Title

Industry Network within the region - by compiling 1985-2000 regional input-output tables in accordance with a size of enterprises-: the case of Kanagawa prefecture in Japan

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Introduction

In recent years, the Japanese economy has gradually begun to emerge from recession of the 90s and is experiencing a phase of recovery after hitting the bottom of the recession in 2002. However, except for large enterprises such as motor companies, most companies and workers feel a long way from full recovery. Census of manufactures 2004 shows that the shipment value of manufacturing product of small and medium size enterprises(SME) in Japan account for 50% of the whole industry. And one of the most characteristic point of Japanese economies is subcontracting network of SME. On the basis of above, we should focus on SME as well as large enterprises to understand the inside of Japanese economy.

On the other side, because of appreciation of yen and economic development of china and ASEAN, shifting production overseas moves ahead and ”hollowing out of the regional economy ” becomes a serious problem. To cope with this situation, “The plan of industry cluster” comes under spotlight as a new regional development plan. This plan aims to create new enterprises and develop SME in order to utilize human capital and human networks in regions associated with SME and with education & research institutes in those regions. Therefore in the view of regional development, while large

enterprises acts globally, the role of SME in the region that is closely related to regional economy is gathering attention.

In addition, it is obvious for the large enterprises of transport equipment and electrical machinery to lead the present Japanese economy, and the activity of SME in Japan is closely related to the activity of large enterprises and thus understanding of transaction between large enterprises and SME is important for grasping the activity of SME.

In this situation, we have used census of manufactures, establishment and enterprise census, census of commerce for quantitative grasp of activity of SME. And Japan's The Small and Medium Enterprise Agency has made input-output tables in accordance with a size of enterprise for analyzing such economy since 1970s, and has released the result of analysis in white paper on small and medium-sized businesses annually. However, while we understand the scale of SME's activity in the region to some extent by using census of manufactures, establishment and enterprise census, census of commerce, it is not easy to understand how SME relates to other industry in this region. On the contrary because input-output tables in accordance with a size of enterprise made by Japan's The Small and Medium Enterprise Agency is a table of national level, we can know the relation between large enterprises and SME and the relation between their enterprises and other industry in the whole Japanese economy. But it is difficult to understand the

relation between SME and other industry in the region which is main issue in recent years by means of its table.

On the basis of an awareness of these problems, this study explores how large enterprises, SME and other industry in the region are related to each other, using regional input-output tables in accordance with the size of enterprise (IOASE). The objective region for compiling the IOASE is Kanagawa prefecture. This region is famous for industrial agglomeration such as general machinery, electronic machinery, and transport equipment with large enterprises as well as SME. However, it is often pointed out that big structural changes happen in this region because of shifting production overseas and declining in employment. This study examines the structural changes in the region from “Bubble economy era” to “Depression in 90s” through compiling 1985-2000 regional IOASE in Kanagawa prefecture.

1. Compiling the IOASE in Kanagawa

First of all, brief overview about Kanagawa prefecture is as follows. Kanagawa is located in the southwest of metropolis Tokyo, having Yokohama port. There are 9 million people in this region, next to Tokyo. It has also a large manufacturing base

which is part of Keihin Industrial area. Some of the famous enterprises are located in this region, such as Cannon, Toshiba, and Sony in electrical machinery, Nissan motor in transport equipment and so on. Shipment value of manufacturing product is 19,351 billion yen, which is second largest number in Japan next to Aichi prefecture which has a largest automobile company. Gross regional product (GRP) in this prefecture is same level of Norway and Austria, which is equivalent to one country. But in late years, because of developing of appreciation of yen against foreign currencies, these industries within the region have moved their factories to foreign countries. This study focuses on this representative region of Japan and reveals the structural changes from 1985 to 2000.

In 1960s, Japan's high economic growth caused "dual structure", referring to the large enterprises of high productivity and the small and medium enterprises of low productivity. It is said that the difference between the large enterprises and SME is not only the size of enterprise, but also the structure of production themselves. Therefore, Japan's The Small and Medium Enterprise Agency has made IOASE for analyzing such economy since 1970s and has released the result of analysis in white paper on small and medium-sized businesses annually.

On the contrary, making of regional IOASE has been done by (Ida, 1997), (Ida, 2000).

In this study, we made IOASE referring to these previous works. Especially, (Ida, 2000) made IOASE in Osaka, Aichi, Kanagawa However the number of sector compiled by their studies is somewhat small, they has only three sectors: manufacturing(large enterprise), manufacturing(SME), non-manufacturing. In this study, we try to divide the sector little more and compile the table which has more than 30 sectors[1].

Based on census of manufactures in Kanagawa, we compute the ratio of manufacturing by size of enterprises in Kanagawa. We set the boundary line of enterprises to divide the large enterprises from SME. Boundary is determined by the number of employers, the enterprises of more than 300 employees are large enterprises and the enterprises of below 300 employees are SME. However, in census of manufactures if the industries only have below 2 establishments, the statistic of shipment value or volume of production about the industry is hidden by X. In that case, it is difficult to compute the ratio of manufacturing by size of enterprises[2]. For this reason, we should choose the industry which has enough number of establishments to divide large enterprises from SME. To put it another way, that industry has importance to Kanagawa region. In this study, we divide the industry in view of the number of establishments and shipment value about general machinery, electrical machinery, transport equipment.

It is the basic concept for compiling the IOASE in Kanagawa that we try to compile the table by obtaining information separately for general machinery, electrical machinery, and transport equipment as far as possible from the IOASE in Japan, not changing the data from the existing input-output tables in Kanagawa.

Outline of compiling the table is as follows. We aggregate IOASE in Japan except general machinery, electrical machinery, and transport equipment and also aggregate existing input-output table in Kanagawa in accordance with aggregated IOASE in Japan.

First of all, we divide the electrical machinery sector (column) in existing input-output table in Kanagawa into two columns by using the ratio of electrical machinery sector of IOASE in Japan by size of enterprises. The sum of these two columns must be equal to existing electrical machinery sector in Kanagawa. On the other hand, we derive production volume and total intermediate input in Kanagawa by size of enterprises from the calculation which is divided existing data of production volume and total intermediate input in Kanagawa by the ratio of manufacturing by size of enterprises in Kanagawa based on census of manufactures in Kanagawa. These production volume and total intermediate input in Kanagawa by size of enterprises must also be fixed. (see figure 1)

<Figure.1>

However, there is no primarily division to meet the condition, simultaneously. Therefore we keep on multiplying the correction coefficient for adjusting to meet the both of condition, until we can make judgments that error is enough small[3].

In same way, we divide the electrical machinery sector (row) in input-output table in Kanagawa into two rows. However, since the data of import from rest of other Japan (IROJ) and export to rest of other Japan (EROJ) do not exist in IOASE in Japan, we assume that large enterprise and SME in Kanagawa have the same ratio of IROJ and EROJ. We continue the same process about general machinery, transport equipment to compile the IOASE in Kanagawa of single year. Finally we complete the IOASE in Kanagawa in 1985, 1990, 1995 and 2000 in same process.

The problem which we have to consider next is the realization of prices to compare these four input-output tables with current prices. For this purpose, we make a deflator which converts the price of the years 1985, 1990, and 1995 to the price of year 2000 from 1985-90-95 linked input-output tables in Japan and 1990-95-2000 linked input-output tables in Japan, and realize the constant price in terms of the year 2000. However, about general machinery, electrical machinery, transport equipment we deflate the price of the year 1985, 1990, 1995 to the price of year 2000 by using wholesale

price index by size of enterprises of Japan's The Small and Medium Enterprise Agency. Furthermore it is assumed that deflators of IROJ and EROJ are same as deflator of domestic production.

2. Analysis of tables

In this chapter, we observe the IOASE in Kanagawa compiled at previous chapter from various angles.

First, we see the change of volume of production in IOASE in Kanagawa and IOASE in Japan. In 1985, Volume of production in Kanagawa is 45,800 billion yen, while Volume of production in Japan is 689,900 billion yen. The volume of production in Kanagawa grew by 29% to 59,100 billion yen over the next five years, while Volume of production in Japan grew by 21.8%. Therefore, the growth rate of Kanagawa economy is higher than that of Japanese economy through this period. However, from 1990 to 1995 the growth rate o Japanese economy grew by 21.8 %, on the other hand the growth rate o Kanagawa economy grew by 1.69%. Furthermore we also see that from 1995 to 2000, the growth rate of Japanese economy is higher than that of Kanagawa economy. As a result, the share of Kanagawa economy in Japan rose from 6.64% in 1985 to

7.04% in 1990, and then fell to 6.57% in 1995 and to 6.45% in 2000. The economic scale of Kanagawa occupy relatively large portion of Japanese economy. However, we see that the relative status of Kanagawa economy is declining in late years.

<Figure.2>

We see how industrial structure has changed through the years by checking the change of composition ratio in Kanagawa. In general machinery, electrical machinery, transport equipment the composition ratio of large enterprises is higher than that of SME as a whole and thus we can point that this region is large enterprise centered economy. However, the composition ratio of large enterprise has declining trend in these days. Especially, large enterprise in electrical machinery and transport equipment decrease their composition ratio sharply in 90s. On the other hand, declining the composition ratio in SME is not so sharply, compared to large enterprises. In addition, financial, insurance, real estate and Public administration and public services are increasing[4].

Secondly, we examine the feature of the Kanagawa economy that is compared to the average feature in Japan by using coefficient of specialization (see figure.3). The coefficient of specialization shows how much the composition ratio of the IOASE in

Kanagawa departs from that of IOASE in Japan. In petroleum products, general machinery in large enterprises, electrical machinery in large enterprises, and transport equipment in large enterprises, coefficient of specialization in Kanagawa have a high value and thus the weight of these industries in Kanagawa is higher than the average of Japan. However, except general machinery in large enterprises, these industries decrease their coefficient of specialization, thus, the production of electrical machinery in large enterprises and transport equipment in large enterprises are decreasing, compared to the average of Japan. On the contrary, general machinery in SME, electrical machinery in SME and transport equipment in SME relatively keeps their value.

<Figure.3>

Thirdly, we examine the relation between Kanagawa and the areas outside the region by separating import, export, IROJ, and EROJ. The figure.4 shows the changes form 1990 to 2000, because the existing input-output table in 1985 does not divide the transaction with outside the region into import, export and IROJ, EROJ. We see that import remain the same level and import experience an increase as well, while IROJ and EROJ decline. That is why the decreasing the IROJ and EROJ is cause of the decreasing the transaction to outside the region Kanagawa.

<Figure.4>

In addition, we examine the transaction to the areas outside the region by sector. First, we see that changes of the IROJ and EROJ in figure.5. Upper half of the figure is EROJ and lower half of the figure is the IROJ. The volume of IROJ by sector derive from summing up the column of the simple IROJ matrix which is made by multiplying the diagonal matrix of IROJ coefficient (the volume of IROJ／（total intermediate demand + domestic final demand）)by the intermediate transaction matrix. This means that we extract the data of the IROJ by sector. In figure5, we see that the volume of the IROJ of the electrical machinery and transport equipment in large enterprises and of construction are decreasing. On the other hand, the volume of IROJ　of the electrical machinery in SME declines from 1985 to 1995 and then increases to 2000. In EROJ, the declining the volume of electrical machinery in large enterprises and transport equipment in large enterprises are main reason of the declining the volume of the EROJ. However, the volume of the EROJ of electrical machinery in SME is increasing.

In same way, we see the import and export in figure 6. The volume of import by sector derive from summing up the column of the simple import matrix which is made by multiplying the diagonal matrix of import coefficient (the volume of import／（total intermediate demand + domestic final demand）)by the intermediate transaction matrix.

In petroleum products and electrical machinery in large enterprises, the volume of

import is large scale and is increasing. As we see in figure4, total volume of export in Kanagawa does not largely decrease, however it is notable that the export of transport equipment in large enterprises makes a sizable drop. On the other hand, general machinery in large scale, general machinery in SME and electrical machinery in SME increase their export.

In the analysis of transaction to the area outside the region, we indicate the results as follows. First, in manufacturing industry, the transaction about IROJ and EROJ decline , however, transaction about the import and export relatively do not decline. Second, the structure of electrical machinery in large enterprises may change into the structure that they import more components to produce the goods, because they keep their exports by increasing the imports. Third, the level of manufacturing production in SME relatively stays constant, compared to large enterprises. Fourth, in general machinery both large enterprises and SME keep its level of import and export, compared to electrical machinery and transport equipment.

In next chapter, we explore the industry network within the Kanagawa by emphasizing the size of enterprises.

<Figure.5>

<Figure.6>

3. The change of industry network by size of enterprise

This chapter focuses on industry network in Kanagawa by using the IOASE in Kanagawa As you know, input-output tables include the inter-industry transactions which have a lot of information. In ordinary input-output analysis, we can calculate the backward linkage or forward linkage by calculating row sum or column sum of the Leontief inverse. However, in backward linkage, or forward linkage, we cannot sufficiently grasp the contents of the propagation and the structure of transaction. Thus, several methods have been developed and adopted to describe the information.

(Ichihashi, 2001) shows the process of propagation by process graph. In (Hollub et al., 1985), by using "Qualitative Input-Output Analysis," they transform the intermediate transactions into the information of 1 or 0 and describe the path trough the transactions. In Japan, there is also the study which uses the "Qualitative Input-Output Analysis" (Asakura, 1997)). Furthermore, (Tokuda, 1997) describes the transaction of Japanese economy in 1994 like a networking method.

On the other hand, mainly from the perspective of economic geography and regional

economy, the studies which uses the input-output analysis has been done for analyzing the industrial agglomeration. Industrial agglomeration theory indicated that once the industries agglomerates in the region, by enhancing the industry relationship, the strong circulation of regional economy lead to regional economic development. This theory is passed on to famous industry cluster theory which attracts the attention as a prescription of regional development[5].

(Feser et al., 2000) speculate the industry cluster of manufactures in the USA. (Learmonth et al., 2003) specify the industry cluster of Scotland by using Scotch input-output tables. In addition, (Oosterhaven et al., 2001) uses the Dutch interregional input-output tables to illustrate the connection of industry within the region and to other region's industry. In Japan, (Baba et al., 1991) shows that it is effective to extract the industry which has the strong relation within the region by illustrating the figure of network of industry.

In this study, we abstract the structure of industry network in Kanagawa by using the IOASE in Kanagawa which compiled in former chapter. At that time, based on the hypothesis that industry network is differ between large enterprises and SME, we try to describe the industry network in order to illustrate the difference of size of the enterprises.

We can indicate the two characteristics about our description of network in region. First, based on the industry network within the region, we consider the net intermediate transaction which removes the import and the IROJ from the intermediate matrix[6]. Second, we set the some filter value to extract the transaction and describe the volume of transaction by the size of an arrow in phases[7].

The process of extraction of industry network is as follows.

① First, to remove the import and the IROJ from the intermediate transaction matrix, we subtract the simple import matrix and the simple IROJ matrix which was made in former chapter from intermediate transaction. Thus, we obtain the intermediate transaction matrix within the region. Concretely speaking, we can obtain the intermediate transaction matrix within the region by $\left(\mathrm{I} - \hat{\mathrm{M}} - \hat{\mathrm{N}}\right)\mathrm{Z}$, where Z denotes a intermediate transaction matrix, $\hat{\mathrm{M}}$ and $\hat{\mathrm{N}}$ denote the diagonal matrix of import coefficient and IROJ.

② We set the filer value to 5 billion yen.

③ After we extract the transactions more than the filter value, we express the network to connect the transactions with an arrow. In case the arrow describes “industry 1→industry 2” , it shows the output from industry 1 to industry 2 and the input from industry 2 to industry 1 simultaneously. In addition we exclude the transaction

which is done by themselves, in view of the basic concept of extraction the inter-industry networks.

Figure 7, figure 8 shows the industry network in 1985, 2000, separating for general machinery, electrical machinery, and transport equipment by size of enterprises. But we extract the networks from the transactions of general machinery, electrical machinery, and transport equipment, and the sector that is directly related to their sectors.

First, we obtain an overview of the network briefly. When we observed the network of the general machinery, electrical machinery, and transport equipment separately, the networks of transport equipment, electrical machinery spread to other industry wider and larger than that of general machinery, in reflection of the character and the scale of industry. Seeing from the viewpoint of size of enterprises, each industries in large enterprises have more various and larger networks.

Secondly, when we compare figure 7 with figure 8 through time, the network is more weakened, because of declining the volume of production. As for the relation between large enterprises and SME, in electrical machinery, transport equipment, the output from SME to large enterprises is large, while the reverse relation is comparatively small. This indicates that the SME sell their products to large enterprises in large quantities, on the other hand the SME purchase the products from large enterprises in small quantities.

Let us look at the network figure in detail. In general machinery, the network is not weakened in 2000, in addition, large enterprises has gradually inputted from more various sectors. Additionally, both large enterprises and SME have increased the input from electrical machinery since 1985. Therefore, general machinery make new network with electrical machinery in the region.

In electrical machinery, both large enterprises and SME have an output to large enterprises in transport equipment all that time. Thus, they are integrated into the transport-centered network. Though the network of electrical machinery is totally weakened from 1985 to 2000, the relative increasing the input from public administration and public services to electrical machinery is the characteristic changes. As we mentioned above, the research and development intra-enterprise provides the significant share of public administration and public services. Therefore, the weight of R&D cost in electrical machinery is also increasing as a view of industry network within the region.

In transport equipment, large enterprises input from various industries such as electrical machinery and SME in transport equipment, and form the network in the region. On the other hand, SME in transport equipment weakened the network within the region from 1985 to 2000, and this trend is more apparent than in electrical

machinery and in SME in general machinery. Furthermore, because of the weakening relation to large enterprises, we can indicate that SME in transport equipment reduce its economic scale[8].

<Figure.7>

<Figure.8>

4. Conclusion

In this study, we examine the change of industry network within the region by compiling the IOASE. The results obtained in this study may be summarized as follows

Firstly, the Kanagawa economy surely has a large enterprises-centered structure, compared to average level in Japan. However, the production volume of large enterprises has declined. On the other hand, the production volume of SME has not declined considerably, and keeps its level, compared to average to average level in Japan.

Secondly, after the Bubble Economy, the production volume of the Kanagawa

economy experience slow growth, compared to average level of Japan. However, export does not change so much and import experience an increase. Thus, it might be inferred from these data that electrical machinery in large enterprise especially import more component to produce the goods for most optimum procurement, not importing goods from rest of other Japan. On the contrary, electrical machinery in SME increases the IROJ to 2000.

Thirdly, about the industry network, the industry network within the region seems to become weak, as it is often said in the “hollowing out of Japanese economy”. However, both general machinery in large enterprises and in SME keep the network from 1985 to 2000, and electrical machinery in SME increase its output to electrical machinery and consequently have a constant networks within the region even in 2000. On the contrary, both transport equipment in large enterprises and in SME decrease their input from other industry in the region and weaken their network. The network of electrical machinery → general machinery is remarkable point for future regional development.

As stated above, the manufacturing by sector and by size of enterprise have different feature in chronological order. In analyzing the regional economy, it is important to consider large enterprise and SME separately from now on.

Future challenge of this study is as follows.

First, we should set the sector of the research and development intra-enterprise independently which is aggregated in this study. In doing so, we can examine the relation between the research and development intra-enterprise and other industry and explore the Kanagawa economy in which the mass production factory converts to R&D factory.

Second, we should collect the data of the ratio of IROJ and EROJ in large enterprises and SME. In this study, we assume the ratio of IROJ and EROJ in large enterprises and SME is same as an initial value, because of lack of the data. Hereafter, we would like to reflect the difference of the ratio of IROJ and EROJ in large enterprises and SME from estimating the data or hearing from several enterprises.

Third, the question is the valuation of industry network in region. Surely, the formation of self-sufficient network helps regional economy to circulate the goods in region. However, in globalization era, the intra-firm trade of assembling the component and of selling internationally is of great importance especially for large enterprises. We have a next question about how to valuate this international division of labor and the regional network, in view of globalization in region.

Postscript

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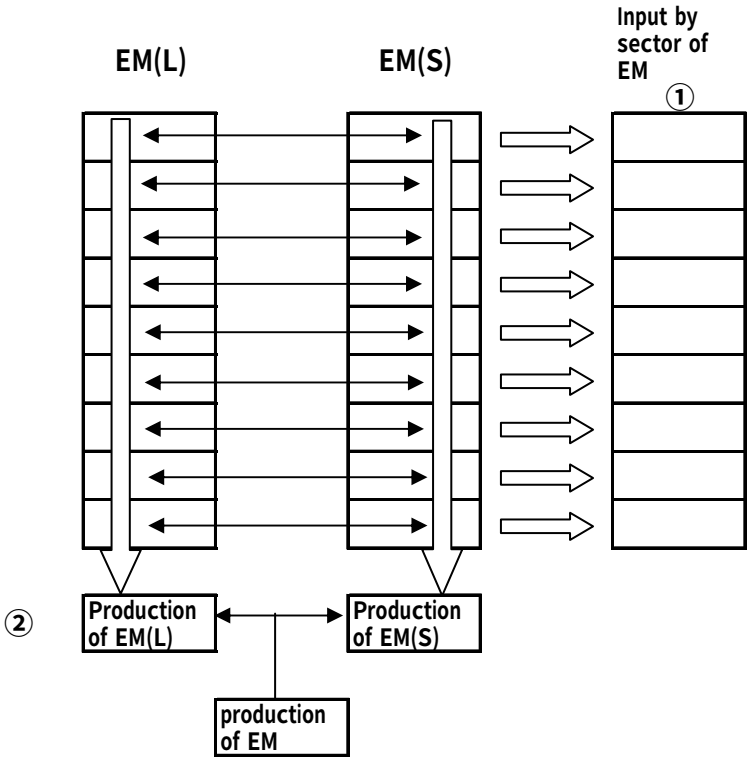

Figure 1 Example of dividing the sector into two columns.

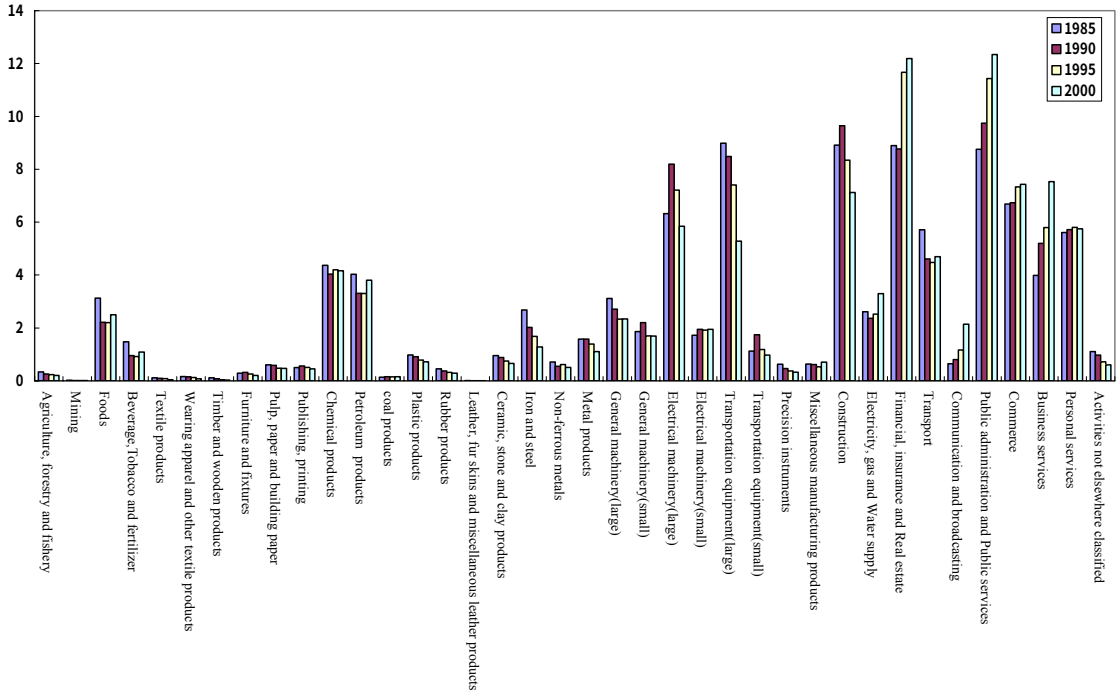

Figure 2 the Composition ratio of IOASE in Kanagawa (unit: %)

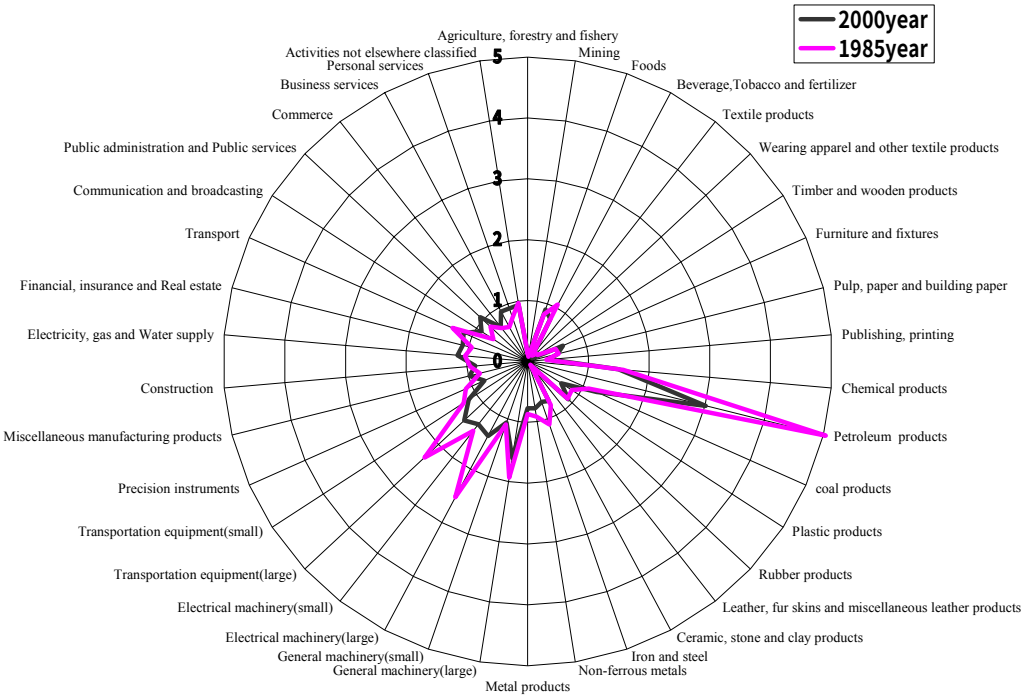

Figure 3 the coefficient of specialization.

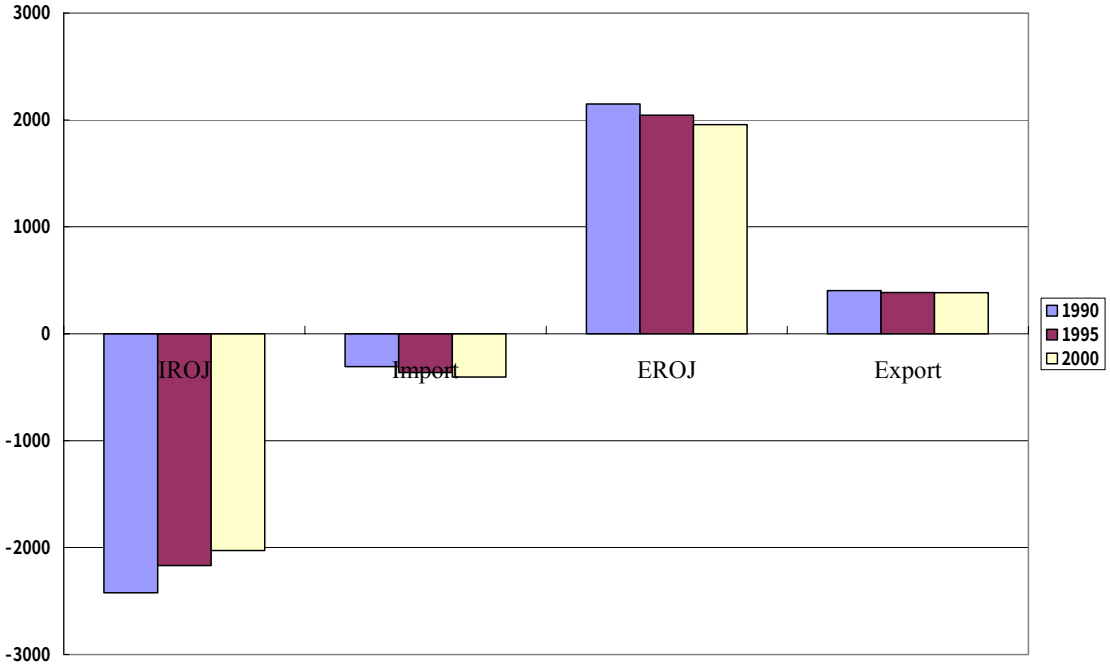

Figure 4 the change of the transaction with other region (unit: million yen)

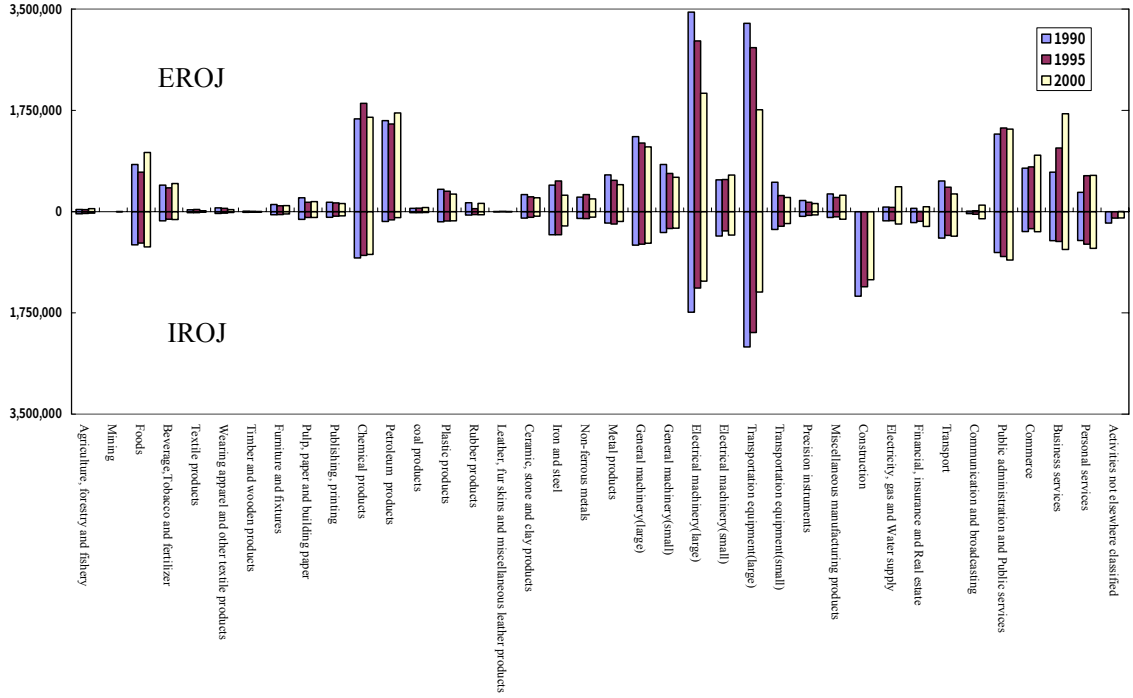

Figure 5 the change of EROJ and IROJ **(unit: million yen)**

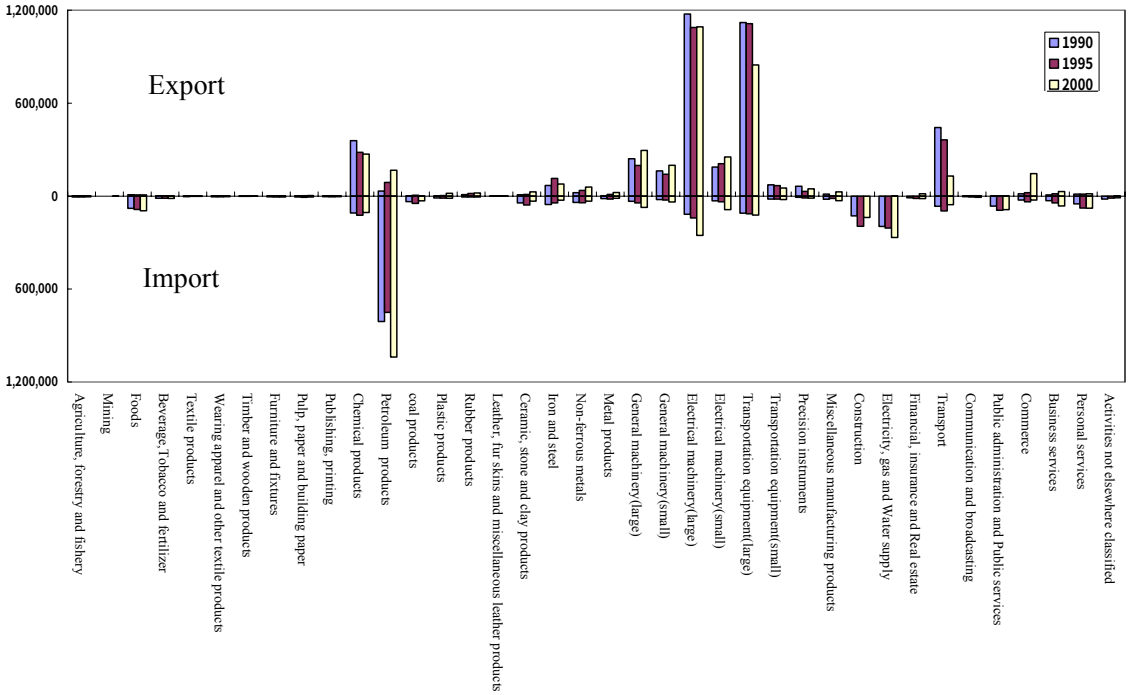

Figure 6 the change of Export and Import **(unit: million yen)**

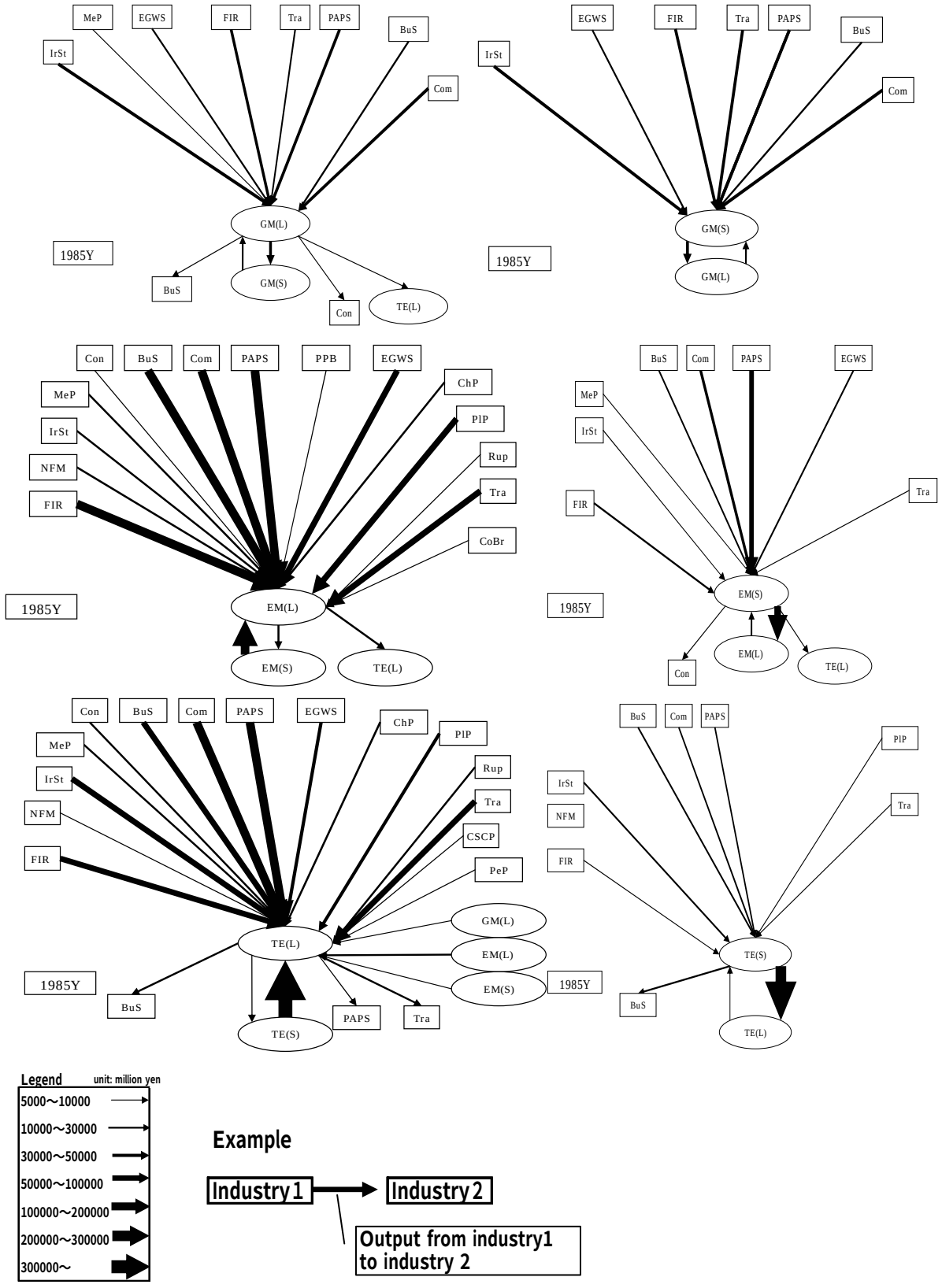

Figure 7 Industry Network in 1985

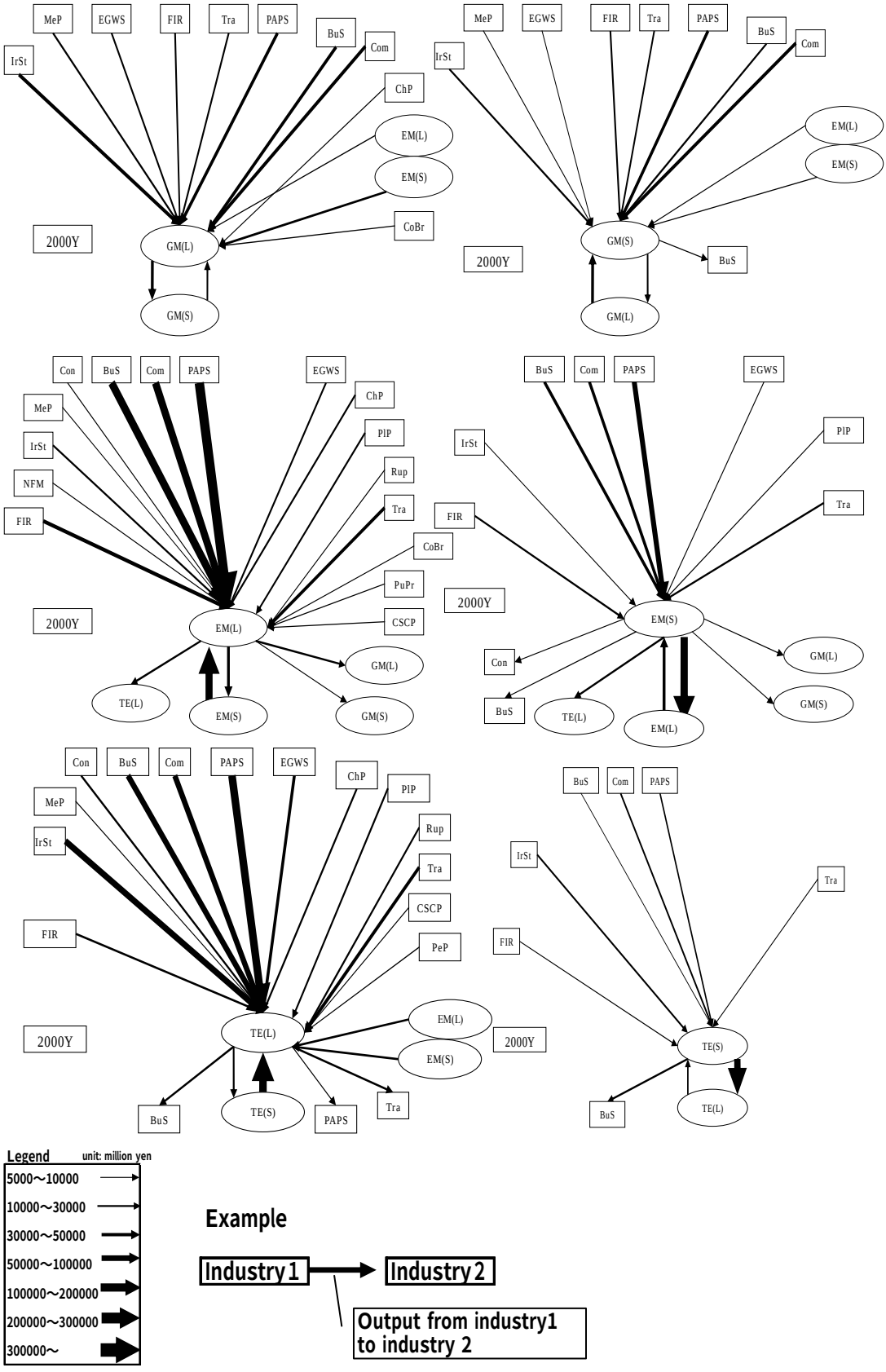

Figure 8 Industry Network in 2000

Appendix 1 the location of Kanagawa

Appendix.2 IOASE in region

			Intermediate sector								Total of Intermediate	Final Demand sector					Regional Production
				division by size of enterprise													
			AFF. etc	GM(L)	GM(S)	EM(L)	EM(S)	TE(L)	TE(S)	other		Final Demand	EROJ	Export	IROJ	Import	
Intermediate sector	division by size of enterprise	AFF. etc	Intermediate Goods									Regioanl Final Demand	EROJ	Export	IROJ	Import	Regional Production
		GM(L)															
		GM(S)															
		EM(L)															
		EM(S)															
		TE(L)															
		TE(S)															
		other															
	Total of Intermediate																
Gross Value Added			Gross Value Added														
Regioanl Production			Regioanl Production														

Appendix.3 Sector Classification

1	Agriculture, forestry and fishery	AFF
2	Mining	Min
3	Foods	Food
4	Beverage,Tobacco and fertilizer	BTF
5	Textile products	TeP
6	Wearing apparel and other textile products	WAOT
7	Timber and wooden products	TWP
8	Furniture and fixtures	FuFi
9	Pulp, paper and building paper	PPB
10	Publishing, printing	PuPr
11	Chemical products	ChP
12	Petroleum products	PeP
13	coal products	CoP
14	Plastic products	PlP
15	Rubber products	Rup
16	Leather, fur skins and miscellaneous leather products	LFMP
17	Ceramic, stone and clay products	CSCP
18	Iron and steel	IrSt
19	Non-ferrous metals	NFM
20	Metal products	MeP
21	General machinery(large)	GM(L)
22	General machinery(small)	GM(S)
23	Electrical machinery(large)	EM(L)
24	Electrical machinery(small)	EM(S)
25	Transportation equipment(large)	TE(L)
26	Transportation equipment(small)	TE(S)
27	Precision instruments	PrIn
28	Miscellaneous manufacturing products	MMP
29	Construction	Con
30	Electricity, gas and Water supply	EGWS
31	Financial, insurance and Real estate	FIR
32	Transport	Tra
33	Communication and broadcasting	CoBr
34	Public administration and Public services	PAS
35	Commerce	Com
36	Business services	BuS
37	Personal services	PeS
38	Activities not elsewhere classified	ANEC

[1] The report of compiling the IOASE in Japan by Japan Applied Research institute (Japan Applied Research institute, 2000)) publish the IOASE in Japan of 61 sectors into which they divide the 23 sectors of manufacturing, the 2 sector of services by size of the enterprises. We use the classification of the IOASE in Japan.

[2] (Ida, 1997) and (Ida, 2000) indicate that this is a main difficulty for compiling the IOASE in region for this reason.

[3] The row sum shift from control totals if we adjust the column sum by multiplying the correction coefficient. Therefore, by using a RAS method, we keep on multiplying the correction coefficient, until an error drops below 0.1^{15}.

[4]Public administration and public services include public administration, education, research, the research and development intra-enterprise, medical services, health and social security and nursing care. In recent years, manufacturing factory in Kanagawa shifts from their mass production factory to research institute. Thus, the volume of public administration and public services that include the research and development intra-enterprise is probably increasing, because the share of the research and development intra-enterprise in public administration and public services is about 25%, and is rinsing trend. However, in this study, the research and development intra-enterprise is aggregated into public administration and public services, because the IOASE in Japan do not have the research and development intra-enterprise sector and this study compiles the IOASE in Kanagawa based on IOASE in Japan.

[5] There are various notions for cluster. In (Porter, 1990), he emphasizes the

geographical concentration and the competitive and corporative position about related fields. On the contrary, (Cžamanski et al., 1979) emphasize the production linkage and indicate that it is IC(industrial complex) status, when the cluster agglomerate the certain area.

[6] In (Inada et al., 1991), they describes the intermediate transaction which include import and IROJ by networking method, which they describe the self sufficiency ratio in its network at the same time. On the other hand, this study describes the net intermediate transactions which exclude import and IROJ from the beginning.

[7] (Oosterhaven et al., 2001) indicate that Qualitative input-output analysis do not describe the scale of transactions sufficiently. In this study, we describe the scale of transaction by size of arrow in consideration of their indication.

[8] Nissan motors which is main transport equipment enterprise in Kanagawa suffered form business slowdown in 90s, compared to other Japanese auto enterprises such as Toyota motor. Under this circumstance, they implemented a variety of measures such as the closing Zama factory, and as a result, they entered into capital tie-ups with Renault in 1999. Eventually, they made an announcement of NRP (Nissan Revival Plan) to review the suppliers substantially. In its plan, they aim to reduce the number of suppliers from 1145 enterprises in 1999 to 600 enterprises in 2002. In this study's network, it is probable that the production of transport equipment in SME declines for this reason.