29.1 billion dollars. Total value added that the United States imports directly and indirectly from

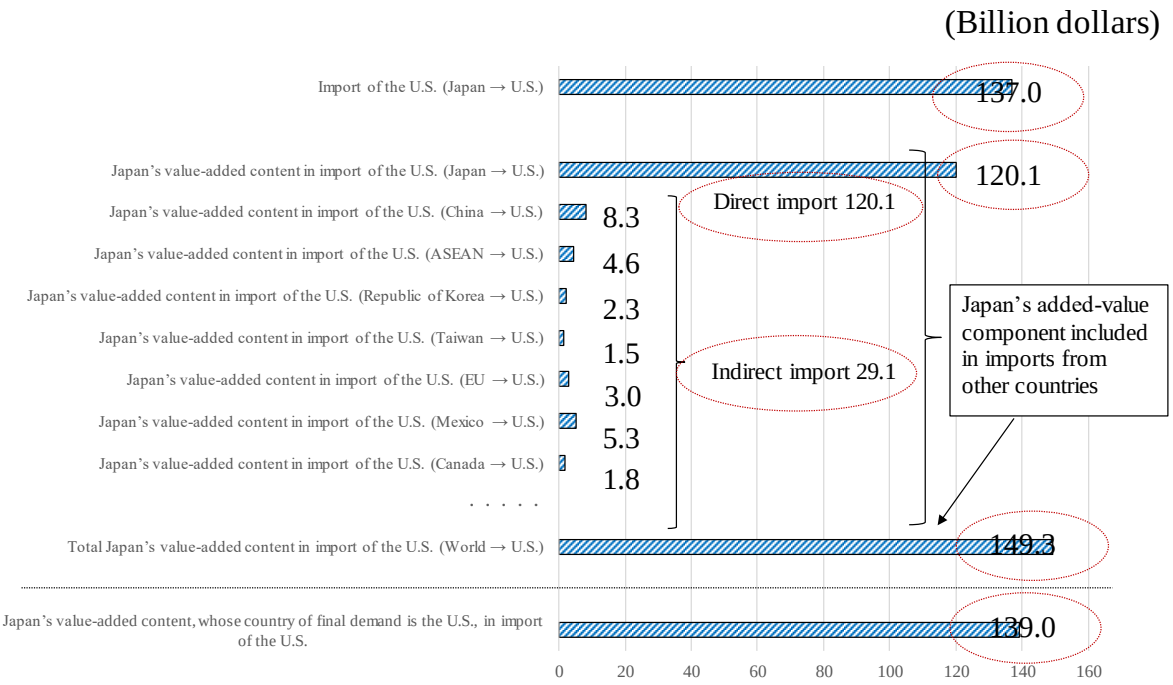
23 The value of value-added included in Japan's exports to other countries. To make it easier to understand, we use the term "exports" here. To be accurate, the figures in Figure Column 5-1 represent the value of value-added in "imports" between two nations or regions in the OECD TiVA database.

Japan reaches 149.3 billion dollars, but not the entire value is for demand in the United States. Some is processed, assembled, and exported to a third country, and Japan's value added worth 139 billion dollars goes to the United States as the country of final demand.

Japan's valued added moves around the world through the GVCs, and it is possible to compile statistics from various perspectives. It is not possible to determine which figures are correct and which ones are incorrect, but caution is advised, as different statistics have different meanings.[24] If trade restricting measures are introduced, whether a country may or may not be affected may change depending on the trade routes.

If trade restricting measures are introduced between the United States and China under the set-up shown in Figure Column 5-1, value-added exports from Japan via China (such as electronic components for smartphones) may be affected, which in turn may affect Japan's exports to China. Japan's exports to China include value added to be re-exported to the United States, as well as value added to stay in China as the country of final demand, such as machine tools used in capital spending, which may also be impacted.

**Figure Column 5-2　U.S. imports from Japan**




Source: OECD TiVA.

Although this explanation is based on a simple structure of Japan to a third country and the third country to the United States, the reality is more complex, involving flows of value added from Japan between the third countries. For instance, a part of the value added exported from Japan to the ROK

24 For the value of value-added exports from Japan to the United States, the value-added from direct exports worth 120.1 billion dollars or the value-added to stay in the United States as the country of final demand worth 139 billion dollars is easy to grasp.

may be re-exported to China and then to the United States as final products. In this case, exports from Japan to ROK may also be impacted.

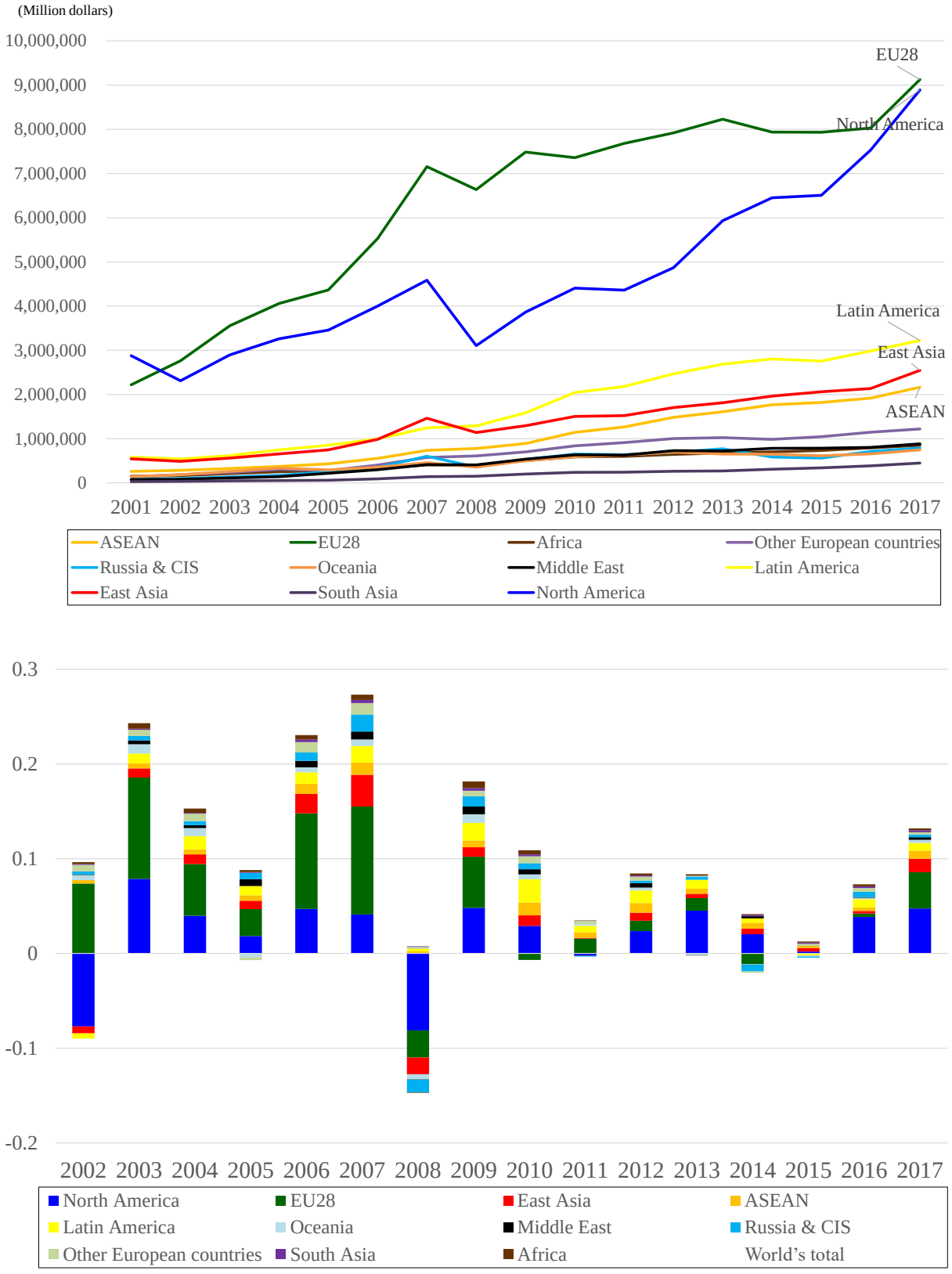
## 2. Globalization of capital

In the previous section, we examined how globalization progressed in terms of goods and services. In this section, we will review how globalization has developed from the viewpoint of capital (money).

### (1) Changes in direct investments

Looking at the flow of money in the world in terms of outstanding direct investments, we find that the value for the whole world has been increasing, but a large part of it is allocated to the EU and North America. There were times after 2000 when East Asia, the ASEAN countries, Russia, the CIS, and Latin America greatly contributed to the growth of outstanding direct investments, but in 2017, the United States and the EU contributed more and we believe that developed countries continue to receive a majority of investments in terms of the size of invested value (Figure II-1-1-2-1).

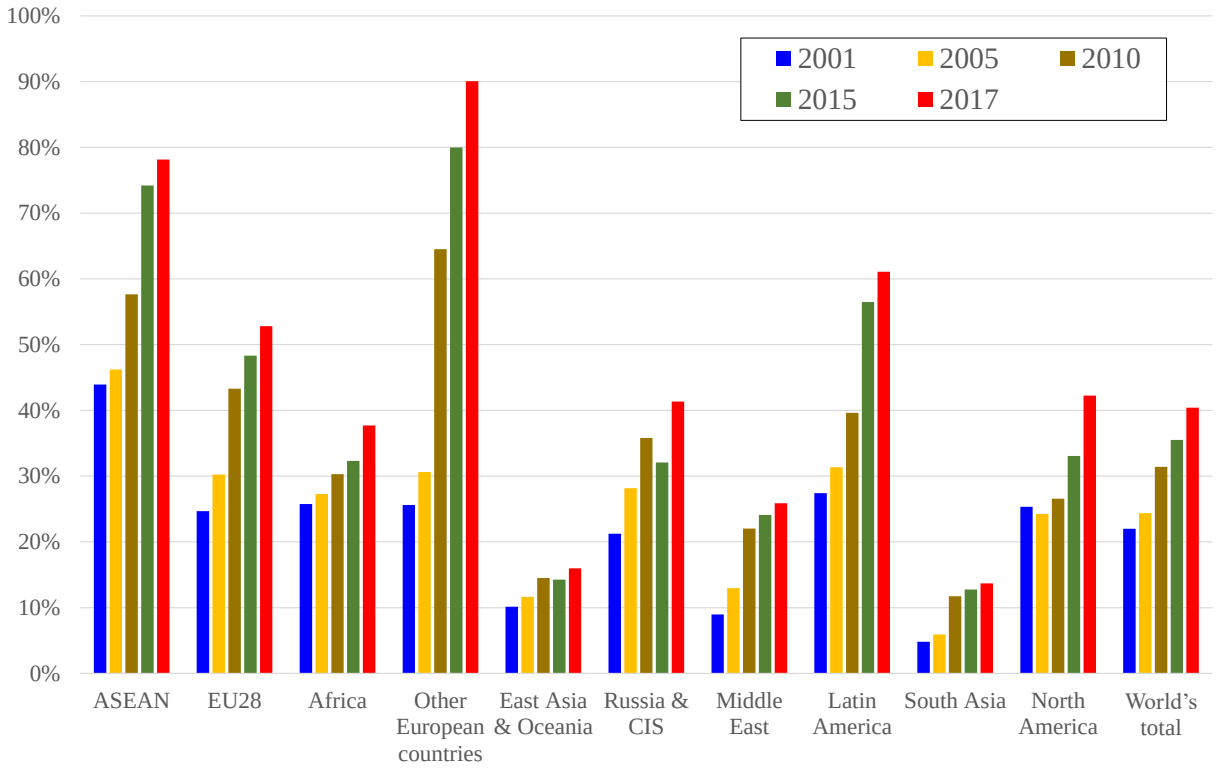
**Figure II-1-1-2-1 Outstanding inward direct investments by region and their growth rates as rate of contribution by region**




Source: UNCTAD (2018).

Although North America and the EU lead in terms of the total value of direct investment outstanding, the direct investment outstanding has been steadily rising in other regions and we think that the increase in inward direct investment from abroad has come to have certain impact to the economic growth of emerging/developing economies whose economic size is not large. Looking at changes in the percentage of the inward direct investment outstanding to nominal GDP of each region, we find that the percentage rose between 2001 and 2017 in every region, with more than 50% reported in the ASEAN, the EU, the other European nations, and Latin America as of 2017. On the other hand, the percentage of the inward direct investment outstanding to the size of GDP is relatively small in South Asia, East Asia and the Pacific, and the Middle East, and we believe that these regions have more room to receive investments than other regions, given the size of their economy (Figure II-1-1-2-2).

**Figure II-1-1-2-2 Changes in the percentage of inward direct investment outstanding to nominal GDP**

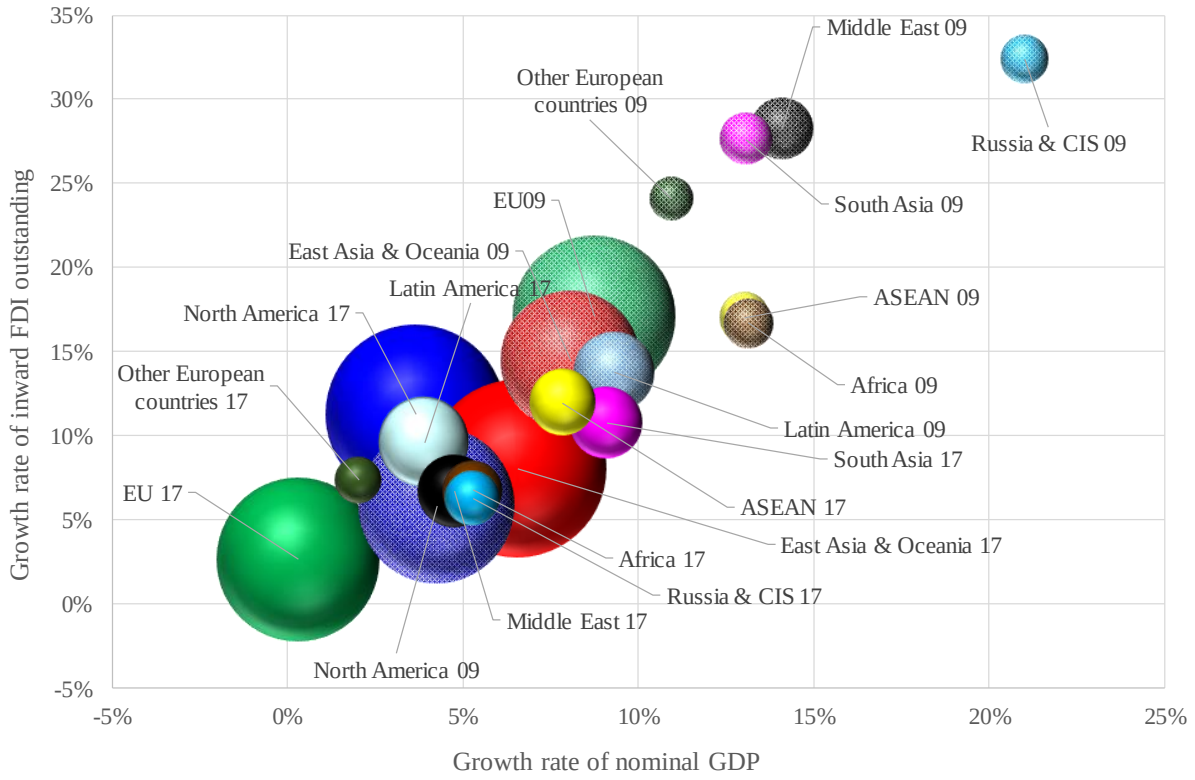



Source: UNCTAD (2018).

Let us look at changes in nominal GDP, its growth, and the growth rate of inward direct investment outstanding from 2009 until 2017. Although the value of nominal GDP of the regions consisting of emerging/developing economies was smaller than that for developed nations between 2002 and 2009, their average GDP growth rate was higher than 10% and the growth rate of their inward direct investment outstanding was generally above 15%, sharply exceeding the growth recorded by developed nations. In contrast, nominal GDP of the regions consisting of emerging/developing economies and the average growth rate of their inward direct investment outstanding fell to levels similar to those for developed

nations between 2010 and 2017, except for the ASEAN countries and South Asia, the two regions which maintained relatively high levels (Figure II-1-1-2-3).

**Figure II-1-1-2-3 Nominal GDP, changes in its growth, and the growth rate of inward direct investment outstanding (2009, 2017)**




Notes: The growth rate of nominal GDP and the growth rate of inward direct investment outstanding of "country name 09" and "country name 17" represent the average values of year-on-year growth rate for 2002-2009 and 2010-2017, and the size of the bubble represents the value of nominal GDP for 2009 and 2017.
Source: UNCTAD (2018), WDI of the World Bank.

Next, we clarify which countries or regions the United States, Japan, China, and Germany, the major capital suppliers for foreign direct investments, focus their investments on and build closer ties with by examining changes in the investment outstanding for their top 25 partner countnries/regions and its growth rate between 2009 and 2017.

The vertical line of the chart shows indices calculated by dividing (investments from country X to country Y/investments from country X to the world) with (investments from the world to country Y/investments from the world to the world), in order to compare which countries/regions the major nations focus on as destinations of their investments and give priority when making investments. If we take the United States in the chart below as an example, the United States carries out investments in Japan 3.8 times as large as those by the rest of the whole world, which means that the United States invests more money than the world's average in Japan and Japan is a comparatively important country for investment for the United States.

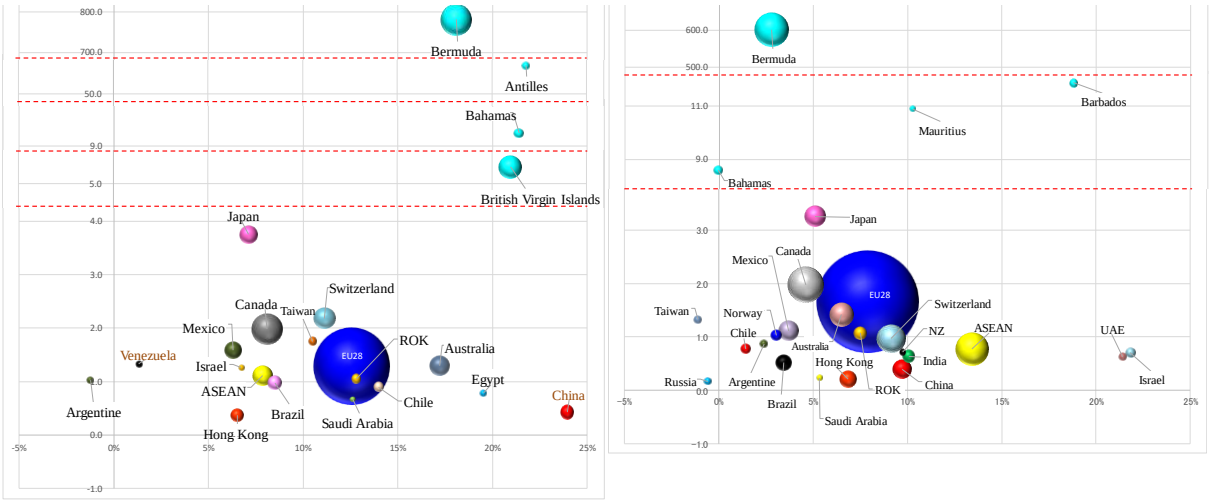
The United States provided the largest investments to the EU in 2009 and 2017. Canada and Japan

reported a comparatively large amount outstanding, albeit smaller than that for the EU, evidence that these nations are important destinations for investment with close ties. Additionally, tax haven countries such as Bermuda, Luxembourg, and the British Virgin Islands enjoy stronger ties.

The rising growth rate of investment outstanding to the ASEAN countries between 2009 and 2017 shows that the ties between the United States and the ASEAN countries were getting stronger, although their closeness was relatively modest. Among the top 25 countries/regions in terms of investment outstanding, Israel, the United Arab Emirates, India, and China enjoyed a high growth rate (Figure II-1-1-2-4).

**Figure II-1-1-2-4　Countries/regions as important investment destinations for the United States**

(2009)　　(2017)




Notes:　We used figures from UNCTAD for 2001-2011 and those from IMF CDIS for 2012-2017. The vertical axis represents the closeness of investment destination for 2001-2009 and 2010-2017 = average figures of (investments from country X to country Y/investments from country X to the world) ÷ (investments from the world to country Y/investments from the world to the world). The horizontal axis represents the average growth rate of year-on-year direct investment outstanding for the same periods. The size of each bubble represents the direct investment outstanding from the United States to each country/region. The same goes for Japan and Germany.

Source:　UNCTAD (2018), UNCTAD (2014) "Bilateral Investment Statistics," IMF CDIS. The same goes for Japan and Germany.

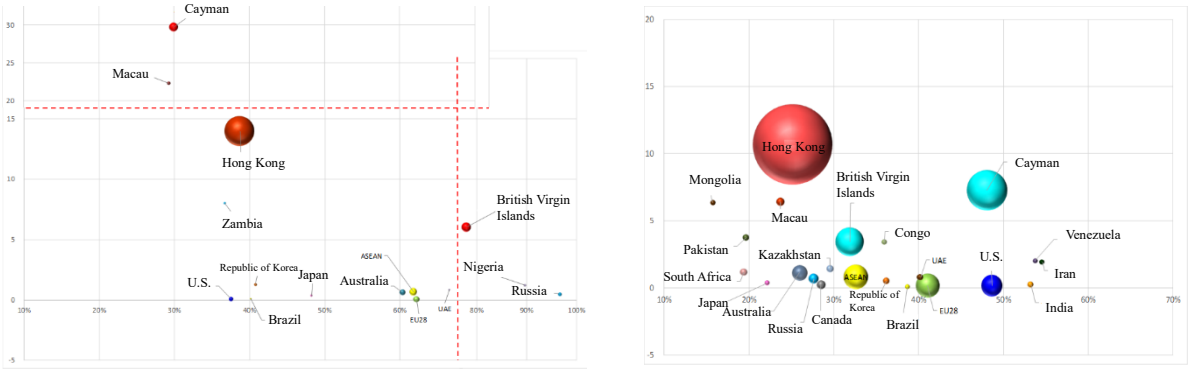
Let us look at changes in investment-related figures for China. China's investment outstanding to Hong Kong was by far the largest, more than 10 times the investment made by the rest of the whole world both in 2009 and 2017. Apart from Hong Kong, the amount outstanding was comparatively large for the Cayman Islands and the British Virgin Islands, implying that China gave priority to tax havens when making investments.

The figure shows that China more sharply increased the investment outstanding to the world compared to the United States, Japan, and Germany between 2009 and 2017 and also diversified destinations. During the same period, the growth rate of investment outstanding for any of China's top 25 countries/regions as investment destination remained more than 10%. As of 2017, the investment outstanding increased for the ASEAN countries, the United States, the EU, and Australia among the top

25 investment destinations and China also carried out active investments in Kazakhstan, Democratic Republic of the Congo, Pakistan, and Venezuela, countries which are not included among top investment destinations for developed economies. It can be assumed that China was building diverse relationships through investments with certain emerging/developing economies, as well as some developed countries/regions such as the United States and the EU. In addition, Laos, Zimbabwe, Tajikistan, Kyrgyzstan, Cambodia, Myanmar, Mongolia, Papua New Guinea, and Zambia were among the nations whose investment outstanding from China amounted to more than 1 billion dollars, more than 5 times the investment made by the rest of the world and which enjoyed strong ties with the country (Figure II-1-1-2-5).

**Figure II-1-1-2-5 Countries/regions as important investment destinations for China**

(2009) (2017)




Notes: We used figures from UNCTAD for 2003-2011 and those from the Statistics Bulletin of China's Outward Foreign Direct Investment for 2012-2017. The vertical axis represents the closeness of investment destination for 2003-2009 and 2010-2017 = average figures of (investments from country X to country Y/investments from country X to the world) ÷ (investments from the world to country Y/investments from the world to the world). The horizontal axis represents the average growth rate of year-on-year direct investment outstanding for the same periods. The size of each bubble represents the direct investment outstanding from China to each country/region in 2009 and 2017. Although China's investment outstanding in Japan was 26th, we included in the figures as reference.

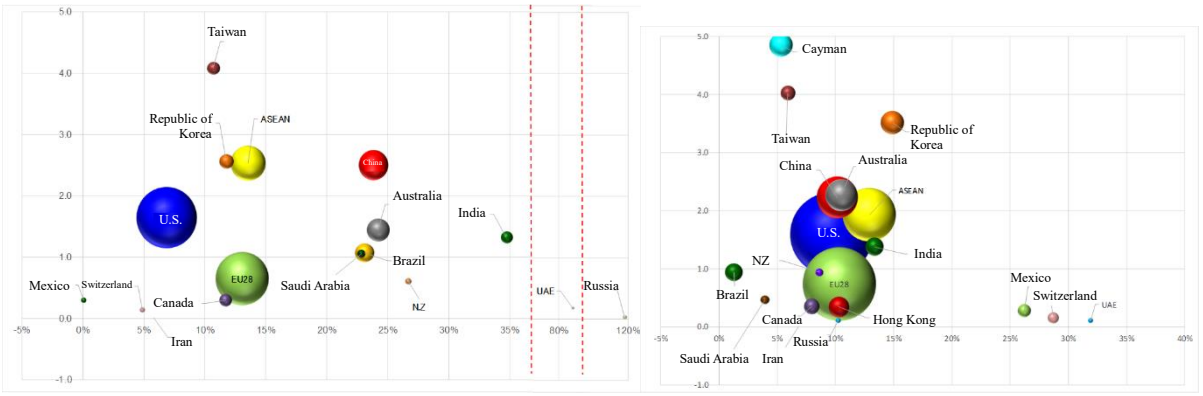
Source: UNCTAD (2018), UNCTA (2014) "Bilateral Investment Statistics," and the Ministry of Commerce of People's Republic of China (2018).

Looking at Japan's investment outstanding, we found that the growth rate for emerging/developing countries/regions including China, Brazil, and India exceeded 20% as of 2009, but the growth moderated since then, with only Mexico, Switzerland, and the UAE reporting more than 20% as of 2017. During the same period, Japan's investment outstanding in Mexico registered the highest growth of 6.1 times, followed by 5.2 times for the UAE, 4.8 times for the United Kingdom, and 4.7 times for Vietnam.

In terms of investment closeness, the Philippines scored 5.7, Thailand 5.6, Cayman Islands 4.9, Taiwan 4.0, and ROK 3.5, meaning that Japan gave priority to them as investment destinations, as compared with the rest of the whole world. Closeness was also high in the other ASEAN member countries, Australia and China, indicating that Asia and the Pacific region is a key investment region for Japan (Figure II-1-1-2-6).

**Figure II-1-1-2-6　Countries/regions as important investment destinations for Japan**

(2009)　　(2017)




Germany focuses its investments in the EU28 (excluding Germany), and although the growth rate of investment outstanding declined in 2010-2017, compared with 2001-2009, closeness went up. While the growth rate of investment outstanding for Germany fell sharply until 2017 compared with that for the United States, Japan, and China, Germany invested aggressively in emerging/developing nations/regions, with the investment outstanding in China growing by a factor of 2.7 times and that in India 3.2 times. Bermuda scored 13.7 in terms of investment closeness with Germany in both 2002-2009 and 2010-2017, albeit a relatively modest investment outstanding of 2 billion dollars. Among countries in which Germany's investment outstanding totaled more than 10 billion dollars as of 2017, Luxembourg recorded 13.7, Austria 5.2, Greece 3.4, Hungary 3.3, Czech Republic 3.1, and the Netherlands 3.0 in terms of closeness in 2010-2017, with other EU member countries also scoring high marks. Germany is not as close to Asia as are the United States, Japan, and China (Figure II-1-1-2-7).

**Figure II-1-1-2-7　Countries/regions as important investment destinations for Germany**

(2009)　　(2017)

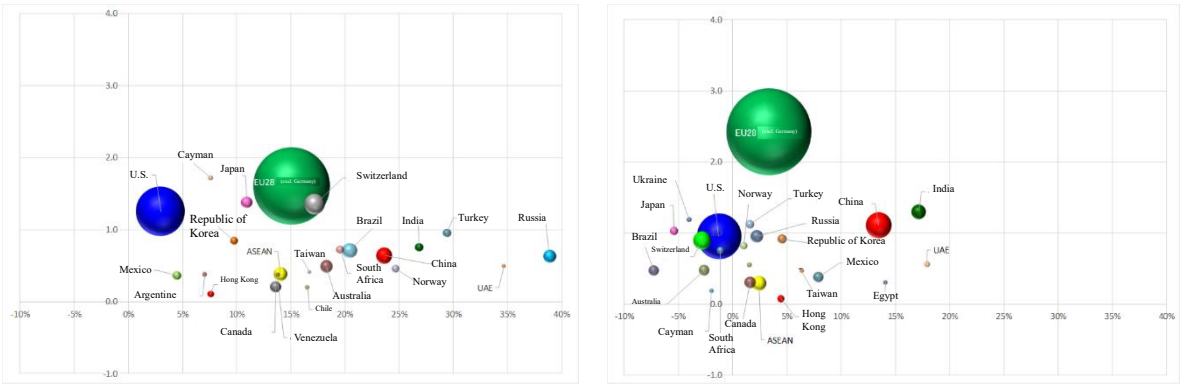
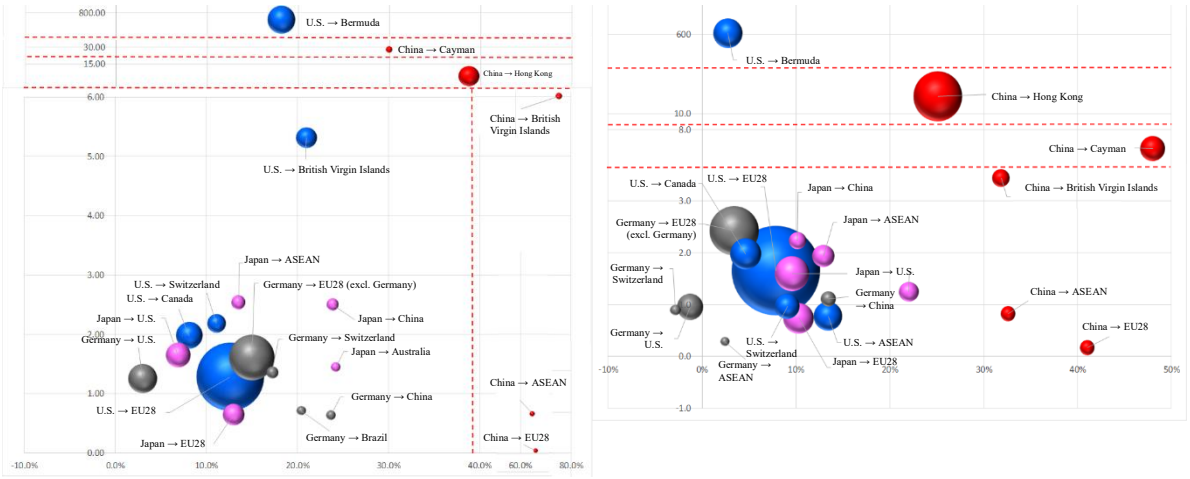


**Figure II-1-1-2-8 Key investment countries/regions for the United States, China, Japan, and Germany**

(2009) (2017)




Notes: Comparison of the top five countries/regions for the United States, China, Japan, and Germany in terms of direct investment outstanding in 2000 and 2017.

Source: UNCTAD (2018), UNCTA (2014) "Bilateral Investment Statistics," IMF, CDIS, and the Ministry of Commerce of People's Republic of China (2018).

The top five countries/regions in terms of investment outstanding for the United States, China, Japan, and Germany are displayed in the Figure above in order to compare the size of their investment outstanding. China was found to be making intensive and fast investments in tax havens as of 2017 (Figure II-1-1-2-8).

### (2) Overseas operations of global companies through establishment of networks of capital

#### (A) Overview of networks of capital

Manufacturing companies in developed countries have expanded their overseas bases searching for regions with low manufacturing costs or large size of markets. In the case of Japan, Japanese companies often establish manufacturing bases in Asia, taking advantage of its conditions for location and, manufacture with some parts procured from Japan and sell locally or export to a third country, or manufacture in key markets such as the United States and neighboring regions. How other major nations develop their businesses overseas? In recent years, many companies from emerging countries, as well as developed nations, have been conducting business overseas. It reveals that companies are diversifying their overseas businesses, while focusing on manufacturing and sales.

In this section, we will outline differences in global operations conducted by manufacturing companies of major countries by region and sector and review the weight of overseas business among manufacturing companies.

Here, we will use the ORBIS database[25] provided by Bureau van Dijk to examine overseas operations of companies from various nations. The database covers company information in 207

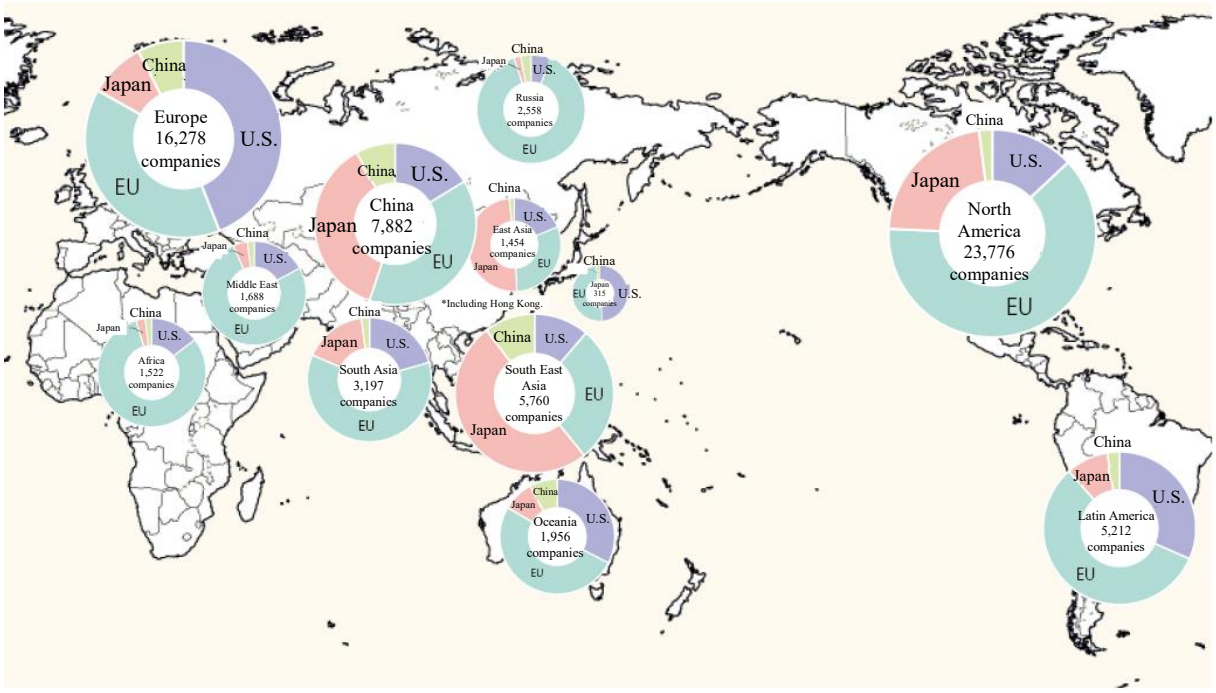
25 In the Figures, Bureau van Dijk is abbreviated as BvD.

countries in the world through 160 data providers worldwide. It is remarkable in that it covers as many as some 300 million companies with information on their shareholders, allowing users to capture capital relationships between companies around the world. However, it is necessary to be mindful that that the percentage of companies listed and details of financial information vary depending on the region.

First, we will outline the geographical distribution of companies in order to identify regions where companies from major countries have strong presence.

Figure II-1-1-2-9 shows the percentages of companies from Japan, the United States, China, and the EU that provide capital[26] to overseas manufacturing companies by mother country (the percentage of the four countries/regions to the total).[27]

**Figure II-1-1-2-9 Distribution of overseas (manufacturing) companies that are (more than 25%) financed by companies from Japan, the United States, China, and the EU**




Notes: Distribution of overseas companies (excluding these countries/region) that are more than 25% financed by companies that reside in Japan, the United States, China, and the EU (based on the number of companies).
Source: BVD "ORBIS."

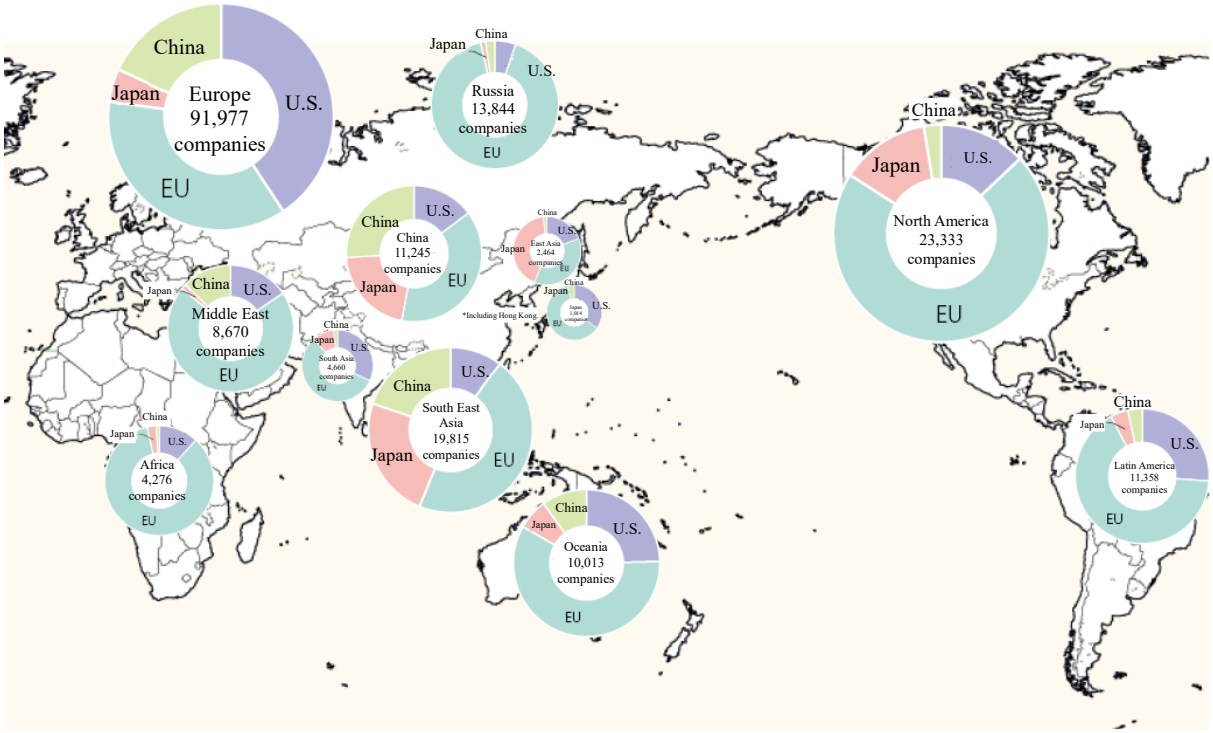
Looking at entry into emerging countries, the EU accounts for a high percentage in both the manufacturing and service sectors in the Middle East, Africa, and Russia. In these regions, 70-80% of foreign companies that appear in the database are from the EU.

26 Providing more than 25% of capital. Subsidiaries operating business and having one of (A) financial data since 2015, (B) address and telephone number, or (C) address and email address listed in ORBIS.
27 The size of the pie chart is based on the total number of overseas subsidiaries whose parent companies reside in the four countries/region. Please use it for reference only, as the number of companies included in the database is small in some regions.

Comparing Japan and China, we find that as a whole there are more Japanese companies than Chinese one providing capital to the manufacturing industry, however, more Chinese companies are located in Russia and the percentages are similar in Europe and Oceania. As for the service sector, some regions have more Chinese companies and the others have, more Japanese one. More Chinese companies are located in Europe, Russia, Oceania, and the Middle East, while more Japanese companies are found in East Asia, South Asia, North America, and Africa.

The comparison of manufacturing companies from Japan and the EU shows that there are around three times more companies from the EU than Japan in North America, about four times in South Asia, about six times in Latin America and Oceania, and more than 10 times in the Middle East and Africa. On the other hand, the percentages are almost the same in China and Hong Kong. Thenumber of Japanese firms is twice as many as that of companies from the EU in Southeast Asia and East Asia. As for the service sector, more companies from the EU are based in all regions except in East Asia. Companies from the EU total more than 10 times the number of Japanese companies in Russia, the Middle East, Latin America, and Africa, and nine times in Oceania, more than five times in North America and South Asia, and just short of two times in Southeast Asia and China including Hong Kong.

**Figure II-1-1-2-10 Distribution of overseas (service) companies that are (more than 25%) financed by companies from Japan, the United States, China, and the EU**




Notes: Distribution of overseas companies (excluding these countries/region) that are more than 25% financed by companies that reside in Japan, the United States, China, and the EU (based on the number of companies). Excluding finance and insurance.

Source: BVD "ORBIS."

Comparing the United States and the EU, we find that companies from the EU have a larger percentage than that from the United States in general. Nevertheless, the percentage of the United States in comparison with the EU is higher in Japan, a similar percentage in the manufacturing sector and less differences in service sector compares with other regions. The difference between the United States and the EU is smaller in the service sector in South Asia and East Asia, as well as the manufacturing sector in Oceania, East Asia, and Latin America, indicating the comparative advantages of the United States in those regions.

As mentioned, Japan has stronger presence in the manufacturing sector compared to Southeast Asia, East Asia, China, and Hong Kong, but it has smaller presence in the other regions. In the service sector, Japan's share was relatively high in Southeast Asia, East Asia, and China and Hong Kong, but its share was even smaller in the other regions compared to the manufacturing sector.

North America receives the highest percentage of capital from manufacturing companies from the EU, but the EU has an extensive network of former colonies around the world indicating that the EU has very strong presence in many parts of the world.

More companies from China and the United States have bases in Europe in both the manufacturing and service sectors than other regions.

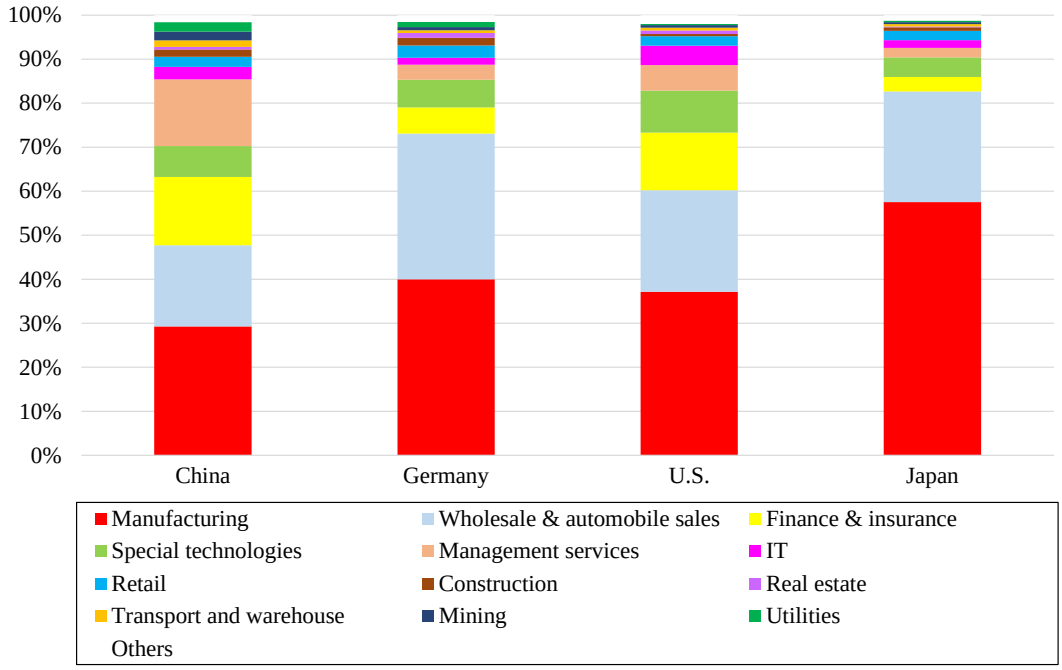
Looking at the total number of foreign companies in the four countries/region (reference value),[28] we find that a huge number of manufacturing and service companies are based in Europe and North America, while these numbers are remarkably small in Japan. Globalization in terms of accepting foreign companies may be more restrictive in Japan than in the other major nations.

Next, we will focus on parent manufacturing companies and identify the sectors where the major countries operate.

Looking at the number and sales of overseas affiliates of manufacturing companies by sector from China, Germany, the United States, and Japan, we find there are as many wholesale businesses as they engaged in the same manufacturing business as their parent (Figure II-1-1-2-12).

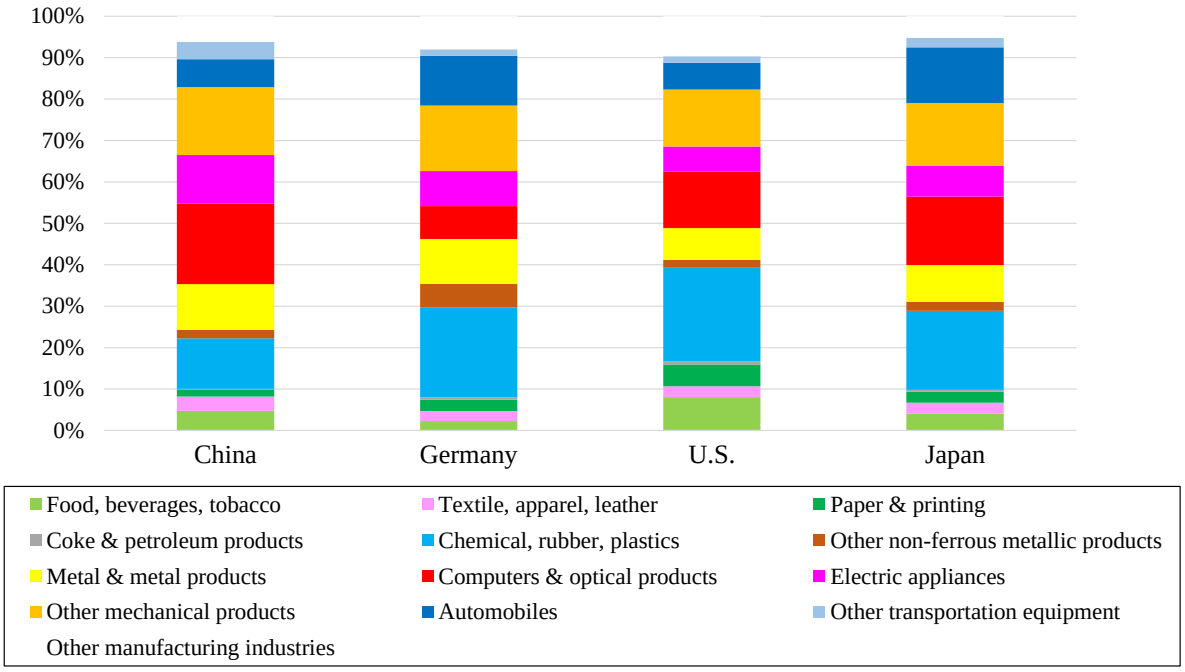
28 The ratio of companies listed to the total number of firms varies by region in ORBIS. It should be noted that the ratio of listing is lower primarily in emerging countries.

**Figure II-1-1-2-11 Breakdown of overseas manufacturing affiliates by sector (number of companies)**




Notes: Sector distribution of overseas companies that are more than 25% financed by companies that reside in each country (based on the number of companies).
Source: BvD "ORBIS."

**Figure II-1-1-2-12 Sector breakdown of overseas manufacturing affiliates of manufacturing companies (number of companies)**




Notes: Sector distribution of overseas companies that are more than 25% financed by companies that reside in each country (based on the number of companies).
Source: BvD "ORBIS."

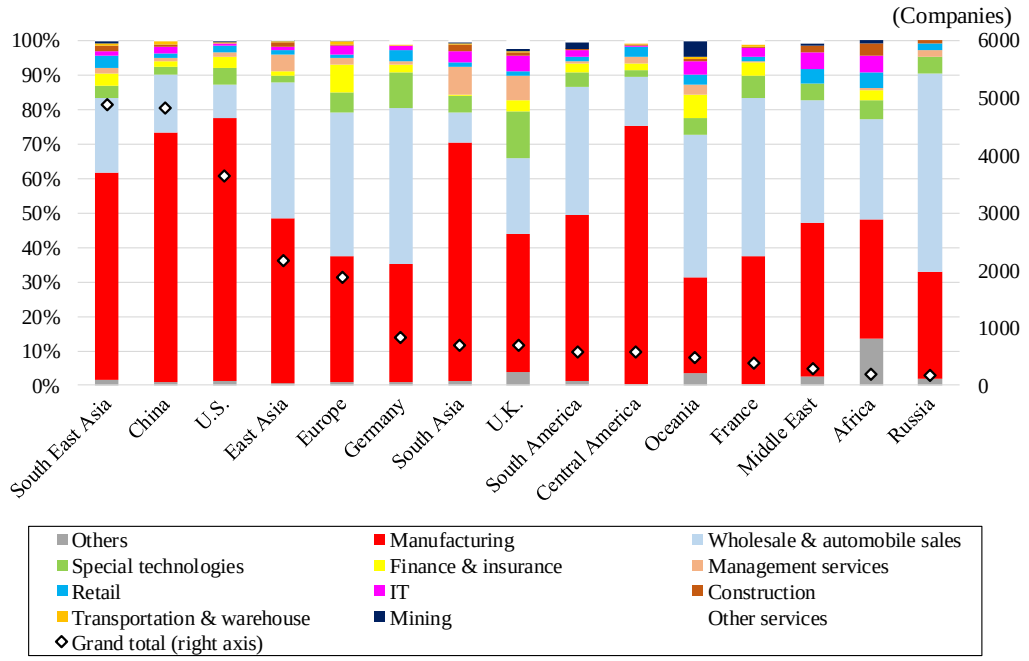
On the other hand, there are many non-manufacturing affiliates other than wholesale and retail from the United States, Germany, and China, and more than 5% of the companies belong to special technology services, while more than 5% of companies from China and the United States are engaged in management service and over 10% in the financial and insurance sector. Although parents are manufacturing companies, they sometimes opt to enter areas other than manufacturing and sales in an effort to expand their businesses or make their business more sophisticated at home, and a similar phenomenon can be observed at overseas affiliates.

In the manufacturing sector, affiliates from the four countries/region are engaged in a variety of industries, including chemicals, automobiles, computer and optical products, other mechanical products, metals and metal products, and foods. Chemicals account for 20-30% in Germany, Japan, and the United States. Machine-related manufacturing combining other machinery, electrical devices, computer, and optical products account for almost 50% of Chinese affiliates, 40% of Japanese counterparts, and 30% each for the United States and Germany. Automobiles account for more than 10% of affiliates from Japan and Germany. The percentage of Chinese affiliates is highest in computer and optical products, accounting for 20% of the manufacturing sector.

Next, we will see the overview by region and sector.

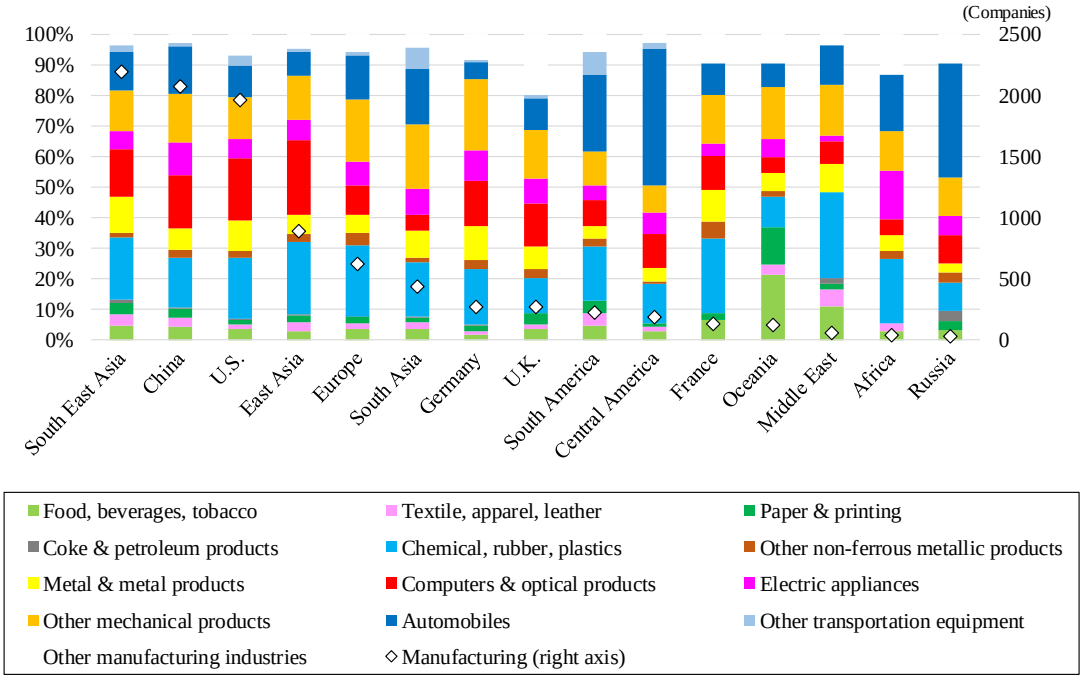
Looking at overseas affiliates of Japanese manufacturing companies, we find a high percentage of the wholesale and manufacturing businesses in all the regions. In the United Kingdom and other European countries, a certain number of special technology services exist, while management services account for around 5% in the United Kingdom and South Asia. IT companies have also made inroads into various regions, although the number is small (Figures II-1-1-2-13, II-1-1-2-14).

**Figure II-1-1-2-13 Number of overseas affiliates of Japanese manufacturing companies (breakdown by industry)**




Notes: Sector distribution of overseas companies that are more than 25% financed by manufacturing companies in Japan.
Source: BvD "ORBIS."

**Figure II-1-1-2-14 Number of overseas affiliates of Japanese manufacturing companies (breakdown by manufactured product)**

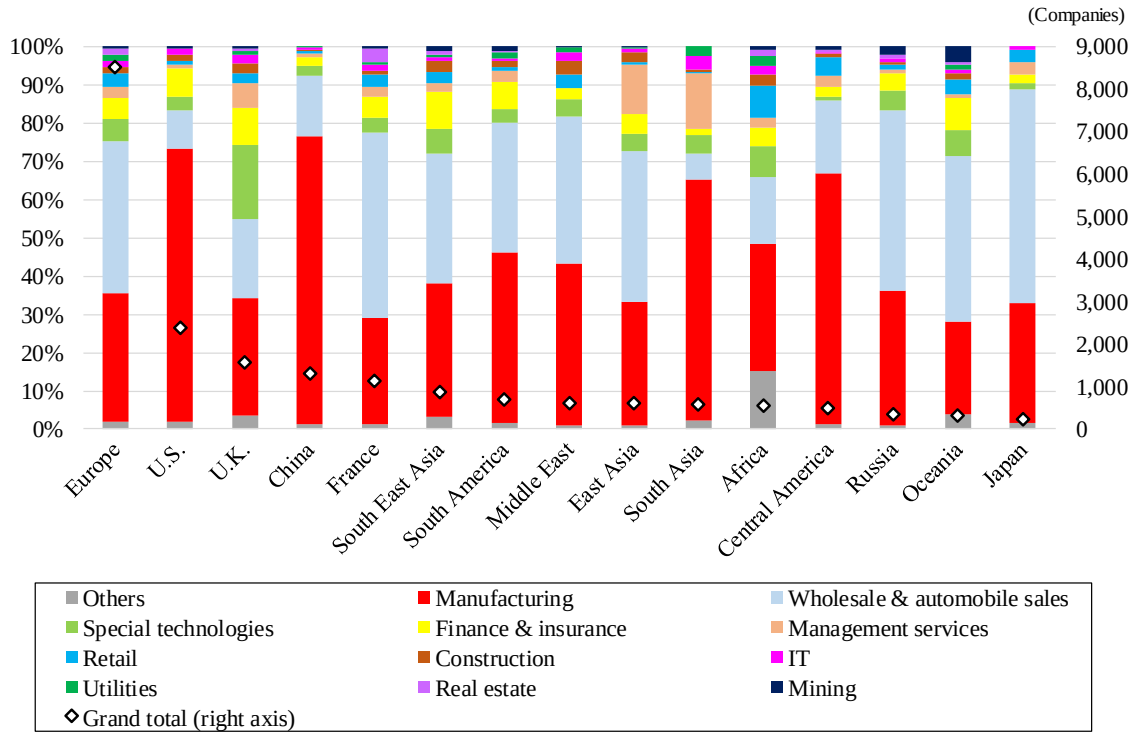



Notes: Sector distribution of overseas companies (manufacturing companies) that are more than 25% financed by manufacturing companies in Japan.
Source: BvD "ORBIS."

Manufactured products are diverse, ranging from automobiles, chemicals, metals, food, electrical equipment, computer and optical products, and other machinery.

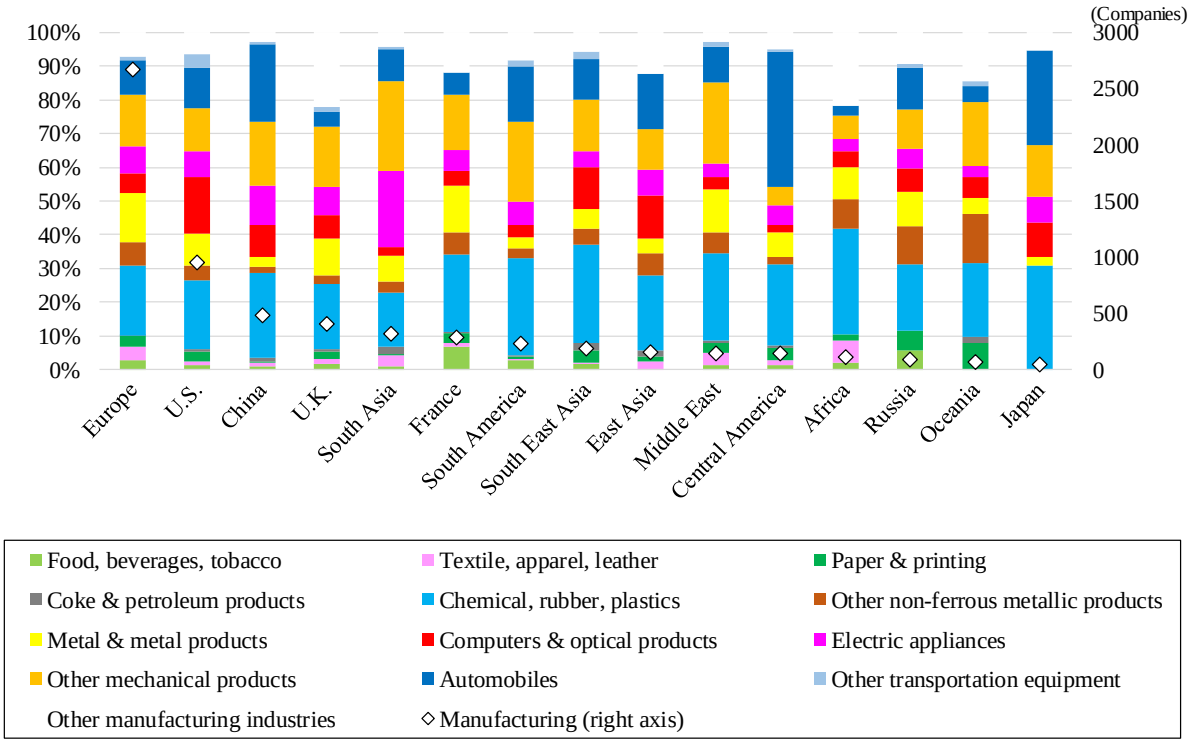
Similar to Japanese companies, the percentage of manufacturing and wholesale companies is very high among overseas affiliates of German manufacturing companies; while in countries such as the United Kingdom, the share of special technology service companies is high (Figures II-1-1-2-15, II-1-1-2-16). Among the manufacturing sector, chemicals, machinery, and automobiles are prominent.

**Figure II-1-1-2-15 Number of overseas affiliates of German manufacturing companies (breakdown by industry)**




Notes: Sector distribution of overseas companies (manufacturing companies) that are more than 25% financed by manufacturing companies based in Germany.
Source: BvD "ORBIS."

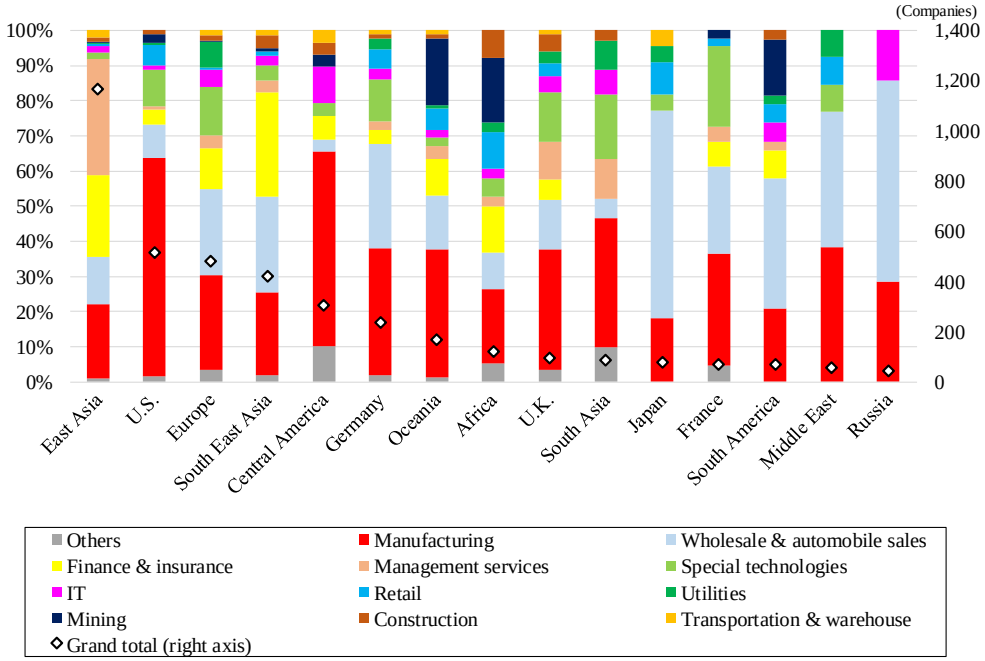
**Figure II-1-1-2-16 Number of overseas affiliates of German manufacturing companies (breakdown by manufactured product)**




Notes: Sector distribution of overseas companies (manufacturing companies) that are more than 25% financed by manufacturing companies based in Germany.
Source: BvD "ORBIS."

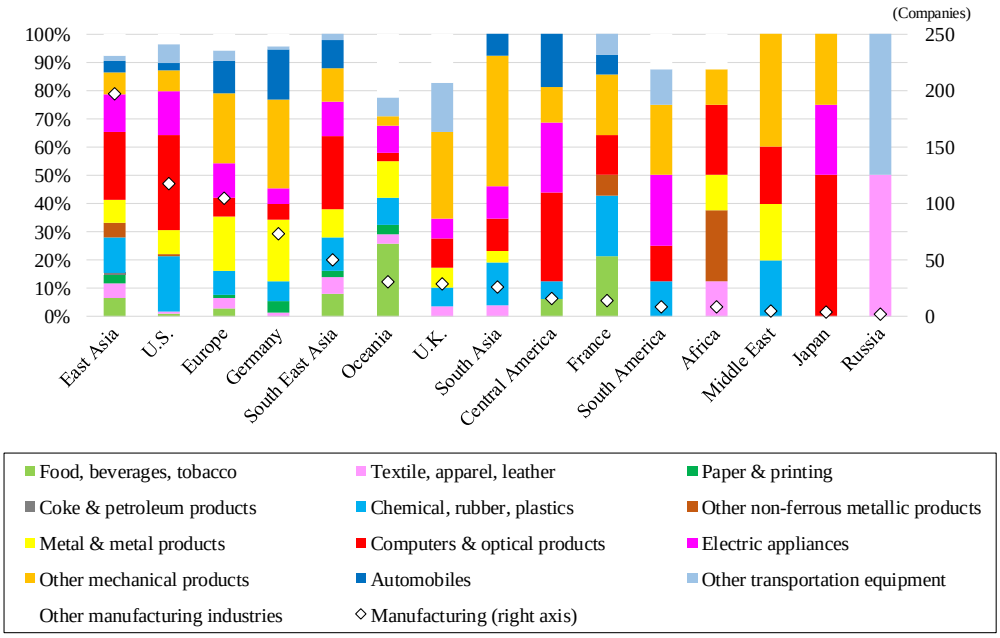
Chinese companies have mining affiliates in Oceania, Africa, and South America, while wholesale companies account for more than 50% of affiliates of Chinese companies in Japan and Russia. Special technology service companies total more than 10% of affiliates of Chinese companies in Europe, the United States, and South Asia, and more than 30% of Chinese affiliates in East Asia are engaged in management services. Within the manufacturing sector, computers and optical products account for a huge share in many regions, including the United States and East Asia. Other machine products are prominent in South Asia, Europe, and the Middle East (Figures II-1-1-2-17, II-1-1-2-18).

**Figure II-1-1-2-17 Number of overseas affiliates of Chinese manufacturing companies (breakdown by industry)**




Notes: Overseas companies that are more than 25% financed by manufacturing companies based in China.
Source: BvD "ORBIS."

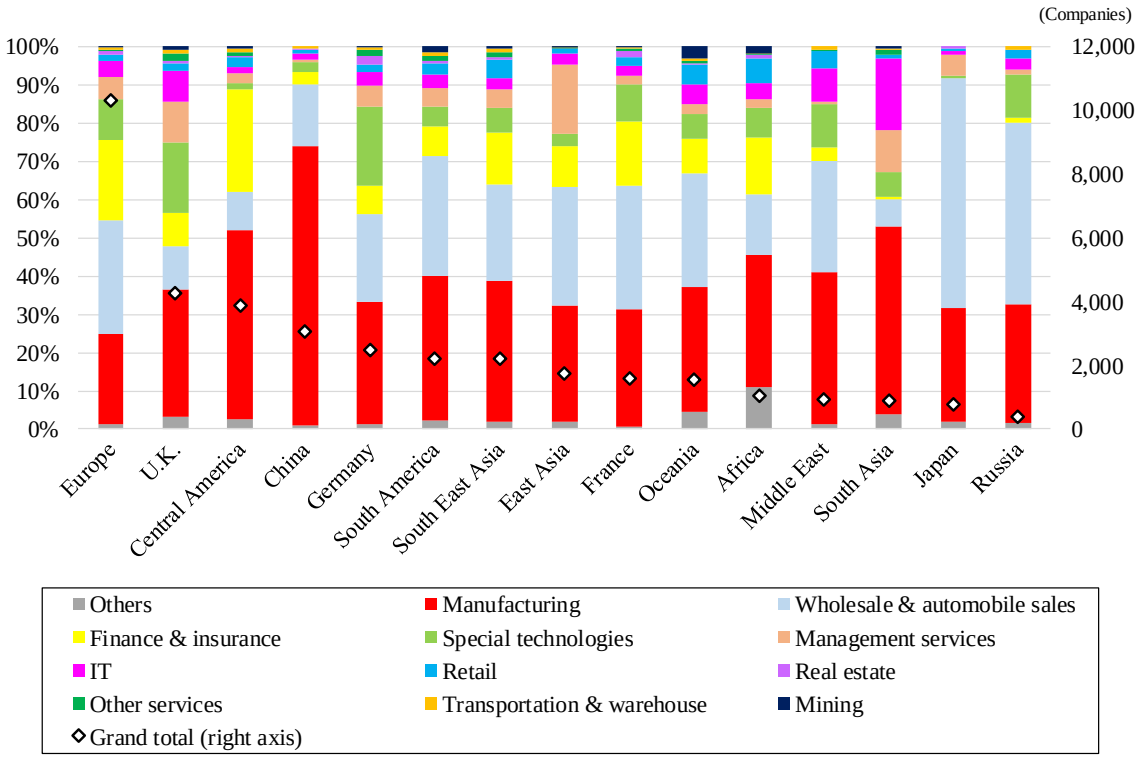
**Figure II-1-1-2-18 Number of overseas affiliates of Chinese manufacturing companies (breakdown by manufactured product)**




Notes: Overseas companies (manufacturing companies) that are more than 25% financed by manufacturing companies based in China.
Source: BvD "ORBIS."

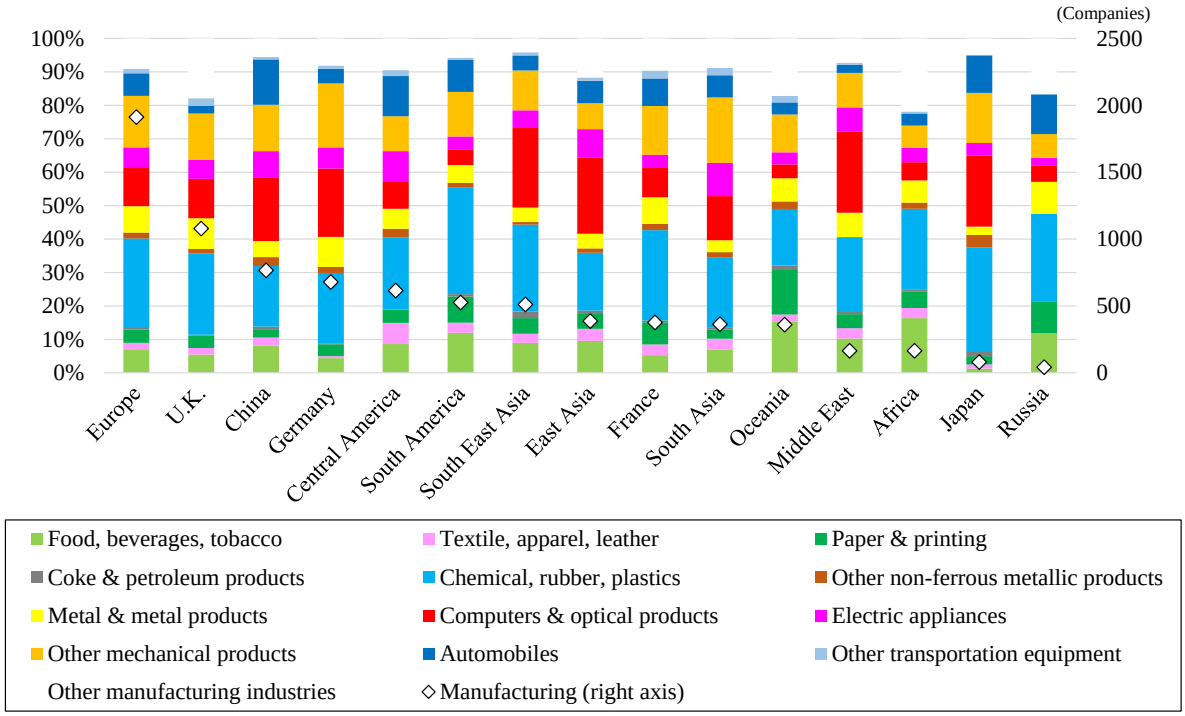
A large portion of overseas affiliates of manufacturing companies based in the United States are engaged in industries other than manufacturing and wholesale, similar to their Chinese counterparts. Many special technology services companies are found in Europe, and telecommunications service companies in the United Kingdom, South Asia, and the Middle East (Figure II-1-1-2-19). Within the manufacturing sector, chemicals amount to 20-30 percent of the total in each region. Computers and optical products, as well as other machine products, are also found in all the regions (Figure II-1-1-2-20).

**Figure II-1-1-2-19 Number of overseas affiliates of U.S. manufacturing companies (breakdown by industry)**




Notes: Overseas companies that are more than 25% financed by manufacturing companies based in the United States.
Source: BvD "ORBIS."

**Figure II-1-1-2-20 Number of overseas affiliates of U.S. manufacturing companies (breakdown by manufactured product)**




Notes: Overseas companies (manufacturing companies) that are more than 25% financed by manufacturing companies based in the United States.
Source: BvD "ORBIS."

Until now, we have reviewed characteristics of overseas operations by manufacturing companies of the major nations. Although Japan's share is higher than the other countries' shares in Southeast Asia, its share is low or extremely low in other regions. As for the service sector, Japan's share in Asia is even lower than that of companies from the EU, in despite of Japan's favorable conditions for location. The variety of industries is small among overseas affiliates of Japanese companies, with a majority engaged in manufacturing and wholesale.

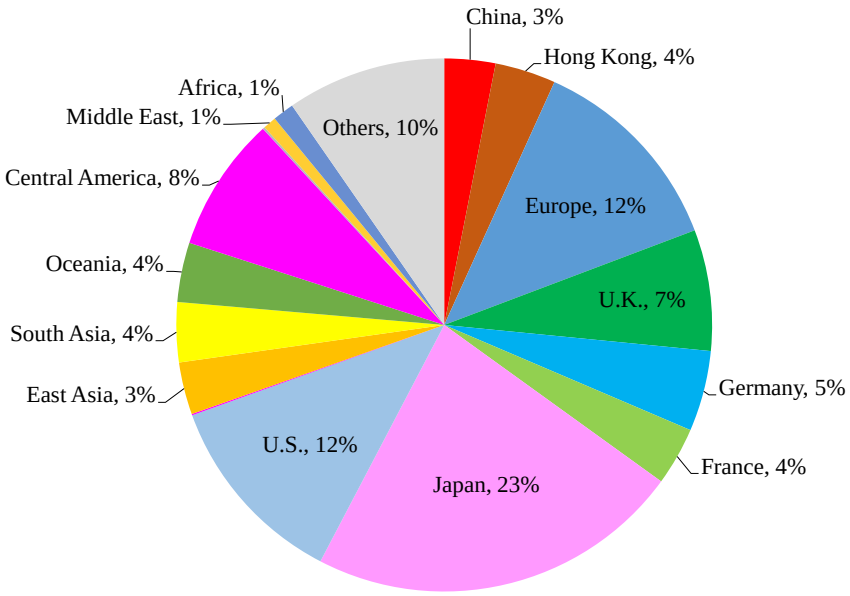
Of course, it is important to revitalize domestic businesses and to build further on the areas in which Japanese companies have competitive advantage, as well as to enter into new areas with high potential. At the same time, the review above implies that there is room for Japanese companies to continue to expand their businesses globally.

**(B) Foreign companies in emerging countries**

We will examine how foreign companies are performing in Southeast Asia, where many affiliates of Japanese manufacturing companies are based.

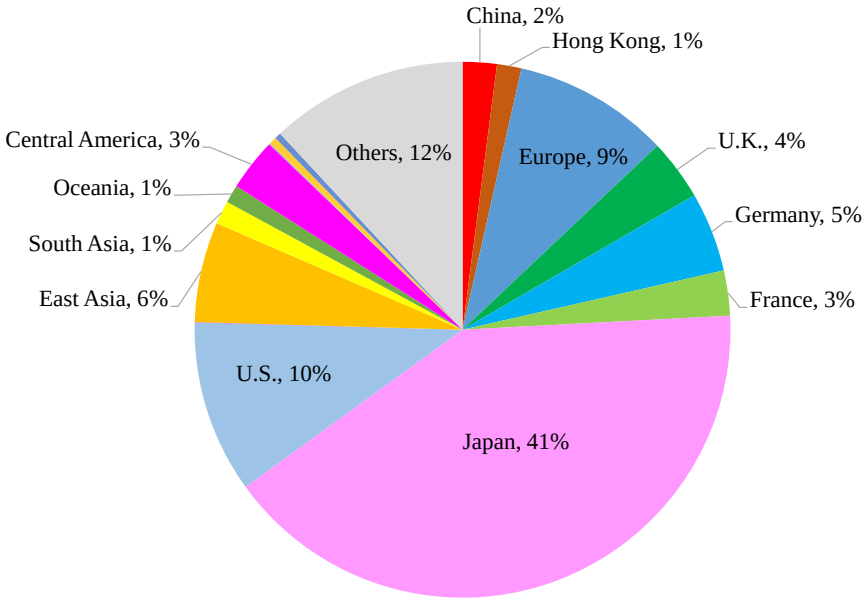
Japan accounts for some 20% of the total number of foreign companies located in the 10 member nations of ASEAN in terms of the location of parent companies, representing the highest percentage by country, followed by the United States and the United Kingdom. Europe, as a whole, accounts for some 30% (Figure II-1-1-2-21).

**Figure II-1-1-2-21 Percentage of parent companies of foreign companies in ASEAN member countries by residing country/region (all industries)**




Notes: Companies in ASEAN member countries that are more than 25% financed by companies overseas (all industries). The number of companies by location of parent companies. 27,392 companies, excluding those companies for which the origin of the parent company is unknown.
Source: BvD "ORBIS."

**Figure II-1-1-2-22 Percentage of parent companies of foreign companies in ASEAN member countries by residing country/region (manufacturing)**



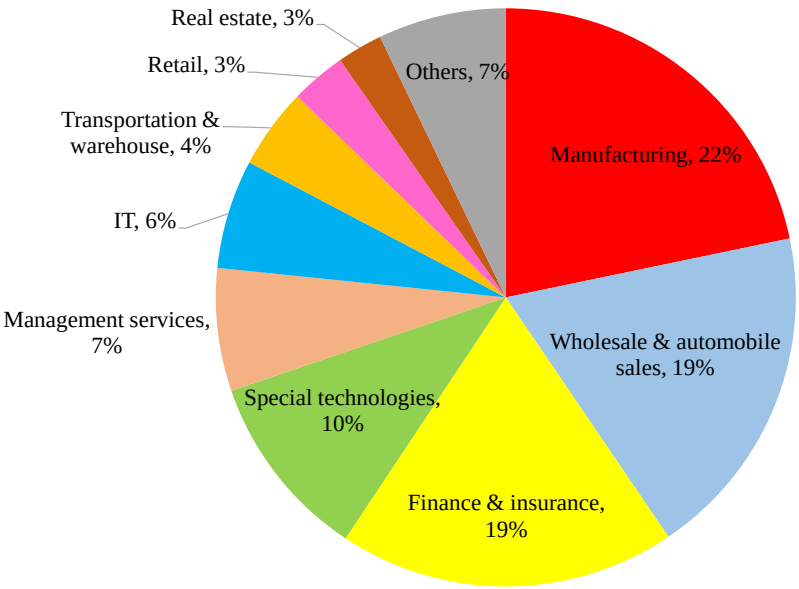

Notes: Companies in the ASEAN member countries that are more than 25% financed by companies overseas (manufacturing). The number of companies by location of parent companies. 5,591 companies, excluding those companies for which the origin of the parent company is unknown.
Source: BvD "ORBIS."

Within the manufacturing sector alone, Japan accounts for more than 40% of foreign companies in terms of the origin of their parent companies (Figure II-1-1-2-22).

Manufacturing, wholesale, and finance/insurance companies each account for some 20% of the total number of foreign companies in the ASEAN member countries, and a certain number of special technology service and management service can also be seen. (Figure II-1-1-2-23).

Within the manufacturing sector, chemicals amount to 20%, and machine-related industries[29] in total account for some 40% (Figure II-1-1-2-24).

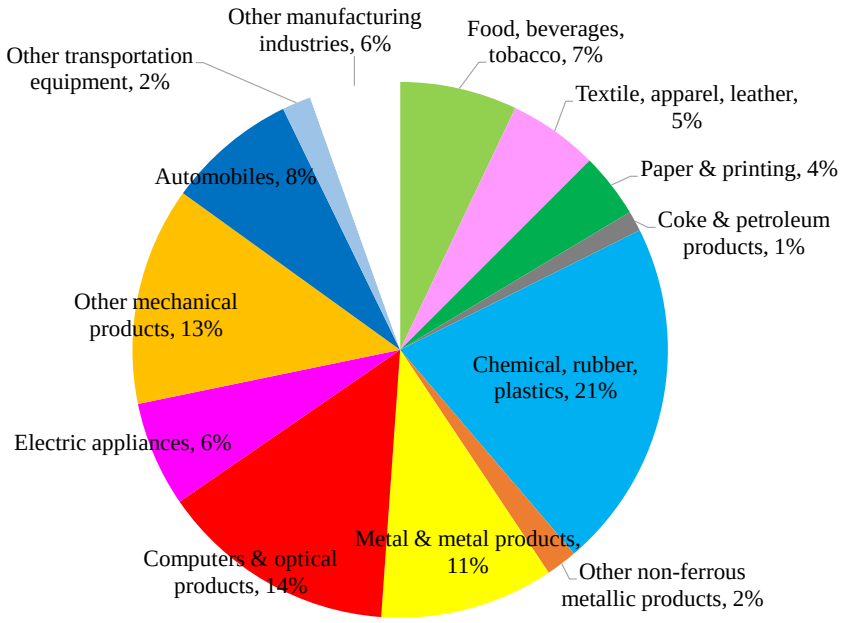
**Figure II-1-1-2-23 Sector distribution of foreign companies in the ASEAN member countries (number of companies)**




Notes: Companies in the ASEAN member countries that are more than 25% financed by companies overseas. By sector (excluding those whose sector is unknown). Number of companies. 25,870 companies, excluding those whose sector is unknown.
Source: BvD "ORBIS."

29 Computers and optical products, electrical equipment, other machinery products, automobiles, and other transportation equipment.

**Figure II-1-1-2-24 Breakdown of foreign companies in the ASEAN member countries by manufactured product (number of companies)**

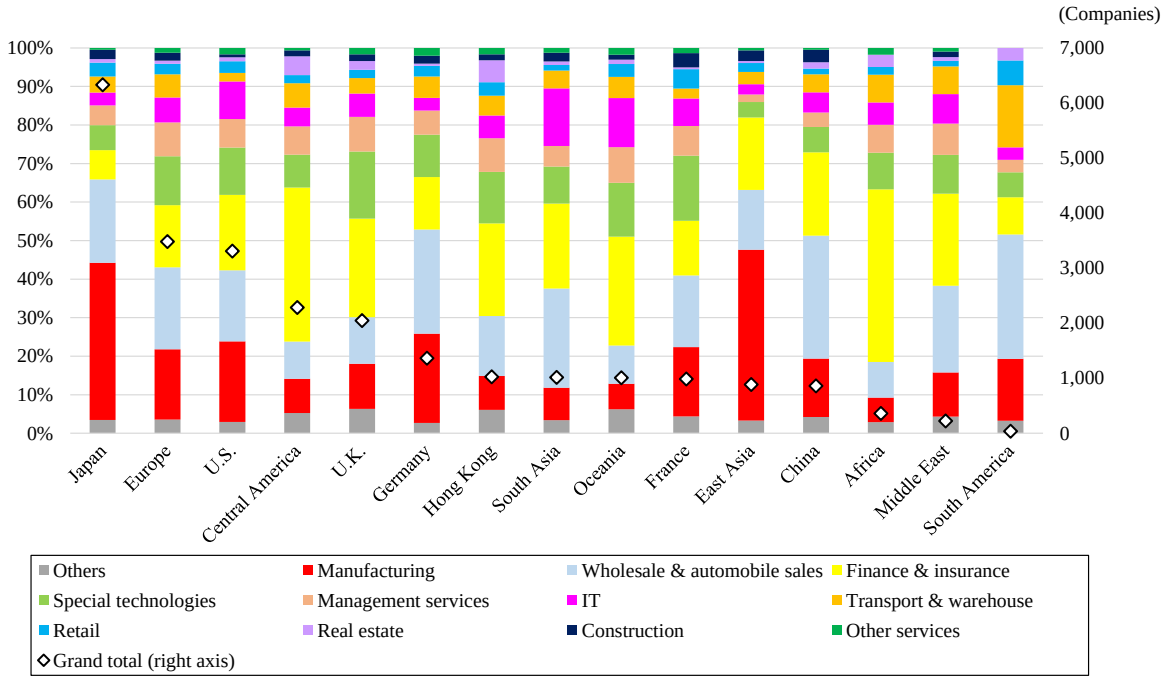



Notes: ASEAN companies (manufacturing) that are more than 25% financed by companies overseas. By manufacturing sector (excluding those whose sector is unknown). Number of companies. 5,622 companies.
Source: BvD "ORBIS."

Next, the sector distribution of companies by location of parent company shows that wholesale and manufacturing companies lead the pack. In particular, Japanese and East Asian companies are mainly engaged in manufacturing, reaching some 40% of the total. As for special technology services, companies from Europe, the United States, and Oceania each account for more than 10% (Figure II-1-1-2-25).

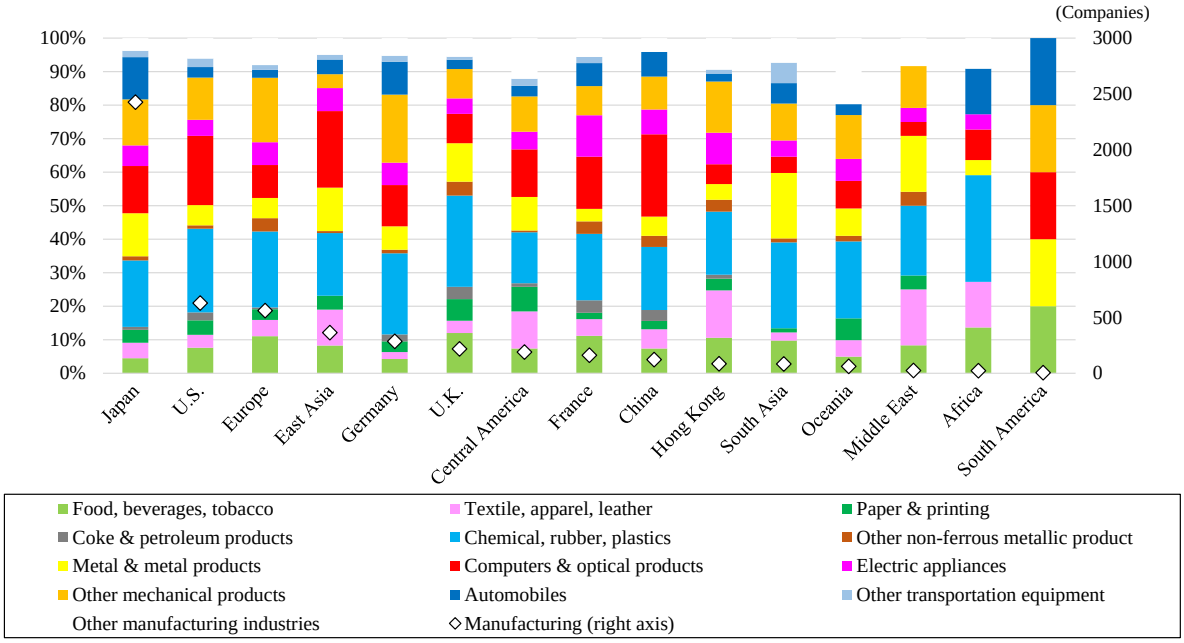
Within the manufacturing sector, chemical affiliates amount to 20-30% of the total in many countries/regions, and companies that manufacture computers and optical products, electrical equipment, and other general machinery are commonly found. With regards to Japanese and German companies, automobiles represent some 10% of the total and the number is relatively high. (Figure II-1-1-2-26).

**Figure II-1-1-2-25 Sector distribution of foreign companies in the ASEAN member countries (number of companies)**




Notes: ASEAN companies that are more than 25% financed by companies overseas. By residing country of parent company. Excluding those companies whose sector is unknown.
Source: BvD "ORBIS."

**Figure II-1-1-2-26 Breakdown of foreign companies in the ASEAN member countries by manufactured product (number of companies)**




Notes: ASEAN companies that are more than 25% financed by companies overseas. By residing country of parent company.
Source: BvD "ORBIS."

**(C) Weight of overseas portion in the sales of manufacturing companies (estimate)**

Next, we will compare the size of business between overseas affiliates and domestic businesses of parent manufacturing companies based on their sales figures.

We will use the ORBIS database published by Bureau van Dijk, again. However, since in many cases only consolidated sales are published, we have made certain assumptions and removed the duplication of sales of the same company through the summing up of consolidated data.

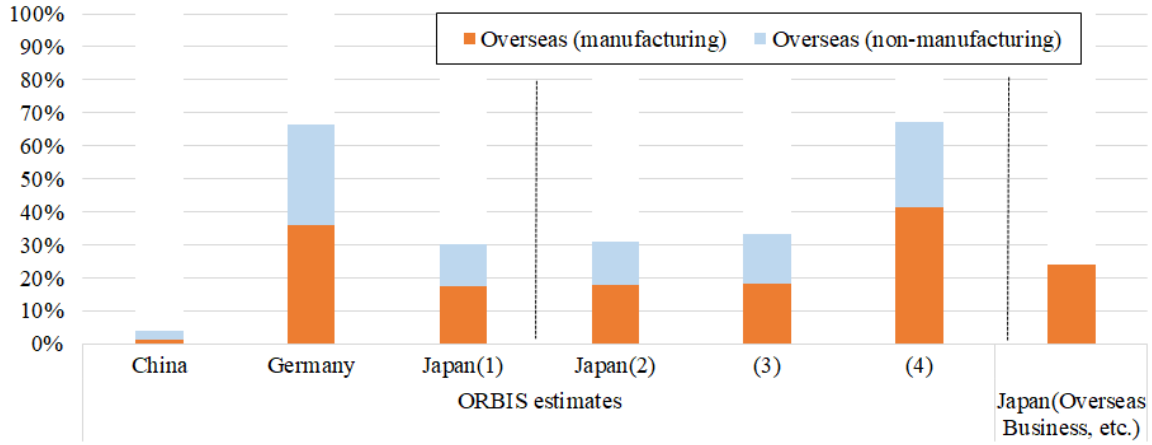
With regards to regional differences in how much financial information is included, we used the Basic Survey on Overseas Business Activities (hereinafter referred to as the "Overseas Business") published by the Ministry of Economy, Trade and Industry only for Japan, in order to make adjustments for regions which have fewer companies with financial data. Specifically, on the basis of sales published in the Overseas Business, we made estimates with regards to regions where ORBIS has a larger number of companies with sales data than the Overseas Business, taking into account the difference in sales found in the two databases (Japan estimate (3) refers to cases with no increase in the number of companies but with an increase only in sales, Japan estimate (4) refers to cases where both sales and the number of companies increase. Details can be found in the Appendix).

With regards to the United States, no comparison is made between domestic and overseas businesses, as the publication of financial data is extremely rare.

Estimates using ORBIS only found that sales of Japanese overseas manufacturing affiliates are slightly below 20% of the domestic business,[30] those of German counterparts slightly below 40%, and those of Chinese peers 1%. Assuming the sectors engaged in by overseas affiliates are spread across industries (excluding finance/insurance), sales of Japanese affiliates came to some 30% of the total, those of German peers just below 70%, and those of Chinese counterparts 4% (Figure II-1-1-2-27).

30 Since the United States and some other countries provide a remarkably smaller amount of financial data than other countries, we supplemented financial data by using the Basic Survey on Overseas Business Activities (surveyed in 2017) for actual figures for FY2016 published by the Ministry of Economy, Trade and Industry and made estimates.

**Figure II-1-1-2-27 Ratio of sales of overseas affiliates to domestic sales of manufacturing companies of respective countries (estimates)**




Notes: 1. When domestic sales of a manufacturing company located in respective countries are deemed 100%, the percentage of sales of overseas affiliates (excluding finance/insurance and whose parent company is engaged in manufacturing). Mainly figures for FY2017.
2. As for the ORBIS estimates, the final parent company is also in the country in question, except for Japan (2).
3. Japan (2), Japan estimates (3) and (4) are not concerned with the location of the final parent company.
4. Japan (2) represents the figure from ORBIS with some figures from the Basic Survey on Overseas Business Activities added to it.
5. Japan estimates (3) and (4) are estimates which derived by adjusting Japan (2) using the Basic Survey on Overseas Business Activities.
6. Japan (the Overseas Business, etc.) used Financial Statements Statistics of Corporations by Industry published by the Finance Ministry for domestic sales for actual figures for FY2016 and the Basic Survey on Overseas Business Activities for actual figures for FY2016 for overseas sales.
7. Parent companies of overseas affiliates are engaged in manufacturing, except for Japan (the Overseas Business, etc.)

Source: Estimates made by the Ministry of Economy, Trade and Industry, using BvD "ORBIS," the Basic Survey on Overseas Business Activities by METI, and Financial Statements Statistics of Corporations by Industry published by the Finance Ministry.

Next, when we made estimates using the Oversea Business with regards to the figures for Japan estimated under ORBIS, the percentage of overseas manufacturing expanded to a maximum 40%, and that of the entire industries rose to just below 70%.[31]

Although estimates were made only for Japan, the percentage of overseas for Germany companies may increase compared to the estimates in the Figure, since Germany is similar to Japan in that it also has a higher percentage of domestic companies with published financial data.

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31 Separately, 1) sales of local corporations overseas (manufacturing) based on the Basic Survey on Overseas Business Activities (2017) (for actual performance of FY2016) divided by 2) sales of domestic sales (manufacturing) in Financial Statements Statistics of Corporations by Industry (for actual performance of FY2016) published by the Ministry of Finance amounts to 23.8%. The ratio of responses to the total is 74.1% for 1), of which the response on sales of local corporation overseas (manufacturing) is 82%. Assuming the ratio of responses to the total on local corporations overseas (manufacturing) is also 74.1%, the percentage of responses on sales among local corporations overseas surveyed comes to 61%. The 23.8% derived earlier divided by 61% is 39%, which is similar to the estimated value in this Section.

Even though they are just estimates, they are plausible, given that companies increasingly expanded their production and sales bases abroad, and overseas operations account for a larger share than domestic businesses at some companies amid stagnant manufacturing activities in developed nations.

The size of overseas business is one factor that may cause political and economic conditions abroad to affect a company's performance. At the same time, it may be an important element to help the company capture growth markets. As seen above, Japanese companies are not so aggressive in their globalization efforts and it is necessary to continue to improve the environments for overseas operations.

Meanwhile, rising labor costs in emerging countries, together with trade friction between China and the United States, the two key locations of Japanese companies' overseas operations, are affecting foreign investment plans of manufacturing companies. Views held by Japanese companies[32] show that in recent years, some Japanese manufacturers have moved overseas bases to third countries, while others have opted to return to Japan, with the trade friction between the United States and China listed as one factor for such moves. Not a few companies are likely to be affected by higher tariffs, as they establish production and sales bases abroad amid intense cost competition. If the trade war accelerates or drags on for a long time, we fear that the number of companies forced to move their bases at substantial costs may increase.

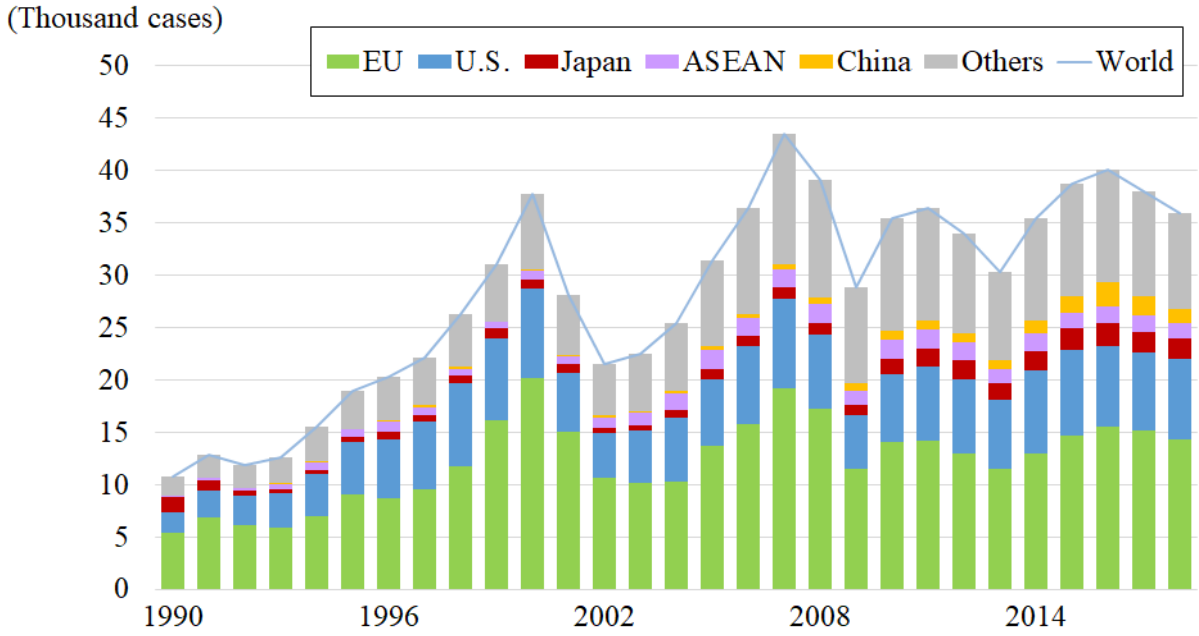
**(D) Expansion of corporate network through M&A**

Global companies conduct business overseas either through their own newly-established bases or through securing a stake in or acquiring local companies. In the following section, we will examine cases of overseas deployment through obtaining a stake or acquisition.

Acquiring companies or securing a stake is conducted for a variety of purposes. These include the pursuit of scale merit, reduction in procuring costs, obtaining sales networks, new businesses, or new technologies. Among them, cross-border mergers and acquisitions have been growing for a long time (Figure II-1-1-2-28). By sector, telecommunication companies stand out as targets of M&A cases by European, U.S., Japanese, and Chinese companies (Figure II-1-1-2-29).

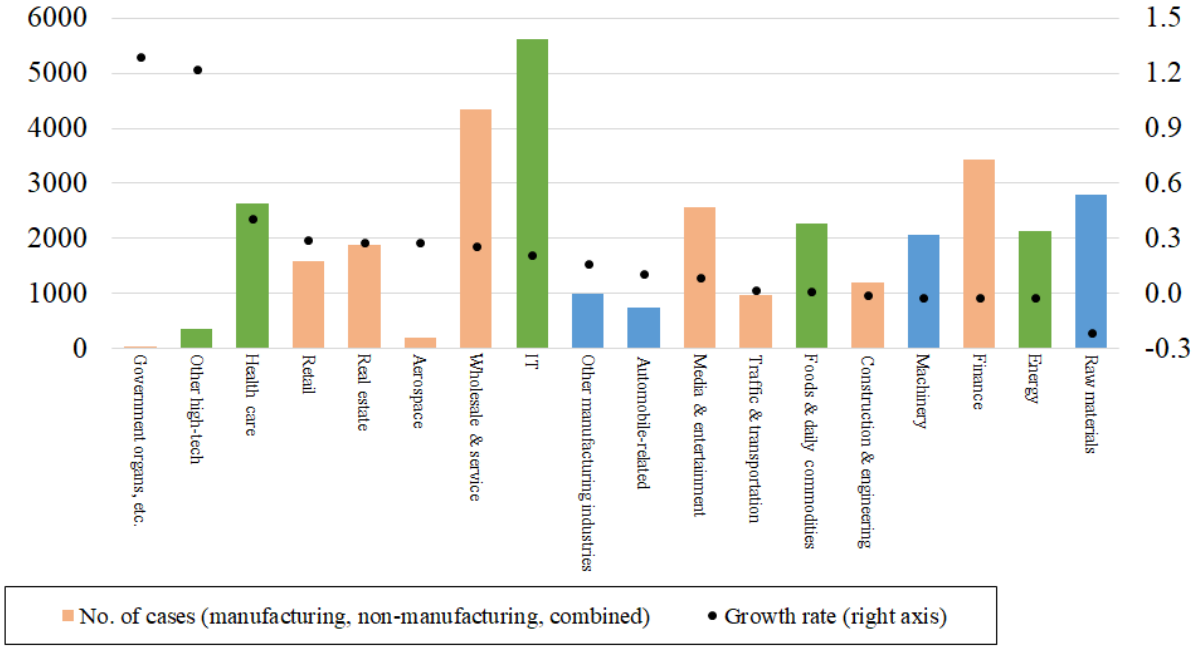
32 Ministry of Economy, Trade and Industry (2019).

**Figure II-1-1-2-28 Changes in the number of cases of cross-border M&A**




Notes: The number of cases of cross-border M&A (completed cases). Country names represent the nationality of ultimate purchasing parent companies. Up to 2018 (based on published years).
Source: Rifinitive.

**Figure II-1-1-2-29 Growth of cross-border M&A by sector**



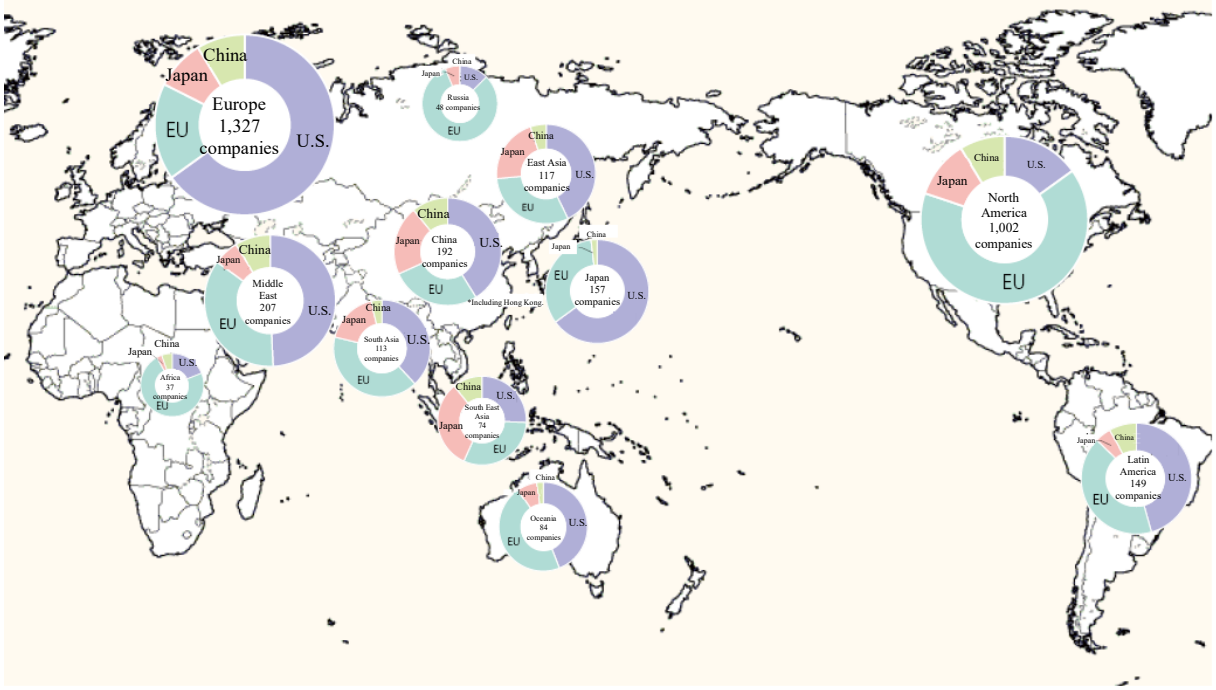

Notes: The number of cross-border M&A cases in which the ultimate purchasing parent companies are located in Japan, the United States, China, and the EU (completed in 2014-2018). Growth rates of the total for 2004-2008 based on the total for 2014-2018.
Source: Rifinitive.

In the following section, we will examine overseas operations through M&A and obtaining a stake in the telecommunication sector, which has been seen especially in many cases of M&A in recent years,

as well as the machinery industry, the sector subjected to many M&A cases within the manufacturing sector, by reviewing a database of companies.[33] We will focus on M&A carried out by companies whose parent company is headquartered in the United States, the EU, China, and Japan.

Mergers and acquisitions of the machinery industry are carried out actively in Europe and North America. Companies from the United States and the EU have conducted the similar number of M&A cases (targeted companies[34]) in Oceania, South Asia, and Latin America, while companies from the United States have secured more M&A cases in Japan, China and Hong Kong, East Asia, and the Middle East than their EU counterparts did. In contrast, companies from the EU are responsible for more than three quarters of M&A cases in Russia and Africa. Although Japanese companies account for a relatively larger percentage of M&A cases in Asia, its share is smaller than those reported by companies from the EU or the United States, except for Southeast Asia. Chinese and Japanese companies reported a similar number of M&A cases in Europe and North America, while Chinese firms secured more cases than Japanese counterparts in Latin America and the Middle East (Figure II-1-1-2-30).

**Figure II-1-1-2-30 Distribution of target companies of cross-border M&A by Japanese, the U.S., Chinese, and the EU companies (machinery sector)**

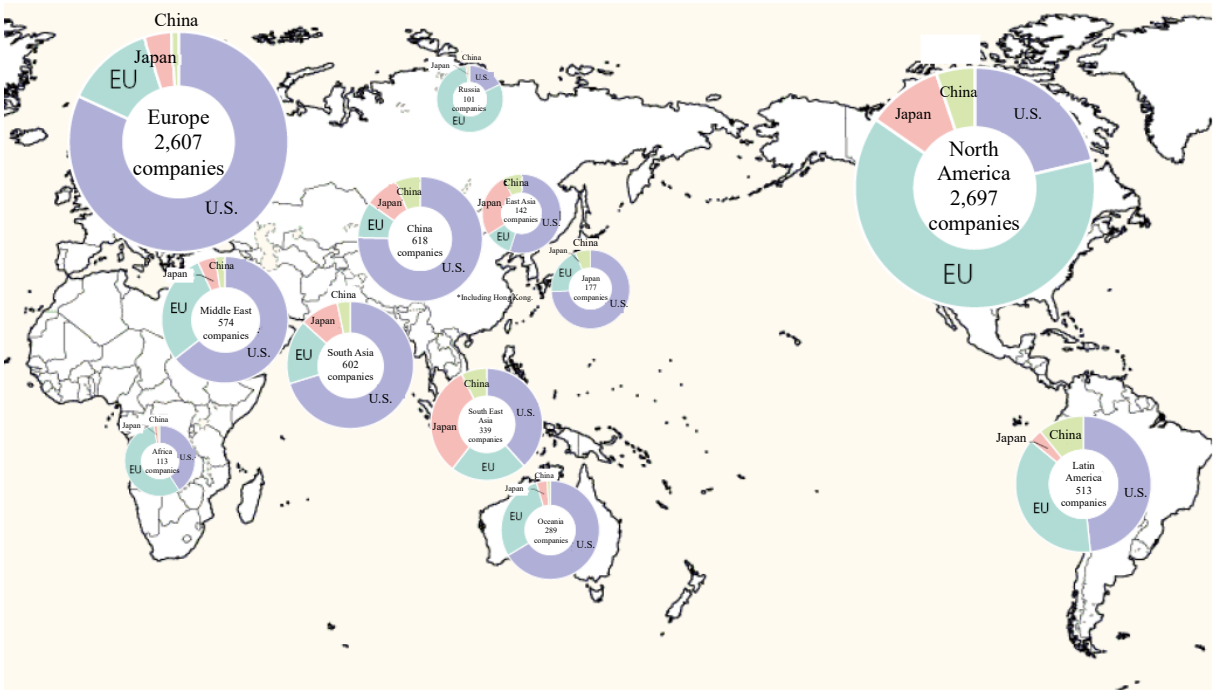



Notes: Distribution of overseas companies (outside the home country) owned more than 10% through M&A by companies based in Japan, the United States, China, and the EU (on the basis of the number of companies).

33 Buread van Dijk's Zephyr was used. In the Figures, the company name is abbreviated as BvD.
34 Not the number of M&A cases, but the number of companies targeted for M&A (in cases where the same company is involved in more than one M&A case, that company is excluded). Of the M&A cases in Zephyr, we selected companies which were targeted for acquisition, integration, merger, and minority stake holding and whose parent company based in the United States, the EU, Japan and China had a stake of over 10%.

Source: BVD "ORBIS."

**Figure II-1-1-2-31 Distribution of target companies of cross-border M&A by Japanese, U.S., Chinese, and EU companies (telecom sector)**




Notes: Distribution of overseas companies (outside the home country) owned more than 10% through M&A by companies based in Japan, the United States, China, and the EU (on the basis of the number of companies).
Source: BVD "ORBIS."

North America is the top destination of company acquisition or financing in the telecommunication sector, followed by Europe.

In the telecommunication sector, companies from the United States stand out as buyers, accounting for some 80% of M&A cases in Europe, approximately three quarters of cases in China, South Asia, and Japan. Japan has a higher percentage in Southeast Asia than in other regions, but its share is slightly below than that of the United States (Figure II-1-1-2-31).

What is the difference between overseas operations through M&A and through affiliates?

For the machinery sector, Table II-1-1-2-32 shows the percentage of (A) cases through M&A (companies targeted for M&A, with more than 10% in stake) divided by (B) the number of overseas companies[35] owned more than 50% by a parent company. In most categories, the percentage is below 100% (in the same Table, cases of more than 100% are shown in yellow, those of more than 200% in red). This means that a parent company has more overseas affiliates than the number of companies whose stake it owns as a result of M&A in recent years. For instance, in the case of U.S. companies' investment in Europe, the number of companies whose stake has been obtained through M&A stands at 39% of the number of companies held as affiliates, while in the case of EU companies' investment in North America, the number of companies whose stake has been acquired through M&A is only 9% of

35 M&A cases with a stake of more than 50% are included in both (A) and (B).

the number of companies owned as affiliates.

**Table II-1-1-2-32 Overview of overseas affiliates and M&A (machinery sector)**

| | | Ratio of M&A (investing company) | | | | Investors (4 nations/region) total | | |
|---|---|---|---|---|---|---|---|---|
| | | U.S. | EU | Japan | China | M&A ratio | No. of M&A | Subsidiaries |
| Targets | Europe | 39% | 20% | 23% | 22% | 30% | 1,372 | 4,590 |
| | Russia | 23% | 10% | 25% | — | 11% | 48 | 426 |
| | North America | 10% | 9% | 4% | 32% | 8% | 1,002 | 11,890 |
| | Latin America | 17% | 9% | 8% | 33% | 12% | 149 | 1,203 |
| | Japan | 283% | 116% | — | 27% | 171% | 157 | 92 |
| | China, HK | 15% | 5% | 4% | 8% | 6% | 192 | 3,022 |
| | East Asia | 49% | 31% | 9% | 60% | 23% | 117 | 505 |
| | SE Asia | 9% | 5% | 3% | 8% | 5% | 74 | 1,505 |
| | South Asia | 17% | 6% | 11% | 12% | 9% | 113 | 1,200 |
| | Oceania | 24% | 16% | 14% | 10% | 18% | 84 | 462 |
| | Middle East | 113% | 27% | 65% | 900% | 53% | 207 | 390 |
| | Africa | 17% | 13% | 8% | 67% | 14% | 37 | 268 |
| Targets total | M&A ratio | 27% | 11% | 6% | 22% | 14% | 3,558 | 25,562 |
| | No. of M&A | 1,559 | 1,342 | 374 | 283 | | | |
| | No. of affiliates | 5,720 | 12,599 | 5,934 | 1,309 | | | |

Notes: 1. When 1) refers to the number of overseas affiliates which are owned more than 50% by companies in the United States, the EU, Japan, and China (March 2019) and when 2) refers to the number of target companies for cross-border M&A (2007-2018, including minority stake holding, excluding the overlapping of companies), the percentage of 1) against 2).
2. Companies classified as BvDsector "Industrial, Electric & Electronic Machinery" in the ORBIS database.
Source: BvD "ORBIS" and "Zephyr."

Under this exercise, only in the case of investments in Japan by companies from the United States and the EU, and the case of investments in the Middle East by companies from the United States and China, did we find the number of companies whose stake has been obtained by M&A exceeded that of overseas affiliates.

To sum up, much of capital networks with overseas companies are based on parent-child relationship in the machinery sector.

It has been confirmed that the ratio of M&A is low in the machinery sector. The examination of the

size of minority stake is involved of all the transaction types of M&A[36] shows that minority stake totaled less than 40% in many cases of M&A (Table II-1-1-2-33).[37] For instance, less than 40% (yellow) was observed in many categories, including investments in Africa by U.S. companies, investments in Latin America by EU companies, and investments in Southeast Asia by Japanese firms.

That means that in the machinery sector, M&A is less common than overseas affiliates and in many cases directed more towards stronger ties.

Reviewing the same percentages for the telecommunications sector, we found that unlike the machinery sector, the number of investments through M&A exceeded the number of affiliates in many categories (Table II-1-1-2-34). Specifically, investments in North America by EU companies, investments in Japan, China and Hong Kong, and the Middle East by U.S. companies, and investments in North America, Latin America, Japan, and the Middle East by Chinese companies are found to be filled in color.

**Table II-1-1-2-33 Ratio of minority stake in M&A (machinery)**

| | | Investing companies | | | |
|---|---|---|---|---|---|
| | | U.S. | EU | Japan | China |
| Targets | Europe | 31% | 32% | 23% | 29% |
| | Russia | 0% | 35% | 0% | — |
| | North America | 40% | 42% | 54% | 70% |
| | Latin America | 28% | 10% | 29% | 46% |
| | Japan | 83% | 83% | — | 0% |
| | China, HK | 72% | 28% | 22% | 14% |
| | East Asia | 55% | 69% | 32% | 50% |
| | SE Asia | 47% | 30% | 17% | 13% |
| | South Asia | 62% | 33% | 22% | 50% |
| | Oceania | 30% | 26% | 50% | 0% |
| | Middle East | 69% | 50% | 62% | 94% |
| | Africa | 14% | 25% | 100% | 50% |
| | All regions | 41% | 39% | 34% | 45% |
| Total number | | 1,588 | 1,371 | 387 | 288 |

Notes: 1. The percentage of minority stake to M&A cases in the machinery sector for 2007-2018 (excluding the overlapping targets in the cases of minority stake holding and other mergers and acquisitions).
2. Companies classified as BvD sector "Industrial, Electric & Electronic Machinery."
Source: BvD "ORBIS" and "Zephyr."

36 In this case, we designated acquisitions, mergers, joint ventures, and minority stake as the transaction types of M&A (published cases for 2007-2018).
37 In the Table, less than 40% is in yellow, while more than 60% is in green.

**Table II-1-1-2-34 Overview of overseas affiliates and M&A (telecom sector)**

| | | M&A ratio (investing company) | | | | Investors (4 nations/region) total | | |
|---|---|---|---|---|---|---|---|---|
| | | U.S. | EU | Japan | China | M&A ratio | No. of M&A | Subsidiaries |
| Targets | Europe | 40% | 15% | 29% | 3% | 30% | 2,607 | 8,755 |
| | Russia | 12% | 11% | 25% | 11% | 11% | 101 | 913 |
| | North America | 135% | 104% | 33% | 286% | 92% | 2,697 | 2,936 |
| | Latin America | 95% | 46% | 52% | 311% | 71% | 513 | 727 |
| | Japan | 485% | 135% | — | 1,100% | 328% | 177 | 54 |
| | China, HK | 431% | 38% | 40% | 53% | 131% | 618 | 470 |
| | East Asia | 110% | 28% | 65% | 92% | 72% | 142 | 197 |
| | SE Asia | 102% | 31% | 71% | 37% | 57% | 339 | 593 |
| | South Asia | 91% | 30% | 118% | 167% | 70% | 602 | 859 |
| | Oceania | 77% | 37% | 26% | 43% | 55% | 289 | 523 |
| | Middle East | 213% | 76% | 371% | 280% | 143% | 574 | 402 |
| | Africa | 148% | 40% | 20% | 33% | 55% | 113 | 204 |
| Targets total | M&A ratio | 65% | 45% | 42% | 32% | 53% | 8,809 | 16,664 |
| | No. of M&A | 4,831 | 2,930 | 694 | 354 | | | |
| | No. of affiliates | 7,443 | 6,452 | 1,666 | 1,103 | | | |

Notes: 1. When 1) refers to the number of overseas affiliates which are owned more than 50% by companies in the United States, the EU, Japan, and China (March 2019) and when 2) refers to the number of target companies for cross-border M&A (2007-2018, including minority stake holding, excluding the overlapping of companies), the percentage of 1) against 2).
2. Companies classified as BvDsector “22 - Computer Hardware, 23 - Communications, 30 - Computer Software, 36 - Information” in the ORBIS database.

Source: BvD “ORBIS” and “Zephyr.”

This means that in the telecommunications sector, partnership with overseas companies by means of ties less strong than parent-child relationship is prevalent.

Just like the machinery sector, we examined the percentage of minority stake in the telecommunications sector, and found that minority stake totaled more than 60% of the total (green) (Table II-1-1-2-35).

**Table II-1-1-2-35 Ratio of minority stake in M&A (telecom sector)**

| | | Investing companies | | | |
|---|---|---|---|---|---|
| | | U.S. | EU | Japan | China |
| Targets | Europe | 46% | 39% | 54% | 61% |
| | Russia | 89% | 63% | 100% | 0% |
| | North America | 52% | 67% | 78% | 93% |
| | Latin America | 78% | 69% | 76% | 88% |
| | Japan | 86% | 80% | — | 45% |
| | China, HK | 97% | 84% | 82% | 44% |
| | East Asia | 80% | 75% | 79% | 91% |
| | SE Asia | 86% | 62% | 72% | 88% |
| | South Asia | 83% | 71% | 92% | 80% |
| | Oceania | 39% | 27% | 80% | 100% |
| | Middle East | 79% | 77% | 92% | 86% |
| | Africa | 59% | 51% | 0% | 100% |
| | All regions | 62% | 63% | 75% | 81% |
| Total number | | 4,938 | 2,970 | 703 | 355 |

Notes: 1. The percentage of minority stake to M&A cases in the telecom sector for 2007-2018 (excluding the overlapping targets in the cases of minority stake holding and other mergers and acquisitions).
2. Companies classified as BvD sector "Computer Hardware, Communications, Computer Software, Information Services."

Source: BvD "ORBIS" and "Zephyr."

Although minority stake is at a disadvantage in that a buyer cannot control its target in the way it likes, synergy effects can be expected from partnership, and depending on the degree and scope of synergy effects, it is possible to take next steps towards acquisition.[38] Capital tie-up through minority stake is more acceptable to a target company, which usually resists outright acquisition.

It has been confirmed with the data used in this analysis that with regards to the machinery sector, a typical example of Japan's manufacturing overseas, many companies opt for overseas affiliates, while in the telecommunications sector, capital tie-ups are more common than outright ownership of affiliates. In Section (2) 1) (Part II, Chapter 1, Section 1 2 (2) 1), out analysis on how manufacturing companies were conducting business in the telecommunication and other sectors and it is possible that companies seem to prefer partnership which brings, in which synergy effects or in which businesses of partners are better leveraged.

As noted before, M&A is conducted for various purposes and M&A by companies from emerging companies for the purpose of obtaining technologies they do not possess has been drawing attention in

38 See Ministry of Economy, Trade and Industry (2018), etc.

recent years. In the following section, we will examine difference in patent holdings through M&A, etc., using patent data.[39]

In what areas can we find many patents held by target companies of M&A? Comparing (A) patents held by domestic companies and (B) patents held by overseas companies whose stake has been acquired through M&A, we find several areas in which the latter outnumbers the former.

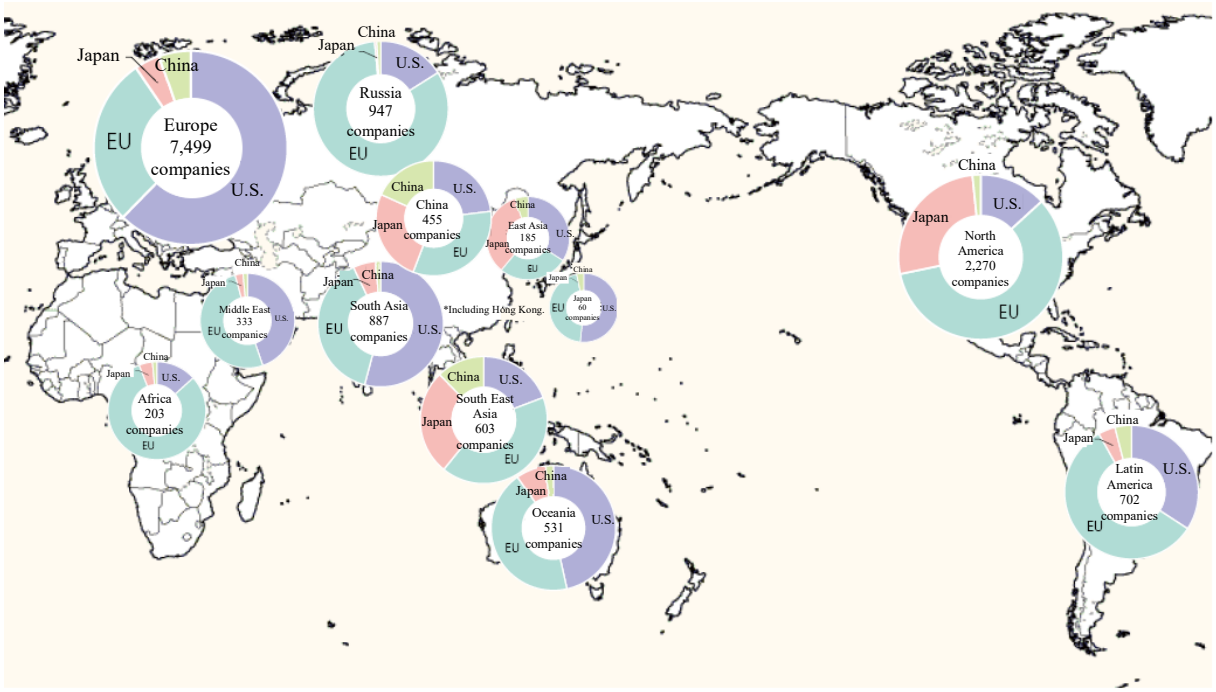
Comparison by sector of the percentages of (B) against (A) shows that digital communications and telecommunications especially report a high ratio. In contrast, the percentage is lower in optics, polymer chemistry and polymers, and machine tools, the sectors in which Japan enjoys technological advantage (Figures II-1-1-2-3 and II-1-1-2-39). In contrast, Japan is still technologically weak in digital communications and telecommunications and it can be the case that Japanese companies are attempting to expand access to technologies held by overseas firms through capital tie-ups.

Examination of the same percentages in terms of the value and the number of patents shows that the percentage in terms of the number of patents is generally higher in the EU and the United States, implying that they are seeking to markedly expand their capital networks through M&A in an effort to increase the possibility of access to many patents.

In contrast, the percentage in terms of the value of patents is higher than that in terms of the number of patents in China and Japan, and when we compare the same percentages in terms of the value per patent, China is significantly higher in many sectors, indicating that the country is accessing high-quality patents through M&A (Figure II-1-1-2-40). Technologies accessed through M&A are very important to China and it is possible that China conducts M&A more for the purpose of obtaining technologies than do other countries.

39 Bureau van Dijk's ORBIS Intellectual Property database. The company name is abbreviated as BvD, and the database as ORBIS-IP in the charts.

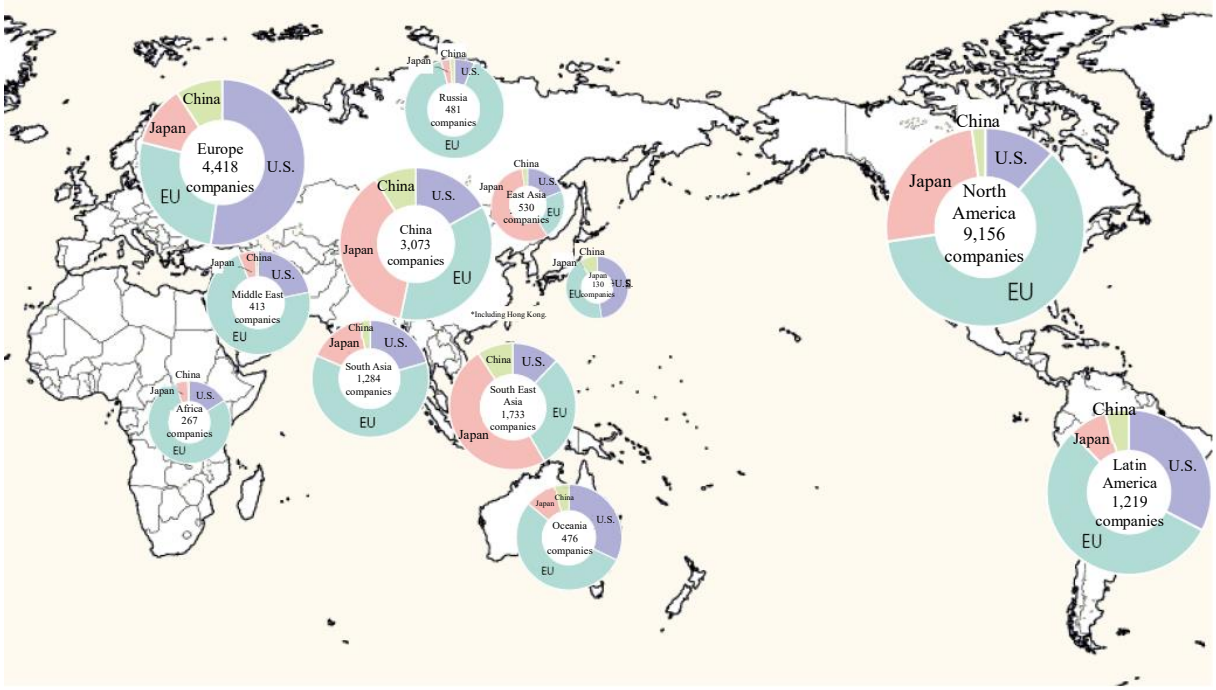
**Figure II-1-1-2-36 (for reference)** **Distribution of overseas companies financed (more than 25%) by companies from Japan, the United States, China, and the EU (telecom sector)**




Notes: Distribution of overseas companies financed (more than 25%) by companies from Japan, the United States, China, and the EU (number of companies).

Source: BVD “ORBIS.”

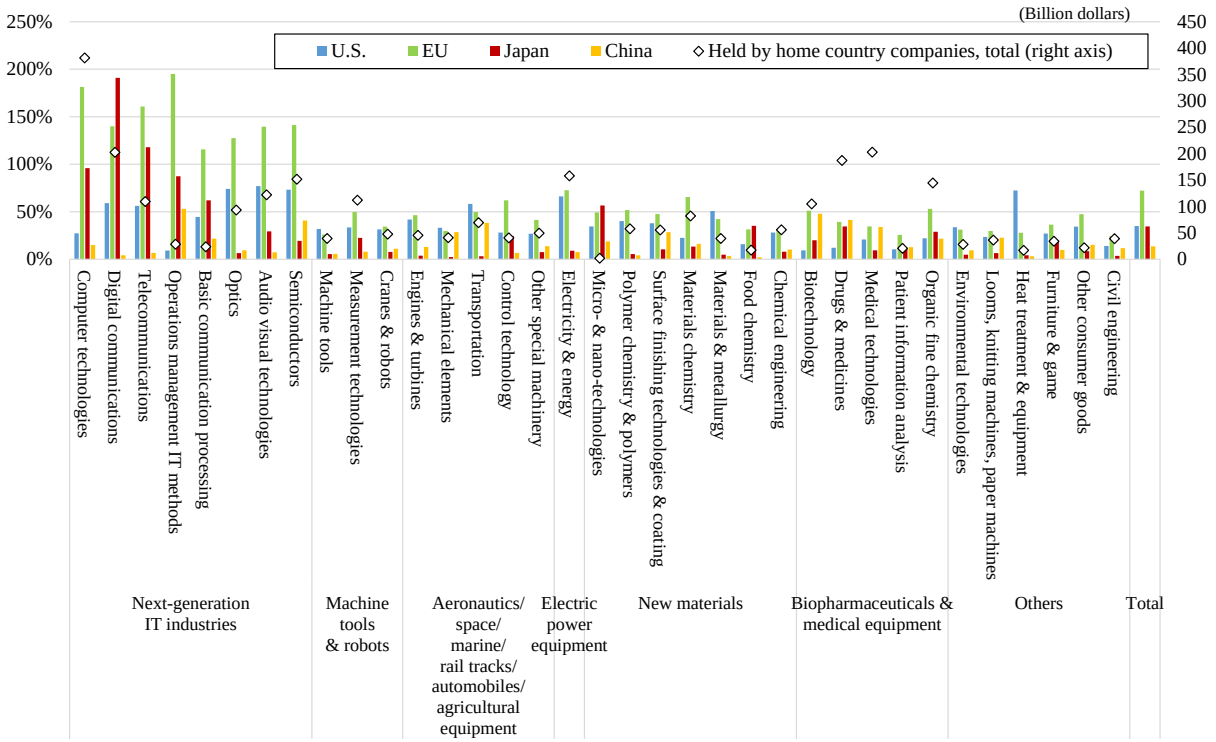
**Figure II-1-1-2-37 (for reference)** **Distribution of overseas companies financed (more than 25%) by companies from Japan, the United States, China, and the EU (machinery sector)**




Notes: Distribution of overseas companies financed (more than 25%) by companies from Japan, the United States, China, and the EU (number of companies).

Source: BVD "ORBIS."

**Figure II-1-1-2-38 Percentage of patents held by target companies of M&A (against value of patents held by companies in the home country[40])**

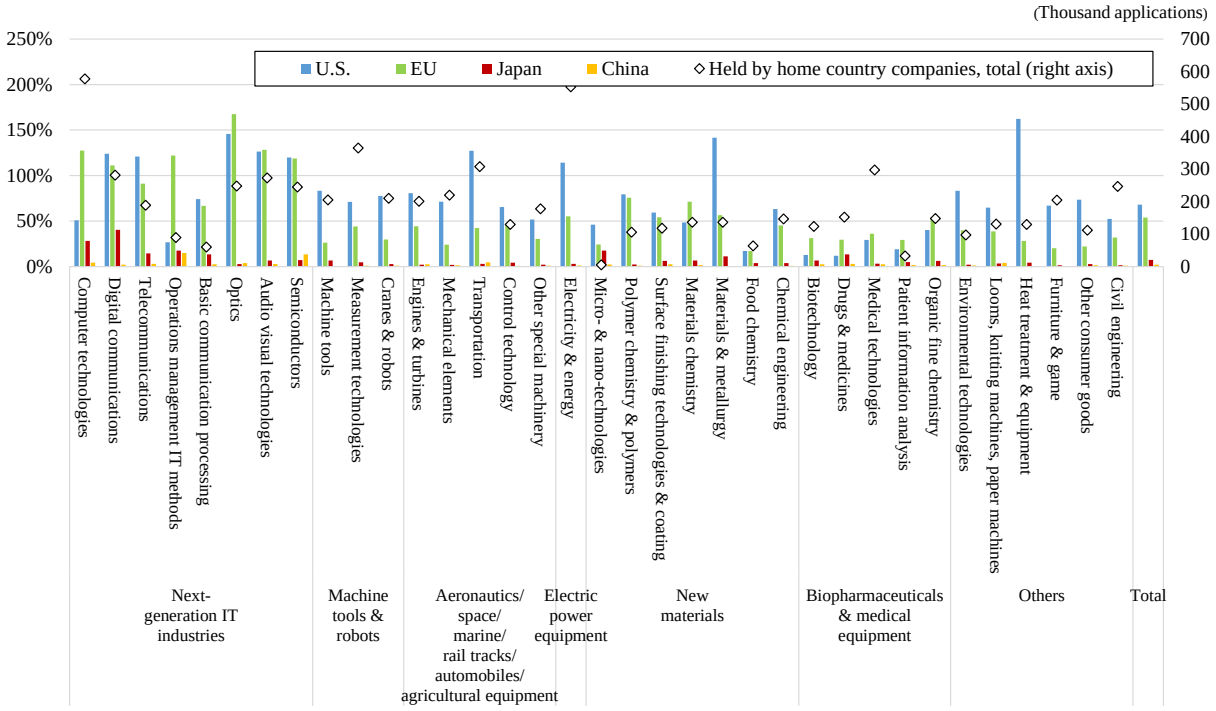



Notes: 1. Percentage of (A) patents held by target companies owning more than 10% through cross-border M&A (2007-2018) to (B) patents held by companies in the home country (excluding foreign-owned companies) and their overseas affiliates (owned more than 50%), (A) divided by (B). Patent applications for 2007-2015 (through 2012 for China).
2. Used the values published in the ORBIS-IP.

Source: BvD "ORBIS-IP" and "Zephyr."

40 As for the values, we used estimates published in Bureau van Dijk's ORBIS Intellectual Property database.

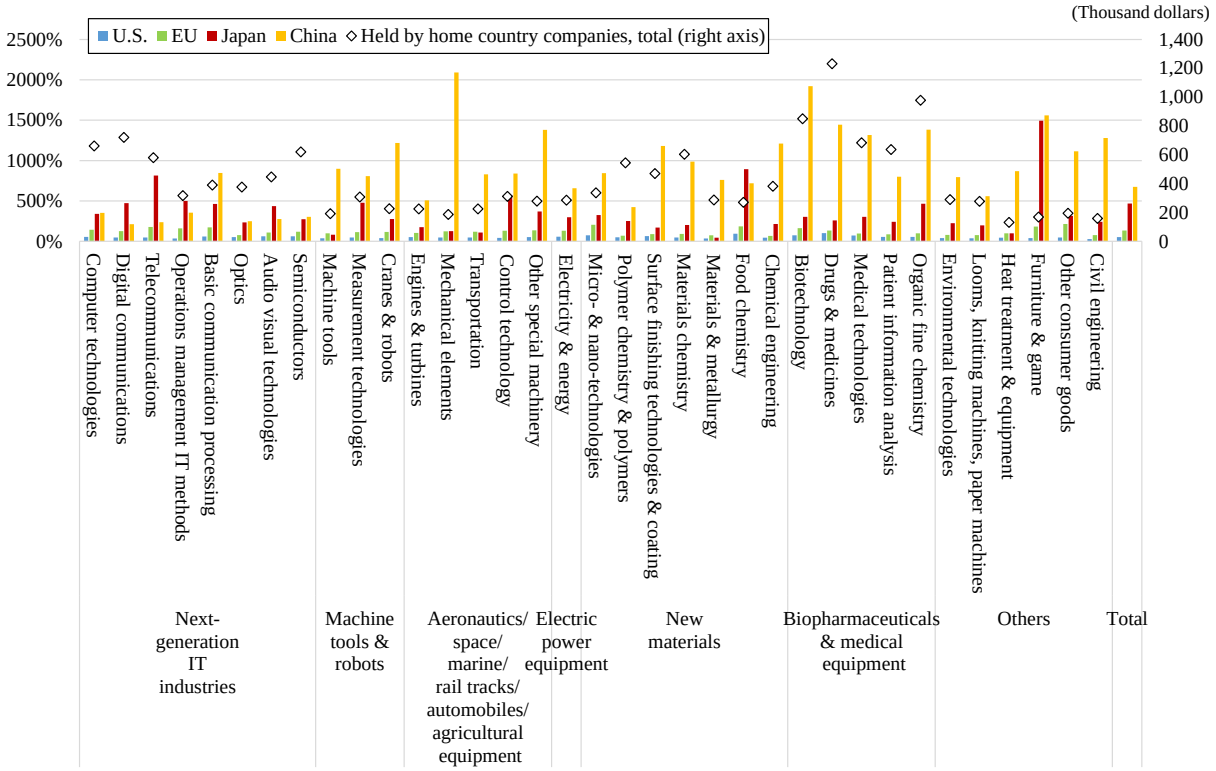
**Figure II-1-1-2-39 Percentage of patents held by target companies of M&A (against the number of patent applications by companies in the home country)**




Notes: Percentage of (A) patents held by target companies owning more than 10% through cross-border M&A (2007-2018) to (B) patents held by companies in the home country (excluding foreign-owned companies) and their overseas affiliates (owned more than 50%) ((A) divided by (B). On the basis of the number of patents. With regards to patents constituting a family, the patent most representative of the family). Patent applications for 2007-2015 (through 2012 for China).

Source: BvD "ORBIS-IP" and "Zephyr."

**Figure II-1-1-2-40 Percentage of estimated unit cost[41] of patents held by target companies of M&A (against patent applications held by companies in the home country)**




Notes: 1. Percentage of the per-patent value (based on the patent family) of (A) patents held by target companies owning more than 10% through cross-border M&A (2007-2018) to (B) patents held by companies in the home country (excluding foreign-owned companies) and their overseas affiliates (owned more than 50%) ((A) divided by (B)). The average on the right-hand axis represents the per-patent value of all the patents held by home companies in the United States, the EU, Japan, and China (based on the patent family). Patent applications for 2007-2015 (until 2012 for China).
2. Used the values published in ORBIS-IP.

Source: BvD "ORBIS-IP" and "Zephyr."

## 3. Globalization of knowledge

### (1) Expansion of research and development overseas

Until now, we have discussed on the global networks of companies through capital ties. Companies are expanding globally in terms of knowledge and technologies. In the past, overseas bases were used mainly for production and sales, but in recent years, research and development has gained importance. According to survey of Japanese companies[42] research and development aimed at the development of new products steadily increased through FY2017 (Figure II-1-1-3-1) while production and sales still accounted for the largest part among functions expanded overseas.

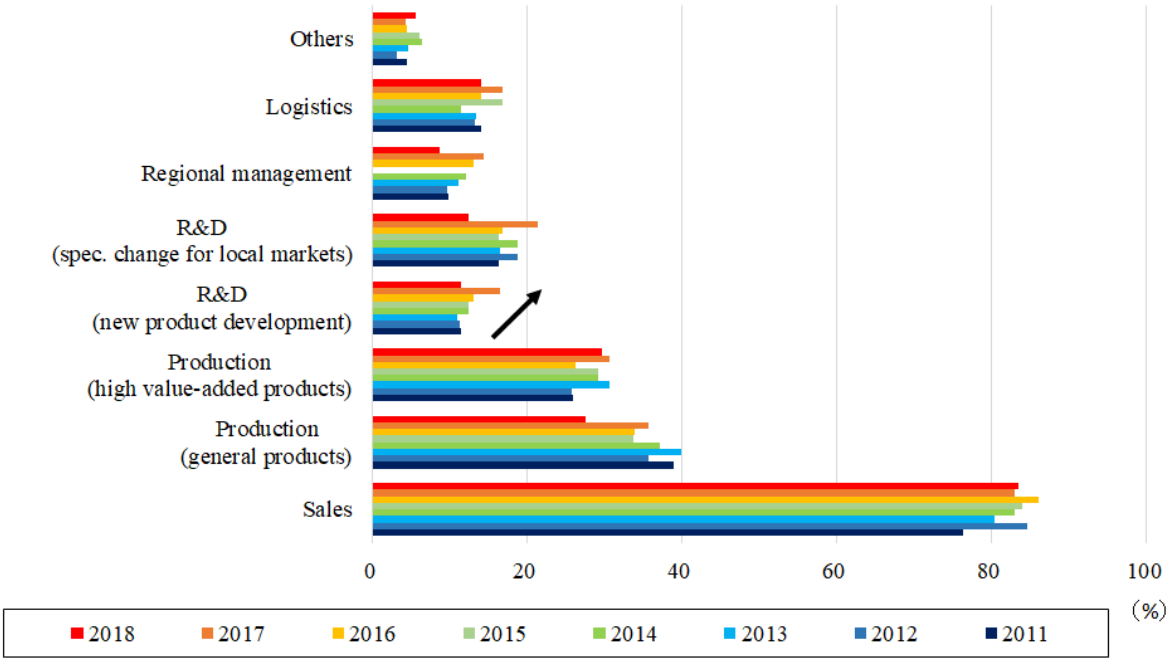
Research and development expenses at overseas affiliates of Japanese manufacturing companies have increased sharply since the 2000's, with the ratios higher than that of in Japan (Figure II-1-1-3-2). By region, research and development expenses, together with sales, have grown remarkably in Asia. In

41 Just like Figure II-1-1-2-38, we used the estimates published in Bureau van Dijk's ORBIS Intellectual Property database as the value of patents to calculate the unit cost.

42 JETRO (2019).

particularly, the growth rate of research and development expenses is higher than that of sales in China, India, the ROK, and Thailand. In terms of the size of research and development expenses, China is the second largest following in China after the United States (Figure II-1-1-3-3), and its ratio at overseas affiliates increased from 2% in FY2002 to 18% in FY2016 (Figure II-1-1-3-4).[43] The percentage for Asia, including Taiwan, the ROK, ASEAN member countries, etc., almost tripled during the same period.

**Figure II-1-1-3-1 Functions that Japan's overseas affiliates plan to expand in the future**

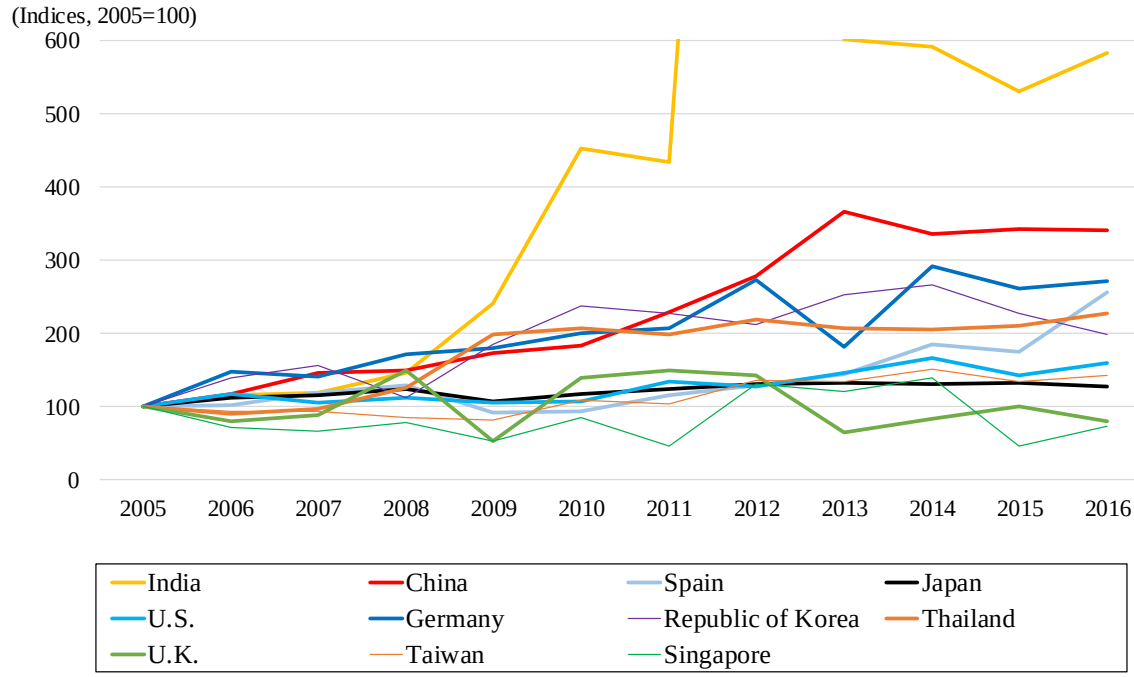



Notes: A survey of Japan's overseas affiliates. Of the companies which currently had bases abroad and planned to expand presence overseas, those who specified in which countries/regions they planned to expand operations (multiple answers).

Source: FY2018 Survey on the International Operations of Japanese Firms by the Japan External Trade Organization (JETRO).

43 US dollars (converted from yen, using the average exchange rate for the year).

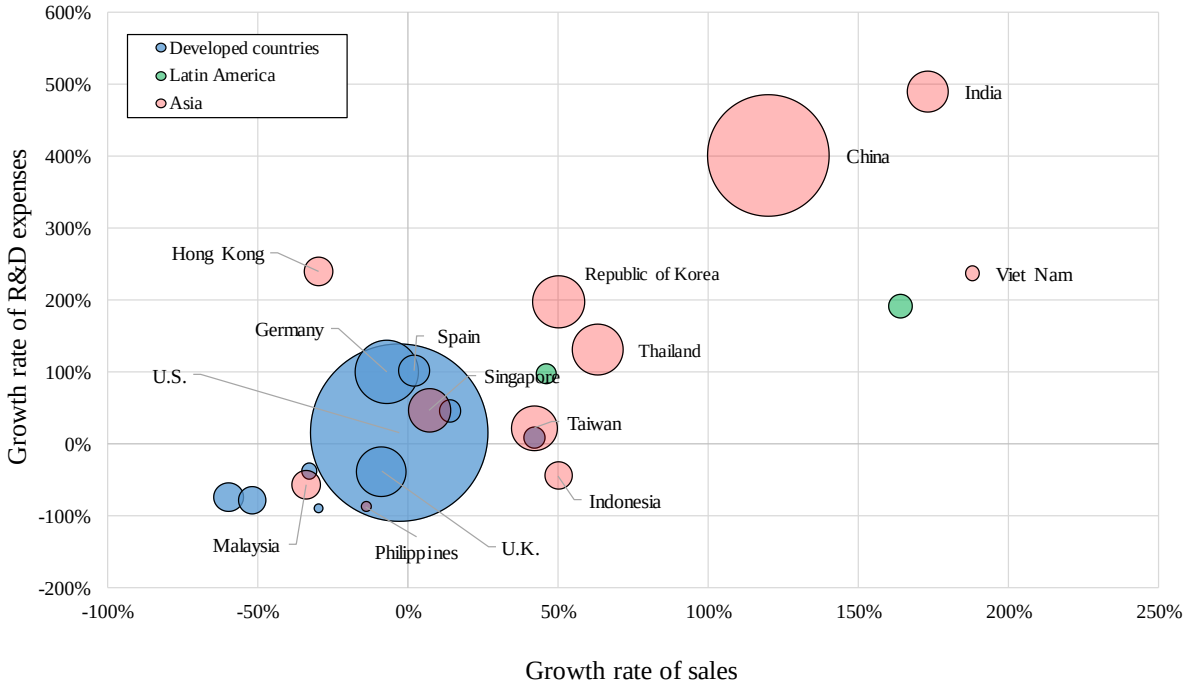
**Figure II-1-1-3-2 (Real) research and development expenses of Japan's overseas affiliates (manufacturing)**




Notes: Research and development expenses of domestic companies in Japan and Japan's overseas affiliates (manufacturing) (by location for overseas affiliates. Top 10 nations in terms of value for FY2015-2016). Obtained real values by applying GDP deflator after conversion to the local currencies.

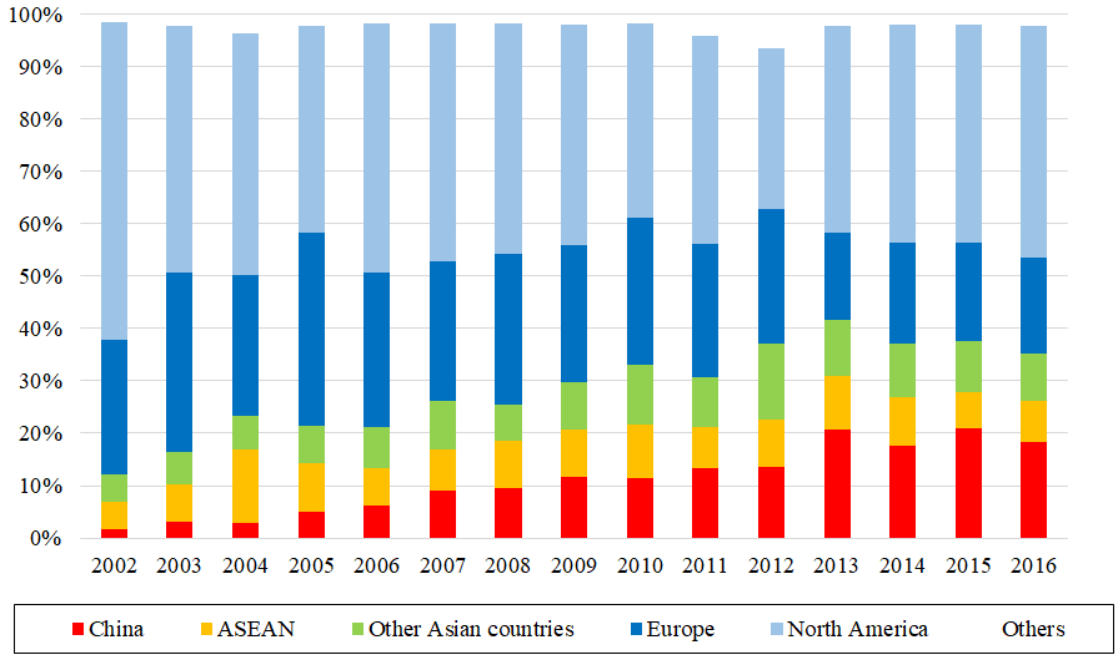
Source: METI's Basic Survey of Japanese Business Structure and Activities and the Survey on Overseas Business Activities, IMF statistics.

**Figure II-1-1-3-3 Real growth rates of research and development expenses and sales at Japan's overseas affiliates (manufacturing)**



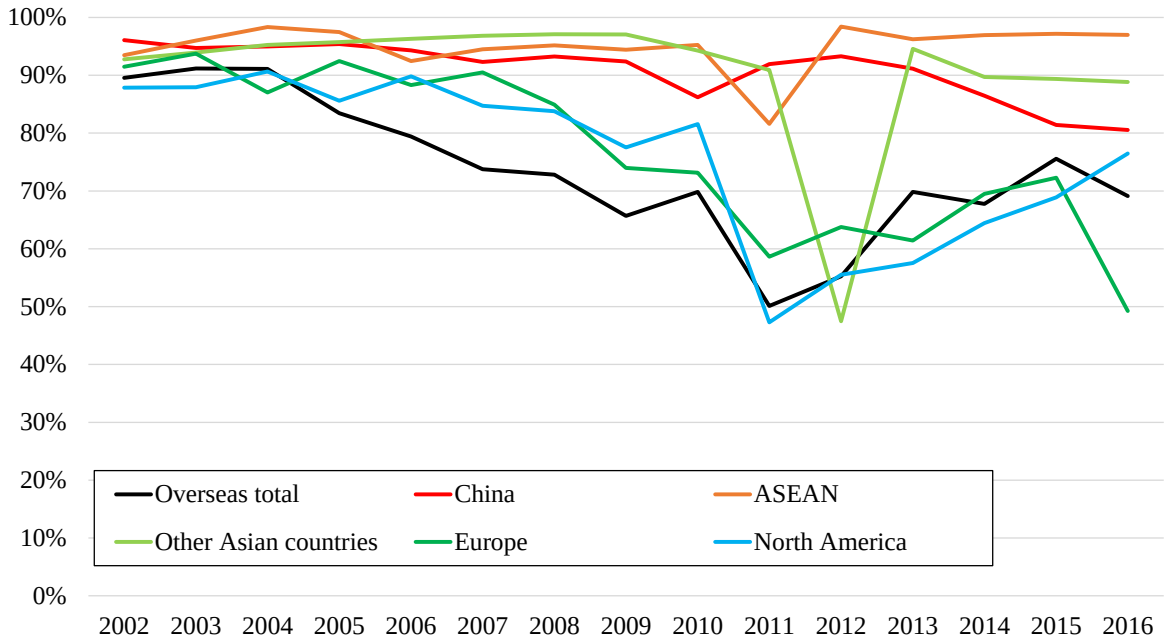

Notes: The size of each bubble represents research and development expenses (average for FY2013-2016, based on the dollar). The growth rate was the total for FY2013-2016 against that for FY2002-2005 (obtained real values by applying GDP deflator after conversion to the local currencies).
Source: METI's Survey on Overseas Business Activities.

**Figure II-1-1-3-4 Percentage of each nation to research and development expenses at Japan's overseas affiliates (manufacturing)**




Notes: Percentage of each nation to research and development expenses at Japan's overseas affiliates (manufacturing).
Source: METI's Survey on Overseas Business Activities.

**Figure II-1-1-3-5 Percentage of manufacturing industries to research and development at Japan's overseas affiliates**



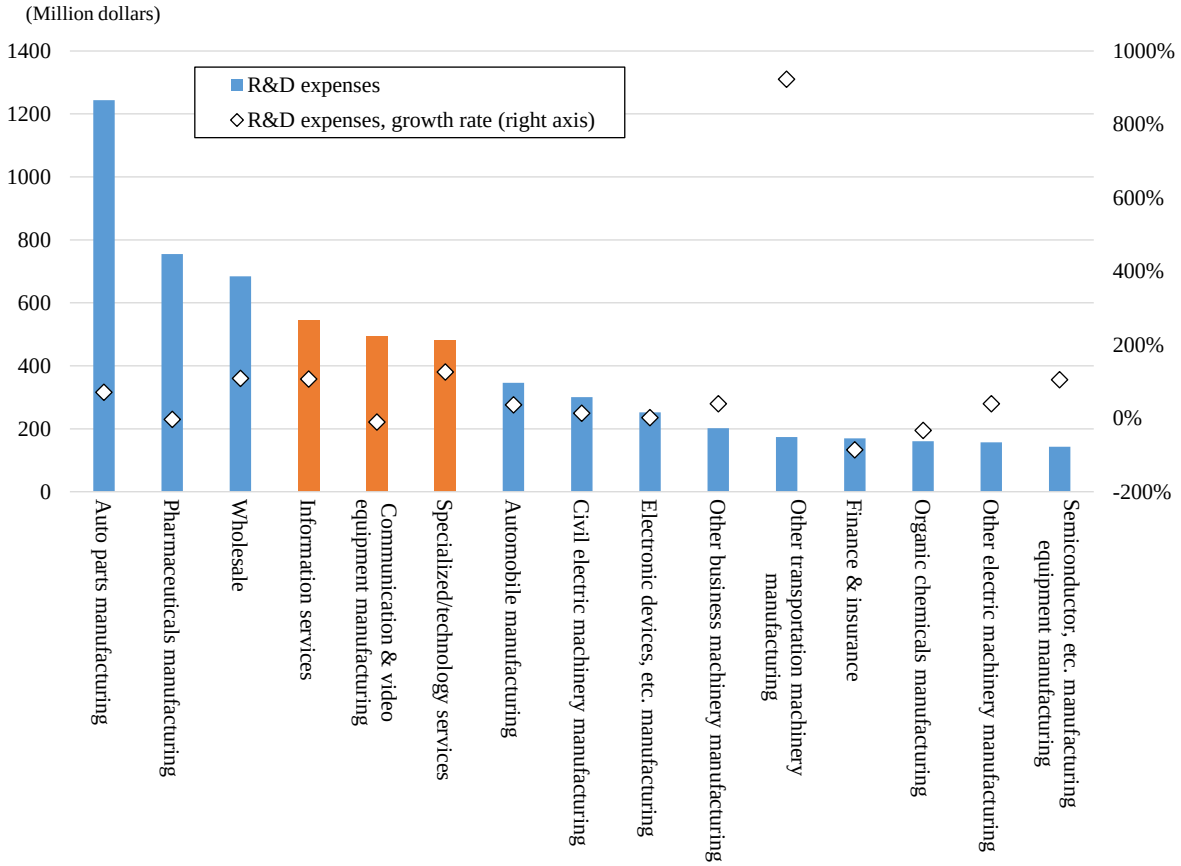

Notes: Percentage of manufacturing industries to research and development expenses of Japan's overseas affiliates in all industries (by location).
Source: METI's Survey on Overseas Business Activities.

In which sectors is research and development conducted overseas? The percentage of manufacturing industries[44] in research and development expenses of Japan's overseas affiliates continued to decline in the 2000's, and the level for FY2016 is as much as 20 points lower compared to the beginning of the 2000's, even though it recovered slightly in the 2010's (Figure II-1-1-3-5).

The size of research and development expenses is large in manufacturers of auto parts, pharmaceuticals, and wholesalers (Figure II-1-1-3-6). Telecommunication and pharmaceutical companies allocate a large amount of research and development expenses relative to their sales (Figure II-1-1-3-7).

On the other hand, specialized/technology services, information services, wholesale, and semiconductor manufacturing equipment manufacturing companies have been reporting a high growth rate especially in recent years, with the growth rate of research and development expenses significantly higher than that of sales in most sectors (Figure II-1-1-3-8), implying they are actively pursuing knowledge-based production activities at overseas bases.

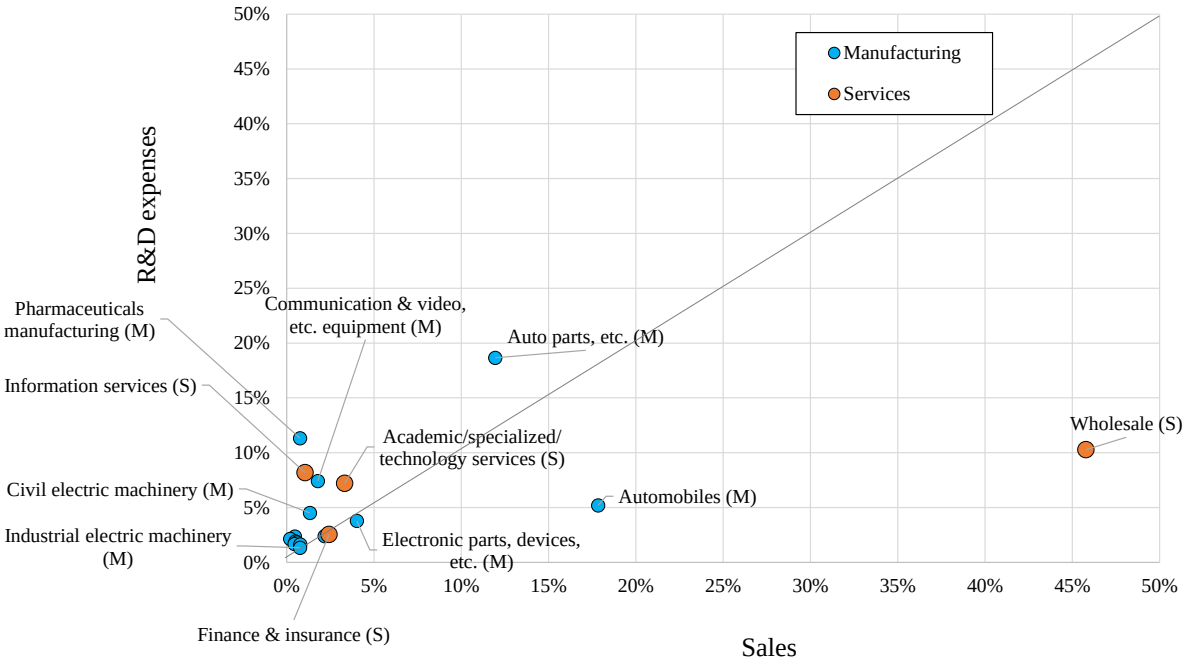
**Figure II-1-1-3-6 Size and growth rate of research and development expenses at Japan's overseas affiliates (by sector)**




Notes: Research and development expenses at Japan's overseas affiliates (average for FY2015-2016, converted from yen to U.S. dollars). Top 15 sectors in terms of R&D expenses (Japan Standard Industrial Classification groups). Growth rate against average for FY2010-2011.
Source: METI's Survey on Overseas Business Activities.

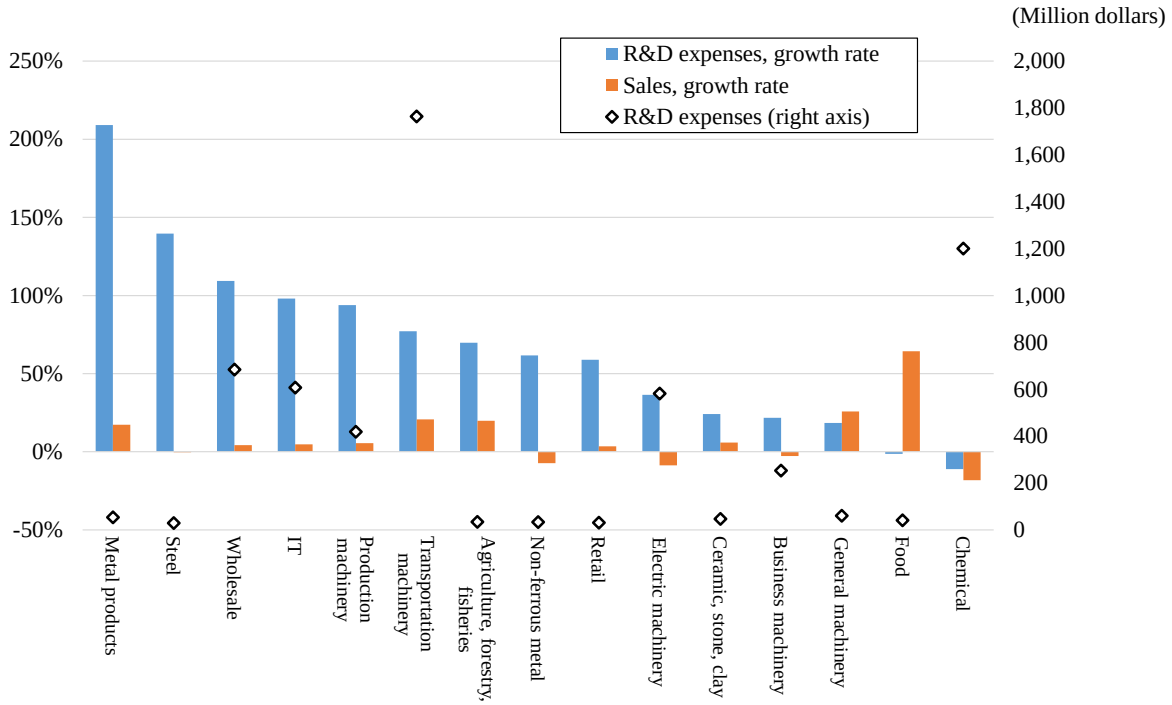
44 All industries covered by METI's Basic Survey of Japanese Business Structure and Activities.

**Figure II-1-1-3-7 Percentage by sector to research and development expenses at Japan's overseas affiliates (FY2015-2016)**




Notes: Percentage of each sector (Japan Standard Industrial Classification groups) to the total (average for FY2015-2016, converted from yen to U.S. dollars).
Source: METI's Survey on Overseas Business Activities.

**Figure II-1-1-3-8 Growth rate of research and development expenses and sales by sector (Japan's overseas affiliates)**[45]




Notes: Research and development expenses at Japan's overseas affiliates (average for FY2015-2016, converted from yen to U.S. dollars). Top 15 sectors in terms of the size of R&D expenses.
Source: METI's Survey on Overseas Business Activities.

Research and development expenses have grown in line with the increase in the number of companies expanding abroad and their size. Research and development expenses whose growth is sharply higher than that of sales indicates the importance of research and development at overseas affiliates amid improving innovation environments in emerging countries and in the context of needs to customize products for respective markets.

### (2) Spread of technologies to emerging countries[46]

In the course of development of emerging countries, the introduction and use of technological knowledge possessed by developed nations plays a very important role for emerging countries to catch up with developed nations. Especially in the course of economic development, industrialization in the typical catch-up style will occur when the industrial structure gradually transforms from less research and development-intensive industries to more research and development-intensive industries. It is believed that Japan has achieved high economic growth after World War II through by adopting overseas technologies aggressively.

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45 The classification for Figure II-1-1-3-8 was modified from the Japan Standard Industrial Classification groups to suit this analysis.

46 Most texts and all the charts in section (2) were written in reference to or quoted from Iino, Urabe, Saito, and Yamauchi (2019) "SHINKOUKOKU NIOKERU CHISHIKISEISANKATSUDOU TO GUROUBARU NETTOWAAKU" (Research Institute of Economy, Trade and Industry (RIETI)).

It has been pointed out that trade (goods and technologies) and foreign direct investment (FDI) are an important channel for the spread of knowledge and technologies.

Among those channels for spillover of knowledge and technologies, (A) trade channels allow technologies to spread by using or analyzing products, or receiving training on their use, as technological information is incorporated into exported products.[47] Human contacts with trade partners can also trigger innovations.[48]

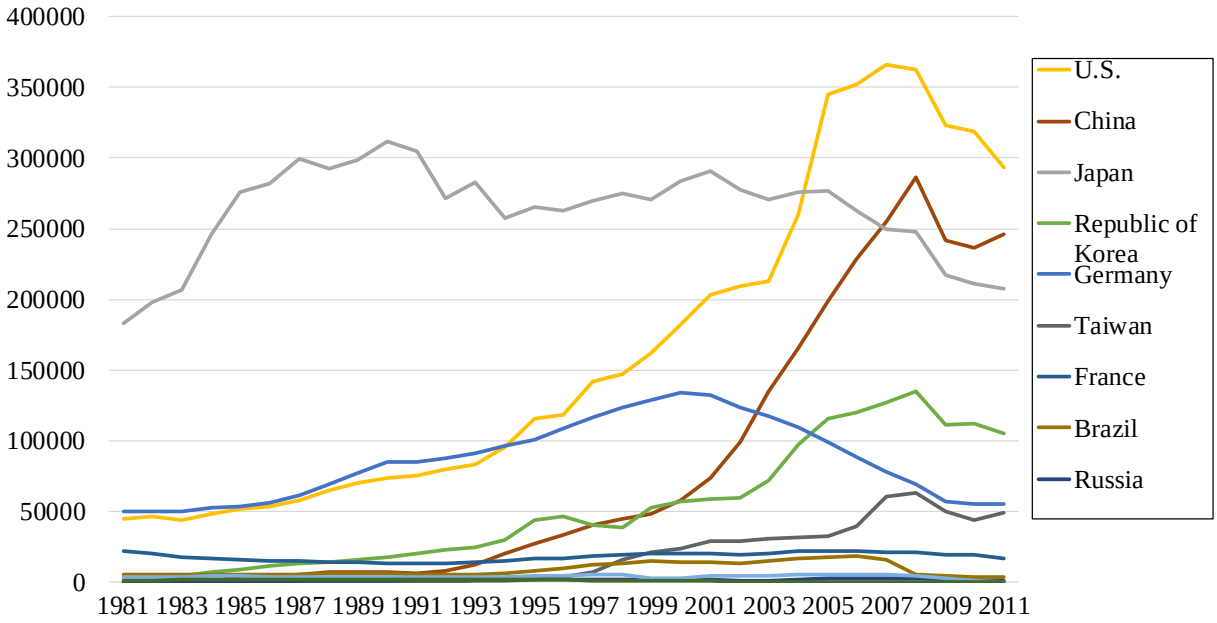
As for (B) the FDI channel, technology is said to spread through observation or imitation by local companies in the same sector, and the provision of technologies to suppliers of components or acquired companies in countries that companies enter into.[49] With regards to FDI, Fosfuri et. al.[50] showed the spread of technologies by local hires of foreign companies moving to a local company, while Rodriguez-Clare[51] demonstrated that close trade relationships between multinational companies and local firms have positive effects on companies in developing countries, by helping spread technological information.

Iino et al. (2019)[52] examined changes in the number of patent applications overseas as a proxy variable for overseas expansion in order to identify how knowledge spreads in emerging countries as a result of the entry by companies from developed countries.

Looking at which country patent applications are submitted to, we found that the number of applications to the Patent Offices in Japan and Germany was decreasing moderately with a sharp decline in the two countries' share, while the number of applications to the Patent Office in China was rising (Figures II-1-1-3-9, II-1-1-3-10).

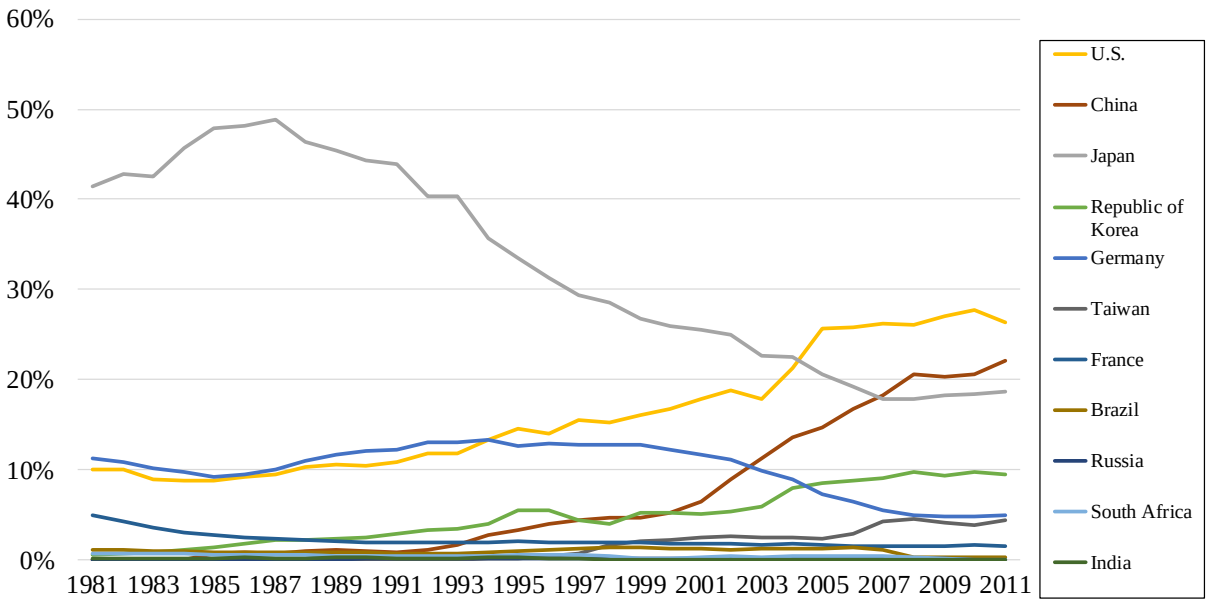
47 Eaton and Kortum (1996).
48 Kiriyama (2012).
49 Kiriyama (2012).
50 Fosfuri, Motta, and Rønde (2001).
51 Rodriguez-Clare (1996).
52 Iino, Urabe, Saito, and Yamauchi (2019).

**Figure II-1-1-3-9 Changes in the number of patent applications to the patent office of respective countries/regions (only applicants whose country/region of residence is known)**




Notes: Covers only applicants whose country/region of residence is known. Therefore, patent applications by individuals are not included.
Source: Iino, Urabe, Saito, Yamauchi (2019).

**Figure II-1-1-3-10 Changes in the share of the patent office of respective countries/regions (share to the total applications to the patent office of respective countries/regions)**




Notes: Covers only applicants whose country/region of residence is known. Therefore, patent applications by individuals are not included. The total of patent applications to the patent office of respective countries/regions, which is the denominator, does not include patent applications to the World Intellectual Property Organization (WIPO) and the European Patent Office.
Source: Iino, Urabe, Saito, Yamauchi (2019).

Now that applications to the patent office in China are growing. What is the composition of applicant companies like?

Examining changes in the ranking of country of residence[53] of applicant companies to the patent offices in emerging nations, we found that companies in the ROK came to the first place from the third place in the 1980's in terms of the number of applications to the patent office of the ROK, indicating that applications from the ROK caught up and exceeded those from foreign applicants, who were technologically more advanced. Chinese companies moderately climbed up the ranking of the number of applications to the patent office in China in the 1990's and have maintained the first place since 2005. It was also confirmed that Taiwan and Brazil have been rising to higher places in terms of the number of patent applications to their domestic patent offices (Table II-1-1-3-11).

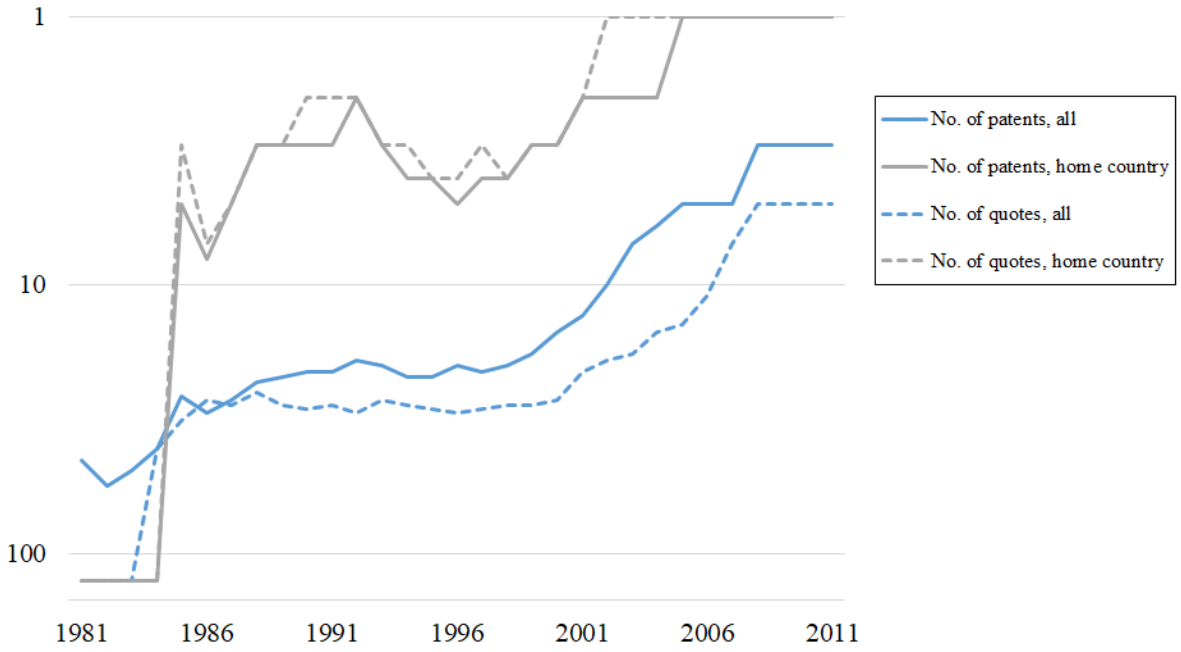
53 In Table II-1-1-3-11 and Figure II-1-1-3-12, calculations were made by address of headquarters of companies applying for patent. However, there is not much difference in the results, even if calculations are done on the basis of the address of companies which own more than 50% of the company applying for patent.

**Table II-1-1-3-11 Ranking of the number of applications to the domestic/regional patent office by country/region of applicant companies**

| | 1981 | 1996 | 2011 |
|---|---|---|---|
| Japan | 1 | 1 | 1 |
| United States | 1 | 1 | 1 |
| Germany | 1 | 1 | 1 |
| ROK | 3 | 1 | 1 |
| China | - | 5 | 1 |
| Taiwan | - | 4 | 1 |
| Brazil | 3 | 3 | 1 |

Notes: Ranking of companies by country/region of residence regarding the number of patent applications to the patent office of the home country/region.
Source: Iino, Urabe, Saito, Yamauchi (2019).

**Figure II-1-1-3-12 Changes in the number of patent applications and the number of quotes in China**




Notes: Ranking of companies based in China in terms of the number of patent applications and quotes (by organization applications are made to). All refers to the ranking based on the total number including the home country. The home country refers to the ranking based on the applications made to the home country.
Source: Iino, Urabe, Saito, Yamauchi (2019).

Looking not only at the ranking of the number of applications to the domestic patent office but also at the ranking in relation to the total number of applications in the world, we found that China's ranking climbed in the 1980's in terms of the number of patent applications and quotes in the country, and the

number of applications and quotes increased in the world afterwards. ROK and Taiwan also saw their rankings rise in terms of the number of applications to the domestic patent office before their ranking in terms of the number of applications to the world went up.

In other words, in the early stage of knowledge-based production activities in emerging countries, more patent applications are made by overseas applicants than by domestic applicants, but together with patent applications, technologies and knowledge flow in from overseas, helping improve domestic technological standards, and leveraging these technologies and knowledge leads to active overseas expansion, a common phenomenon observed in many countries. It is possible that the inflow of knowledge on technologies and knowledge from abroad may be contributing to the development of knowledge-based production activities in emerging countries.

**(3) Links between patent applications and overseas operations of companies**[54]

Patent applications overseas contribute to the spread of technologies in emerging countries and represent the transfer of knowledge and technologies abroad, as seen under (2). However, its fundamental purpose is to protect companies' own technologies and to secure business areas.

How are the relationships between overseas operations and countries where patents are applied for under globalization? Iino et al. examined links between patent applications abroad and goods trade and FDI.

They focused on data regarding patent applications, trade, and FDI of 11 countries; namely, the United States, Germany, France, Japan, Brazil, China, the ROK, Taiwan, Russia, India, and South Africa.

Figures II-1-1-3-13 and II-1-1-3-14 show patent applications abroad, Figures II-1-1-3-15 and II-1-1-3-16 refer to external FDI, and Figures II-1-1-3-17 and II-1-1-3-18 represent export networks. The colors of the lines are the same as those of the circles at the end, which represent countries/regions filing patent applications, external FDI, and exports. In other words, the circle at the end of a line is the starting point of the line of the same color, with the thickness of the line representing volume.

The examination of patent applications filed to the patent office of foreign countries shows that many lines are thicker in 2010 than in 2001, indicating that exchange of technological knowledge is more active. In particular, the lines from Japan and other countries to the United States and the lines from the United State to China are markedly thicker (Figures II-1-1-3-1 and II-1-1-3-14).

54 Most texts and all the charts in section (3) were written in reference to or quoted from Iino, Urabe, Saito, and Yamauchi (2019).

**Figure II-1-1-3-13 Networks of patent applications (2010)**[55]

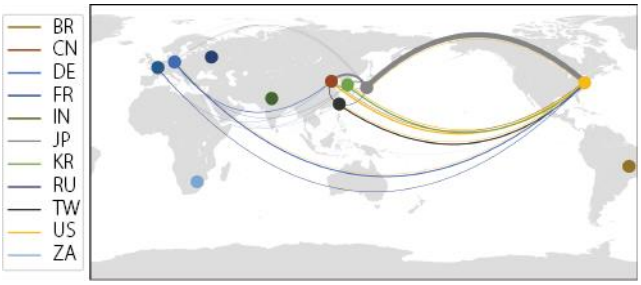



**Figure II-1-1-3-14 Networks of patent applications (2001)**

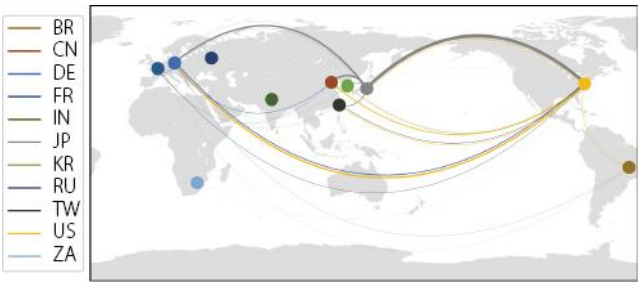
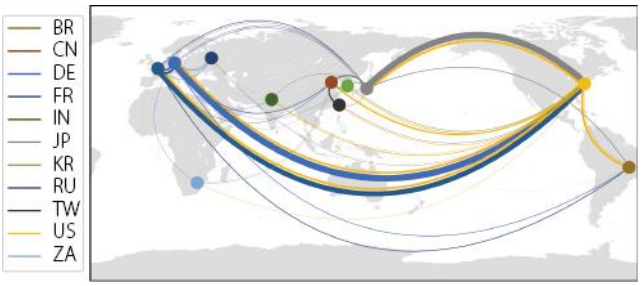



**Figure II-1-1-3-15 Networks of outward FDI (2010)**




The lines of outward FDI networks from Europe and Japan to the United States are thicker in 2010 than in 2001. As for the lines of trade (export) networks, we find that the lines from China to the United States and other countries and the lines from the United States, Japan, and other countries to China are thicker.

Comparing the flow of patent applications with the flow of FDI and trade, we find that the lines from Japan to the United States are thicker in both patent applications and outward FDI, while the lines from the United States are thicker in patent applications and trade (exports) to China. With regards to Germany and France, the lines to the United States are thicker in all three areas of patent applications, outward FDI, and trade (exports). Given these findings, the flow of patent applications is similar to that of FDI and trade, at least in developed nations.

55 Alphabet codes in Figures II-1-1-3-13 to II-1-1-3-18 represent nations/regions where the lines start (BR: Brazil, CN: China, DE: Germany, FR: France, IN: India, JP: Japan, KR: ROK, RU: Russia, TW: Taiwan, US: the United States, and ZA: South Africa).

**Figure II-1-1-3-16　Outward FDI networks (2001)**

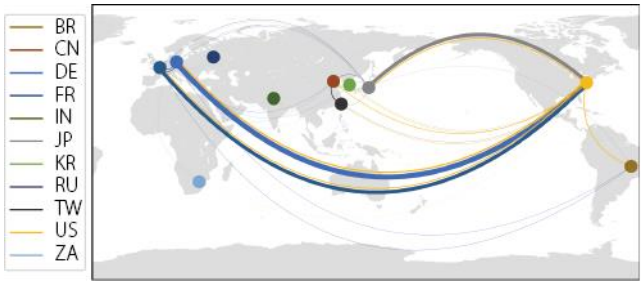



**Figure II-1-1-3-17　Trade (export) networks (2010)**

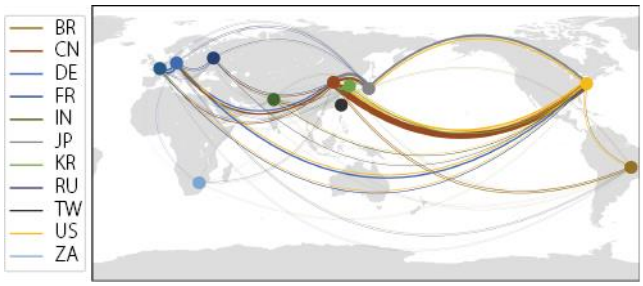
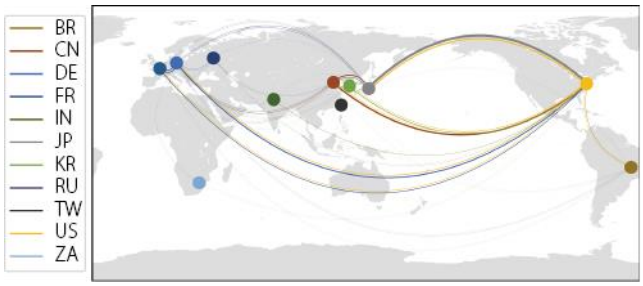
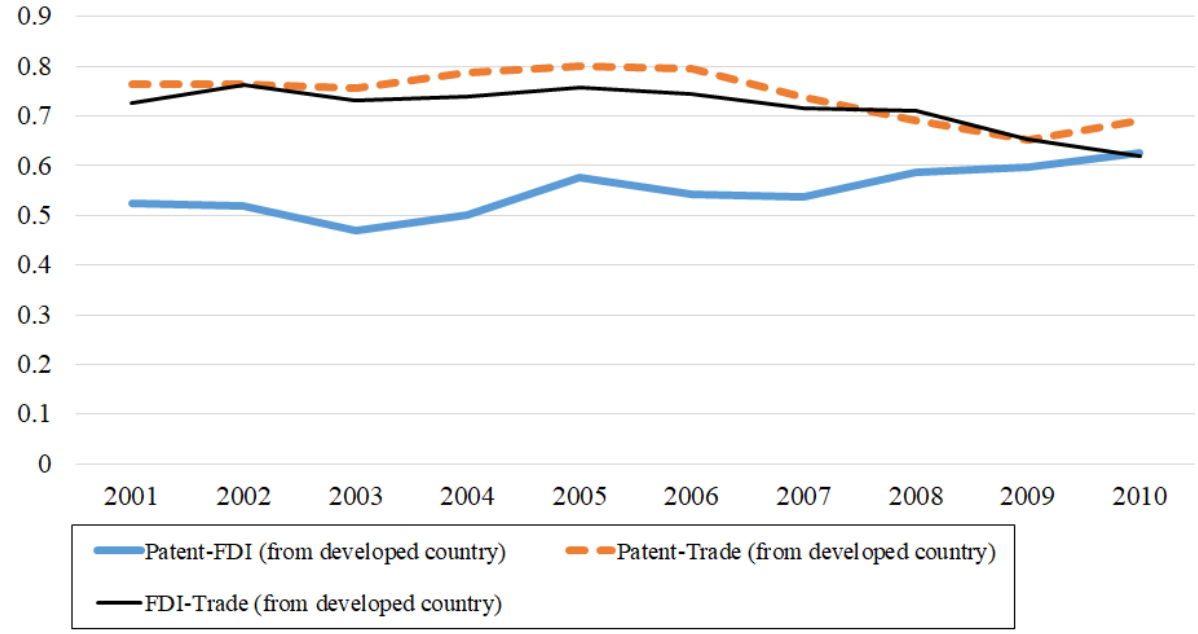



**Figure II-1-1-3-18　Trade (export) networks (2001)**




Next, examining the correlation between the countries where patent applications are filed by companies from the major developed nations of the United States, Germany, France, and Japan and the target countries of FDI or exports, we found that the correlation with target countries of exports has been moderately declining, while that with target countries of FDI has been rising (Figure II-1-1-3-19). As the percentage of overseas sales is rising in the sales of companies in developed nations, the importance of FDI is growing, while that of exports is falling in relative terms.

**Figure II-1-1-3-19 Correlation between patents and trade/FDI (developed nations)**




Notes: Changes in each correlation coefficient of patents and FDI, patents and trade, and FDI and trade from major developed nations (Japan, the United States, Germany, and France) to a total 11 countries (these four nations and emerging countries/regions (Brazil, China, the ROK, Taiwan, Russia, India, and South Africa)) (export, external FDI, overseas patent applications).
Source: Iino, Urabe, Saito, and Yamauchi (2019).

Although the correlation is becoming weaker between trade and patents in developed nations, it is still higher than that between FDI and patents. Given that only some export companies possess bases overseas, it is natural for target countries of export and patent applications to be strongly correlated and to remain important for export countries of industrial goods.

In developed countries, the correlation between FDI and trade is gradually declining. Companies from developed nations conduct FDI mainly for manufacturing purposes. It is possible that the correlation between target countries of FDI and exports has declined as a result of increasing local procurement of intermediate goods, instead of importing from the developed country in question.

To sum up, it has been confirmed that cross-border patent applications and the resulting spread of technologies and knowledge are linked to FDI and trade, and that the links are changing in that the spread of technologies and knowledge as a result of FDI is larger than before, while the spread as a result of trade is becoming slightly less important.

The correlation with regards to patents and trade is also increasing in emerging countries as well as developed nations, with the possibility of spread of technologies and knowledge going in various directions.

On the other hand, FDI and patent applications are targeted to a small number of countries such as China and the United States, while there is often only a small inflow into originating countries of FDI and patent applications, representing an asymmetrical flow. When only a small inflow of cases of FDI and patent applications is reported as in Japan, the inflow of technologies and knowledge from overseas may also be weak.

**(4) Global networks of companies regarding innovation**[56]

Combination of different knowledge is said to be a vital factor to bring innovations. People separated by a long distance often possess different knowledge[57] and in this sense, the spread of knowledge and technologies across borders may have strong influence on innovations at home.

Knowledge can be disseminated overseas through international joint research, in addition to trade (goods and technologies) and outward FDI. Iino et al.[58] empirically verified the effects of international joint research between companies on the quality of corporate innovations by regarding joint patent applications by companies as joint research.

Iino et al. argue that international joint patents have effects of improving the quality of patents (the number of quotes).

The same study picked companies in the six major countries of Japan, Germany, France, the United States, China, and the ROK[59] that have conducted joint patent applications and international joint research in the past, and analyzed the correlation between joint patent applications or international joint applications, and the number of quotes.[60] It found that the companies that belong to networks of joint applications or international joint applications tend to have their patents quoted more often than those that do not belong to such networks, and in many cases, international joint application networks have greater impact on the number of quotes than do joint application networks (Table II-1-1-3-20), implying that having an international network helps improve the quality of corporate research.

**Table II-1-1-3-20 Correlation between international joint research and quality of patents (regression analysis)**

| | U.S. | Japan | Germany | ROK | France | China |
|---|---|---|---|---|---|---|
| Joint applications | 0.104*** | 0.114*** | 0.130*** | 0.100*** | 0.088*** | 0.711*** |
| Int'l joint appl. | 0.169*** | 0.155*** | 0.229*** | 0.307*** | 0.253*** | 0.627*** |
| Observed cases | 188,400 | 45,016 | 67,794 | 38,465 | 18,648 | 51,019 |

Notes: 1. Explained variable is the number of quotes from patents whose application was made in 1990-2010 (standardized using the average figure of quotes per application year). Controlled through the total patent applications, company age, industry classifications. Joint applications include both international and domestic joint applications.
2. ***: $p < 0.01$, **: $p < 0.05$, *: $p < 0.1$.

Source: Iino, Inoue, Saito, and Todo (2018).

56 We mainly quoted and referred to (1) Iino, Inoue, Saito and Todo (2018) "How Does the Global Network of Research Collaboration Affect the Quality of Innovation?," (2) Todo and Kashiwagi (2017) "GUROUBARUNA KIGYOU NETTOWAAKUKARAMITA NIHONKIGYOU NO GENJOU."

57 Todo, Matous, and Inoue (2015).

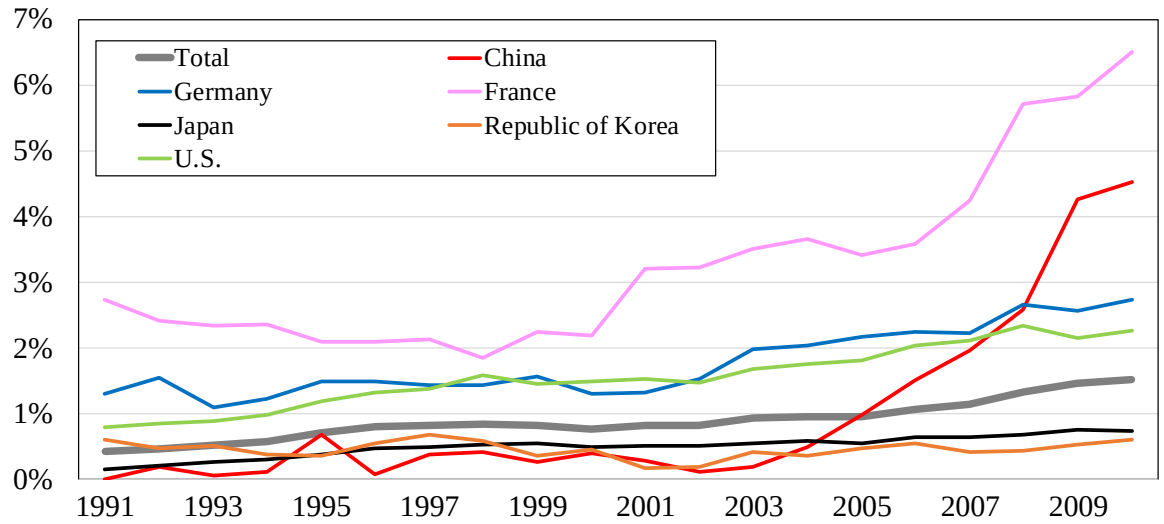
58 Iino, Inoue, Saito, and Todo (2018).

59 These six nations accounted for 80% of the total number of patent applications filed by companies between 2000 and 2010.

60 Controlled through the total number of patent applications, company age, industry classifications. 1991-2010.

The ratios of international joint patents of major countries show that China and France grew sharply during the 2000's, while Japan's ratio was below the world average (Figure II-1-1-3-21).

**Figure II-1-1-3-21 Changes in the ratios of international joint patents (to total patents)**

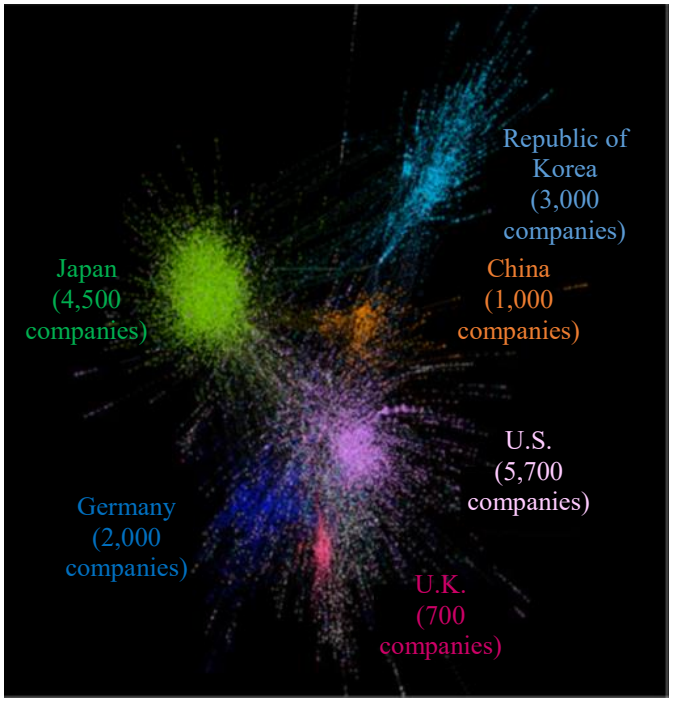



Notes: Ratios of international joint patents to patents filed by companies whose location is known in the ORBIS patent database. Through 2010.
Source: Iino, Inoue, Saito and Todo (2018).

According to Todo and Kashiwagi (2017),[61] Japanese companies do not have sufficient links with global companies in joint research networks represented by the joint possession of patents, although they enjoy close ties in Japan. Figure II-1-1-3-22, which visualizes networks of joint patent ownerships, shows that Japanese companies are clustered away from the center of corporate networks of major countries, compared to those of Europe, the United States, and China, implying less internationalization than the other countries.

61 Todo and Kashiwagi (2017).

**Figure II-1-1-3-22 Joint research networks of global companies (2011-2013)**




Source: Todo and Kashiwagi (2017).

Japanese companies tend to be introverted because there are already a sufficient number of research partners in Japan.[62] If that is the case, weaker ties with foreign companies may not pose a serious problem in terms of innovations. However, the correlation between international joint patents and the quality of patents has become stronger in the 2000's than in the 1990's.[63] In addition, given that accelerating the progress of technologies and knowledge is called for, it seems that expanding corporate networks including foreign companies and inviting technologies and knowledge from abroad are becoming more important.

## 4. Movement of people

We will look at how the movement of people has changed in the world in terms of immigrants, students, and tourists.

Firstly, immigrants from Latin America, the Middle East, and Africa to the United States and 15 member countries of the EU continued to increase between 2000 and 2016. Immigrants from the Middle East to member countries of the OECD grew by a factor of 3.5 times, with those to 15 member nations of the EU reporting the highest growth of 4.1 times and the United States 2.3 times.

Immigrants from China and South Asia to developed countries were also seen increasing, with Chinese immigrants in Australia up by a factor of 3.6 times between 2000 and 2016 and 2.3 times in 15 member countries of the EU during the same period. Immigrants from South Asia were up by a factor

62 Todo and Kashiwagi (2017) indicated through the analysis of diversity in joint research networks that Japanese companies conduct joint research with a variety of researchers in Japan.
63 Iino, Inoue, Saito, and Todo (2018).

of 7.8 times in Australia, 2.4 times in 15 member nations of the EU, and 1.6 times in North America.

The ratio of Latin American immigrants in North America fell slightly to 34.9% in 2016 from 37.0% in 2000, while that of immigrants from South Asia rose to 12.1% from 10.7%, that of immigrants from ASEAN member countries increased to 11.6% from 9.0%, and that of immigrants from Africa expanded to 10.1% from 6.0% during the same period. In 15 member nations of the EU, many immigrants continue to arrive from Europe, but immigrants from the Middle East increased to 16.2% in 2016 from 8.1% in 2000, replacing Africa, the region which used to be the second largest immigrant-sending region after Europe and whose ratio fell to 10.9% from 13.7% in the same period. In Japan, immigrants from the ASEAN accounted for 35.3% in 2016 from 34.1% in 2000, compared with those from China whose share fell to 24.2% from 27.2% in the same period. Immigrants from South Asia were in third place in 2017 at 7.1%, a sign of growing ties with the region. Immigrants from South Asia were also increasing in Australia, with the percentage totaling 26.6% in 2016 from 6.7% in 2000. In terms of immigration, movements of people between the Middles East and South Asia, and developed nations are expanding rapidly (Figure II-1-1-4-1).

Next, changes in inbound students at tertiary levels[64] in major countries show that the number of students from emerging/developing countries studying in developed nations has increased significantly, indicating growing human flows between regions and stronger ties among people with higher academic backgrounds.

The number of foreign students studying in the member nations of the OECD grew by a factor of 2.3 times to some 3.5 million in 2016 from approximately 1.52 million in 2000. In particular, the number of students from China ballooned by 7.3 times to some 790,000 from approximately 110,000. As a result, the ratio of Chinese students studying in the member nations of the OECD amounted to 22.4% in 2016 from 7.1% in 2000, replacing the 15 member nations of the EU, which accounted for the highest percentage of 23.3% as of 2000 (13.3% in 2016).

The ratio of Chinese students studying in North America also rose to 31.9% from 10.5%, and increased to 11.3% from 2.4% in 15 member nations of the EU during the same period. In Japan, their percentage grew to 53.4% from 47.0% during the same period. On the other hand, a growing number of Chinese students opt to study in 15 member nations of the EU and Australia, rather than in Japan. The percentages of Chinese students studying in the member nations of the OECD show that Japan slipped to 9.7% in 2016 from 25.9% in 2000, while Australia rose to 14.2% from 4.6% and the EU increased to 21.1% from 16.6% during the same period.

In Japan, the number of students from the ASEAN grew by a factor of 5.3 times between 2000 and 2016 and that from South Asia expanded by 7.4 times during the same period. The share of students from ASEAN member countries to the total increased to 12.7% in 2016 from 4.8% in 2000, illustrating that more ASEAN students prefer to study in Japan (Figure II-1-1-4-2).

The quality of foreign students studying in China is improving in line with the increase in the number

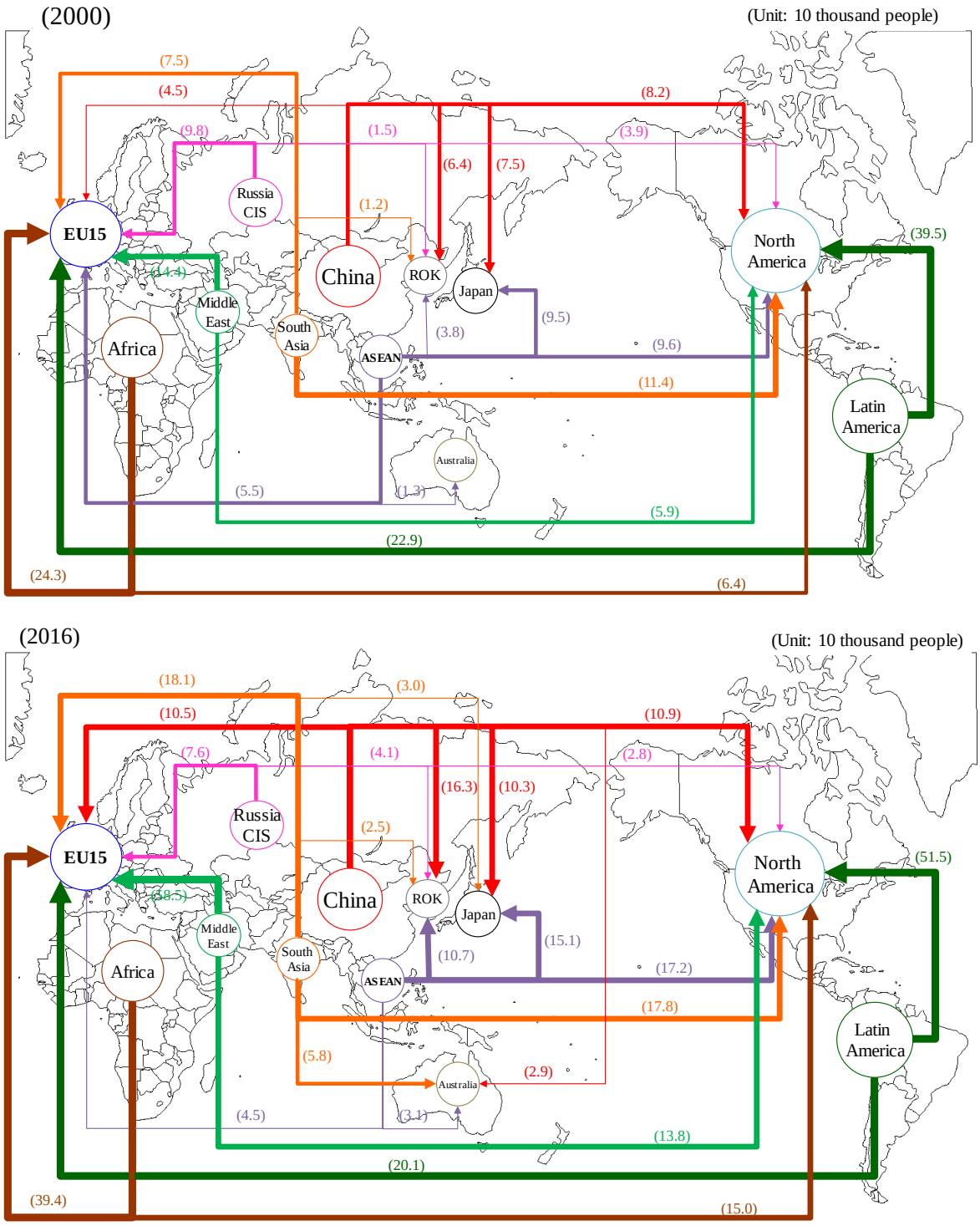
64 The number of students at “tertiary” level. Tertiary level education is classified into Level 5 (qualifications for research and vocational skills, technological and vocational skills), and Level 6 (advanced researchers studying for Ph.D., etc.).

of students. The percentage of students in a degree course rose to 47.4% in 2016 from 26.3% in 2000, indicating that institutes of higher education in China have come to attract people with higher academic backgrounds from abroad.

In addition to higher education, the number of students studying in China for both short and long periods have been growing sharply. The presence of students from ASEAN member countries, South Asia, and Africa stands out, signaling closer ties between China and these emerging/developing nations (Figure II-1-1-4-3).

Movements of people around the world (on an outbound and inbound basis irrespective of the purpose of a trip) show that East Asia and the Pacific report sharp growth on an outbound basis. On an inbound basis, ASEAN member countries surpassed North America in 2017. Meanwhile, no major changes were observed in emerging regions except for East Asia, the Pacific, and ASEAN member countries (Figure II-1-1-4-4).

**Figure II-1-1-4-1 Changes in the number of people who have arrived in developed nations from emerging/developing countries**

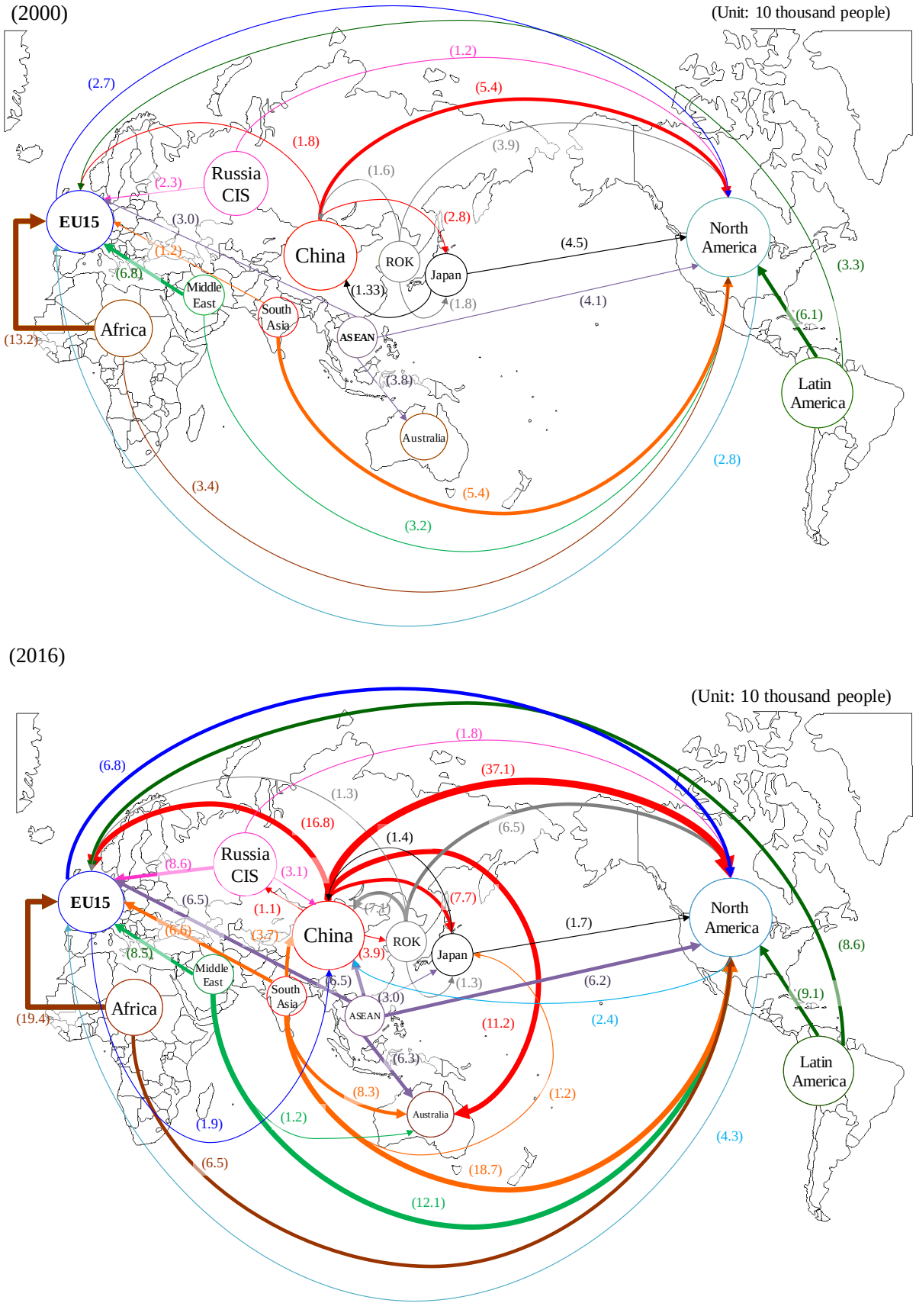



Notes: 1. Shows only regions/countries where the influx or outflow is more than 20,000 people each year. Movements of people from emerging countries to developed nations.

2. The number of immigrants is calculated on the basis of the Basic Resident Register of respective countries. Immigrants to Japan are foreigners who possess valid visas and who intend to stay in Japan for more than 90 days.

Source: OECD International Migration Database “Inflows of foreign population by nationality.”

**Figure II-1-1-4-2 Changes in the number of foreign students studying at tertiary level in developed countries and China**



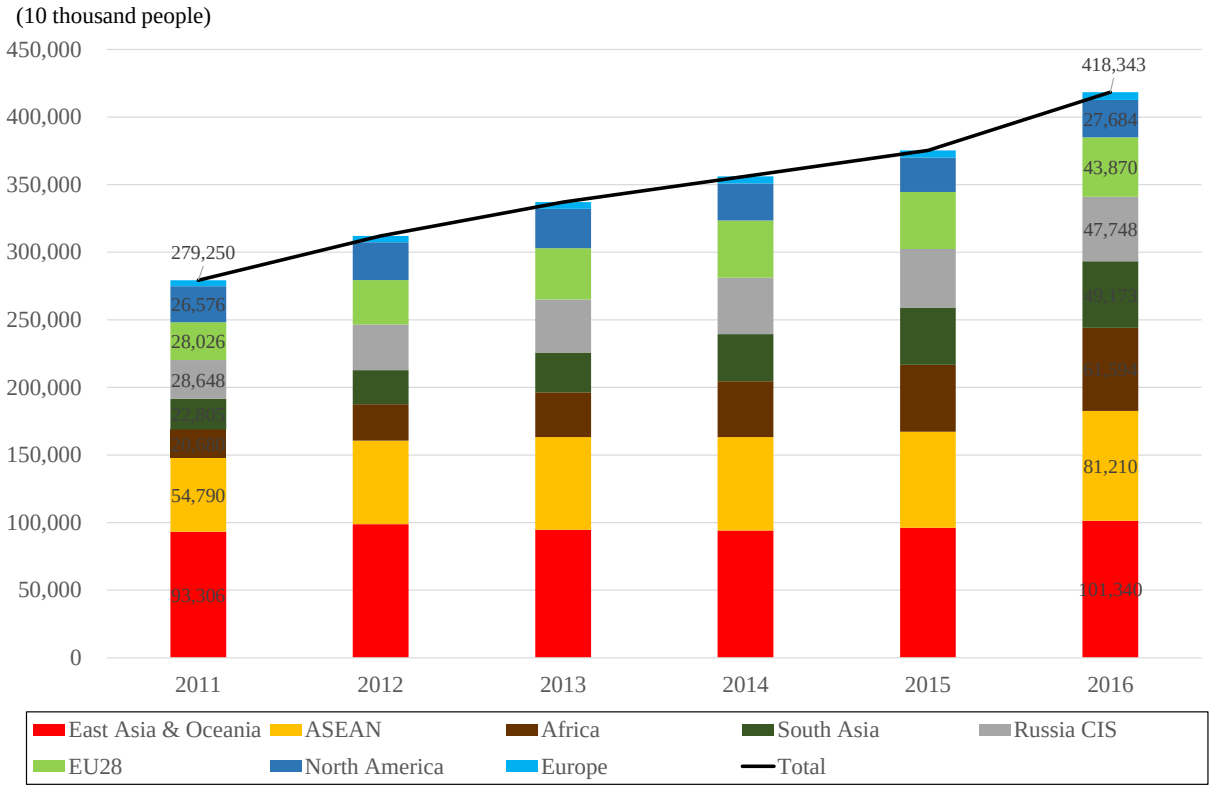
Notes: 1. Foreign students studying in the member countries of the OECD are those at tertiary level, which is classified into Level 5 (qualifications for research and vocational skills, technological and vocational skills), and Level 6 (advanced researchers studying for Ph.D., etc.), while foreign students studying in China are those studying at institutes of higher education or research institutes, including those learning the Chinese language, and as such, their level does not match the tertiary level prescribed for the OECD database.

2. We took the number of foreign students in China by country of origin from the total figures for the countries whose data exist in official documents published by the Chinese government. Regional breakdown for 2000 represents the United States for North America, the United Kingdom, Germany, and France for the EU, Vietnam, Indonesia, Thailand, the Philippines, Malaysia, Singapore, and Laos for ASEAN, Russia for Russia and the CIS, and Pakistan for South Asia. Regional breakdown for 2016 represents the United States for North America, Germany, and France for the EU, Thailand, Indonesia, Vietnam, Laos, and Malaysia for ASEAN, Russia and Kazakhstan for Russia and the CIS, and Pakistan and India for South Asia.

3. Shows only regions/countries where there is influx/outflow of more than 10,000 people each year. The lines mean more than 200,000 > between 100,000 and 200,000 > between 50,000 and 100,000 > between 10,000 and 50,000 in the order of thickness. Rounded to one decimal place.

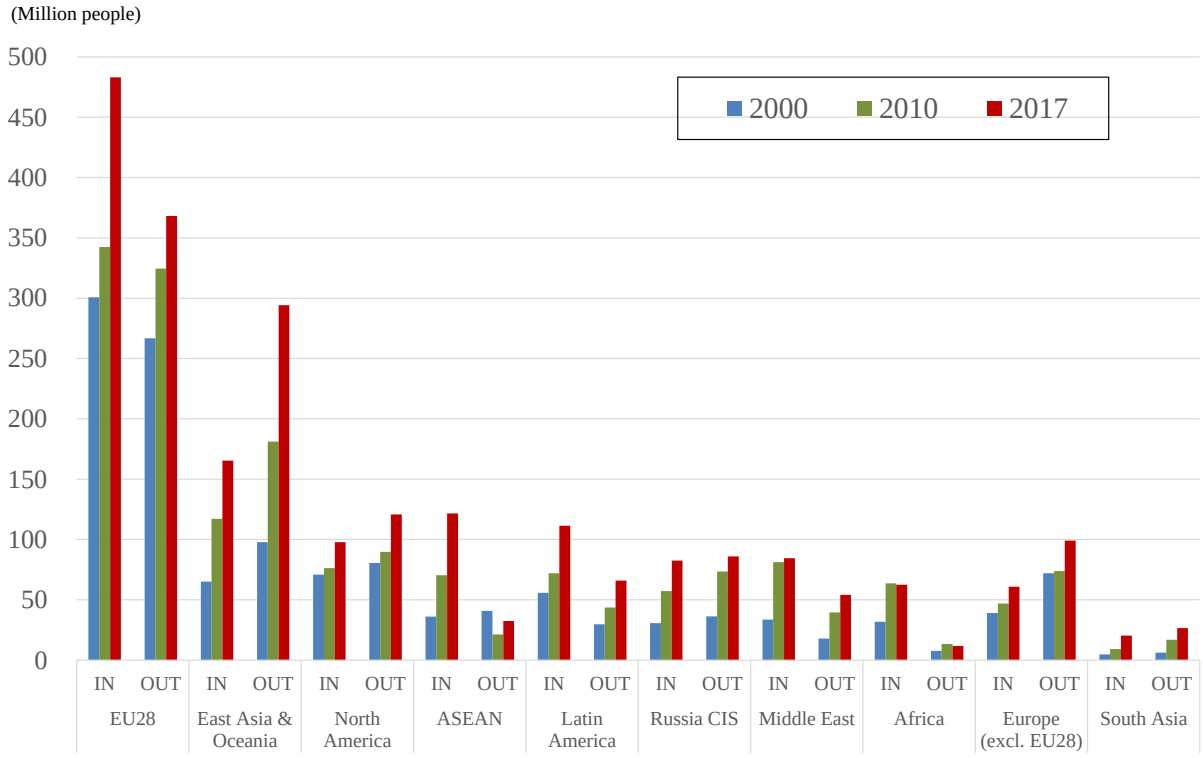
Source: The number of foreign students in member nations of the OECD is based on OECD. Stat. The number of foreign students studying in China was calculated, using "*Inbound International Students in China, 2005-2016*" compiled by the Ministry of Education of People's Republic of China for the "*China Power*" (https://chinapower.csis.org/china-international-students/) by the Center for Strategic and International Studies (CSIS) and data published for each year by the same ministry.

**Figure II-1-1-4-3 Changes in the number of international students studying in China by country of origin**




Source: "*Inbound International Students to China, 2011-2016*" published by the Foreign Ministry of the People's Republic of China for the "*China Power*" (https://chinapower.csis.org/china-international-students/) by the Center for Strategic and International Studies (CSIS).

**Figure II-1-1-4-4 Changes in the number of inbound and outbound tourists by region around the world**




Notes: Used the numbers of international tourism, arrivals and departures, and added them up by respective country. Please note that the index for the world does not match the total of all the countries. For the EU and ASEAN member countries, inbound and outbound arrivals and departures within the respective regions are also included.

Source: WDI (World Bank) (Original: World Tourism Organization, Yearbook of Tourism Statistics, Compendium of Tourism Statistics and data files).

**Column 6　Economic Policy Uncertainty Index**

In recent years, uncertainty surrounding the world economy is growing, as exemplified by the referendum conducted in the United Kingdom to decide whether the country should leave the EU and the victory of Donald Trump in the U.S. presidential election. Although it is essentially difficult to quantify such "uncertainty," researchers in the United States[65] have created an economic policy uncertainty index based on media articles regarding the uncertainty of economic policies in major newspapers, and a number of countries have followed suit, compiling a similar index.[66] In this section, we will use the economic policy uncertainty index and describe the correlation with economic indices and indices of various countries, and look at how the uncertainty facing various countries is linked to other countries.

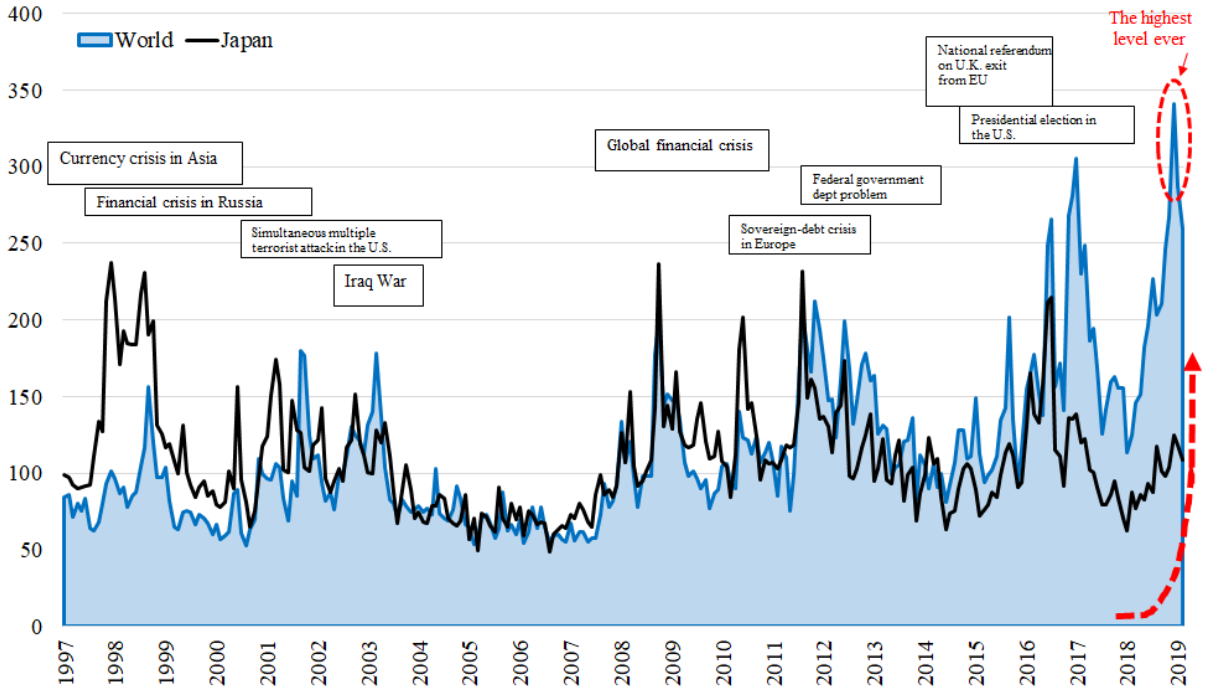
**(1) Correlation between economic policy uncertainty index and the economy**

First, we will look at changes in the economic policy uncertainty index in the world (Figure Column 6-1). Uncertainty in the U.S., the largest economy in the world, and other developed countries can easily affect the economic policy uncertainty index of the world. In fact, the index rose sharply in 2016, when the national referendum was held in the United Kingdom to decide whether or not the country should leave the EU, and the presidential election was held in the United States. The index rose further in January 2017 when the Trump administration was inaugurated before falling afterwards, as people became more confident in the growth of the U.S. economy, which has a large economic impact, on the back of large tax cuts. However, the economic policy uncertainty index of the world and that for Japan turned upwards in 2018, with the economic policy uncertainty index of the world reported the highest level ever in December 2018. It can be assumed that uncertainty grew due to the worsening of trade friction between the United States and China, concerns about the slowdown of the Chinese economy, the conflict between Italy and the EU over Italy's proposed budget, and concerns about the U.K.'s possible departure from the EU without any deal.

65 Scott R. Baker, Nicholas Bloom, and Steven J. Davis

66 The United States, Canada, Brazil, Chile, the United Kingdom, Germany, Italy, Spain, France, the Netherlands, Australia, Russia, India, China, ROK, Japan, Mexico, Ireland, Sweden, and Greece have the economic policy uncertainty index.

**Figure Column 6-1　Changes in the economic policy uncertainty index of the world and Japan**

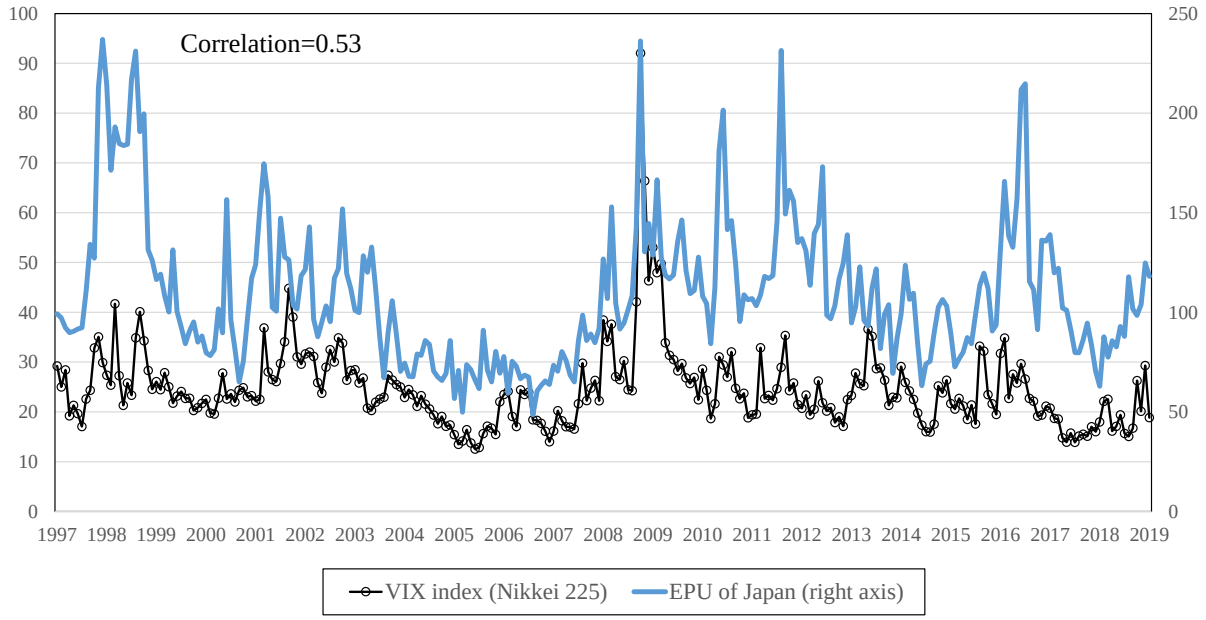



Source:　Davis (2016). Website of Economic Policy Uncertainty Project (http://www.policyuncertainty.com/global_monthly.html) (as of May 13, 2019).
Arbatli et al. (2017). Website of Economic Policy Uncertainty Project (hhhttp://www.policyunceratinty.com/japan_monthly.html) (as of May 13, 2019).

Such heightened uncertainty is regarded as "risk" to investors, possibly impacting the financial markets. Looking at the correlation between the economic policy uncertainty index of Japan and the VI index,[67] we find not a small correlation between the two, although the two can move in different directions (Figure Column 6-2). In particular, the correlation between the VI index and the economic policy uncertainty index of Japan is higher than that for the United States, the United Kingdom, and France (Figure Column 6-3).

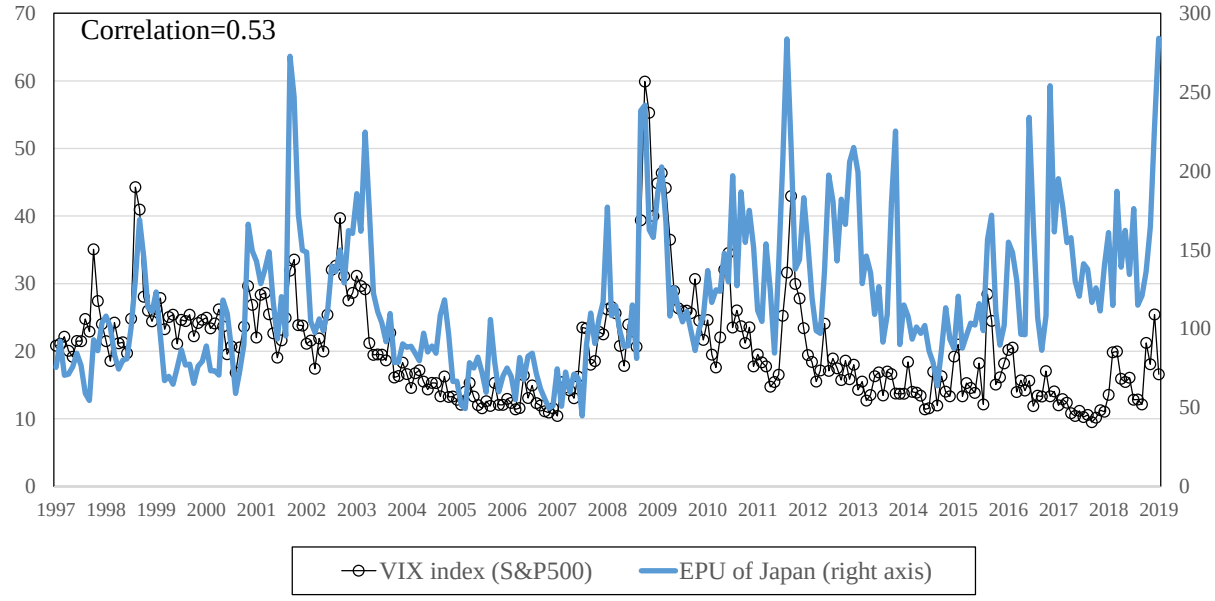
67 The VI index represents an index of the scope of movements of stock prices expected by investors and is said to indicate the level of pessimism among investors.

**Figure Column 6-2　VI Index (Nikkei 225) and the economic policy uncertainty index of Japan**




Source:　Arbatli et al. (2017) regarding economic policy uncertainty index.
Downloaded from the website of the Economic Policy Uncertainty Project (as of May 13, 2019).
VIX Index (Nikkei 225) was based on Refinitiv.

**Figure Column 6-3　VI Index (S&P500) and the economic policy uncertainty index of the United States**




Source:　Baker, Bloom and Davis (2016) regarding the economic policy uncertainty index.
Downloaded from the website of the Economic Policy Uncertainty Project (as of May 13, 2019).
VIX Index (S&P500) was based on Refinitiv.

When the environments surrounding corporate activities become more uncertain, companies tend to put off capital spending. Some argue that decision making is based on uncertainty, particularly in the

case of irreversible investments such as machine equipment.[68]

**(2) Correlation of the economic policy uncertainty index of respective countries**

Next, we will examine how much the economic policy uncertainty index is linked to other countries.

The world has globalized, supported by the expansion of free trade. China's entry into the World Trade Organization (WTO) in 2001 was one of the factors that triggered the expansion of free trade. Therefore, we will describe how the correlation for each country changed before and after China's entry into the WTO.

**Table Column 6-4 Correlation of the economic policy uncertainty index of each country/region (before and after China's entry into the WTO)**

| | | Japan | U.S. | Europe | China | Global index |
|---|---|---|---|---|---|---|
| Japan | Pre-WTO entry | | 0.38 | 0.21 | 0.05 | 0.50 |
| | Post-WTO entry | | 0.44 | 0.27 | 0.38 | 0.40 |
| U.S. | Pre-WTO entry | | | 0.43 | 0.40 | 0.70 |
| | Post-WTO entry | | | 0.80 | 0.70 | 0.88 |
| Europe | Pre-WTO entry | | | | 0.37 | 0.57 |
| | Post-WTO entry | | | | 0.55 | 0.81 |
| China | Pre-WTO entry | | | | | 0.30 |
| | Post-WTO entry | | | | | 0.67 |

Notes: 1. We set 1997-end of 2000 as the sample period of the pre-entry into WTO, while designating 2001-end of 2004 as the sample period of post-entry into WTO.
2. The global index is the index of 19 countries, excluding the own country.
3. Europe includes the United Kingdom, France, Germany, Italy, and Spain.

Source: Arbatli et al. (2017), Baker, Bloom and Davis (2016), and Davis (2016).
Data were downloaded from the website of Economic Policy Uncertainty Project (as of March 2019). The global index excluding the own country was calculated by using the weight of GDP published in IMFWEO (October 2018).

First, we will look at the correlation between Japan and other countries. The comparison between the pre-entry and post-entry periods shows that the correlation with the global index declined, while that with the United States, Europe, and China rose. In general, each country, including China, which had joined the WTO, showed a higher correlation with other countries (Table Column 6-4).

The comparison of the periods before and after the global financial crisis[69] also shows higher correlation between countries. In particular, Japan became closer to the United States, Europe, and China, indicating that each country including Japan became vulnerable to the uncertainty surrounding policies of other countries.

68 Japan Center for Economic Research (2017)
69 We designated 1997-end of 2006 as the pre-financial crisis period and 2007-end of 2016 as the post-financial crisis period, as we concluded that it made sense to include the subprime loan crisis caused by BNP Paribas in 2007, a precursor to the demise of Lehman Brothers, in the post-crisis period.

In contrast, the economic policy uncertainty index of the United States showed lower correlation with the countries except Japan, and with the global index (Table Column 6-5). This is because of the percentage of articles about individual policies,[70] which is the origin of the economic policy uncertainty index of the U.S. Fiscal policies account for 46% of the total number of articles, exerting the highest impact on the overall economic policy uncertainty index.[71] In fact, the comparison of the correlations between the U.S. index and the index of other countries between the periods before and after the global financial crisis shows that high correlation was observed with China and Europe before the crisis, but correlation was much lower after the crisis. In contrast, the economic policy uncertainty indexes of Japan and the United States showed higher correlation before as well as after the global financial crisis. The degree of correlation with the U.S. fiscal policy uncertainty index greatly affects the correlation with the U.S. economic policy uncertainty index.

Next, we will look at the percentage of articles about individual policies in Japan to see changes in the impact that individual policies have on the overall picture. The average for the period between 1987 and 2018 shows that fiscal policies came to the top, followed by monetary policies, trade policies, and forex policies. Most recently, there has been more impact from trade policies than from monetary policies (Figure Column 6-7).

70 The United States publishes the uncertainty index of individual policies, including trade, monetary, and financial policies, as well as security, healthcare, and regulatory reforms.

71 Scott R. Baker (2016).

**Table Column 6-5 Correlation of the economic policy uncertainty index of each country/region (before and after the financial crisis)**

| | | Japan | U.S. | Europe | China | Global index (Excluding own country) |
|---|---|---|---|---|---|---|
| Japan | Pre-financial crisis | | 0.34 | 0.22 | 0.10 | 0.37 |
| | Post-financial crisis | | 0.63 | 0.58 | 0.45 | 0.63 |
| U.S. | Pre-financial crisis | | | 0.76 | 0.66 | 0.84 |
| | Post-financial crisis | | | 0.62 | 0.41 | 0.59 |
| Europe | Pre-financial crisis | | | | 0.56 | 0.76 |
| | Post-financial crisis | | | | 0.70 | 0.82 |
| China | Pre-financial crisis | | | | | 0.59 |
| | Post-financial crisis | | | | | 0.63 |

Notes: 1. We designated 1997-end of 2006 as the pre-financial crisis period and 2007-end of 2016 as the post-financial crisis period (9 years each).
2. The global index is the index of 19 countries, excluding the own country.
3. Europe includes the United Kingdom, France, Germany, Italy, and Spain.

Source: Arbatli et al. (2017), Baker, Bloom and Davis (2016), and Davis (2016).
Data were downloaded from the website of Economic Policy Uncertainty Project (As of March 2019). The global index excluding the own country was calculated by using the weight of GDP published in IMFWEO (October 2018).

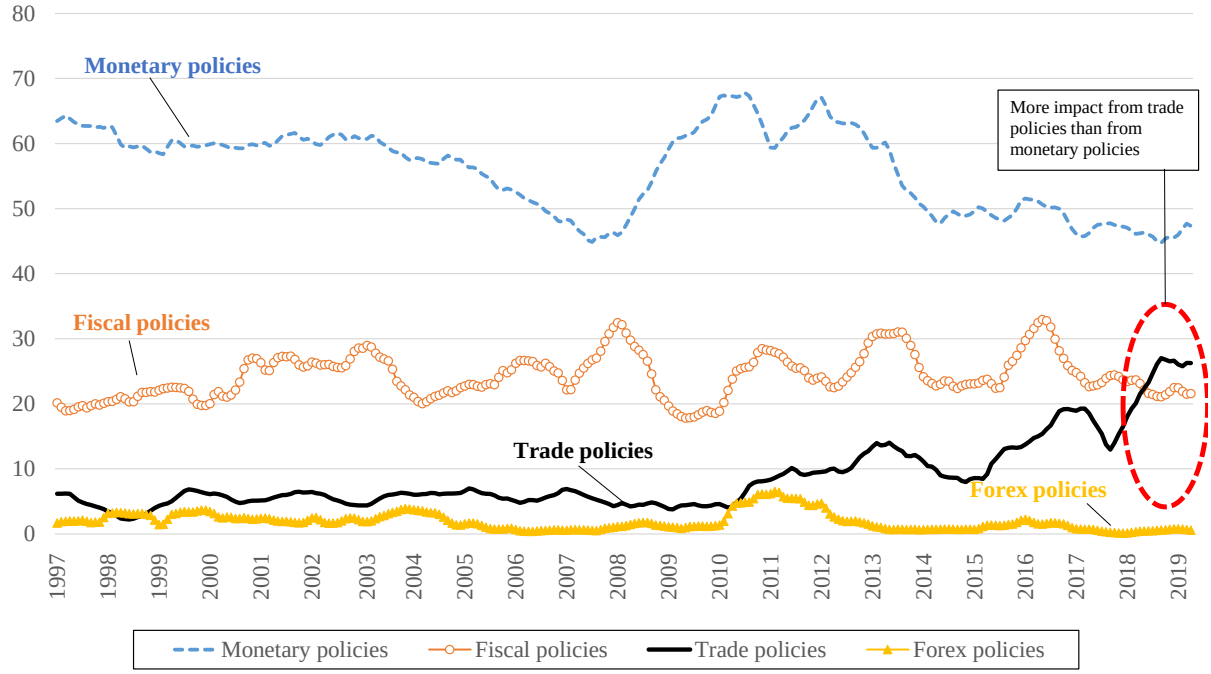
**Figure Column 6-6 Correlation between the U.S. economic policy uncertainty index and the economic policy uncertainty indexes of other countries (before and after the financial crisis)**

| | Japan | | China | | Europe | |
|---|---|---|---|---|---|---|
| Pre-financial crisis | 0.19 | | 0.61 | | 0.70 | |
| Post-financial crisis | 0.38 | ↑ | 0.13 | ↓ | 0.33 | ↓ |

Notes: 1. We designated 1997-end of 2006 as the pre-financial crisis period and 2007-end of 2016 as the post-financial crisis period.
2. Europe includes the United Kingdom, France, Germany, Italy, and Spain.

Source: Arbatli et al. (2017), Baker, Bloom and Davis (2016).
Data were downloaded from the website of Economic Policy Uncertainty Project (as of May 13, 2019).

**Figure Column 6-7　Origin of economic policy uncertainty in Japan**

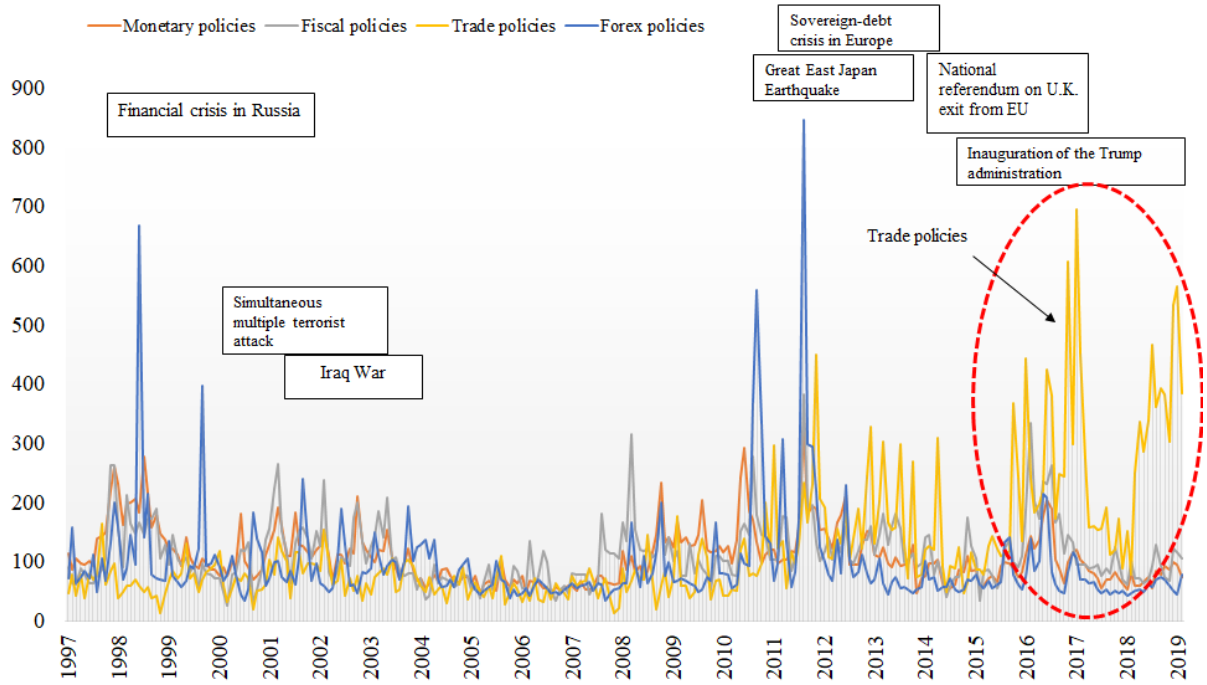



Notes:　12-month centralized moving average.
Source:　Arbatli et al. (2017).
Data were downloaded from the website of Economic Policy Uncertainty Project (as of May 13, 2019).

Next, we will look at changes in Japan's individual policies' uncertainty index. We found that the forex policy uncertainty index rose sharply at the time of financial crisis in Russia, which was triggered by the currency crisis in Asia, and when Japan was hit by the Great East Japan Earthquake. In recent years, uncertainty of trade policies has been higher than that of forex policies (Figure Column 6-8).

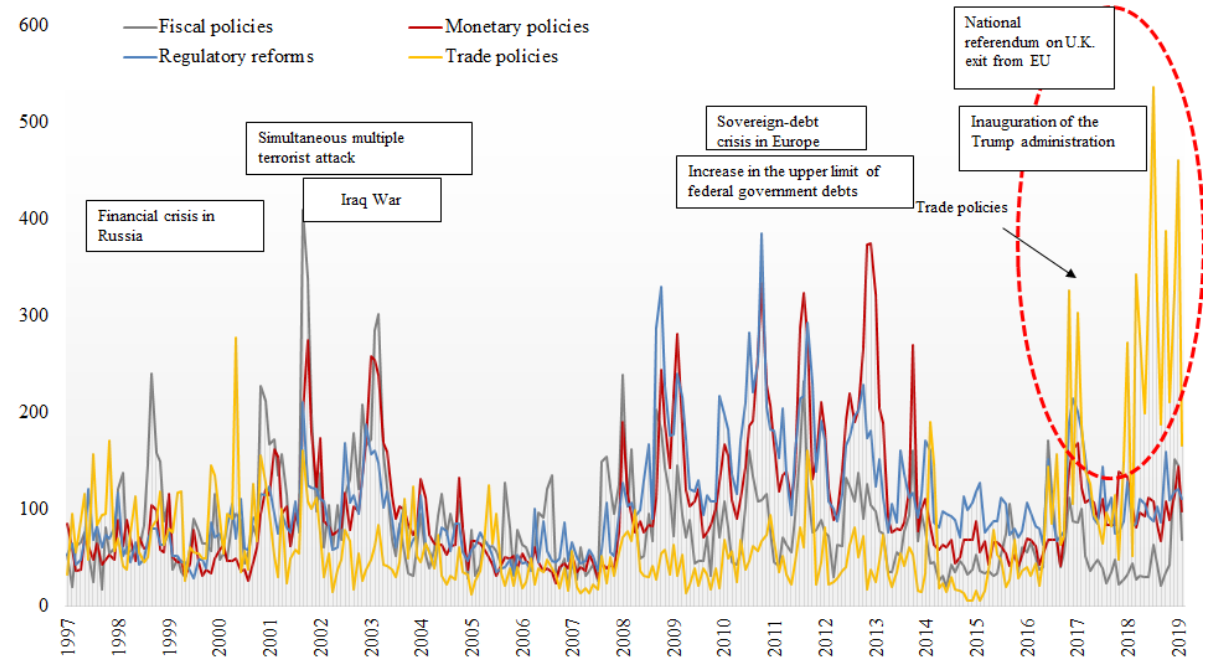
Changes in the uncertainty index of individual policies in the United States show that the fiscal monetary policy uncertainty index rose markedly in the 2000's, when the United States suffered the September 11 attacks and the Iraq war broke out. Later, uncertainty of the fiscal policy increased due to the debate regarding a possible increase in the upper limit of federal government debts. In recent years, following the national referendum in the United Kingdom to decide whether or not the country should leave the EU and the inauguration of the Trump administration in the United States, uncertainty of trade policies deteriorated more sharply than that of fiscal or monetary policies. From a long-term perspective, trade policies are becoming more uncertain in both Japan and the United States (Figure Column 6-9).

**Figure Column 6-8　Changes in the uncertainty index of Japan's respective policies**




Notes:　Each indicator has been indexed with the average between 1987 and 2015 as 100.
Source:　Arbatli et al. (2017). Data were downloaded from the website of Economic Policy Uncertainty Project (as of May 13, 2019).

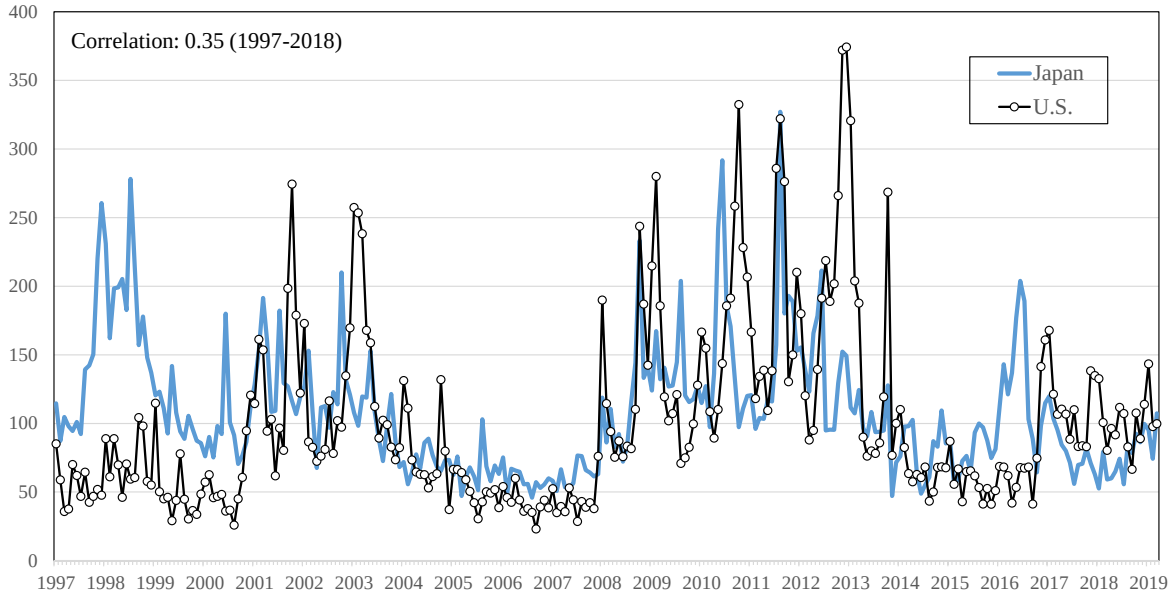
**Figure Column 6-9　Changes in the uncertainty index of respective policies of the United States**




Notes:　The United States publishes the uncertainty indices above, as well as those of security, healthcare, fixed income and forex, government spending, and regulatory reform of benefits.
Each indicator has been indexed with the average between 1987 and 2015 as 100.
Source:　Baker, Bloom and Davis (2016). Data were downloaded from the website of Economic Policy Uncertainty Project (As of May 13, 2019).

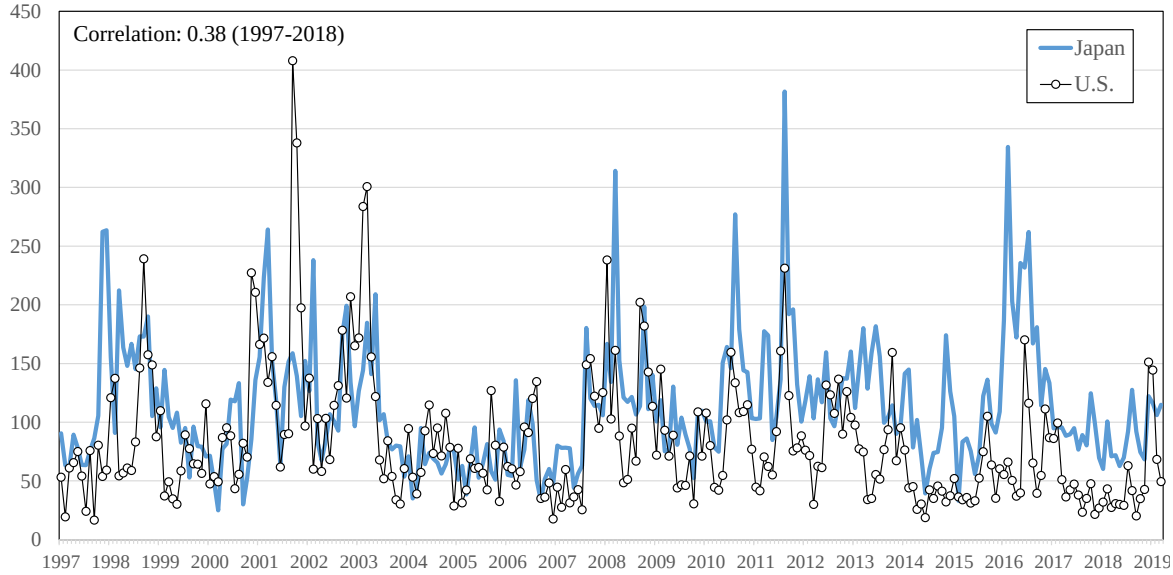
Looking at the degree of correlation between the uncertainty index of respective policies between Japan and the United States, we find that correlation is lowest with fiscal policies whose share of articles to the total is the lowest, while correlation with trade policies is the highest (Figures Column 6-10, 6-11, 6-12).

**Figure Column 6-10 Changes in the fiscal policy uncertainty index of Japan and the United States**




Source: Arbatli et al. (2017), Baker, Bloom and Davis (2016).
Data were downloaded from the website of Economic Policy Uncertainty Project (as of May 13, 2019).

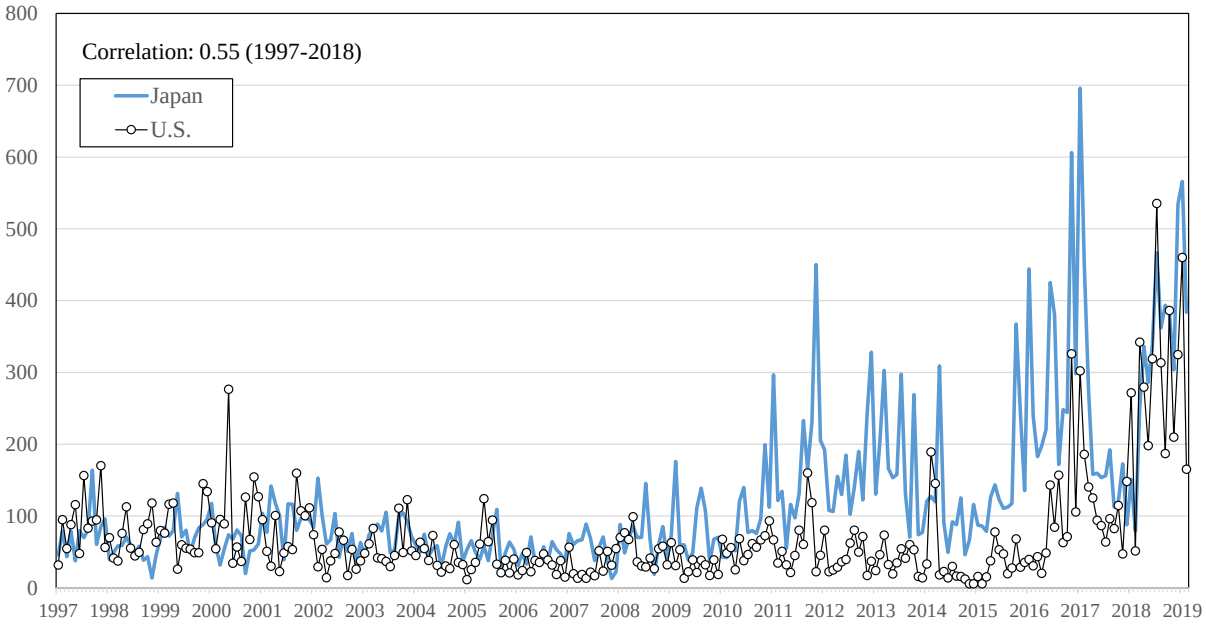
**Figure Column 6-11 Changes in the monetary policy uncertainty index of Japan and the United States**




Source: Arbatli et al. (2017), and Baker, Bloom and Davis (2016).
Data were downloaded from the website of Economic Policy Uncertainty Project (as of May 13,

2019).

**Figure Column 6-12 Changes in the trade policy uncertainty index of Japan and the United States**




Source: Arbatli et al. (2017), and Baker, Bloom and Davis (2016).
Data were downloaded from the website of Economic Policy Uncertainty Project (as of May 13, 2019).

**Figure Column 6-13 Changes in the correlation between the trade policy uncertainty index of Japan and the United States**

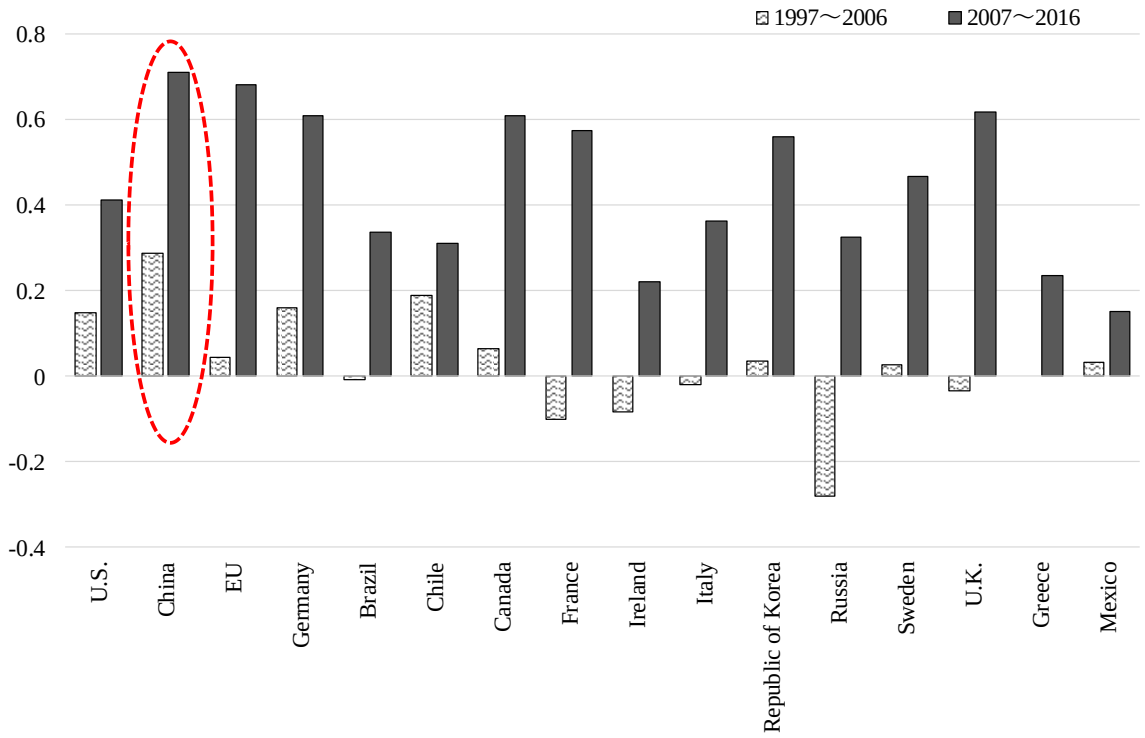

Notes: Calculated the correlation coefficient for each year.
Source: Arbatli et al. (2017), and Baker, Bloom and Davis (2016).
Data were downloaded from the website of Economic Policy Uncertainty Project (as of May 13, 2019).

Figure Column 6-13 shows changes in the correlation coefficient between the trade policy uncertainty index of Japan and that of the United States calculated per year. On a long-term perspective, we found that the correlation has basically been on an upward trend since 2014, albeit with some variations, implying stronger correlation of trade policies of the two nations.

Figure Column 6-14 shows the correlation between Japan's trade policy uncertainty index and that of economic policy uncertainty index of respective countries in order to examine the relationship between the uncertainty of Japan's trade policy and that of economic policies of respective nations.

We will analyze the period from 1997 to 2006 and the period from 2007 to 2016 separately, just as we did in Table Column 6-4. No country reported a correlation higher than 0.5 from 1997 until 2006. However, many countries recorded higher correlation, especially with China, between 2007 and 2016 (Figure Column 6-14).

**Figure Column 6-14 Changes in the correlation between the trade policy uncertainty index of Japan and the economic policy uncertainty index of respective countries**

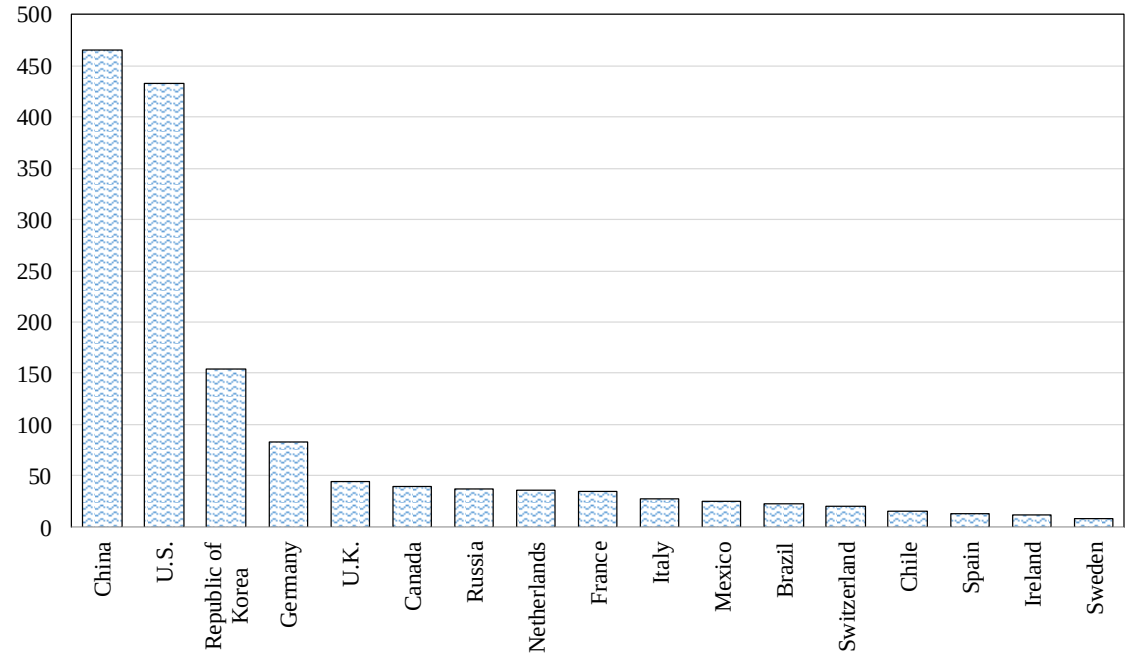



Notes: Excluding countries for which we were unable to obtain data from 1997 or for which data until 2016 were unavailable.

Source: Arbatli et al. (2017) and Baker, Bloom and Davis (2016).
Data were downloaded from the website of Economic Policy Uncertainty Project (as of May 13, 2019).

**Figure Column 6-15　Total value of trade with Japan (sum for 1997-2018)**

(100 million dollars)




Source: Global Trade Atlas.

Looking at the total value of trade between Japan and respective countries, we found that the volume of total trade and the uncertainty index were not in proportion. Japan's total value of trade with China, whose correlation with Japan has grown sharply, is much larger than the value with other countries (Figure Column 6-15).

In recent years, Japan's trade policy uncertainty index and the economic policy uncertainty index of respective countries have become more correlated, implying that Japan's trade policy is more vulnerable to policies of other nations. With the correlation between trade policy uncertainty between Japan and the Unites States growing stronger, trade friction between the United States and China needs to be closely monitored.