# Section 3 Structural Change of Trade and Economy in Japan

# 1. Structural Change of the Trade in Japan

## (1) Significance of the Trade in Japan

Based on the changes of the global economy in 2010 as discussed in Chapter 1, and the short term dynamic change of the world trade as explained in the previous section in this chapter, and in order to connect to the analysis and policy theory being discussed in after Chapter 3, in this section, we will explain about the long term structural changes "Trade" (commercial deal with foreign countries) of Japan. For the sake of it, in this sector, we will first show the significance of trade in Japan, then we will show the influence of trade given to structure of economy and industry in Japan mainly as "Ripple Effect".

At first, as a premise, we roughly classify changes of trade and economy, and industrial structure after the modern (Meiji) period. As Japan is poor in resources due to its geographical conditions, and it is not self-sufficient in its food production, this island nation had a weak point that was difficult to be overcome. So, there was no way but to import such natural resources after Japan's modernization began, dependence on mineral resources such as oil rose. Japan acquired foreign currency needed to import such materials by so-called "Processing Trade" – importing resources as low-processed materials, and exporting processed products of secondary industry. Such dependence on import continues to be a weak point of the Japanese economy even in this modern period. And as explained in Chapter 1, influence of resource-diplomacy such as price hike of resources and export embargo of rare-earths by China became problem some in 2010.

On the other hand, as a result of economic growth by "Processing Trade", "Full Set Type" (an economic structure in which all industrial sectors are contained at certain level in one country) economic structure was established in Japan. As a result, though Japan has to depend on import for most of its resources and food items, the country has maintained a low export dependency of around 10% (contrasted with GDP) for a long time, next only to the U.S. among the developed countries. Namely, connections among domestic industrial sectors are so close that the economic and industrial structure of Japan can sustain this condition indefinitely if export contrasted with GDP is kept at around 10%.

It is important to understand that the establishment of this economic and industrial structure was indispensable as it was a historic process in which it was considered that Japan should strive to develop all industrial fields within its borders. Around 100 years ago when Japan grew conscious of modernization, it couldn't establish separate industrial structures in cooperation with other East Asian countries. Because, they were already colonized by European countries and so, they didn't have any independent opportunities of acting spontaneously to promote modernization of their countries through industrialization.<sup>1</sup>

However, since around 1990, it was easier to purchase and import into Japan inexpensive goods from these East Asian countries as they grew richer through economic development. This was also

<sup>&</sup>lt;sup>1</sup> Seki (1993), p.36

due to other relevant factors like currency appreciation and so on. In this way, the inevitability of "Full Set Type" or all inclusive industrial structure that once made Japan's economy to work for Japan alone was lost, and it became increasingly difficult to maintain it. Therefore, the structural conversion to "International Specialization" structure began. And in this process, the transfer of Japan's production bases to foreign countries, the increase of direct foreign investment, imports of inexpensive final goods and intermediate goods from Japan's overseas factories and foreign firms, and Japan's specialization to highly value-added final goods and exports of intermediate goods that require high and special technology had advanced. We are going to explain about these changes and the influence that those changes exerted on domestic economy in Japan.

## (2) Change of "Current Account" in Japan

First of all, among "Balance of Payments Statistics", we look at the change of "Current Account" that is the value of result of business transactions in domestic commerce. However, we don't simply look by the classification of "Balance of Payments Statistics", matching with the analysis using the Input-Output Table statistics in this sector, we divide "Trade" and "Currents without Trade". "Trade" is the export and import in the Input-Output Table statistics, and similar to the total of "Goods Trade" and "Service Trade" in "National Accounts of Japan". In order to get closer to this definition, we treat the thing that removed "Royalties and License Fees" and "Construction Service" from "Services" of "Balance of Payments Statistics" as a "Service Trade". In addition, we make the value as "Currents without Trade" that subtracting the "Trade" from "Current Account". Namely, we treat "Royalties and License Fees" and "Construction Service" in "Currents without Trade" (Figure 2-3-1-1).

			Current A	Account			
Palanaa of	Trada		Services		Cumont		
Payments	Balance	Other Service Balance	Other ServiceLoyalties and License FeesConstru- Service		Transfers	Income	
Classification in	Goods Trade	Service Trade		Others		Income	
This Section	Tra	ade		Current with	hout Trade		
The Input Output Table	Import,	, Export		Inappli	icable		
Tuoto							

Figure 2-3-1-1 Balance of Payments, Input-Output Table and classification in this section

Source: Ministry of Economy, Trade and Industry, Japan

First of all, Japanese "Current Account" not only maintains a continuous surplus, but it also continues to increase for the recent 20 years. In addition, when it comes to ratio of breakdown of the Japanese Current Account contrasted with GDP, as the long term tendency, "Trade" (total of "Goods

Trade" and "Service Trade") decreases while "Currents without Trade" increases. Most of this "Currents without Trade" is "Income" (Figure 2-3-1-2).



Figure 2-3-1-2 Current Balance contrasted with GDP of Japan

Note2: When it comes to P-value, this represents a value lower than 0.001 for both "Current Account" and "Current without Trade" and a high value of 0.105 for "Trade".

Sources: Balance of Payments (BOJ), National Accounts (Cabinet Office)

In addition, it is only Japan in the G20 that is able to maintain the current account surplus for the last 21 years from 1990 to 2010. According to the data of IMF, among the G20, when arranging the number of years of top-five countries that produced current account surplus, it lists 21 years for Japan, 20 years for China, 17 years for Russia, followed by a little bit lower listings of 14 years for South Korea and Saudi Arabia.<sup>2</sup>

Taking the tendency of "Goods Trade" to decline and "Income" to increase into consideration, it seems to be possible to forecast that the Japanese "Goods Trade" will move to deficit sooner or later, and Japan will grow to be a state to earn profit from "Income" such as the U.K. and the U.S.

Therefore, we compare Japanese constitution of "Current Account" among four countries –such as the U.K. and the U.S. with earning by "Income" while "Goods Trade" is in deficit, and Germany that is said to have similar economic structure with Japan such as dependency on exports and strong manufacturing. According to the data of IMF, the number of years when these countries booked Current Account surplus are, for 21 years from 1990, 11 years for Germany, 1 year for the U.S. and 0 year for the U.K. In addition, we use data for 2007 in this comparison. This is because the

 $<sup>^2</sup>$  Based on "WEO April, 2011", and IMF (2011). However, there is no data from 1990 to 1991 for Russia.

influence of the financial crisis still remained as of 2010, so the data just before that period is preferable to remove the influence of this crisis.

In comparison of "Current Account" of these four countries, ratios contrasted with GDP of the U.K. and Germany are larger than those of Japan and the U.S. We guess that this is due to the vast inner trade in economic zone of Europe. In addition, "Current Account" is in deficit in the U.K. and the U.S., and in comparison of the breakdown, we can understand that surplus of "Goods Trade" of Germany and "Service Trade" of the U.K. is huge (Left of Figure 2-3-1-3).

Figure 2-3-1-3 Comparison of Current Accounts of four countries, contrasted with GDP, 2007 (Left: Gross, Right: Net)



Sources: "BOP", "WEO" (IMF)

In contrast, when we divide the Japanese "Current Account" into "Credit" and "Debit", the composition ratio of "Goods Trade" and composition ratio of surplus of income balance are big, in "Net". Due to this, we can see that the reason why the ratio of income balance surplus accounting for Japanese current account surplus is big is not because of large amount of acceptance but small amount of payment. Namely, like the U.K. and the U.S., when domestic direct investment is promoted and government bonds are purchased by foreigners, income balance surplus will decline (Right of Figure 2-3-1-3).

On the other hand, as showed in Chapter 1, due to prolongation and expanding-tendency of the global imbalance, correction of "Current Account" by the countries in deficit was an agenda for discussion in the international conference in 2010.<sup>3</sup> Due to this, we can understand that it is difficult to increase "Current Account" additionally.

## (3) Change of the Japanese "Trade Structure"

Next, we see the change of the Japanese trade structure in 20 years by using "National Account". When it comes to the Japanese trade value (total of goods trade and service trade), we can see that both exports and imports increases after 2001 while the value of net exports (Trade Balance) doesn't change in the long run although there is some fluctuation (Figure 2-3-1- 4).

<sup>&</sup>lt;sup>3</sup> In the G20 Summit conference from Nov. 11th to 12th in 2010, it was committed to promote action to correct excessive imbalance and make current balance to be sustainable. Please reference to the Chapter 1 for details.



Figure 2-3-1-4 Ratio of trade value contrasted with GDP of Japan (degree of dependence on Trade, Yen, ratio of current value)

Therefore, we compare the Japanese structure of "Goods Trade" with foreign countries. Here, we compare Japan with three countries, the U.S., the U.K. and Germany and look at "Current Account". However, economic ties have been strengthened in the European region, in particular after 1993 when the E.U. was established. Therefore, we guess that ratios of both imports and exports contrasted with GDP in Germany and the U.K. rose in comparison with those of Japan and the U.S. Therefore, we use values in which regional trade with other European countries are removed for explanation. However, due to the limitation of data, we perform comparison only with "Goods Trade" (Figure 2-3-1-5).

When comparing the Japanese "Goods Trade" with those of Germany and the U.K., outside the E.U., and the U.S. "Goods Trade", it changed at around the same level as in the 1990s, then exports contrasted with GDP of Japan and Germany increased by about 5% since 2000.

On the other hand, imports of Japan and Germany were low in strength by 5% under the same measure while imports of the U.K. and the U.S. were around 10% in the 1990s. In addition, after 2000, imports of Japan have increased rapidly after 2005 to rise to the similar level of the U.S.

Taking these factors into consideration, we can see the reasons why the Japanese net current account surplus is big. This is because exports have risen while the recent import ratio has also risen to the same level of U.S. imports and that is the main factor of the deficit in the global imbalance, and payment in "Currents without Trade" is small.<sup>4</sup>

Notes; As the data in 2010 is preliminary one, they are not divided into goods and services. Sources; National Accounts (Cabinet Office).

<sup>&</sup>lt;sup>4</sup> When it comes to the global imbalance, please refer to the section 3, Chapter 1.



Figure 2-3-1-5 Comparison of "Goods Trade" value contrasted with GDP among 4 countries (Left: Export, Right: Import)

Next, based on such changes in trade, we can explain about the shift of "Goods Trade" according to the level of processing. The data of "RIETI-TID 2010" used for explanation divides and shows the trade value of each country according to industrial distinction, degree of processing in detail, and classify goods into 5 categories, such as, "Primary Goods", "Processed Goods", "Parts and Components", "Capital Goods" and "Consumption Goods". When we classify these items while matching them to analyze them using the Input-Output Table in this sector, "Primary Goods", "Processed Goods" and "Capital Goods" are classified as intermediate goods, and "Capital Goods" are classified as final goods.<sup>5</sup>

According to "RIETI-TID 2010", it is only "Primary Goods" whose net export grew negative after 1992. However, "Processed Goods" was also negative before that. Next, in recent years, we can see that exports of "Parts and Components" increases. We guess that this is because exports of parts used for consumption goods produced in China and South Korea registered an increase. In addition, we can see that net exports of "Consumption Goods" in recent years is about zero while it was plus until mid-1990s, and net exports of recent final goods is mostly "Capital Goods" (Figure 2-3-1-6).

In addition, when we calculate net value of exports, and ratios of net exports contrasted with GDP according to the degree of processing of goods in 1990, 2000 and 2009, the added up values are 2.0%, 2.8% and 1.0% respectively. In contrast, when we calculate absolute values of exports and imports at each production process, add them up and calculate ratios of total values contrasted with GDP, they are increasing by 17.2%, 18.8% and 22.0%, respectively. Due to these facts, we can see that trade value has increased 1.3 times since 1990 while net exports continue to increase by 1 - 3%. In addition, ratio of "Processed Goods" and "Parts and Components" in the group of "Intermediate Goods" accounting for exports is increasing as 44.6% in 1990, 53.3% in 2005 and 58.7% in 2009 (Figure 2-3-1-6).

<sup>&</sup>lt;sup>5</sup> According to the classification by RIETI-TID 2010, 2 categories of "Processed Goods" and "Parts and Components" are classified as "Intermediate Goods".

Figure 2-3-1-6 Values of "Goods Trade" according to degree of processing of Japan (Left: Gross, Right: Net)



Due to these facts, we can see that during "Full Set Type" era until mid-1990s, Japan exported final goods ("Consumption Goods" and "Capital Goods") and highly-processed "Parts and Components" while imported "Primary Goods", and since then, exports of "Parts and Components" and "Processed Goods" in the group of "Intermediate Goods" increased while ratio of final goods accounting for exports declined.

# (4) Change of the Japanese "Currents without Trade"

Next, we see breakdown of "Currents without Trade", namely "Income", "Royalties and License Fees" and "Current Transfer". As these data are same as until now, in comparison of ratios of "Currents without Trade" contrasted with GDP of Japan with Germany, the U.K. and the U.S., we can see that "Portfolio Investment Income" accounts for considerable portion in Japanese "Currents without Trade" while "Direct Investment Income" is huge in the U.K. and the U.S. In addition, "Credit" and "Debit", we can see "Debit" of "Currents without Trade" is small in Japan. In this way, we can see that structure of the Japanese "Income" is boldly different from that of the U.K. and the U.S. (Figure 2-3-1-7).





Next, we see trend of balance of the Japanese "Currents without Trade". However, as definition of "Balance of Payments Statistics" was revised in around 1996, although it is posted when data is made available, values after 1996 are used for explanation. According to Figure 2-3-1-8, Japan maintains surplus in all categories excepting "Current Transfers" and "Compensation of Employees" which are in deficit. Besides, "Royalties and License Fees" was also in deficit until 2002.

Figure 2-3-1-8 Balance of "Current without Trade" constructed with GDP of Japan (Left: Gross, Right: Net)



Notes 2: As the data collected before 1995 are the former "Balance of Payments Statistics", the values of "Royalty and License Fees" and "Construction Service" are not available

Source: Balance of Payments (BOJ), National Accounts (Cabinet Office)

We are going to see items where "Credit" is big, namely, balance is surplus. First of all, when we subdivide "Royalties and License Fees" for which the balance has produced a surplus recently, increase of "Debit" is bigger than that of "Credit", and deficit of net balance is increasing. At first, although "Credit" of the "Royalties and Licenses Fees" is increasing, amount of increase of "Debit" is bigger than that, and deficit is increasing. On the other hand, when it comes to balance of "Royalties and License Fees", amount of surplus expanded until the financial crisis after it registered a surplus in 1998. This is attributed to the increase of "Credit" concerning "Royalties and License Fees" due to expansion of local production by local subsidiaries in foreign countries owned by domestic Japanese firms.

It can be said that increase of "Royalties and License Fees" and decrease in exports advance in parallel. Of course, when "Royalties and License Fees" increases, the effect of increase of exports of "Intermediate Goods" to counterpart can be possible as a secondary effect, but most of "Intermediate Goods" is local procurement, or using inexpensive goods made in foreign countries, and probability of exports from Japan is limited to specific intermediate goods. Therefore, it can be said that the sum including fee for use decreases in comparison with gross exports of final goods (Figure 2-3-1-9).

Figure 2-3-1-9 Ratio of Royalty and License Fees constructed with GDP of Japan (Left: Gross, Right: Net)



Notes1: GDP 2010 is preliminary value.

Notes2: As the data collected before 1995 are the values of former "Balance of Payments Statistics", they are defined differently and that they aren't illustrated.

Sources: Balance of Payments (BOJ), National Accounts (Cabinet Office)

Next, seeing trends in "Investment Income", large portion of both balance and "Credit" in Japanese "Investment Income" is "Portfolio Investment Income" amounting to 70%, while the "Direct Investment Income" is around 20% of the whole.<sup>6</sup> Large portion of credit of "Portfolio Investment Income" is bond interest, and difference between interest and equity is that you can receive interest even when the investment partner does not earn any profit, and you can receive equity when the investor earns a profit according to the amount of investment. Namely, most of the breakdowns of "Portfolio Investment Income" is "Income on Equity". The difference between "Income on Debt" and "Income on Equity" is the same as of interest and equity mentioned before. Namely, we can see that Japan gets a lot of equity from "Direct Investment" (Figure 2-3-1-10).





Notes1: GDP 2010 is preliminary value.

Notes2: As the data collected before 1995 are the values of former "Balance of Payments Statistics", they are defined differently and that they aren't illustrated.

Sources: Balance of Payments (BOJ), National Accounts (Cabinet Office)

<sup>&</sup>lt;sup>6</sup> "Direct Investment" in "Balance of Payments Statistics" means the initial deal (purchasing stock and so on) to establish the "Direct Investment Relationship (ratio of financing is 10% or more)", and following all deals (increase of capital, loan of fund) between direct investors and direct investment counterparts.

Due to these facts, we can see that, unlike the U.K. and the U.S.A, the structure of Japanese "Currents without Trade" is such that the ratio of participation in the management of the investment partner is low, and many of them are low-risk.

In addition, "Re-invested Earnings" that are an amount re-invested in the local country are included in "Income on Equity" that is one item of the "Direct Investment Income". Because this money does not return to Japan, it doesn't directly connect to the domestic demands, namely awakening of consumption. However, it can be thought that there is an indirect effect that exports of intermediate goods to factories that are re-invested increases to some extent.

The amount that doesn't return home due to such re-investment can be calculated from "Balance of Payments Statistics" and "Survey of Overseas Business Activities". As this value is easily influenced by shortages one that we can see when values prior to the financial crisis are averaged. According to "Balance of Payments Statistics", the average of 2003 - 2007 is 41.3%, and according to "Overseas Business Activity Basics Investigation", the average of 2003 - 2006 that falls short of the value of 2007 is 72.6%, and this didn't return home country. Although two values are boldly separated due to the difference in definition, no matter which value is adopted, the ratio that doesn't return home is high<sup>7</sup> (Figure 2-3-1-11).

Figure 2-3-1-11 Ratio of "Return on Re-investment" (Left) and "Retained Ratio" of Japan (Right)



2) "Net income in fiscal year should be" > 0.

Sources: Survey of Overseas Business Activities (METI)

### (5) Change of the Japanese industrial structure

Next, using "GDP Classified by Economic Activities" (Cabinet Office), we see long term changes of Japanese GDP and industrial composition ratio. When we see the GDP that indicates national

<sup>&</sup>lt;sup>7</sup> The graph of the "Retained Ratio" in Figure 2-3-1-11 is made from values placed in the "Survey of Overseas Business Activities" (1992 - 2006).

economic size and growth in real amount and in a "Chain-Linked", after 1990, it increases moderately excepting the short term influence of the Asia Currency Crisis in 1997 and Financial Crisis in 2008. In addition, we can see that the industrial composition ratio changes without any great change (Figure 2-3-1-12).



Figure 2-3-1-12 Change of Gross Domestic Production classified by each economic activity in Japan (Real: Chain Linked)

Intuitively speaking, we can see that "Production Approach" of the GDP is the remainder after deducting cost of materials from sales. On the other hand, we can see that "Expenditure Approach" of the GDP is the remainder after deducting cost of materials and import from purchases by households, firms and foreign countries and so on.

Next, we see the same change of industrial composition ratio by the value of gross production in Input-Output Table. The amount of total production, unlike the GDP, it includes the invested amounts (cost) of intermediate goods (law materials), and equivalent to sales. It is also possible to recognize the invested-amount of intermediate goods for the sake of production of each goods and services on the Input-Output Table. First of all, we compare economic and industrial structures twice in 1990 and 2005 using this Input-Output Table.<sup>8</sup>

Sources: National Accounts (Cabinet Office)

<sup>&</sup>lt;sup>8</sup> To compare the so-called "Lost 2 Decades" in details, we compare the years 1990 and 2005. This is because we will make a "basic table" that is non-competitive import type mechanism in the Input-Output Table occurring once in 5-year cycle. In addition, we consolidate them into 34 or 22 sectors following calculation based on the most detailed classification in each year (about 400 sectors). Please refer to

Therefore, we see constitution of the amounts of domestic production and imports that are supply in Input-Output Table, and "Domestic Demand" (domestic final demand) and "Foreign Demand" (exports) that are demand of that. Here, we use ratio of composition calculated from Input-Output Table of 34 sectors (Table 2-3-1-13).

Table 2-3-1-13	Change of Composition Ratios for demand and supply in Japan (Input-Output
Table, %)	

Domest: Final (Domest: Final Demand)         Foreign Ermand (Exp-triangle Domestic)         Domestic Production         Import Import           Total of top-5 sectors         57.1         81.9         84.5         87.4         57.8         61.0         70.5         68.3           Total of top-10 sectors (color of sixth place and lower)         79.2         92.2         94.0         94.5         73.4         78.3         87.4         86.1         77.4         78.3         87.4         86.5         3.1         11.0         0.9         0.01         0.1         2.0         1.4         6.5         3.1         11.0         1.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0			Demand Supply								
Unitsure Deration         Construct (Bornation)         Distance (Bornation)         Distance (Bornation) <thdistance (Bornation)         Distance (Bo</thdistance 				Domestic	Demand	Foreign	Eemand	Dom	antia		
Demail         Description         Production         Production           1990         2005         1990         2005         1990         2005         1990         2005         68.3           Total of top-10 sectors (color of sixth place and lower)         79.2         92.2         94.0         94.5         73.4         78.3         87.4         86.1           Primary         Agriculture, forestry and fishery         1         1.1         0.9         0.1         0.1         2.0         1.4         6.5         3.1           Industry         Mining         2         0.0         0.0         0.0         0.2         0.1         18.6         21.2           Beverages and Foods         3         6.3         5.3         0.5         0.4         4.5         3.7         9.5         7.8           Textile products         6         0.7         0.5         5.4         6.6         3.0         2.2         1.3         3.5         2.8         0.5         5.6           Petroleum and coal products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8           Secondary         Meaf products         1         0.0				(Domes	tic Final			Dom	estic	Imp	ort
Image: 1000 1000 1000 1000 1000 1000 1000 10				Dem	and)	(Exp	orts)	FIOUU	iction		
Total of top-5 sectors         57.1         81.9         84.5         87.4         57.8         61.0         70.5         68.3           Total of top-10 sectors (color of sixth place and lower)         79.2         92.2         94.0         94.5         73.4         78.3         87.4         86.1           Primary         Agriculture, forestry and fishery         1         1.1         0.9         0.1         0.1         2.0         1.4         6.5         3.1           Industry         Mining         2         0.0         0.0         0.0         0.2         0.1         1.4         6.5         3.1           Beverages and Foods         3         6.3         5.3         0.5         0.4         4.5         3.7         9.5         7.8           Chemical products         4         1.7         0.2         1.6         0.7         1.6         0.7         1.6         0.3         2.8         5.0         5.6           Chemical products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8           Chemical products         7         0.6         0.1         1.0         5.1         2.1.3         1.6         1.3				1990	2005	1990	2005	1990	2005	1990	2005
Total of top-10 sectors (color of sixth place and lower)         79.2         92.2         94.0         94.5         73.4         78.3         87.4         86.1           Primary         Agriculture, forestry and fishery         1         1.1         0.9         0.1         2.0         1.4         6.5         3.1           Industry         Mining         2         0.0         0.0         0.0         0.0         0.2         0.1         18.6         2.1.2           Industry         Munp paper and wooden products         3         6.3         5.3         0.5         0.4         4.5         3.7         9.5         7.8           Textile products         4         1.7         0.2         1.6         0.7         0.5         2.2         1.3         3.5         2.8         5.0         5.6           Petroleum and coal products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8         2.2         1.5         3.0         0.7         1.5         3.4         3.6         0.6         0.0         0.1         1.2         0.3         0.6         0.9         0.1         1.6         1.3         3.1         2.6         1.4 <td< td=""><td>Total of top</td><td>-5 sectors</td><td></td><td>57.1</td><td>81.9</td><td>84.5</td><td>87.4</td><td>57.8</td><td>61.0</td><td>70.5</td><td>68.3</td></td<>	Total of top	-5 sectors		57.1	81.9	84.5	87.4	57.8	61.0	70.5	68.3
Primary Industry         Agriculture, forestry and fishery         1         1.1         0.9         0.1         0.1         2.0         1.4         6.5         3.1           Industry         Mining         2         0.0         0.0         0.0         0.0         0.0         0.2         0.1         18.6         21.2           Beverages and Foods         3         6.5         5.3         0.5         0.4         4.5         3.7         9.5         7.8           Textile products         4         1.7         0.2         1.6         0.7         1.6         0.5         4.9         5.0           Chemical products         5         0.6         0.2         0.7         0.5         5.4         6.6         3.0         2.8         5.0         5.6           Petroleum and coal products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8           Secondary         Non-ferrous metals         10         0.0         0.0         1.1         1.7         0.9         0.8         5.4         3.6           Industry         Metal products         11         0.3         0.1         1.2         0.9         1.3<	Total of top	-10 sectors (color of sixth place and lower)		79.2	92.2	94.0	94.5	73.4	78.3	87.4	86.1
Industry         Mining         2         0.0         0.0         0.0         0.2         0.1         18.6         21.2           Beverages and Foods         3         6.3         5.3         0.5         0.4         4.5         3.7         9.5         7.8           Textile products         4         1.7         0.2         1.6         0.7         1.6         0.5         4.9         5.0           Pulp, paper and wooden products         5         0.6         0.2         0.7         0.5         2.2         1.3         3.5         2.8           Chemical products         6         0.7         0.5         5.4         6.6         3.0         2.8         5.0         5.6           Petroleum and coal products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8           Caramic, stone and clay products         8         0.1         0.1         1.0         1.0         1.2         0.7         0.8         5.4         3.6           Industry         Metal products         11         0.3         0.1         1.2         0.9         1.9         1.3         0.6         0.9           Industry	Primary	Agriculture, forestry and fishery	1	1.1	0.9	0.1	0.1	2.0	1.4	6.5	3.1
Beverages and Foods         3         6.3         5.3         0.5         0.4         4.5         3.7         9.5         7.8.8           Textile products         4         1.7         0.2         1.6         0.7         1.6         0.5         4.9         50.0           Pulp, paper and wooden products         5         0.6         0.2         0.7         0.5         2.2         1.3         3.5         2.8         5.0         5.6           Petroleum and coal products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8           Ceramic, stone and clay products         8         0.1         0.1         1.0         1.0         1.2         0.7         0.8         0.7           Iron and steel         9         0.0         0.0         3.7         3.8         3.1         2.6         1.6         1.3           Secondary         Metal products         11         0.3         0.1         1.1         0.9         0.8         5.4         3.6           Industry         Metal products         11         0.3         0.1         1.2         0.7         7.5         2.3         1.6         1.8         3.5<	Industriy	Mining	2	0.0	0.0	0.0	0.0	0.2	0.1	18.6	21.2
Textile products         4         1.7         0.2         1.6         0.7         1.6         0.5         4.9         5.0           Pulp, paper and wooden products         5         0.6         0.2         0.7         0.5         2.2         1.3         3.5         2.8           Chemical products         6         0.7         0.5         5.4         6.6         3.0         2.8         5.0         5.6           Puroleum and coal products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8           Ceramic, stone and clay products         8         0.1         0.1         1.0         1.2         0.7         0.8         0.7           Inon and steel         9         0.0         0.0         3.7         3.8         3.1         2.6         1.6         1.3           Industry         Non-ferrous metals         10         0.0         0.0         1.1         1.7         0.9         0.8         5.4         3.6           Industry         General machinery         12         3.8         2.2         1.5         3.1         2.6         3.2           Information and communication electronics equipment		Beverages and Foods	3	6.3	5.3	0.5	0.4	4.5	3.7	9.5	7.8
Pulp, paper and wooden products         5         0.6         0.2         0.7         0.5         2.2         1.3         3.5         2.8           Chemical products         6         0.7         0.5         5.4         6.6         3.0         2.8         5.0         5.6           Petroleum and coal products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8           Ceramic, stone and clay products         8         0.1         0.1         1.0         1.0         1.2         0.7         0.8         0.7           Industry         Mon-ferrous metals         10         0.0         0.0         1.1         1.7         0.9         0.8         5.4         3.6           Metal products         11         0.3         0.1         1.2         0.9         1.9         1.3         0.6         0.9           General machinery         12         3.8         2.8         12.2         11.5         3.7         3.1         2.6         3.8           Iaformation and communication electronics equipment         14         2.3         1.2         1.3         0.6         6.1         1.7         1.4         5.3		Textile products	4	1.7	0.2	1.6	0.7	1.6	0.5	4.9	5.0
Chemical products         6         0.7         0.5         5.4         6.6         3.0         2.8         5.0         5.6           Petroleum and cola products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8           Ceramic, stone and clay products         8         0.1         0.1         1.0         1.0         1.2         0.7         0.8         0.7           Industry         Non-ferrous metals         10         0.0         0.0         1.1         1.7         0.9         0.8         5.4         3.6           General machinery         12         3.8         2.8         12.2         11.5         3.7         3.1         2.6         3.8           Electrical machinery         13         2.1         1.2         5.7         7.5         2.3         1.6         1.8         3.5           Information and communication electronics equipment         14         2.3         1.2         13.0         5.6         2.1         1.1         2.4         6.0           Electrical machinery         15         0.1         0.0         5.6         8.6         1.4         1.7         1.4         5.3		Pulp, paper and wooden products	5	0.6	0.2	0.7	0.5	2.2	1.3	3.5	2.8
Petroleum and coal products         7         0.6         1.1         0.5         1.2         1.3         1.7         4.5         3.8           Ceramic, stone and clay products         8         0.1         0.1         1.0         1.2         0.7         0.8         0.7           Iron and steel         9         0.0         0.0         3.7         3.8         3.1         2.6         1.6         1.3           Mon-ferrous metals         10         0.0         0.0         1.1         1.7         0.9         0.8         5.4         3.6           Metal products         11         0.3         0.1         1.2         0.9         1.9         1.3         0.6         0.9           General machinery         12         3.8         2.8         12.2         1.7         3.7         3.1         2.6         3.8           Electronic components         15         0.1         0.0         5.6         8.6         1.4         1.7         1.4         5.3           Information and communication electronics equipment         16         2.9         2.3         2.35         20.8         5.2         5.4         4.1         3.0           Transportation equipment         16		Chemical products	6	0.7	0.5	5.4	6.6	3.0	2.8	5.0	5.6
Secondary         Ceramic, stone and clay products         8         0.1         0.1         1.0         1.2         0.7         0.8         0.7           Industry         Inon and steel         9         0.0         0.0         3.7         3.8         3.1         2.6         1.6         1.3           Industry         Metal products         11         0.3         0.1         1.2         0.9         1.9         1.3         0.6         0.9           General machinery         12         3.8         2.8         12.2         11.5         3.7         3.1         2.6         3.8           Electrical machinery         13         2.1         1.2         5.7         7.5         2.3         1.6         1.8         3.5           Information and communication electronics equipment         14         2.3         1.2         13.0         5.6         8.6         1.4         1.7         1.4         5.3           Transportation equipment         16         2.9         2.3         23.5         20.8         5.2         5.5         4.1         3.9           Precision instruments         17         0.5         0.4         2.9         1.9         0.5         0.4         1.3		Petroleum and coal products	7	0.6	1.1	0.5	1.2	1.3	1.7	4.5	3.8
Iron and steel         9         0.0         0.0         3.7         3.8         3.1         2.6         1.6         1.3           Secondary Industry         Non-ferrous metals         10         0.0         0.0         1.1         1.7         0.9         0.8         5.4         3.6           Metal products         11         0.3         0.1         1.2         0.9         1.9         1.3         0.6         0.9           General machinery         12         3.8         2.8         12.2         11.5         3.7         3.1         2.6         3.8           Electrical machinery         13         2.1         1.2         5.7         7.5         2.3         1.6         1.8         3.5           Information and communication electronics equipment         14         2.3         1.2         13.0         5.6         2.1         1.1         2.4         6.0           Electricit components         15         0.1         0.0         5.6         8.6         1.4         1.7         1.4         5.3           Transportation equipment         16         2.9         2.3         23.5         20.8         5.2         5.5         4.1         3.9           Prec		Ceramic, stone and clay products	8	0.1	0.1	1.0	1.0	1.2	0.7	0.8	0.7
Secondary Industry         Non-ferrous metals         10         0.0         0.0         1.1         1.7         0.9         0.8         5.4         3.6           Industry         Metal products         11         0.3         0.1         1.2         0.9         1.9         1.3         0.6         0.9           General machinery         12         3.8         2.8         12.2         11.5         3.7         3.1         2.6         3.8           Information and communication electronics equipment         14         2.3         1.2         13.0         5.6         2.1         1.1         2.4         6.0           Electronic components         15         0.1         0.0         5.6         8.6         1.4         1.7         1.4         5.3           Transportation equipment         16         2.9         2.3         23.5         20.8         5.2         5.5         4.1         3.9           Precision instruments         17         0.5         0.4         2.9         1.9         0.5         0.4         1.3         2.0           Miscellaneous manufacturing products         18         1.0         0.6         3.0         3.7         3.2         2.6         5.2		Iron and steel	9	0.0	0.0	3.7	3.8	3.1	2.6	1.6	1.3
Industry         Metal products         11         0.3         0.1         1.2         0.9         1.9         1.3         0.6         0.9           General machinery         12         3.8         2.8         12.2         11.5         3.7         3.1         2.6         3.8           Electrical machinery         13         2.1         1.2         5.7         7.5         2.3         1.6         1.8         3.5           Information and communication electronics equipment         14         2.3         1.2         13.0         5.6         2.1         1.1         2.4         6.0           Electronic components         15         0.1         0.0         5.6         8.6         1.4         1.7         1.4         5.3           Transportation equipment         16         2.9         2.3         23.5         20.8         5.2         5.5         4.1         3.9           Precision instruments         17         0.5         0.4         2.9         1.9         0.5         0.4         1.3         2.0           Miscellaneous manufacturing products         18         1.0         0.6         3.0         3.7         3.2         2.6         5.2         4.8	Secondary	Non-ferrous metals	10	0.0	0.0	1.1	1.7	0.9	0.8	5.4	3.6
General machinery         12         3.8         2.8         12.2         11.5         3.7         3.1         2.6         3.8           Electrical machinery         13         2.1         1.2         5.7         7.5         2.3         1.6         1.8         3.5           Information and communication electronics equipment         14         2.3         1.2         13.0         5.6         2.1         1.1         2.4         6.0           Electronic components         15         0.1         0.0         5.6         8.6         1.4         1.7         1.4         5.3           Transportation equipment         16         2.9         2.3         22.08         5.2         5.5         4.1         3.9           Precision instruments         17         0.5         0.4         2.9         1.9         0.5         0.4         1.3         2.0           Miscellaneous manufacturing products         18         1.0         0.6         3.0         3.7         3.2         2.6         5.2         4.8           Electricity, gas and heat supply         20         1.1         1.2         0.0         0.0         1.0         0.0         0.0         0.0         0.0	Industry	Metal products	11	0.3	0.1	1.2	0.9	1.9	1.3	0.6	0.9
Electrical machinery         13         2.1         1.2         5.7         7.5         2.3         1.6         1.8         3.5           Information and communication electronics equipment         14         2.3         1.2         13.0         5.6         2.1         1.1         2.4         6.0           Electronic components         15         0.1         0.0         5.6         8.6         1.4         1.7         1.4         5.3           Transportation equipment         16         2.9         2.3         23.5         20.8         5.2         5.5         4.1         3.9           Precision instruments         17         0.5         0.4         2.9         1.9         0.5         0.4         1.3         2.0           Miscellaneous manufacturing products         18         1.0         0.6         3.0         3.7         3.2         2.6         5.2         4.8           Construction         19         19.2         11.3         0.0         0.0         10.2         6.5         0.0         0.0           Electricity, gas and heat supply         20         1.1         1.2         0.0         0.0         1.0         0.0         0.0         0.0         0.0 <t< td=""><td></td><td>General machinery</td><td>12</td><td>3.8</td><td>2.8</td><td>12.2</td><td>11.5</td><td>3.7</td><td>3.1</td><td>2.6</td><td>3.8</td></t<>		General machinery	12	3.8	2.8	12.2	11.5	3.7	3.1	2.6	3.8
Information and communication electronics equipment         14         2.3         1.2         13.0         5.6         2.1         1.1         2.4         6.0           Electronic components         15         0.1         0.0         5.6         8.6         1.4         1.7         1.4         5.3           Transportation equipment         16         2.9         2.3         23.5         20.8         5.2         5.5         4.1         3.9           Precision instruments         17         0.5         0.4         2.9         1.9         0.5         0.4         1.3         2.0           Miscellaneous manufacturing products         18         1.0         0.6         3.0         3.7         3.2         2.6         5.2         4.8           Construction         19         19.2         11.3         0.0         0.0         10.2         6.5         0.0         0.0           Bectricity, gas and heat supply         20         1.1         1.2         0.0         0.0         1.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0		Electrical machinery	13	2.1	1.2	5.7	7.5	2.3	1.6	1.8	3.5
Electronic components         15         0.1         0.0         5.6         8.6         1.4         1.7         1.4         5.3           Transportation equipment         16         2.9         2.3         23.5         20.8         5.2         5.5         4.1         3.9           Precision instruments         17         0.5         0.4         2.9         1.9         0.5         0.4         1.3         2.0           Miscellaneous manufacturing products         18         1.0         0.6         3.0         3.7         3.2         2.6         5.2         4.8           Construction         19         19.2         11.3         0.0         0.0         10.2         6.5         0.0         0.0           Electricity, gas and heat supply         20         1.1         1.2         0.0         0.0         1.8         1.9         0.0         0.0           Water supply and waste disposal business         21         0.7         0.6         0.0         0.0         0.7         0.9         0.0         0.0           Commerce         22         11.9         12.8         4.3         11.7         9.4         10.9         0.7         1.0           Finance and insuranc		Information and communication electronics equipment	14	2.3	1.2	13.0	5.6	2.1	1.1	2.4	6.0
Transportation equipment         16         2.9         2.3         23.5         20.8         5.2         5.5         4.1         3.9           Precision instruments         17         0.5         0.4         2.9         1.9         0.5         0.4         1.3         2.0           Miscellaneous manufacturing products         18         1.0         0.6         3.0         3.7         3.2         2.6         5.2         4.8           Construction         19         19.2         11.3         0.0         0.0         10.2         6.5         0.0         0.0           Electricity, gas and heat supply         20         1.1         1.2         0.0         0.0         1.8         1.9         0.0         0.0           Water supply and waste disposal business         21         0.7         0.6         0.0         0.0         0.7         0.9         0.0         0.0           Commerce         22         11.9         12.8         4.3         11.7         9.4         10.9         0.7         1.0           Finance and insurance         23         2.0         2.5         0.9         0.9         3.6         4.3         1.6         0.7           Real estate		Electronic components	15	0.1	0.0	5.6	8.6	1.4	1.7	1.4	5.3
Precision instruments         17         0.5         0.4         2.9         1.9         0.5         0.4         1.3         2.0           Miscellaneous manufacturing products         18         1.0         0.6         3.0         3.7         3.2         2.6         5.2         4.8           Construction         19         19.2         11.3         0.0         0.0         10.2         6.5         0.0         0.0           Electricity, gas and heat supply         20         1.1         1.2         0.0         0.0         1.8         1.9         0.0         0.0           Water supply and waste disposal business         21         0.7         0.6         0.0         0.0         0.7         0.9         0.0         0.0           Commerce         22         11.9         12.8         4.3         11.7         9.4         10.9         0.7         1.0           Finance and insurance         23         2.0         2.5         0.9         0.9         3.6         4.3         1.6         0.7           Real estate         24         9.2         12.1         0.0         0.0         5.7         6.8         0.0         0.0           Industry         Informat		Transportation equipment	16	2.9	2.3	23.5	20.8	5.2	5.5	4.1	3.9
Miscellaneous manufacturing products         18         1.0         0.6         3.0         3.7         3.2         2.6         5.2         4.8           Construction         19         19.2         11.3         0.0         0.0         10.2         6.5         0.0         0.0           Electricity, gas and heat supply         20         1.1         1.2         0.0         0.0         1.8         1.9         0.0         0.0           Water supply and waste disposal business         21         0.7         0.6         0.0         0.0         0.7         0.9         0.0         0.0           Commerce         22         11.9         12.8         4.3         11.7         9.4         10.9         0.7         1.0           Finance and insurance         23         2.0         2.5         0.9         0.9         3.6         4.3         1.6         0.7           Real estate         24         9.2         12.1         0.0         0.0         5.7         6.8         0.0         0.0           Industry         Information and communications         26         1.1         4.1         0.4         0.5         2.7         4.7         0.9         1.0 <td< td=""><td></td><td>Precision instruments</td><td>17</td><td>0.5</td><td>0.4</td><td>2.9</td><td>1.9</td><td>0.5</td><td>0.4</td><td>1.3</td><td>2.0</td></td<>		Precision instruments	17	0.5	0.4	2.9	1.9	0.5	0.4	1.3	2.0
Construction         19         19.2         11.3         0.0         0.0         10.2         6.5         0.0         0.0           Electricity, gas and heat supply         20         1.1         1.2         0.0         0.0         1.8         1.9         0.0         0.0           Water supply and waste disposal business         21         0.7         0.6         0.0         0.0         0.7         0.9         0.0         0.0           Commerce         22         11.9         12.8         4.3         11.7         9.4         10.9         0.7         1.0           Finance and insurance         23         2.0         2.5         0.9         0.9         3.6         4.3         1.6         0.7           Real estate         24         9.2         12.1         0.0         0.0         5.7         6.8         0.0         0.0           Industry         Information and communications         26         1.1         4.1         0.4         0.5         2.7         4.7         0.9         1.0           Public administration         27         4.7         7.8         0.0         0.0         2.3         4.0         0.0         0.0           Education and		Miscellaneous manufacturing products	18	1.0	0.6	3.0	3.7	3.2	2.6	5.2	4.8
Electricity, gas and heat supply         20         1.1         1.2         0.0         0.0         1.8         1.9         0.0         0.0           Water supply and waste disposal business         21         0.7         0.6         0.0         0.0         0.7         0.9         0.0         0.0           Commerce         22         11.9         12.8         4.3         11.7         9.4         10.9         0.7         1.0           Finance and insurance         23         2.0         2.5         0.9         0.9         3.6         4.3         1.6         0.7           Real estate         24         9.2         12.1         0.0         0.0         5.7         6.8         0.0         0.0           Industry         Information and communications         26         1.1         4.1         0.4         0.5         2.7         4.7         0.9         1.0           Public administration         27         4.7         7.8         0.0         0.0         2.3         4.0         0.0         0.0           Education and research         28         4.5         5.1         0.0         0.5         3.3         3.7         0.0         0.9           Medical		Construction	19	19.2	11.3	0.0	0.0	10.2	6.5	0.0	0.0
Water supply and waste disposal business         21         0.7         0.6         0.0         0.7         0.9         0.0         0.0           Commerce         22         11.9         12.8         4.3         11.7         9.4         10.9         0.7         1.0           Finance and insurance         23         2.0         2.5         0.9         0.9         3.6         4.3         1.6         0.7           Real estate         24         9.2         12.1         0.0         0.0         5.7         6.8         0.0         0.0           Industry         Information and communications         26         1.1         4.1         0.4         0.5         2.7         4.7         0.9         1.0           Public administration         27         4.7         7.8         0.0         0.0         2.3         4.0         0.0         0.0           Education and research         28         4.5         5.1         0.0         0.5         3.3         3.7         0.0         0.9           Medical service, health, social security and nursing care         29         6.2         10.3         0.0         0.0         5.5         0.1         0.0           Other public services </td <td></td> <td>Electricity, gas and heat supply</td> <td>20</td> <td>1.1</td> <td>1.2</td> <td>0.0</td> <td>0.0</td> <td>1.8</td> <td>1.9</td> <td>0.0</td> <td>0.0</td>		Electricity, gas and heat supply	20	1.1	1.2	0.0	0.0	1.8	1.9	0.0	0.0
Commerce         22         11.9         12.8         4.3         11.7         9.4         10.9         0.7         1.0           Finance and insurance         23         2.0         2.5         0.9         0.9         3.6         4.3         1.6         0.7           Real estate         24         9.2         12.1         0.0         0.0         5.7         6.8         0.0         0.0           Transport         25         2.9         3.1         8.1         7.7         4.9         5.2         5.4         5.1           Information and communications         26         1.1         4.1         0.4         0.5         2.7         4.7         0.9         1.0           Public administration         27         4.7         7.8         0.0         0.0         2.3         4.0         0.0         0.0           Education and research         28         4.5         5.1         0.0         0.5         3.3         3.7         0.0         0.9           Medical service, health, social security and nursing care         29         6.2         10.3         0.0         0.0         3.1         5.2         0.0         0.0           Other public services <td< td=""><td></td><td>Water supply and waste disposal business</td><td>21</td><td>0.7</td><td>0.6</td><td>0.0</td><td>0.0</td><td>0.7</td><td>0.9</td><td>0.0</td><td>0.0</td></td<>		Water supply and waste disposal business	21	0.7	0.6	0.0	0.0	0.7	0.9	0.0	0.0
Finance and insurance         23         2.0         2.5         0.9         0.9         3.6         4.3         1.6         0.7           Real estate         24         9.2         12.1         0.0         0.0         5.7         6.8         0.0         0.0           Transport         25         2.9         3.1         8.1         7.7         4.9         5.2         5.4         5.1           Information and communications         26         1.1         4.1         0.4         0.5         2.7         4.7         0.9         1.0           Public administration         27         4.7         7.8         0.0         0.0         3.3         3.7         0.0         0.9           Medical service, health, social security and nursing care         29         6.2         10.3         0.0         0.0         3.1         5.2         0.0         0.0           Other public services         30         0.7         0.8         0.1         0.0         0.5         0.5         0.1         0.0           Business services         31         1.2         1.5         0.8         0.9         5.2         6.6         1.8         1.4           Personal services <td< td=""><td></td><td>Commerce</td><td>22</td><td>11.9</td><td>12.8</td><td>4.3</td><td>11.7</td><td>9.4</td><td>10.9</td><td>0.7</td><td>1.0</td></td<>		Commerce	22	11.9	12.8	4.3	11.7	9.4	10.9	0.7	1.0
Real estate         24         9.2         12.1         0.0         0.0         5.7         6.8         0.0         0.0           Transport         25         2.9         3.1         8.1         7.7         4.9         5.2         5.4         5.1           Information and communications         26         1.1         4.1         0.4         0.5         2.7         4.7         0.9         1.0           Public administration         27         4.7         7.8         0.0         0.0         2.3         4.0         0.0         0.0           Education and research         28         4.5         5.1         0.0         0.5         3.3         3.7         0.0         0.9           Medical service, health, social security and nursing care         29         6.2         10.3         0.0         0.0         3.1         5.2         0.0         0.0           Other public services         30         0.7         0.8         0.1         0.0         0.5         0.5         0.1         0.0           Business services         31         1.2         1.5         0.8         0.9         5.2         6.6         1.8         1.4           Personal services <t< td=""><td></td><td>Finance and insurance</td><td>23</td><td>2.0</td><td>2.5</td><td>0.9</td><td>0.9</td><td>3.6</td><td>4.3</td><td>1.6</td><td>0.7</td></t<>		Finance and insurance	23	2.0	2.5	0.9	0.9	3.6	4.3	1.6	0.7
Tertiary Industry         Transport         25         2.9         3.1         8.1         7.7         4.9         5.2         5.4         5.1           Information and communications         26         1.1         4.1         0.4         0.5         2.7         4.7         0.9         1.0           Public administration         27         4.7         7.8         0.0         0.0         2.3         4.0         0.0         0.0           Education and research         28         4.5         5.1         0.0         0.5         3.3         3.7         0.0         0.9           Medical service, health, social security and nursing care         29         6.2         10.3         0.0         0.0         3.1         5.2         0.0         0.0           Other public services         30         0.7         0.8         0.1         0.0         0.5         0.5         0.1         0.0           Business services         31         1.2         1.5         0.8         0.9         5.2         6.6         1.8         1.4           Personal services         32         10.5         10.2         0.8         1.3         5.4         5.4         5.4         3.9		Real estate	24	9.2	12.1	0.0	0.0	5.7	6.8	0.0	0.0
Industry         Information and communications         26         1.1         4.1         0.4         0.5         2.7         4.7         0.9         1.0           Public administration         27         4.7         7.8         0.0         0.0         2.3         4.0         0.0         0.0           Education and research         28         4.5         5.1         0.0         0.5         3.3         3.7         0.0         0.9           Medical service, health, social security and nursing care         29         6.2         10.3         0.0         0.0         3.1         5.2         0.0         0.0           Other public services         30         0.7         0.8         0.1         0.0         0.5         0.5         0.1         0.0           Business services         31         1.2         1.5         0.8         0.9         5.2         6.6         1.8         1.4           Personal services         32         10.5         10.2         0.8         1.3         5.4         5.4         5.4         3.9	Tertiary	Transport	25	2.9	3.1	8.1	7.7	4.9	5.2	5.4	5.1
Public administration         27         4.7         7.8         0.0         0.0         2.3         4.0         0.0         0.0           Education and research         28         4.5         5.1         0.0         0.5         3.3         3.7         0.0         0.9           Medical service, health, social security and nursing care         29         6.2         10.3         0.0         0.0         3.1         5.2         0.0         0.0           Other public services         30         0.7         0.8         0.1         0.0         0.5         0.5         0.1         0.0           Business services         31         1.2         1.5         0.8         0.9         5.2         6.6         1.8         1.4           Personal services         32         10.5         10.2         0.8         1.3         5.4         5.4         5.4         3.9	Industry	Information and communications	26	1.1	4.1	0.4	0.5	2.7	4.7	0.9	1.0
Education and research         28         4.5         5.1         0.0         0.5         3.3         3.7         0.0         0.9           Medical service, health, social security and nursing care         29         6.2         10.3         0.0         0.0         3.1         5.2         0.0         0.0           Other public services         30         0.7         0.8         0.1         0.0         0.5         0.5         0.1         0.0           Business services         31         1.2         1.5         0.8         0.9         5.2         6.6         1.8         1.4           Personal services         32         10.5         10.2         0.8         1.3         5.4         5.4         5.4         3.9		Public administration	27	4.7	7.8	0.0	0.0	2.3	4.0	0.0	0.0
Medical service, health, social security and nursing care         29         6.2         10.3         0.0         0.0         3.1         5.2         0.0         0.0           Other public services         30         0.7         0.8         0.1         0.0         0.5         0.5         0.1         0.0           Business services         31         1.2         1.5         0.8         0.9         5.2         6.6         1.8         1.4           Personal services         32         10.5         10.2         0.8         1.3         5.4         5.4         5.4         3.9 <td></td> <td>Education and research</td> <td>28</td> <td>4.5</td> <td>5.1</td> <td>0.0</td> <td>0.5</td> <td>3.3</td> <td>3.7</td> <td>0.0</td> <td>0.9</td>		Education and research	28	4.5	5.1	0.0	0.5	3.3	3.7	0.0	0.9
Other public services         30         0.7         0.8         0.1         0.0         0.5         0.5         0.1         0.0           Business services         31         1.2         1.5         0.8         0.9         5.2         6.6         1.8         1.4           Personal services         32         10.5         10.2         0.8         1.3         5.4         5.4         5.4         3.9		Medical service, health, social security and nursing care	29	6.2	10.3	0.0	0.0	3.1	5.2	0.0	0.0
Business services         31         1.2         1.5         0.8         0.9         5.2         6.6         1.8         1.4           Personal services         32         10.5         10.2         0.8         1.3         5.4         5.4         5.4         3.9		Other public services	30	0.7	0.8	0.1	0.0	0.5	0.5	0.1	0.0
Personal services         32         10.5         10.2         0.8         1.3         5.4         5.4         3.9		Business services	31	1.2	1.5	0.8	0.9	5.2	6.6	1.8	1.4
		Personal services	32	10.5	10.2	0.8	1.3	5.4	5.4	5.4	3.9
Office supplies         33         0.0         0.0         0.0         0.2 $0.2$ $0.0$ 0.0         0.0	0.1	Office supplies	33	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0
Others         Activities not elsewhere classified         34         0.0         0.0         2.6         0.1         0.7         0.4         4.3         1.0	Others	Activities not elsewhere classified	34	0.0	0.0	2.6	0.1	0.7	0.4	4.3	1.0

Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

First of all, seeing "Domestic Demand", we can see that shift to the tertiary industry is occurring such as, the composition ratio of "Transportation" and "Information and Communication" increases while that of "Transportation Machine" and "Information and Communications Equipment" decreases. When it comes to "Foreign Demand", exports of "Electronic Parts", namely intermediate goods,

Notes 3 concerning the Input-Output Table and the calculation method used.

increases while exports of "Information and Communications Equipment" as the final goods decreases. In addition, we can see increase of the composition ratio of service exports as "Commerce" increases.

On the other hand, seeing "Imports", not only raw materials, such as "Mining", but also, we can see increase of electronics-related imports, so far recognized as Japan's strength, like highly-processed intermediate goods such as "Chemical Products" and "Electronic Parts", and "Information and Communications Equipment."

In addition, upon comparing the value of 1990 and 2005, we can see that composition ratios of the tertiary industry account for imports and exports. Namely, when focusing only on influence of "Trade", there is lesser meaning for the tertiary industry to be seen in details than the primary and the secondary industries. Based on these facts, we are now going to compare and analyze 13 service-related sectors out of 34 sectors of industrial classification, after the 22nd "Commerce" sector is consolidated, by using the Input-Output Table of 22 sectors.

### (6) For Summary

We have seen "Current Account" and its breakdown, and the changes of the GDP as per things mentioned above. First of all, when considering only "Current Account", we are prone to raise expectations for "Currents without Trade" such as the "Income", because it seems that trade surplus decreases while "Currents without Trade" increases. However, if dividing it into "Credit" and "Debit", where trade amount is large in both in case of imports and exports, we can see that surplus of balance of "Currents without Trade" is large due to small amount of "Debit".

By considering the breakdown of this "Currents without Trade", we can see that Japan receives interests by "Portfolio Investment Income" in many cases, not doing direct investment in foreign countries and acquire returns, namely equity from them like the U.K. and the U.S. Namely, Japan acquires foreign money without having much relation with production activities while in case of the U.K. and the U.S., they acquire foreign money but with contribution to production activities in foreign countries.

In addition, breakdown of "Royalties and License Fees" is, although the amount is small, the balance of the "Royalties and Licenses Fees" is in deficit, and the balance of the "Industrial Processes Franchises, etc." is a surplus. This "Industrial Processes Franchises, etc." offers a strong substitute for exports.

On the other hand, when seeing breakdown of "Trade", we can see that although ratio of amount of net exports contrasted with GDP changes at certain level, as trade of intermediate goods increases that trade amount increases. This shows that international specialization of Japanese economic structure, that once conducted processing trade under industrial structure of "Full Set Type", has progressed considerably. Influence of such structural changes brought in Japanese domestic economic and industrial structure is verified in next section.

## Column 2. Influence of Long Term Price Hike (High Yen) against Economic Structure

The price hike (high yen) mentioned here is not about the market tendency of higher yen that topped ¥80/\$ after the East Japan Great Earthquake on Mar. 11, 2011 but about the long term price hike over the past 2 decades that is emphasized by comparing it with "Purchasing Power Parity".

"Purchasing Power Parity" (PPP) used in this explanation is the amount of money in each currency needed to purchase the similar product and service in a different economic zone. Namely, it shows "how much money it will cost in the local currency in each of the country to live a similar life".

Here, we calculate the ratio between the exchange rates against dollar dominated PPP as released by IMF and foreign exchange rates (dollar dominated), and compare those with Yen when fixed at 1. This ratio shows the difference in price levels -- namely, how much more money we will need to live when moving from that country to Japan (Column Figure 2-1).

# Column Figure 2-1 The ratio of the exchange rate of dollar based PPP and foreign exchange rate



Note1: For matching the rate in 1999 when euro was introduced, deutsche mark-dominated foreign exchange rates before 1998 were converted to show euro-dominated rates. Note2: The PPP-dominated exchange rate against dollar in 2010 is according to the estimation by IMF. Sources: "WEO", "IFS" (IMF)

When considering Column Figure 2-1, the value of graph of South Korea changes at around 2 for many years, so we can see it can be said that "the price level in South Korea is half of that in Japan". In addition, after 1985 (the Plaza Accord), we can see that until around 2005, price level in Japan was chronically higher than not only those of China and South Korea but also those of developed countries such as U.S., U.K. and Germany.

For example, the value of 2 in South Korea means that, the same product can be made with about half the price in South Korea. We guess that it was a strong incentive to make much of the gentrification and image strategy concerning products, depending on imports of intermediate goods for cost reduction and transferring factories overseas as the result of such handicaps continue for many years. In addition, as Japan couldn't win in exports of final goods, when it comes to portion of intermediate goods that are part of final goods, Japan was forced to change the contents of exports such as exporting matters that required high-technology to produce that foreign firms cannot produce as of today. We think that these facts offered strong incentives to change composition of exporting-goods after 1990.

In addition, in the case of imports, in the same way, goods produced with half the prices in South Korea are to be imported at prices that include transportation charge. Although price-gap is reduced and transportation charge and others are added, Japan is forced to compete against products and consumer goods produced in newly emerging countries such as daily necessities and expendable supplies that are not easy to discriminate in quality, and price which are prone to be important judgment standard. As it can't be explained simply by expansion of processing trade after 1990 alone, we guess that this handicap is also a strong incentive to increase imports of consumer goods and highly processed intermediate goods.

In addition, for three years from 2005 to 2007, the values of the U.K. and Germany were lower than 1, and the values of other countries were also almost 1. Namely, the price level in the euro zone was higher than Japan around that time, and price-gaps against other countries were not so big too. Around that time, Japanese economy recovered, export increased and employment increased too (Figures 2-3-1-4 and 2-3-3-10).

## 2. Changes of Economic and Industrial Structures, and "Ripple Effect"

# (1) Related Matters in the Domestic Industry and Weakening of "Ripple Effect" (Fallacy of Composition)

In item 2, in this section, we are going to explain the Japanese economic and industrial structures and related changes in them as the basis for showing the influence of the Japanese trade exerted on the domestic economy. Here, taking into account not only direct goods deals but also "Ripple Effect" that the emerges in production process under "macro-viewpoint", we are going to show that acts under management-like "micro-viewpoint" caused "Fallacy of Composition" in the Japanese economy. "Fallacy of Composition" means that acts judged to be right and rational under micro-viewpoint could bring about unanticipated results on a macro-scale when they are gathered.

As a premise to explain them, at first, we explain the meanings of inter-industrial relation and "Ripple Effect" by using examples. Inter-industrial relation is, literally, connections between industries in production activities, and "Ripple Effect" is a chain reaction of production that emerges in the inter-industrial structure. The induction of this "Ripple Effect" is brought by the consumption (demand) of the final goods. The final goods are consumed for other than production activities, and the consumers are classfied into "Domestic Demand" (consumption and investment by households, firms and the government) and "Foreign Demand" (export).

For example, in order to purchase a vehicle as a final good, we assume that the following inter-industrial relation is indispensable in extracting "Materials" from "Resources", and processing them into "Parts", and using them to manufacture "Vehicle" like Figure 2-3-2-1. When explaining this in reverse, demanding "Vehicle" induces manufacturing of "Vehicle", intermediate goods of "Parts" are purchased for production of "Vehicle", and induction of production emerges, such as "Materials" for "Parts" and "Resources" for "Materials". Such a chain of production is called "Ripple Effect".

When viewing the economy of one particular country in "macro-viewpoint", it creates a problem when considering whether such a chain of production is performed domestically or overseas. Therefore, we compare a "Full Set Type" industrial structure with the inherent conditions in an international specialization process in progressed and trade of intermediate goods are conducted.

# Example of "Flowing Out of Ripple Effect": Only Assembling of Vehicles Is Domestically Performed.

As a supplement to explain "Flowing Out of Ripple Effect", we take an example of "Only assembling of vehicle" for importing "Parts and Components" to produce "Vehicle" in Figure 2-3-2-1. First of all, when seeing the example from the standpoint of "vehicle" industry, "Vehicle" are produced domestically in both cases. On the other hand, seeing from a macro-viewpoint, production is conducted by domestic "Vehicle" industry, and that induces productions of "Parts", "Materials" and "Resources". However, due to imports of "Parts", productions of not only "Parts" but also "Materials" and "Resources" are done in foreign countries. If "Ripple Effect" flowed out to foreign countries by "Parts" is to be returned to home country, it is necessary to export intermediate goods of "Materials".

In this way, it is the purpose of Item 2 in this section to show inter-industrial relation and domestic "Ripple Effect" by that in a macro-viewpoint that is overlooked by seeing one industry in a micro-viewpoint.



Figure 2-3-2-1 Domestic Inter-industrial relation, and flow of "Ripple Effect"

Source: Ministry of Economy, Trade and Industry

# **Full Set Type**

In the Japanese "Full Set Type" industrial structure before 1990, like Figure 2-3-2-1, when domestic "Vehicle" were sustained by both "Domestic Demand" (domestic consumption of the final goods) and "Foreign Demands" (exports), production was done by domestic "Vehicle" industry, and productions of domestic "Parts" and "Materials" were accelerated by that. However, "Ripple Effect" flows abroad at the stage of imports of "Resources" because "Resources" depend on imports. Namely, in a micro-viewpoint, it is evaluated that only production of "Vehicle" are performed domestically. On the other hand, in a macro-viewpoint, it is evaluated that production of "Vehicle" induces productions

of domestic "Parts" and "Materials". Such a chain of production activities of three industries of "Vehicle", "Parts" and "Materials" is "Ripple Effect" caused domestically.

## Trade of Intermediate Goods along with International Specialization

Based on this, we see an example of three kinds of intermediate goods trade along with the international specialization in Figure 2-3-2-1. First of all, in the example of "Intermediate Goods Imports", Japan imports "Materials" that are processed by one step from "Resources". Due to that, domestic production of "Materials" is halted. On the other hand, in the example of "Intermediate Goods Export", domestic production of "Vehicle" is halted because "Vehicle" are imported from foreign firms, or manufactured in factories of domestic firms' in foreign countries. When both "Intermediate Goods Trade" are performed, only production of "Parts" is performed domestically.

When such "Intermediate Goods Trade" is seen only from a micro-viewpoint, although items are simply shifted from exports of the final goods to exports of intermediate goods, it is evaluated to be good because the amount of exports is maintained. In addition, when seeing in a viewpoint of a firm (management), it is evaluated to be proper because it earned profit by exporting goods that can be sold.

However, when we evaluate this in a macro-viewpoint, production-inducement to 1 or 2 industries among 3 industries are lost, and problems such as increase of unemployment, decline of tax revenue and so on occur. In addition, in the long term, indirect influences that are difficult to evaluate such as decline of consumption by former employees in secondary industry that lost the opportunity of production, capital consumption by such industries and fiscal expenditures sourcing in payment of tax money. This is an example of "Fallacy of Composition" that "when acts that are evaluated to be right and rational in a micro-viewpoint are united, that causes an unanticipated result in macro".

## (2) Trade and Flow of "Ripple Effect"

Next, we explain about the flow of "Ripple Effect" that can be recognized by using inter-industrial relation of one country. Unlike examples considered until now, it is very difficult to recognize "Ripple Effect", because actual final goods are not only a vehicle but diversified, Inter-industrial relation is complexly connected and domestic products and imports are not a choice between two things but market share exists. In order to digitize such "Ripple Effect" and analyze, it is necessary to, by using Input-Output Table, process it to various graphs and tables.<sup>9</sup>

First of all, as a premise, we show the domestic structure of inter-industrial relation and flow of "Ripple Effect" caused by that.

In Figure 2-3-2-2, when we show that the flow of "Ripple Effect" is caused by "Domestic Demand" and "Foreign Demand", then circulates in the structure of the domestic inter-industrial relation and induces domestic production. By this circulation, the production more than consumption of the final goods are performed. In the figure, we draw "Induction of Ripple Effect" by exports by blue line, and "Flowing Out of Ripple Effect" by imports by red line.<sup>10</sup>

<sup>&</sup>lt;sup>9</sup> When it comes to Input-Output Table and Input-Output analysis used in this section, please refer to Notes 3. <sup>10</sup> In Input-Output Table in one country, intermediate goods and final goods in exports (blue line) are not differentiated, but lumped together and treated as final goods. This is because an overseas follow-up



# Figure 2-3-2-2 Flow of "Ripple Effect" in Domestic

Source: Ministry of Economy, Trade and Industry

In addition, the green line is a portion that has nothing to do with production activity directly. Among them, the green arrow drawn to be "Deals of Money without Trade" is the commerce with foreign countries in "Currents without Trade" shown in Item 1 of this section, and "Income", "Royalties and License Fees" and "Current Transfers" in "Balance of Payments Statistics" are included in this. In addition, when the green arrow is hitting "Value Added" (GNI = GDP + net income from overseas), then going to "Domestic Demand" from there shows that acquired profits circulates to become new "Domestic Demand".

When we explain about the purpose of trade in a micro-viewpoint, it is to acquire foreign money to import. On the other hand, in an explanation in a macro-viewpoint, an export is one of the engines that make domestic economy work. Namely, exports take a role to supplement "Ripple Effect" to maintain domestic economic circulation.

As an arrow of red line shows, it is unavoidable to some extent for domestic economy that is forced to import resource and food to flow out "Ripple Effect" overseas. Under such a structure, negative chain reaction occurs in that domestic production decline, that cause decline of the value-added and "Domestic Demand" decreases. Therefore, it is necessary to supplement "Ripple Effect" with exports. In addition, acquiring foreign money by exports and "Currents without Trade" is also an

survey is necessary. On the other hand, as imports are the deals and consumptions occur domestically that it is possible to divide consumption of goods into domestic and imports by each sector in detail. But it requires large trouble and expenses for the processing. In Japan, such Input-Output Table (non-competitive import model) is made once in 5-years as a basic table in a year when the number in one place is 0 or 5. When it comes to a table of non-competitive import model, please refer to Notes 3.

engine that promotes economic growth, and as "Full Set Type" industrial structure was established in Japan that it was possible to continue growth effectively by 10% of exports contrasted with GDP.

# (3) Direct Change of Linkage of Inter-industry Structure

Next, we see change of the linkage structure among domestic industries.

To do so, we pick up input ratios needed to produce each one of the goods, and show them on graph by method of thermography.<sup>11</sup> Thermography is a method to express temperature or pressure, and used to show rise of body temperature by exercise, vasoconstriction by smoking lowers body temperature and so on.





Source: Input-Output Tables for Japan (Ministry of Internal Affairs and Communications)

<sup>&</sup>lt;sup>11</sup> When it comes to structure and coloring of Input-Output Table, please refer to Notes 3.

In Figure 2-3-2-3, locations where linkage of Inter-industry are strong are painted by warm colors such as red and yellow, and weak locations are painted by cool colors such as aqua or blue. In addition, in the left side of the graph, it expresses intermediate consumption caused by production, and the right side, it expresses domestic intermediate consumption except imports.

When comparing the amount of input of intermediate goods including imports with input of domestic only intermediate goods excluding imports, although intermediate input structure itself doesn't change so much between 2 points of time, as imports of intermediate goods increase in "Agriculture, Forestry and Fishing" and "Mining" that highly depend on imports that we can confirm as weakening inter-industry structure.

Next, we see the graph that shows domestic production ratio by each goods and consumer from data of Input-Output Table. In this case, ratios of domestic production goods accounting for consumption are expressed by colors, as locations where domestic production is high are by warm colors such as red and yellow, and locations where imports is high are by cool colors such as aqua and blue.

When seeing Figure 2-3-2-4, although 1990 was in cool colors as imports of primary industries were large, we can see that almost others are in warm colors of red. In 2005, although we can see that imports in "Domestic Demand" and imports in manufacturing industries such as consumption (cross) of "Information and Telecommunication Equipment" have increased, we aren't impressed so much that imports have basically increased.





Source: Input-Output Tables for Japan (Ministry of Internal Affairs and Communications)

So next, we see change of "Domestic Production Ratio" that shows ratio of domestic production in supply and production of goods that summarized linkage among industries. Here, we mutually compare, "Domestic Production Ratio", "Self-Sufficiency Ratio" in supply side and "Local Content Ratio" in production.<sup>12</sup>

<sup>&</sup>lt;sup>12</sup> 2 out of 4 kinds of "domestic production ratios" used by Fujikawa (1998) are used.

First of all, when taking "Vehicle" as an example, "Self-Sufficiency Ratio" means the ratio of domestic vehicles, which are sold domestically, namely the ratio of domestic vehicles accounting for supply. When seeing change of "Self-Sufficiency Ratio", we can see that there is a declining tendency in general. In addition, when it comes to each sector, we can see bold decline in "Textiles", "Information and Communications Equipment", "Electronics Parts" and "Precision Machinery" as well as "Mining". Namely, we can see that electronics related "Self-Sufficiency Ratio" is declining. (Figure 2-3-2-5)



Figure 2-3-2-5 Change of "Self-Sufficiency Ratio" at 4 Points of Time in Japan

Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)



Figure 2-3-2-6 Change of "Local Content Ratio" at 4 Points of Time in Japan

Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

On the other hand, also taking a vehicle as an example, "Local Content Ratio" means domestic production ratio of intermediate goods that are necessary for production of vehicles, namely, domestic production ratios of law materials, parts and so on. When comparing this "Local Content Ratio", we can see that there is a declining tendency in general too. When seeing this in each sector, we can see that not only "Oil and Coal Product" depends on imports, but also "Electric Machine", "Information and Communications Equipment", "Electronic Parts" and "Electricity, Gas and Heat Supply" are declining remarkably. Namely, imports of resources increase as the result of increase of exports of intermediate goods, as the result of decline of self-sufficiency ratio, "Local Content Ratio" of the sector that uses them for production declined (Figure 2-3-2-6).

## (4) Change of the Overall Influence Structure

Based on the change of "Direct Effect" that already explained, next, we are going to see the whole change of "Ripple Effect" that includes not only "Direct Effect" but also "Indirect Effect". In this case, as shown in Figure 2-3-2-1, as the result of imports of "Parts" for production of "Vehicle", we show the value that includes loss of opportunity of domestic production of "Materials" and "Resources". In this case, strength and weakness of "Ripple Effects" caused by inter-industrial relation are described by colors that locations where "Ripple Effect" is strong are by warm colors such as red and yellow, and weak locations are by cool colors such as aqua and blue.

When showing "Ripple Effect" by inter-industrial relation in the same expression of Figure 2-3-2-3, by comparing graphs of left and right, we can see that "Ripple Effect" is considerably flowing out overseas due to imports, and flowing out increased considerably in the latest 15 years. Particularly, we can see that "Ripple Effect" to "Metals" and "General Machinery" that are used as intermediate goods in many cases decreases (Figure 2-3-2-7).

Based on these, although seeing the amount of trade and direct inter-industrial structure is, of course, important regarding commerce, it is insufficient to recognize how much domestic economy moves by exports in macro-viewpoint, so we can see that it is also necessary to recognize "Ripple Effect".

Next, we define the value of "Domestic Remained Ratio" as how much "Ripple Effect" remains domestically in each final goods sector that influences, and each industrial sector that influenced, then see change of that. In this case, as shown Figure 2-3-2-1, as the result of imports of intermediate goods for production of "Vehicle", we digitize not only that intermediate goods but also loss of opportunity of domestic production of other intermediate goods that are necessary to make that as "Flowing Out of Ripple Effect" In this case, amount of how much "Ripple Effect" remains domestically is described by colors, locations where "Ripple Effect" remained are by warm colors such as red and yellow, and not remained locations are by cool colors such as aqua and blue.

In addition, in analysis, we use both 2 methods that the one is to see how "Ripple Effect" remains in "Production Process" not to count imports of final goods, and the one to see how "Ripple Effect" remains in "Whole Process" including imports of final goods.





Source: Input-Output Tables for Japan (Ministry of Internal Affairs and Communications)

First of all, when seeing how much of "Ripple Effect" caused by deals of intermediate goods among industries in "Whole Process" in Figure 2-3-2-8 remains domestically, we can see that it declines boldly in 15 years, and there is a tendency that there is a similarity in cross direction. In addition, concerning vertical direction of "Production Process", namely production sectors affected from "Ripple Effect", we can see that declines of sectors with the numbers of smaller that 18th of "Miscellaneous Manufacturing Products" are larger than sectors with the numbers of 19th of "Construction" or sectors of subsequent numbers. This is because domestic production ratio of intermediate goods of service related sectors are higher than that of manufacturing ones.

Figure 2-3-2-8 Change of "Domestic Remainder Ratio" of "Production Process" of Japan



Source: Input-Output Tables for Japan (Ministry of Internal Affairs and Communications)







Next, when considering, the flowing out of "Ripple Effect" due to selection of domestic and imported goods as final goods, the change of "Whole Process" shown in Figure 2-3-2-9, we can see that domestic "Ripple Effect" declined drastically due to fall of consumption of domestic final goods of "Textile Products", "Pulp, Paper and Wooden Products", "Information and Communication Electronics Equipment", "Precision Machinery" and "Miscellaneous Manufacturing Products". When it comes to "Whole Process", decline of all sectors are remarkable, in particular, we can see fall in vertical direction. This is because when an importation is done in the stage of consumption of final goods, domestic "Ripple Effect" isn't induced.

Finally, we see the graph that extracts changes in the latest 15 years of Figure 2-3-2-10. In this case, the way of increase or decrease of remainder of domestic "Ripple Effect" is shown by colors,

that locations where more "Ripple Effect" remains domestically than before are described by red shading, and locations where lesser "Ripple Effect" remains domestically are by blue shading.



Figure 2-3-2-10 Fluctuation for 15- Years of Both "Domestic Remainder Ratio" of Japan

Source: Input-Output Tables for Japan (Ministry of Internal Affairs and Communications)

According to this, we can see that effect of cutoff of inter-industrial relation in "Production Process" is spread to the whole industry. Particularly, although the values of final goods (the first line), such as "Oil and Coal Products", "Ceramic, Stone and Clay Products", "Electronic Components" and "Transportation Equipment", are red, namely, the ratio of domestic production increases, "Domestic Remainder Ratio" under that are almost blue, namely, minus. This shows that as inter-industrial relation is cutoff that "Ripple Effect" that occurred with much effort does not reach domestic industry. Such cutoff of indirect effect, that isn't easy to feel because it isn't direct-like one, is occurring as the structural change in economy and industry.

#### (5) For summary

Hitherto, using Input-Output Table, we explained about recent change of economic and industrial structures by showing domestic inter-industrial relation and structural change of "Ripple Effect" from a macro-viewpoint. First of all, by seeing "Direct Effect", namely change of direct production inducement on inter-industrial relation, we showed weakening of inter-industrial relation due to increase of imports. Next, by seeing not only "Direct Effect" but also change of "Ripple Effect" that includes indirect influence, we showed that indirect influence that isn't easy to appear is enhanced, and its weakening become larger than in case of only seeing "Direct Effect".

However, it is rash to conclude that "Flowing Out of Ripple Effect" due to imports is a problem only by the above-mentioned analysis. As we explained in Item 1 in this section, there is a process that Japan was able to establish "Full Set Type" of industries concentrated in one country, as economic and industrial structures of economies in neighboring countries were undeveloped. Therefore, it is unavoidable that Japan can't maintain the full set type when economies in neighboring newly emerging countries develop. As a result, the amount of flowing out of "Ripple Effect" by imports surely increases. On the other hand, as overseas markets expand being effected by other countries' growth and naturally, the opportunities to increase amount of exports also increase. And when one is able to increase the amount of exports by taking advantage of this opportunity, "Inducement of Ripple Effect" also increases along with that.

Now, without arguing only about the negative effect of "Flowing Out of Ripple Effect" due to increase of imports, it is necessary to compare that with "Inducement of Ripple Effect" as the result of increase of exports, and verify the balance, and evaluate whether domestic economy is working just like before, namely if "Ripple Effect" is occurring or not.

Therefore, in Item 3 of this section, we are going to compare "Flowing Out of Ripple Effect" by imports with "Inducement of Ripple Effect" by exports, then evaluate that by recognizing change of "Balance of Ripple Effect". In addition, we are going to explain the influence that the structural change of "Ripple Effect" had on employment.

## Column 3 Domestic Inter-industrial Relation among Regions, and "Ripple Effect" of Exports

By "East Japan Great Earthquake Disaster" (from now on, referred to as "the Great Earthquake") of March 11, 2011, the production and the consumption in other domestic regions having a little direct damage caused by "the Great Earthquake" and other countries are affected due to damages mainly in the Tohoku and Kanto districts. Therefore, by using the 2005 Inter-Regional Input-Output Table, we show domestic inter-industrial structure among regions mainly centering on the disaster-hit areas of Tohoku district and Kanto district.

The domestic regional tables divide the country into 9 districts of Hokkaido, Tohoku, Kanto, Chubu, Kinki, Chugoku, Shikoku, Kyushu and Okinawa, and shows not only in each district but also inter-industrial structure among regions. However, this division is different from the administrative division, for example, there is a difference such as 4 prefectures of Niigata, Yamanashi, Nagano and Shizuoka included in the Kanto region. (Column Figure 3-1)

Here, we are going to see that from where production in each region is caused by "Ripple Effect" of consumption of final goods, namely how much each district depends on "Ripple Effect" of demand in each district. For example, when parts produced in Tohoku are used in a vehicle produced in Chubu, and a consumer living in Kanto purchased that, it is notated that Kanto induced production not only in Chubu but also in Tohoku. However, in this method, it isn't shown that it mediates the production of a vehicle in Chubu but shows that Kanto induced the production only in Tohoku.





In Column 3-2 Table, districts that induce "Ripple Effect" are lined up in horizontal direction, and districts that receive "Ripple Effect" are lined up in vertical direction. The values are "Ripple Effect" occurring in and out of the country, and "Composition Ratio" is the ratio of "Ripple Effect" that each district receives from the whole country, and the total of all domestic districts in vertical direction are 100%. In addition, the values of "Domestic" are composition ratios that show where "Ripple Effect" each district receives is coming from, and the total in horizontal direction should be 100%.

			-									
							Domestic	:				
	Composition	Own	Other									
	Ratio	Ristrict	District	Tohoku	Kanto	Hokkaido	Chubu	Kinki	Chugoku	Shikoku	Kyushu	Okinawa
Tohoku	6.0	63.7	36.3	63.7	21.4	1.9	4.0	4.3	1.5	0.7	2.3	0.2
Kanto	43.1	75.8	24.2	3.5	75.8	1.7	6.0	5.6	2.4	1.2	3.6	0.3
Hokkaido	3.6	70.8	29.2	3.1	14.2	70.8	3.9	4.3	1.3	0.5	1.8	0.1
Chubu	13.0	60.9	39.1	2.4	18.1	1.4	60.9	8.8	2.7	1.3	4.2	0.3
Kinki	16.1	66.6	33.4	1.9	13.8	1.3	6.9	66.6	3.4	1.8	4.0	0.3
Chugoku	6.5	59.4	40.6	1.8	14.0	1.2	5.7	8.7	59.4	2.4	6.5	0.3
Shikoku	2.7	63.0	37.0	1.7	12.3	0.9	4.8	8.3	4.6	63.0	4.2	0.2
Kyushu	8.4	75.1	24.9	1.2	9.2	0.6	3.6	5.2	3.4	1.1	75.1	0.4
Okinawa	0.6	82.2	17.8	0.6	8.1	0.3	2.2	3.0	0.7	0.3	2.5	82.2

Column Table 3-2 Domestic linkage of "Ripple Effect" (Calculate Composition Ratio to make the total in horizontal direction by 100%, or in unit %)

Source: Ministry of Economy, Trade and Industry

When seeing "Ripple Effect" each district receives, as from Kanto to Tohoku is 21.4%, to Chubu is 18.1% and to other districts is around 10% that are larger than the values of other districts. In addition, when comparing the values between "Own District" and "Other Districts", the Tohoku, the Chubu, the Chugoku and the Shikoku districts depend on other districts by nearly 40%, and remaining districts depend on by more than 20% only, except Okinawa. This value shows how much each district depends on other districts.

Next, we show how much "Ripple Effect" exports by each district brings to each district. In this case, for example, parts of a vehicle exported from the Chubu district is produced in the Tohoku region, and thus Tohoku receives "Ripple Effect" of exports by Chubu.

Column Table 3-3 shows, like Column Table 3-2, "Ripple Effect" that exports by each district brings to each district. In this case, horizontal direction is the districts that produced goods to export, and vertical direction is the districts that receive "Ripple Effect" by production of them. In addition, "Composition Ratio" is, no matter if own district or other districts, ratio of "Ripple Effect" that each district received by exports via each country.

According to Column Table 3-3, when it comes to "Composition Ratio", exports from the Kanto are large by 39.5% after all. In addition, we can see that "Ripple Effect" other districts receive from the Kanto are larger than the values of other districts -- 19.8% for the Tohoku, 26.6% for the Hokkaido, and around 10% for other districts. On the other hand, when it comes to the Chubu area, while "Composition Ratio" of inter-industrial structure of "Ripple Effect" in Column Table 3-2 is 13.0%, "Composition Ratio" of exports is bigger by 20.3%, and the value of "Ripple Effect" giving to other

districts to the Kanto is as big as 9.3%. As "composition ratios" in exports is 39.5% in the Kanto, and 20.3% in the Chubu that are 60% totally, we can see that "Ripple Effect" that the linkage between these 2 districts brings mutually is big.

							Domestic					
	Composition	Own	Other									
	Ratio	district	district	Tohoku	Kanto	Hokkaido	Chubu	Kinki	Chugoku	Shikoku	Kyushu	Okinawa
Tohoku	4.4	64.2	35.8	64.2	19.8	0.2	7.0	3.5	1.9	0.5	3.0	0.0
Kanto	39.5	77.5	22.5	2.0	77.5	0.1	9.3	4.2	2.4	0.7	3.6	0.0
Hokkaido	0.9	36.1	63.9	4.0	26.6	36.1	16.6	7.6	3.6	1.0	4.5	0.0
Chubu	20.3	76.6	23.4	1.2	10.4	0.1	76.6	4.8	2.5	0.5	4.0	0.0
Kinki	15.5	69.9	30.1	1.2	10.8	0.1	9.1	69.9	3.8	1.4	3.7	0.0
Chugoku	8.9	67.1	32.9	1.0	10.2	0.1	7.8	6.7	67.1	1.6	5.4	0.0
Shikoku	2.3	62.8	37.2	1.2	12.3	0.1	7.2	6.9	4.4	62.8	4.9	0.0
Kyushu	8.0	79.9	20.1	0.7	7.1	0.0	4.6	3.6	3.1	0.9	79.9	0.0
Okinawa	0.2	72.6	27.4	0.7	10.9	0.1	5.5	4.2	1.6	0.4	4.0	72.6

Column	Table	3-3	Domestic	linkage	of	"Ripple	Effect"	due	to	exports	by	each	district.
(Calcula	te Com	positio	on Ratio to	make th	ne to	otal in ho	rizontal (	direct	tion	by 100%	ó, OI	r in ur	uit %)

Source: Ministry of Economy, Trade and Industry

In addition, the value of "own district" of Hokkaido is low by 36.1%. This shows that it doesn't export directly from Hokkaido, but the ratio of indirect exports in the form of intermediate goods produced in the Hokkaido area are used in products exported from other districts. Particularly, as the exports via the Kanto and the Tohoku is 30.6% totally, that is near to 36.1% of direct exports from Hokkaido, we can see that the degree of Hokkaido depends on exports from 2 disaster hit districts is high. From these, we can guess that the damages of "the Great Earthquake" in Hokkaido are light, and therefore, it could withstand the negative economic influence boldly.

Thus, due to the domestic industrial linkage among districts, we can see that "Ripple Effect" varies among districts, thereby even in Hokkaido where the amount of direct imports is small in terms of supplying intermediate goods that are used by exporting goods in other districts, there is a structure in which it is indirectly receiving the benefit of exports. Conversely speaking, we can confirm that inter-industrial structure among districts is important for not only domestic consumption but also for exports, and the reconstruction of the disaster hit regions is also important for the economy of other districts.

## 3. Influence to Ripple Structure Caused by Change of Trade Structure

#### (1) Change of Trade and Ripple Structure

In Item 3 of this section, based on the explanation about change of industrial structure earlier in Item 2 in this section, we define the difference between "Induction of Ripple Effect" caused by exports and "Flowing Out of Ripple Effect" caused by imports as "Balance of Ripple Effects", and are going to see the effects created by them.

As a premise, we clarify evaluation standard in Item 3 of this section. As we show in Item 2 of this section, domestic inter-industrial linkage is cut off due to increase of import, and "Ripple Effect" occurring in Japan is weakened. This itself is caused, to some extent, by shift from "Full Set Type" of industrial structure in Japan to international specialization. On the other hand, as opportunity of exports is increased by economic growth of foreign countries, and it is increasing actually, we guess that the amount of "Induction of Ripple Effect" is also increasing. In addition, trade is a measure from the perspective of macro-viewpoint, and the purpose of it is to make domestic economy work. Therefore, it is not enough to simply remain aware of the increase or decrease of the trade volume, but we should think about whether the domestic "Ripple Effect" caused by that is enough or not.

Therefore, concerning trade, we are going to calculate the amount of "Induction of Ripple Effect" by exports and "Flowing Out of Ripple Effect" by imports, then compare balance of that. In this comparison, when "Flowing Out" is larger and it leads to increase of unemployment, it means that enough "Ripple Effect" isn't caused to make domestic economy work sufficiently. If "Outflow" is bigger, and it leads to increase of the unemployment by this comparison, I may not wake up "Ripple Effect" that only moves national economy enough. From such a viewpoint, using the Input-Output Table, we are going to calculate "Ripple Effect" shown by Figure 2-3-3-1, and then use it for analysis.<sup>13</sup>



Figure 2-3-3-1 Inducement and Flowing Out of "Ripple Effect" that can be calculated.

Source: Ministry of Economy, Trade and Industry, Japan

<sup>&</sup>lt;sup>13</sup> Figure 2-3-3-1 is the extraction of that "Ripple Effect" that can be seen in Input-Output analysis in Figure 2-3-2-2.



Figure 2-3-3-2 Skyline Chart of Japan in 1990

Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)





Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

First of all, we are going to show "Ripple Effect" caused by trade using the skyline chart. The skyline chart shows the relation between structure of "Ripple Effect" that various industries of a certain country receives and the demand-scale.<sup>14</sup> Namely, we divide "Ripple Effect" into "Domestic Demand" and "Foreign Demand" based on origin of induction to show that in the figure (Figure 2-3-3-2 and Figure 2-3-3-3).

When comparing skyline charts in 1990 and 2005, the length of the whole graph rises in the vertical direction. This shows that "Ripple Effect" caused by exports is increased. In addition, the position of "Self-Sufficiency Ratio Line" (red line) is lowered. This shows that the quantity of "Ripple Effect" flowing out by imports is increased.

In addition, when seeing the horizontal direction, we can see that the share of the tertiary industry (under the definition of the Input-Output Table, in the right position than construction) in demand increases. Increase of the shares of this service industry is an important change when looking at the industrial structure. However, as Skyline chart shows, the service industry received influence of exports (between the 100% line and the whole graph) lightly, and influence of imports (between the self-sufficiency ratio line and the whole graph) is also light. Namely, we can see that it is easily influenced by trade neither directly nor indirectly, so not important in seeing commerce. From this fact, like Item 2 of this section, we are going to analyze it based on industrial classification of 22 sectors in Item 3 of this section too.

Next, we are going to explain the difference in "Ripple Effect" between "Domestic Demand" and "Foreign Demand" based on "Direct Effect" and "Indirect Effect" separately. The "Indirect Effect" shows that induction of production of intermediate goods is caused by either "Domestic Demand" or "Foreign Demand". Namely, the total of "Direct Effect" and "Indirect Effect" is "Ripple Effect" (Table 2-3-3-4).

Direct Effect		Indirect	Effect	Ripple	Effect		
	Direct	Lifect	muneer	Liter	(Direct +	Indirect)	Domestic
	Domestic Demand	Foreign Demand	Domestic Demand	Foreign Demand	Domestic Demand	Foreign Demand	Production
1990	49.3	5.5	38.4	6.8	87.7	12.3	100.0
1995	51.8	5.0	37.5	5.7	89.3	10.7	100.0
2000	51.7	6.0	35.4	6.9	87.1	12.9	100.0
2005	49.5	7.6	33.9	9.0	83.4	16.6	100.0

 Table 2-3-3-4
 Component ratio of dependence on "Ripple Effect" (Input-Output Table, %)

Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

First of all, when comparing the values of "Direct Effect" and "Indirect Effect", we can see that the value of indirect effect is larger. Due to only this, we can see the importance of not only "Direct Effect" from a micro-viewpoint, but also "Indirect Effect" from a macro-viewpoint. Next, when seeing composition ratios of "Ripple Effect" caused by "Domestic Demand" and "Foreign Demand",

<sup>&</sup>lt;sup>14</sup> When it comes to the way of creating the skyline chart, please refer to Notes 3.

and when it comes to "Direct Effect", there is a gap of around 7 times the value that accounts for 7.6% for "Foreign Demand" and 49.5% for "Domestic Demand" in 2005.<sup>15</sup> In addition, when it comes to "Ripple Effect", the relevant values in 2005 were 16.6% for "Foreign Demand" and 83.4% for "Domestic Demand". So the gap is reduced to around 5 times in 2005 from around 7 times in 1990. This is because "Foreign Demand" causes more "Ripple Effect", and we are going to explain this later (Table 2-3-3-4). Next, seeing this according to industrial sectors, not only many in the secondary industry but the dependency ratios on "Foreign Demands" increases in "Mining" that depends on imports and the tertiary industry that exports less. This is because the industry that doesn't export directly also benefits indirectly from exports due to "Ripple Effect", and be induced production (Table 2-3-3-5).

Table 2-3-3-5Breakdown of "Ripple Effect," and Composition Ratio according to industrialsection (Input-Output Table, %)

			Breakdown of "Ripple Effect" Component Ratio							
			Domestic (Domes	Demand tic Final	Foreign	Eemand	Domestic (Domes	Demand tic Final	Foreign	Eemand
			Dem	and)	(Exp	orts)	Dem	and)	(Exp	orts)
			1990	2005	1990	2005	1990	2005	1990	2005
Total Indust	ry		87.7	83.4	12.3	16.6	100.0	100.0	100.0	100.0
Primary	Agriculture, forestry and fishery	1	98.5	98.4	1.5	1.6	2.3	1.6	0.2	0.1
Industry	Mining	2	95.2	87.2	4.8	12.8	0.3	0.1	0.1	0.1
	Beverages and Foods	3	99.0	98.7	1.0	1.3	5.0	4.4	0.4	0.3
	Textile products	4	89.5	75.6	10.5	24.4	1.7	0.4	1.4	0.7
	Pulp, paper and wooden products	5	91.0	86.5	9.0	13.5	2.3	1.4	1.6	1.1
	Chemical products	6	75.8	62.1	24.2	37.9	2.6	2.1	5.9	6.4
	Petroleum and coal products	7	87.4	82.7	12.6	17.3	1.3	1.7	1.3	1.8
	Ceramic, stone and clay products	8	88.7	76.6	11.3	23.4	1.2	0.7	1.1	1.0
	Iron and steel	9	71.3	53.7	28.7	46.3	2.5	1.7	7.1	7.3
Secondary	Non-ferrous metals	10	70.6	51.6	29.4	48.4	0.7	0.5	2.1	2.2
Industry	Metal products	11	88.8	81.7	11.2	18.3	1.9	1.3	1.7	1.4
	General machinery	12	75.0	63.2	25.0	36.8	3.1	2.4	7.4	6.9
	Electrical machinery	13	75.1	53.1	24.9	46.9	2.0	1.0	4.7	4.6
	Information and communication electronics equipment	14	61.9	59.4	38.1	40.6	1.5	0.8	6.6	2.8
	Electronic components	15	51.6	31.8	48.4	68.2	0.8	0.6	5.3	6.8
	Transportation equipment	16	57.2	47.4	42.8	52.6	3.4	3.1	17.9	17.2
	Precision instruments	17	62.4	58.5	37.6	41.5	0.4	0.3	1.6	1.0
	Miscellaneous manufacturing products	18	82.2	72.0	17.8	28.0	3.0	2.3	4.6	4.4
	Construction	19	99.4	98.6	0.6	1.4	11.6	7.7	0.5	0.5
Tertiary	Electricity, gas and heat supply	20	89.1	86.8	10.9	13.2	1.8	2.0	1.6	1.5
Industry	Water supply and waste disposal business	21	95.6	94.1	4.4	5.9	0.8	1.0	0.3	0.3
	Secrvives and others	22	93.0	90.9	7.0	9.1	49.9	63.1	26.6	31.5

Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

<sup>&</sup>lt;sup>15</sup> Calculation of production inducement dependency ratio in Input-Output analysis.

In addition, as shown in Figure 2-3-2-2, "Domestic Demand" is caused by the value-added caused by production circulations, then it led to consumption of final goods. Namely, the value-added caused by production of "Foreign Demand" is the fund of "Domestic Demand". In the calculation of "Ripple Effect" in this time, this part can't be calculated. However, when taking this effect into consideration, the effect that exports brings to domestic economy become larger.

As the reason of the increase of dependency on "Induction of Ripple Effect" due to "Foreign Demand", it can be guessed that decline of composition ratio of "Domestic Demand" due to increase of "Foreign Demand" and weakening of "Ripple Effect" of "Domestic Demand" due to "Ripple Effect" become to be prone to flow out by increase of imports are united. Therefore, based on the change of such an economic structure, we are going to see difference of "Ripple Effect" between "Domestic Demand" and "Foreign Demand", and the change of that in next (Figure 2-3-3-6).

Figure 2-3-3-6 Domestic gap of "Ripple Effect" between Domestic Demand and Foreign Demand in Japan



Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

First of all, when comparing blue part of the bar graph, we can see that "Foreign Demand" is larger than "Domestic Demand" at the same amount in "Ripple Effect". This is because there are final goods with low processing degree, such as foods manufactured domestically, while highly processed goods are core in exports just like the word of "Process Trade" literally (mentioned before, Table 2-3-1-13).

On the other hand, when seeing "Foreign Demand", we can see that potential "Ripple Effect" -- namely, red part that shows not flowed out "Ripple Effect" that would've been realized domestically if

imports had not been done -- expanded, and the gap between the blue part that shows actual "Ripple Effect". This ratio is "Domestic Remainder Ratio", namely the ratio of "Ripple Effect" remains domestically raised in Item 2 of this section. When this "Domestic Remainder Ratio" is shown via a line graph, we can see that both "Foreign Demand" and "Domestic Demand" are becoming not to be able to remain "Ripple Effect" domestically. In addition, the gap between "Domestic Demand" and "Foreign Demand" in "Domestic Remainder Ratio" is widening. From these facts, we can see that it is becoming more difficult for "Ripple Effect" caused by "Foreign Demand" to remain domestically than "Ripple Effect" caused by "Domestic Demand".

In addition, investment returns of "Currents without Trade" rises. From this, it can be guessed that "Ripple Effect" by "Currents without Trade" is smaller than that of "Foreign Demand". In addition, due to re-investment returns, internal reserves and so on, portion of profit isn't led to consumption and investment. From these, when comparing "Ripple Effect" caused by the same amount of money, it can be guessed that "Currents without Trade" is lesser than "Foreign Demand".

# (2) Change of Ripple Effect and Factorization

Next, we are going to compare "Ripple Effect" in trade from 1990 to 2005. Therefore, we use a graph in which the horizontal axis shows the ratio of "Foreign Demand" against "Domestic Demand", and vertical axis shows "Balance of Ripple Effect" caused by trade. In addition, like Current Account, we express the case that "Inducement" is larger than "Flowing Out" as "black", adversely in case that "Outflows" is larger as "Deficit".

First of all, we show the conditions of "Balance of Ripple Effect" in each year, and show significance of the conditions that balance is zero by seeing the influence that gives to employment later. However, we note that there is nothing more meaningful than the balancing of income and expenditure when "Balance of Ripple Effect" is zero or nearly zero.

In addition, we show the ratio of import and export amounts as shown in Figure 2-3-1-4 contrasted with GDP given in numerical values (Table 2-3-3-7).

	R	atio per GD	Р	Difference from 1990				
	Exports	Imports	Net Exports	Exports	Imports	Net Exports		
1990	10.4	-9.4	0.9					
1995	9.1	-7.7	1.4	-1.2	1.7	0.5		
2000	11.0	-9.5	1.5	0.6	-0.1	0.5		
2005	14.3	-12.9	1.4	4.0	-3.5	0.4		
2010P	15.2	-14.1	1.1	4.9	-4.7	0.2		

 Table 2-3-3-7
 Change of ratios of export and import per GDP of Japan (National Account, %)

Source: Compiled using date in the National Account. (Cabinet Office)

When seeing this, although both exports and imports increase, and the degree of increase is the same, we can see that net exports are in the black and there is no significant change.

#### Analysis 1 Comparison at 4 Points of Time from 1990 to 2005

First of all, we show the relation between ratios of "Foreign Demand" (amount of exports) and "Domestic Demand" (amount of domestic consumption of final goods) and "Balance of Ripple Effect" during 4 points in time in 1990, 1995, 2000 and 2005. Here, we show the ratio of real foreign demand against the domestic demand and the ratio that "Balance of Ripple Effect" against the domestic demand becomes to be not deficit, then compare then between point of times (Figure 2-3-3-8).

# Figure 2-3-3-8 Change of "Balance of Ripple Effect" of Japan

("Balance of Ripple Effect" per "Ripple Effect by Domestic Final Demand", %)



(Ratio between exports and domestic final demand, %) Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

Each straight line in Figure 2-3-3-8 shows the influence exerts on "Balance of Ripple Effect" under the industrial structure during each point of time as exports increase. In addition, the  $\blacklozenge$  mark on the line shows the ratio of "Foreign Demand" against "Domestic Demand" at each point of time, and the **u** mark shows the ratio of "Foreign Demand" against "Domestic Demand" that makes "Balance of Ripple Effect" to be zero at each point of time. First of all, when comparing the formula of each line, we can see that the graph in 2005 (the value of the vertical axis when the value of the horizontal axis is zero) becomes small, and the degree of leaning becomes small too. This graph shows the flowing out of ripple effect under conditions of exports is zero, namely amount of flowing out of ripple effect caused by "Domestic Demand". On the other hand, the degree of leaning shows the change of "Balance of Ripple Effect" by the increase of exports. From these, we can see that both "Domestic Demand" of the y-intercept and the degree of leaning of "Balance of Ripple Effect" caused by "Foreign Demand" decreased in 2005.

In addition, the point of intersection with the horizontal axis in 2005 marked is the point where "Balance of Ripple Effect" becomes zero. Namely, it shows that it was necessary to raise "Foreign Demand" ratio constructed with "Domestic Demand" from 14.6% to 16.1%, by around 2.5%, to erase "Balance of Ripple Effect" in deficit of 1.6%.

# Analysis 2 Comparison of Trade Structure in 1990 and 2005

Next, we calculate to factorize the structural change that occurred from 1990 to 2005 in the same method of expression of Figure 2-3-3-8. Here, we perform analysis by using the virtual Input-Output Table that makes trade structure as the conditions in 1990 based on Input-Output Table in 2005. Namely, we use the thing that makes the values of consumption of final goods, the ratios between domestic production and imports concerning consumption of each intermediate goods and the values of trade such as structural ratio of exports to be that in 1990 to analyze. Here, we note this condition as "Trade 1990".

Due to this, we theorize the conditions that so called "Full Set Type" import structure that isn't prone to be caused by "Ripple Effect" of imports in 1990 was maintained in 2005, and was able to calculate inducement effect of "Ripple Effect" by exports and "Flowing Out Effect" by imports.





("Balance of Ripple Effect" per "Ripple Effect by Domestic Final Demand", %)

(Ratio between exports and domestic final demand, %)

Notes: In "Trade 1990", based on 2005, import-coefficient and composition ratio of exports are changed to the values in 1990

Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

Figure 2-3-3-9 shows the comparison between the conditions in 2005 as shown in Figure 2-3-3-8 and the results of "Trade 1990". When seeing the flow of arrow marks connecting each point and these,  $\blacklozenge$  mark that is on the line of "Trade 1990" in Figure 2-3-3-9 is the result of calculation supposing the conditions in 1990 concerning structure of exports and imports and the ratio of the amount of exports against domestic demand based on economic structure in 2005. Based on the conditions of this  $\blacklozenge$  mark, when the ratio of exports against domestic demand is 10.8%, "Balance of Ripple Effect" is a surplus of 1.5%. Although the ratio of exports against domestic demand increased to 14.6% by 3.8% in 2005 as  $\blacklozenge$  shows that is on the line of "2005", "Balance of Ripple Effect" declined by 3.1% to deficit of 1.6%.

It is 2 arrow marks that factorize this change of 2 points into factors of exports and imports.

## Increase of "Inducement of Ripple Effect" Due to Increase of Exports

First of all, the arrow from marks  $\bullet$  to  $\bullet$  on the line of "Trade 1990" is the increased portion of "Ripple Effect" due to increase of the amount of exports, and "Balance of Ripple Effect" increased by 4.6% due to this factor.

# Increase of "Flowing Out of Ripple Effect" Due to Increase of Imports

In addition, the arrow downing from marks  $\blacklozenge$  to  $\blacklozenge$  is "Flowing Out of Ripple Effect" due to increase of imports in each consumption, and "Balance of Ripple Effect" decreased by 6.5%. Due to this, "Balance of Ripple Effect" declined by 3.1% comparing with the case of mark  $\blacklozenge$  maintaining the trade level in 1990.

In response to these changes of "Ripple Effect", when it comes to trade amounts, as shown in Figure 2-3-1-3 and Table 2-3-3-7, as the result of exports increased boldly while imports also increased, net exports didn't change. This means that the ratio of net exports against the GDP seems to keep a certain level and maintain status quo, as the result of progress of invisible structural change, "Balance of Ripple Effect" declined by 3.1%. It means that it failed to increase the exports sufficiently to make up for the decline of "Ripple Effect" due to cutoff of ties in inter-industrial linkage that existed in "Full Set Type" industrial structure. It is not be possible for increase of the export that only supplemented the decrease of "Ripple Effect" by a connection to the industrial linkage that existed in the industrial structure of "Full Set Type" having died out sufficiently.

#### (3) Effect That Structural Change Brings to the Number of Employment

Next, we are going to see the relation between amount of production and the number of employment. In addition, here, we are going to analyze only the number of employment, and will not treat change in the form of employment such as decline of per capita wage level and increase of irregular employment.

When seeing labor market as a precondition, we can see that the reason of change of domestic unemployment ratio is different according to the period. As the definition of the unemployment rate is the number of dividing the number of the employees by labor force, the unemployment rate increases and decreases by the change of these two values (Figure 2-3-3-10).



Figure 2-3-3-10 Change of domestic labor force in Japan(reference year of 1980)

Notes: The numbers of employees, labor force and productive population are gap between the numbers in 1980.

Source: Compiled using date in "Population Census Report", "Annual Report of Population Estimates" and "Labor Force Survey". (Ministry of Internal Affairs and Communications, Statistics Bureau, Statistical Survey Department, Population Census Division)

First of all, the number of the employees and labor force increased from 1980 through 1991 at almost the same pace, and the unemployment rates decreased from 1987 to 1991. On the other hand, the unemployment rates continued to increase from 1992 to 2002. When seeing this with changes of the number of employees, labor force and unemployment, we can see that the reason of increase of unemployment is different before and after 1997. In the early half from 1992 to 1996, although the number of employees that is numerator was at the uppermost limit, the labor force that is a denominator continued to increase. In contrast, in the later half from 1997 to 2003, although the labor force that is a denominator decreased, as the decrease of the number of employees as a numerator was larger than that, unemployment rates increased. In addition, the decrease in productive age population (15-65) began in 1997, and continues to decrease in a lump.

Next, decline of unemployment ratio from 2003 to 2007 was caused by that increase of the number of employees was larger than increase of labor force, and as we point out in column 2, domestic price level was the lowest relatively after 1990. In addition, as the number of employees declined after 2008, unemployment ratio returns to the level in 2003.

Next, we explain that how much "Domestic Demand" and "Foreign Demand" create employment (Table 2-3-3-11).

	Direct	Effect	Indirec	t Effect	Ripple	Effect	
	Domestic Demand	Foreign Demand	Domestic Demand	Foreign Demand	Domestic Demand	Foreign Demand	Total
1990	55.3	3.3	37.5	3.9	92.8	7.2	100.0
1995	57.7	3.3	35.8	3.2	93.5	6.5	100.0
2000	57.1	3.9	35.3	3.7	92.4	7.6	100.0
2005	56.3	5.0	34.2	4.5	90.5	9.5	100.0

Table 2-3-3-11Change of Employment Inducement Effect of Japan (Input-Output Table,<br/>Employment Table, %)

Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

First of all, it is less than 5% of the employees who are working in the field that are directly concerned with "Foreign Demand", and we can see the number reaching around 2 times as much of 10% when including "Ripple Effect". However, when taking long-term effect of supplement of "Ripple Effect" as shown in Figure 2-3-2-2 into consideration, the effect that "Foreign Demand" brings to employment is larger than that.

When comparing this with the effect of production as shown in Table 2-3-3-4, we can see that employment effect of "Foreign Demand" is small. In addition, although "Indirect Effect" was larger than "Direct Effect" in 1990, "Direct Effect" becomes larger since 1995. This shows that the decrease of indirect "Ripple Effect" over employment was larger than production. This shows that although indirect "Ripple Effect" is caused by "Domestic Demand" and "Foreign Demand", it doesn't reach to industries that produce domestic intermediate goods sufficiently, and doesn't lead to employment.

When seeing this on the basis of each industrial sector, as it is labor-intensive, we can see that composition ratios are high in "Agriculture, Forestry and Fishery" and "Service and Others" that the ratios of wages in proportion of the amount of production are high (Table 2-3-3-12).

Next, we show the change of the number of employees in matching with Analysis 1 and Analysis 2.

		,	Er	Dependent	ce Ratio of	ent	Composition Ratio of Employment Inducement			
			Domestic (Domes Dem	Domestic Demand (Domestic Final Demand)		Eemand orts)	Domestic (Domes Dem	Demand tic Final and)	Foreign Eemand (Exports)	
			1990	2005	1990	2005	1990	2005	1990	2005
Total Indus	try		92.8	90.5	7.2	9.5	100.0	100.0	100.0	100.0
Primary	Agriculture, forestry and fishery	1	99.0	98.9	1.0	1.1	9.3	8.1	1.2	0.9
Industriy	Mining	2	93.7	85.7	6.3	14.3	0.2	0.0	0.1	0.1
	Beverages and Foods	3	99.1	98.8	0.9	1.2	2.8	2.5	0.3	0.3
	Textile products	4	91.2	78.0	8.8	22.0	2.2	0.6	2.7	1.5
	Pulp, paper and wooden products	5	92.9	88.9	7.1	11.1	1.6	0.9	1.6	1.1
	Chemical products	6	80.6	70.4	19.4	29.6	0.7	0.4	2.1	1.8
	Petroleum and coal products	7	88.6	84.9	11.4	15.1	0.1	0.0	0.1	0.1
	Ceramic, stone and clay products	8	87.5	77.7	12.5	22.3	0.7	0.4	1.3	1.2
	Iron and steel	9	72.4	56.3	27.6	43.7	0.5	0.3	2.3	2.2
Secondary	Non-ferrous metals	10	69.3	52.1	30.7	47.9	0.2	0.1	1.2	1.1
Industry	Metal products	11	86.6	78.8	13.4	21.2	1.8	1.1	3.5	2.9
	General machinery	12	75.6	62.5	24.4	37.5	1.6	1.2	6.8	6.8
	Electrical machinery	13	72.8	50.6	27.2	49.4	1.1	0.5	5.2	4.4
	Information and communication electronics equipment	14	59.3	59.2	40.7	40.8	0.5	0.2	4.8	1.4
	Electronic components	15	52.9	31.5	47.1	68.5	0.5	0.3	5.2	5.9
	Transportation equipment	16	57.8	47.3	42.2	52.7	1.0	0.8	9.7	8.3
	Precision instruments	17	62.7	55.6	37.3	44.4	0.3	0.2	2.2	1.3
	Miscellaneous manufacturing products	18	84.8	74.3	15.2	25.7	2.5	1.9	5.8	6.3
	Construction	19	99.5	98.6	0.5	1.4	10.6	9.2	0.6	1.2
Tertiary	Electricity, gas and heat supply	20	89.7	86.5	10.3	13.5	0.3	0.3	0.5	0.5
Industry	Water supply and waste disposal business	21	95.5	94.5	4.5	5.5	0.6	0.7	0.3	0.4
	Secrvives and others	22	94.9	93.0	5.1	7.0	61.0	70.2	42.4	50.5

# Table 2-3-3-12Dependence Ratio and Composition Ratio of Employment Inducement.(Input-Output Table, Employment Table, %)

Source: Input-Output Tables of Japan (Ministry of Internal Affairs and Communications)

## Analysis 3 Comparison During the 4 Points of Time from 1990 to 2005

First of all, as well as Analysis 1, we show the relations between the amount of production and employment in 1990, 1995, 2000 and 2005, then conduct comparison between the points of time (Table 2-3-3-13).

At first, although amount of production continues to increase, nominal GDP decreased from 2000 to 2005. This shows that the increase of amount of production (income) does not lead to the increase of the value-added (expense).

In addition, due to the increase of the labor force (denominator), employment rates continue to decrease, and we can also see that increase of amount of production doesn't lead to employment. The unemployment rates rose by around 2 times from 2.1% to 4.4% from 1990 to 2005, and it is equivalent to 1,677,000 when converted it into the number of people with an employment table. In addition, it was due to hike of composition ratio of labor-intensive service industry that the number of employees

increased in 2005 than in 2000. Based on such unemployment rate and the increase of the unemployment number of people, we verify the change of trade structure.

Table 2-3-3-13Comparison of "Ripple Effect" structure at 4 Points of time in Japan (Matching to<br/>figure 2-3-3-8)

	Nominal	Production amo	unt (¥ trillion)	The number	of employment (	Unemployment (10 thousand)			
	GDP (¥ trillion)	Production amount	Export 1%	Employment rate	The number of employment	Export 1%	Unemployment rate	The number of unemployment	
1990	442.8	872.2	10.0	61.9%	6,582.1	44.2	2.1%	141.4	
1995�	495.2	937.1	10.8	61.4%	6,737.7	47.3	3.2%	219.1	
2000	503.0	958.9	9.5	59.5%	6,828.9	40.2	4.7%	339.0	
2005	501.7	972.0	11.1	57.7%	6,670.1	43.4	4.4%	309.2	

Note 1: Employment rate and unemployment rate are quoted from the "Long-Term Employment Statistics" in the "Labor Force Survey".

Note 2: The number of employment and unemployment rate are the numbers calculated from "Employment Table" attached to "Input-Output Table", unemployment rate and overall unemployment rate, and doesn't match to the number in "Labor Force Survey".

Note 3: Locations where the number is declined (increased in case of unemployment) than previous time are colored by blue.

Source: "Input-Output Tables" and "Labor Force Survey". (Ministry of Internal Affairs and Communications)

## Analysis 4 Comparison of Trade Structure between 1990 and 2005

Next, we factorize the changes of ripple effect brought by structural change occurring from 1990 to 2005 as mentioned in above Analysis 2.

The items in Table 2-3-3-14 match with Figure 2-3-3-9. Here, we are going to explain, based on the conditions of "Trade 1990  $\blacklozenge$ ", that the economic and industrial structures reach the level of 2005, while trade structure remains in the level of 1990. First of all, when comparing "Trade 1990  $\blacklozenge$ " with "Trade 1990  $\blacklozenge$ ", the unemployment rate decreased by 1.5%, and employment rose by 1,767,000". Due to the change of import structure like that of "2005  $\blacklozenge$ ", in comparison with standard of "Trade 1990  $\blacklozenge$ ", unemployment rate rose by 0.8% and employment declined by 900,000.

Table 2-3-3-14 Factorization of "Ripple Effect" structure in 1990 and 2005 (Reference of "Trade 1990♦", and matching to figure 2-3-3-9)

		Domestic F (¥ tri	Production llion)	Number of employment (10 thousand)			
		Value of Production	Amount of Change	Number of Employment	Amount of Change	Ratio	
Trade 1990	٠	983.2		6,757.8			
Trade 1990	٠	1,030.2	47.0	6,934.5	176.7	1.5%	
Measured value in 2005	٠	972.0	-11.2	6,670.1	-87.7	-0.8%	

Note 1: "Trade 1990" is the virtual conditions that domestic industrial structure is in 2005, and structures of imports and exports are in 1990.

Note 2: Locations where the number is declined (increased in case of unemployment) than previous time are colored by blue.

Source:Compiled using data from "Input-Output Tables" and "Labor Force Survey". (Ministry of Internal Affairs and Communications)

When gathering these up, among the number of 2,645,000 unemployed people, we can see that 877,000 persons lost jobs due to the weakening of domestic inter-industrial linkage, and remaining 1,768,000 due to the gap between increase of labor force and increase of demand. Namely, the amount of increase of exports is insufficient to make up for weakening of domestically induced ripple effect due to increase of imports.

Table 2-3-3-15 Promotion of exports	and employment	(Reference of	measured	values in	n 2005,
and matching to figure 2-3-3-9)					

	Export	Unemployme	Balance of	Domestic Production (¥ trillion)		Number of employment (10 thousand)	
	Ratio	nt Ratio	Ripple Effect	Value of Production	Amount of Change	Number of Employment	Amount of Change
Real Value in 2005	14.6%	4.4%	-1.6%	972.0		6,670.1	
Balance is Zero(Balanced)	16.1%	3.5%	0.0%	988.7	16.7	6,735.5	65.5
Unemployment Rate 2.1%	20.7%	2.1%	4.9%	1,039.4	67.4	6,832.7	162.6

Note: 2.1% is unemployment rate in 1990.

Source: Compiled using data from "Input-Output Tables" and "Labor Force Survey". (Ministry of Internal Affairs and Communications)

Finally, we show necessary amount of exports to attain unemployment rate in 1990 under the economic structure in 2005. Table 2-3-3-15 shows comparison that in case of exports are increased until to realize "Balance of Ripple Effect" is balanced under the conditions in 2005, and in case of exports are increased to realize unemployment rate of 2.1% (unemployment rate in 1990). According to that, in order to make unemployment rate to be 2.1% in 2005 virtually, exports is by around 20%, namely around 6% shortage in proportion of domestic demand.

# (4) Summary

As things mentioned above, we show the changes of "Balance of Ripple Effect" that difference of "Induction of Ripple Effect" by exports and "Flowing Out of Ripple Effect" by imports, and the influence that the changes affect to employment. When seeing trade value simply, as both exports and imports increase by similar degree, and ratio of net trade against GDP is maintained at the certain value, we can evaluate that it changes at almost same level. However, by seeing the influence that trade gives to "Ripple Effect", we can see that "Ripple Effect" becomes to be prone to flow out as inter-industrial linkage is cut off. Due to these changes, "Balance of Ripple Effect" turned to minus in 2005. Namely, along with international specialization, as "Flowing Out of Ripple Effect" increase too much that "Ripple Effect" doesn't remain domestically enough.

In addition, the unemployment ratio increased in same period of this change. However, as a factor of that, there is an aspect that the labor supply continued to increase during the period of economic growth stagnation 1990s. In addition, we show that increases of the output value from 2000 to 2005 didn't connected to increases of GDP (amount of value added) and employment, but both of them decreased. This shows that the circulation of domestic "Ripple Effect" -- as shown in Figure 2-3-2-2,

distribution of value-added that is the result of production, and induction of "Domestic Demand" based on value-added and induction of production due to that -- has weakened.

These results show that international specialization didn't progress as that could induce enough "Ripple Effect" domestically. This shows that the necessity to think about the domestic "Induction of Ripple Effect" rises in thinking about trade policies in a viewpoint of macro than the era of "Full Set Type" industrial structure.

# 4. Conclusion

As mentioned above, making domestic economy as the point of argument, we explained about the effect of domestic economic structure and trade and industry from a macro-viewpoint. Japan maintained a "Full Set Type" industrial structure by itself as neighboring countries were developing ones and unable to construct an international specialization structure until mid. 1990s. This "Full Set Type" industrial structure lost inevitability as neighboring emerging countries attained economic growth and international specialization progressed for 2 decades, and the current structure was realized. In addition, when it comes to Japanese trade, both the amounts of exports and imports increased while the ratio of intermediate goods rose. This interpretation can be evaluated differently from a micro and macro-viewpoints.

When speaking from a micro-viewpoint, this change is the result of actions undertaken by each industry and firm, bidding for survival and development and paying attention to the changing world economy. Namely, actions such as finding a way of escape from the problems caused by reduction of domestic and overseas markets (reduction of domestic demand and foreign demand), reduction of prices to compete against other countries and other brands in the world market, production at places nearer to the consumers, local production to avoid economic friction with sales counterparts, increase of direct investment and transfer of factories overseas for these purposes, and increase of imports and exports of intermediate goods are rational in micro management viewpoint.

On the other hand, when speaking about the effects of such micro-judgment from a macro-viewpoint, it brought so-called "Hollowing Out" such as cutoff of close ties of domestic inter-industrial structure that was called "Full Set Type", flowing out of "Ripple Effect" along with that, decrease of employment and so on. Due to this influence, incentive to move production bases and markets abroad is more and more strengthened at the micro-level. Namely, rational acts occurred from micro-viewpoint cause problems in macro-level as the result of "Fallacy of Composition", and that strengthens incentive that strengthens acts from a micro-viewpoint. It is the political tasks to cause structural changes that lighten or make to be plus such "Fallacy of Composition", or install Japanese economy into the global inter-industrial structure to introduce "Ripple Effect" to Japan in the international specialization structure.

In addition, this analysis shows that fluctuation occurred between the number of labor force and that of employees after the burst of bubble economy. At present, decreases of labor force and employees are approximately equal, and as the result, the unemployment doesn't decline. In addition, although nominal amount of production of Input-Output Table was increased from 2000 to 2005, the nominal GDP was decreased, and so did the number of employees. This shows that the increase in amount

volume of production doesn't lead to increase of value-added and "Domestic Demand", and is unable to bring more opportunities for employment under the current domestic economic structure.

However, these are quantitative problems, and furthermore, problems of the balance, and balance of income and expenditure levels are rather than qualitative ones. When shift from full set type to international specialization is accelerated, it is unavoidable that hollowing out occurs to some extent. In addition, along with economic development in other countries, it is unavoidable that production bases and markets move to foreign countries. The problem is that these changes are large enough to make domestic "Balance of Ripple Effect" to reduce, and make domestic labor market shrink to the degree that the number of unemployment doesn't decline although labor force falls. Namely, the problem is the conditions that change which are qualitatively unavoidable are occurring excessively, and it is a political task to adjust that from a macro-viewpoint.

In addition, "Currents without Trade" in commerce, namely, "Income" balance and "Royalties and License Fees" are effective measures to acquire foreign money from a micro-viewpoint and in a well-balanced management style. However, when evaluating from a micro-viewpoint as the driving force to move domestic economy, these are substitute means of exports, and the effect is smaller than exports of the same amount. In addition, although it causes "Domestic Demand" indirectly, but "Domestic Demand" brings smaller "Ripple Effect" into domestic territory than "Foreign Demand" (export) so that its effect is necessary to be evaluated carefully.

Thus, it is necessary to foster multi-directional promotion of exports so that domestic "Induction of Ripple Effect" increases. In addition, while micro-level measures to diversify means to acquire foreign money, such as direct investment and transfer of production bases overseas and so on are done, measures from a macro-viewpoint are necessary to improve domestic economic system and structure to make benefits return home, and go to consumption or investment.