

## **An Input-Output Analysis of the Economic Dependence between Japanese Enterprises and Non-Japanese Enterprises in China and Japan<sup>1</sup>**

by

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### **Abstract**

The purpose of our research is firstly to create an International Input-Output Table for analyzing Japanese enterprises in China, and secondly to examine the dependence between China and Japan by using this original table. This paper focused on the activities of Japanese enterprises in China and reconstructed an I-O table with constant prices covering 1995 and 2000. We elucidated that the type of Japanese enterprises is "Chinese and Japanese Private Consumption Dependent Type". In addition, we presented further explanations on the classification of the "Chinese and Japanese Private Consumption Dependent Type" by sectors.

### **Introduction**

As the purpose of the study, we mainly focused on foreign direct investment (FDI), which is an international capital movement which changes the interdependent relationships such as trades or technology transfer between investing countries and receiving countries, and the structure of both sides' demand and supply. Thus, it has a great influence on both investor and receiver countries.

According to our investigations, it can be briefly said that FDI in China by Japanese companies has showed an expanding tendency since 2000 after the doldrums in the late 1990's and reached 6.53 billion dollars in 2005 with a 19.8% rise compared to the previous year. On the other hand, it is observed that in 2002 as a peak year of the number of Japanese enterprises in China reached 177 with a 22.0% increase compared to the previous year. In this point, the purpose of our research is firstly to create a 1995-2000 Linked International Input-Output Table for Analyzing Japanese Enterprises in China (Linked Japanese Enterprises Analysis I-O: LJEAI-O) and secondly to exam-

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ine the economic dependence between Japanese enterprises and non-Japanese enterprises in China and Japan by using this original table.

Most of the studies which analyzed the economic relationship between China and Japan such as Munakata (2001), Ito (2003), and Kwan (2005) focused on the approach by theoretical and statistical analysis. In addition, due to the restriction of the delayed development of the China-Japan I-O Table, analysis of the recent China-Japan relationship using the International I-O Table is extremely rare. Yamada (2002) analyzed the influence of Japan's FDI by using the International I-O model. However, the subjects of Yamada's study were Japanese enterprises in the U.S.A. Also, the reconstructed U.S. A.-Japan International I-O Table has a drawback in comparing current prices of two different time points (1990 and 1995). As a different point of this study, we focused on the activities of Japanese enterprises in China and reconstructed an I-O table with constant prices covering 1995 and 2000. In addition, Narita (1994) and MITI (1998) analyzed the influence of FDI on investing countries by using the I-O table, that is, the influence that the economic activities of Japanese enterprises abroad has on Japan. In contrast to the preceding studies mentioned above, we developed the original I-O table based which we identified the structure of Japanese enterprises in China for the first time.

This report consists of the following four sections. The first section clarifies the framework of this study. Then, the second section explains how to project the LJEAI-O in order to analyze Japanese enterprises in China. The third section examines the dependence between Japanese, China (non-Japanese enterprises) and Japan by using this original table. Lastly, the summary of this study is given along with the concluding remarks.

## 1 Framework of the Study

As the approach of our study, the structure of the International I-O Table can be shown as  $y$  and  $z$  are selected countries ( $y, z = C, J$ .  $C$  is China, and  $J$  is Japan),  $\gamma$  are the rest of countries (excludes Japan and China). Then, the following correlation is formulated according to the International I-O Table between China and Japan.

$$\sum_z X^{yz} + \sum_z F^{yz} + \sum_z L^{y\gamma} = X^y \quad (1)$$

$$\sum_z X^{yz} + BA^z + WTA^z + DA^z + V^z = X^z \quad (2)$$

where

$X^{yz}, F^{yz}$  : Intermediate input, final demand of countries ( $y, z$  and  $\gamma$ )

$L^{y\gamma}$  : Export of country  $y$  to country  $\gamma$

$BA^z$  : International freight and insurance for import of country  $z$ 's intermediate sections

$WTA^z$  : Import of country  $z$ 's intermediate sections from the Rest of the World

$DA^z$  : Custom duties and import commodity taxes of country  $z$ 's intermediate sections

$V^z$  : Value-added of country  $z$

**Table 1: The Format of the 1995–2000 Linked International Input–Output Table for Analyzing Japanese Enterprises in China (LJEAI–O)**

	Intermediate Demand			Final Demand		Export to the Rest of World	Total Output
	Non-Japanese Enterprises	Japanese Enterprises	Japan	China	Japan		
Non-Japanese Enterprises in China	$X^{Cc}$	$X^{Cj}$	$X^{CJ}$	$F^{Cc}$	$F^{Cj}$	$L^{C\gamma}$	$X^{Cc}$
Japanese Enterprises in China	$X^{Cj}$	$X^{Cj}$	$X^{Cj}$	$F^{Cj}$	$F^{Cj}$	$L^{C\gamma}$	$X^{Cj}$
Japan	$X^{Jc}$	$X^{Jj}$	$X^{Jj}$	$F^{Jc}$	$F^{Jj}$	$L^{J\gamma}$	$X^{Jj}$
Freight and Insurance	$BA^{Cc}$	$BA^{Cj}$	$BA^{Jj}$	$BF^{Cc}$	$BF^{Cj}$		
Rest of World	$WTA^{Cc}$	$WTA^{Cj}$	$WTA^{Jj}$	$WTF^{Cc}$	$WTF^{Cj}$		
Tariff and Import Commodity Taxes	$DA^{Cc}$	$DA^{Cj}$	$DA^{Jj}$	$DF^{Cc}$	$DF^{Cj}$		
Intermediate Input	$EA^{Cc}$	$EA^{Cj}$	$EA^{Jj}$	$EF^{Cc}$	$EF^{Cj}$		
Value-added	$V^{Cc}$	$V^{Cj}$	$V^{Jj}$				
Total Input	$X^{Cc}$	$X^{Cj}$	$X^{Jj}$				

Notes

$RF$  : International freight and insurance for import of final demand sections

$WTF$  : Import of final demand section from the world

$DF$  : Custom duties and import commodity taxes of final demand sections

$X^y, X^z$  : Domestic production of country  $y$  and country  $z$  (gross output and gross input)

On the other hand, non-Japanese enterprises in China are  $Cc$ , and Japanese enterprises in China are  $Cj$ ,<sup>2</sup> when selected countries/companies are  $e, f, z$  ( $e, f = Cc, Cj, J; z = C, J$ ) and formulas (1) and (2) can be rewritten as follows;

$$\sum_f X^{ef} + \sum_z F^{ez} + \sum_\gamma L^{e\gamma} = X^e \tag{3}$$

$$\sum_e X^{ef} + BA^f + WTA^f + DA^f + V^f = X^f \tag{4}$$

Table 1 shows the format of the LJEAI-O.

## 2 Projection of LJEAI-O

### 2.1 Materials Used for Projection

The 1990-1995-2000 Linked China-Japan International Input-Output Table (LCJI-O) is used in projecting the LJEAI-O. This table has 33 industrial sectors and standardizes each year’s price valuation in USD, then converts them in real terms by the price basis

<sup>2</sup> Hereinafter “Non-Japanese enterprises” and “Japanese Enterprises” mean enterprises in China if not otherwise specified.

<sup>3</sup> See Teng and Fang, 2006 for details of the 1990-1995-2000 Linked China-Japan International Input-Output Tables.

inflator of 2000.<sup>3</sup>

Also, materials of the Wagakuni Kigyou no Kaigai Jigyou Katsudou (Report on Overseas Activities of Japanese Enterprises) (hereinafter called "WKKJK") by the Min-

**Table 2: Converter for the Sector Classification of 1995-2000 Linked International Input-Output Table for Analysis of Japanese Enterprises in China (LJEAI-O)**

LJEAI-O		WKKJK		LCJI-O	
No. (16-Sector Classification)		No. (18-Sector Classification)		No. (33-Sector Classification)	
01	Agriculture, Forestry and Fishery	01	Agriculture, Forestry and Fishery	01	Agriculture
				02	Forestry
				03	Animal Husbandry
				04	Fishery
02	Mining	02	Mining	05	Coal Mining
				06	Crude Oil and Natural Gas
				07	Metal Mining
				08	Non-metal Mining
03	Food and Tobacco	04	Food and Tobacco	09	Food and Tobacco
04	Textile, Clothing and Leather	05	Textile	10	Textile
				11	Clothing and Leather
05	Timber, Furniture, Manufacture of Paper and Printing	06	Timber, Manufacture of Paper	12	Timber, Furniture
				13	Manufacture of Paper and Printing
06	Oil and Coal	14	Oil and Coal	14	Oil and Coal
07	Chemical Products	07	Chemical Products	15	Chemical Products
08	Smelting of Metals	09	Non-ferrous metals	18	Smelting of Metals
		08	Ferrous metals		
09	Machinery	10	Machinery	20	Machinery
10	Electric Machinery	11	Electric Machinery	21	Electric Machinery
				22	Electronic
11	Transport Equipment	12	Transport Equipment	23	Transport Equipment
12	Measuring Instruments	13	Measuring Instruments	24	Measuring Instruments
13	Other Manufacturing Goods	15	Other Manufacturing Goods	25	Other Manufacturing Goods
				16	Rubber Products
				17	Non-metal Mineral Products
				19	Metal Products
14	Construction	03	Construction	27	Construction
15	Trade	16	Trade	30	Trade
16	Other Services and Others	17	Services	32	Other Services
				33	Public Administration
		18	Others	28	Transportation
				29	Communication
				31	Banking and the Insurance
				26	Electricity, Gas and Water
90	Total	Total		90	Total

istry of Economy, Trade and Industry (the former Ministry of International Trade and Industry) are used in projecting the activities of Japanese enterprises. Data in the WKKJK such as Japanese enterprises' sales by countries, sales by buyer and supplier, and enterprises' costs and profits are especially functional for this study. However, for data by countries, aggregation and disclosure of data of Japanese enterprises in China started from 1994. Due to this constraint of materials, 1995 and 2000 are used as the subject years for the analysis in this study.

For sector classification, the WKKJK has 18 industrial sectors, and the LCJI-O has 33 industrial sectors. As a result of consolidating sectors of the WKKJK and the LCJI-O, the number of sectors of the LJEAI-O ends up as 16 (see Table 2).

For prices in the WKKJK, the currency unit of Japanese enterprises' data is converted from local currency to Japanese yen. In this study, nominal prices of Japanese enterprises in yen terms are reevaluated to USD terms by using the yen exchange rate against USD. Moreover, the price basis inflator of 2000 is created and used for converting nominal values of 1995 into real terms.

## 2.2 Projection of LJEAI-O

### (1) Japanese Enterprises' Output

The output of Japanese enterprises means the price-aggregate of products produced by production activities in China and it is very important for controlling both the rows and columns of I-O tables. However, due to the constraint of materials, Japanese enterprises' sales by industrial sectors in the WKKJK are used as the output by industrial sectors in this study (see Table 3). Also, as commercial sales differs from the concept of commercial domestic output (commercial margin) in I-O tables, general administrative and selling expenses (rent expenses, packaging and transport expenses, payroll, and depreciation of fixed assets) and operating profits of Japanese enterprises are aggregated and used as the trade's output. (see Table 4).

### (2) Japanese Enterprises' Input and Value Added

#### a) Japanese Enterprises' Total Input and Total Value Added

In this study, Japanese enterprises' total input and total value added are determined as follows.

Japanese enterprises' total input ( $ETA^{Ci}$ : row vector by section column) is calculated by subtracting payroll and depreciation of fixed assets from Japanese enterprises' cost of sales in the WKKJK (consumption of goods and services were used for manufacturing and sales of products).

Total value added ( $V^{Ci}$ : row vector by section column) is calculated by subtracting total input from total sales. For classified items of value added, payroll and depreciation of fixed assets are divided based on the data of the WKKJK. Then, payroll and depreciation of fixed assets are subtracted from total value added (sum of column values), and the remaining amount is defined as other value added including operating surplus and net taxes on production.

However, in projection by industrial sectors, the total amount of payroll, depreciation of fixed assets and operating profits in selling expenses of trade is regarded as this sector's total value added. Then, the total input of this sector is calculated by subtracting total value added from domestic output.

**Table 3: Sales by Buyer, Japanese Enterprises (in Current Prices)**

(1000US \$)					
Year	Sector	Sales to China	Export to Japan	Export to the Rest of the World	Total
1995	Agriculture, Forestry and Fishery	81873	72581	4444	158899
	Mining	96	4646	0	4742
	Food and Tobacco	96598	27546	4029	128174
	Textile, Clothing and Leather	75377	459388	16468	551233
	Timber, Furniture, Manufacture of Paper and Printing	28184	1488	0	29673
	Oil and Coal	11099	9685	0	20785
	Chemical Products	155018	17266	72783	245067
	Smelting of Metals	116532	11663	5922	134117
	Machinery	77886	251478	218488	547852
	Electric Machinery	1002371	876334	1063757	2942462
	Transport Equipment	1283606	79864	97183	1460653
	Measuring Instruments	56794	135371	138571	330736
	Other Manufacturing Goods	81980	67276	142728	291984
	Construction	29609	553	43	30204
	Trade	897523	362046	375473	1635041
	Other Services and Others	119573	14725	64	134361
	Total		4114119	2391909	2139953
2000	Agriculture, Forestry and Fishery	0	0	0	0
	Mining	0	0	0	0
	Food and Tobacco	864962	136921	24524	1026408
	Textile, Clothing and Leather	1326065	1509697	392920	3228681
	Timber, Furniture, Manufacture of Paper and Printing	188568	2598	3693	194859
	Oil and Coal	20933	2765	2431	26130
	Chemical Products	1406087	203656	191203	1800946
	Smelting of Metals	1617092	143333	272367	2032792
	Machinery	1114058	2308834	893013	4315904
	Electric Machinery	9339362	7778027	7268925	24386313
	Transport Equipment	3980607	427948	283845	4692400
	Measuring Instruments	818669	1639120	242433	2700223
	Other Manufacturing Goods	1560898	694507	464118	2719523
	Construction	193737	1113	2171	197021
	Trade	1153122	856753	924319	2934195
	Other Services and Others	1658161	544790	358690	2561641
	Total		25242321	16250063	11324653

## b) Division by Countries

Japanese enterprises' total input (ETA<sup>ci</sup>) calculated in the previous section is divided longitudinally into the three groups, "Input from China", "Input from Japan", and "Input from the Rest of the World" by the following method.

**Table 4: Output of Trade, Japanese Enterprises (in Current Prices)**

General Administrative		Selling Expenses				Operating Profits	Total
		Rent	Packaging and Transport	Payroll	Depreciation		
1995	60536	4848	797	12970	734	-6540	73345
2000	1598042	147156	164378	405159	85488	533972	2934195

Sources: Ministry of Economy, Trade and Industry (2003), Ministry of International Trade and Industry (1998)

First, input (valued at CIF: duties and imposition on imports deducted) is divided into “Input from the Rest of the World ( $X^{Cj}$ )” and “Input from the Target Area (China and Japan)” based on the local supply rate (ratio of purchase amount from supplier) in the WKKJK (see Table 5). Then, international freight and insurance premiums ( $BA^{Cj}$ ) are subtracted in order to match “Input from the Target Area” with producers’ prices in the I-O table. Finally, based on the local supply rate in the WKKJK, “Input from the Target Area” valued at producers’ price is divided into “Input from China ( $X^{CCj}$ )” and “Input from Japan ( $X^{JCj}$ )”.

(3) *Input from Non-Japanese Enterprises and Japanese Enterprises in China*

a) *Sales of Intermediate Goods to China by Japanese Enterprises*

First, “Sales of Intermediate Goods to China by Japanese Enterprises ( $X^{CjC}$ )” is separated from Intermediate Demand of Domestic China ( $X^{CC}$ ). Yamada (2002) used a ratio of Japanese enterprises in economic activities of the U.S.A. in order to separate economic activities of Japanese enterprises in the U.S.A.-Japan International I-O Table. A similar method was used in this study that is as follows.

Sales of Intermediate Goods to China by Japanese Enterprises (row total column vector of  $X^{CjC} + X^{CjJ}$ ) = Intermediate Demand of Domestic China (row total column vector of  $X^{CC}$ ) \* Ratio of Sales to China by Japanese Enterprises (column vector) in Total Sales to Domestic China ( $X^{CC} + F^{CC}$ ) (5)

b) *Input Between Japanese Enterprises*

Next, by longitudinal section, “Input from Japanese Enterprises (column total of  $X^{CjJ}$ )” is separated from input from China into Japanese enterprises. This process is to project transactions between Japanese enterprises.

Input from Japanese Enterprises into Japanese Enterprises (column total row vector of  $X^{CjJ}$ ) = Input from China into Japanese Enterprises (column total row vector of  $X^{CjC} + X^{CjJ}$ ) \* Ratio (column vector) of Input and Purchase Amount of Japanese Enterprises’ Goods in Input and Purchase Amount in Domestic China ( $X^{CC} + F^{CC}$ ) (6)

c) *Input from Japanese Enterprises into Non-Japanese Enterprises*

By longitudinal section, “Input from Japanese Enterprises (column total of  $X^{CjC}$ )” is separated from input from China into non-Japanese enterprises.

Input from Japanese Enterprises into non-Japanese Enterprises (column total row vector of  $X^{CjC}$ ) = Input from China into non-Japanese Enterprises (column total row

\* indicates a square matrix with the vector lined diagonally (also applied below)

**Table 5: Purchase Value and its Composition by Sectors, Japanese Enterprises (in Current Prices)**  
**Table 5-1 Purchase Value**

Sector	(1000US\$)							
	1995				2000			
	From China	From Japan	From the Rest of the World	Total Supply	From China	From Japan	From the Rest of the World	Total Supply
Agriculture, Forestry and Fishery	104508	5220	0	109728	160490	1995	16118	178603
Mining	43	0	0	43	1216	464	195	1874
Food and Tobacco	59622	2881	829	63332	514058	6189	123281	643528
Textile, Clothing and Leather	52031	204965	49266	306262	792929	818076	399666	2010671
Timber, Furniture, Manufacture of Paper and Printing	6762	3891	0	10653	112248	14503	5651	132402
Oil and Coal	457	574	4029	5061	8806	1531	4046	14382
Chemical Products	50436	10217	16862	77514	567913	401281	143899	1113093
Smelting of Metals	66734	35881	11184	113800	827271	686044	139055	1652371
Machinery	125324	115671	62386	303381	1821045	1212007	303962	3337014
Electric Machinery	410887	1170997	616458	2198341	6011376	6181433	7012879	19205688
Transport Equipment	418743	511620	36285	966649	1111849	1249234	95203	2456287
Measuring Instruments	37402	70168	143940	251510	1161743	1031224	46664	2239631
Other Manufacturing Goods	47906	21539	12577	82022	789570	405586	212870	1408026
Construction	27653	32	0	27684	155229	0	4565	159794
Trade	272688	144121	53158	469966	13084467	15772293	14614689	43471448
Other Services and Others	34510	5358	2647	42515	1733692	292363	627123	2653178
<b>Total</b>	<b>1715703</b>	<b>2303136</b>	<b>1009622</b>	<b>5028461</b>	<b>28853902</b>	<b>28074223</b>	<b>23749865</b>	<b>80677990</b>

Sources: Ministry of Economy, Trade and Industry (2003), Ministry of International Trade and Industry (1998)



Table 5-2: Composition of Purchase

Sector	(Total Supply=100)							
	1995				2000			
	From China	From Japan	From the Rest of the World	Total Supply	From China	From Japan	From the Rest of the World	Total Supply
Agriculture, Forestry and Fishery	95.24	4.76	0.00	100.00	89.86	1.12	9.02	100.00
Mining	100.00	0.00	0.00	100.00	64.85	24.75	10.40	100.00
Food and Tobacco	94.14	4.55	1.31	100.00	79.88	0.96	19.16	100.00
Textile, Clothing and Leather	16.99	66.92	16.09	100.00	39.44	40.69	19.88	100.00
Timber, Furniture, Manufacture of Paper and Printing	63.47	36.53	0.00	100.00	84.78	10.95	4.27	100.00
Oil and Coal	9.03	11.34	79.62	100.00	61.23	10.65	28.13	100.00
Chemical Products	65.07	13.18	21.75	100.00	51.02	36.05	12.93	100.00
Smelting of Metals	58.64	31.53	9.83	100.00	50.07	41.52	8.42	100.00
Machinery	41.31	38.13	20.56	100.00	54.57	36.32	9.11	100.00
Electric Machinery	18.69	53.27	28.04	100.00	31.30	32.19	36.51	100.00
Transport Equipment	43.32	52.93	3.75	100.00	45.27	50.86	3.88	100.00
Measuring Instruments	14.87	27.90	57.23	100.00	51.87	46.04	2.08	100.00
Other Manufacturing Goods	58.41	26.26	15.33	100.00	56.08	28.81	15.12	100.00
Construction	99.88	0.12	0.00	100.00	97.14	0.00	2.86	100.00
Trade	58.02	30.67	11.31	100.00	30.10	36.28	33.62	100.00
Other Services and Others	81.17	12.60	6.23	100.00	65.34	11.02	23.64	100.00
Total	34.12	45.80	20.08	100.00	35.76	34.80	29.44	100.00

Note: This table was calculated based on the table 5-1

vector of  $X^{Ccc} + X^{Cjc}$  × Ratio (column vector) of Input and Purchase Amount of Japanese Enterprises' Goods in Input and Purchase Amount in Domestic China (7)

d) Input from Japanese Enterprises into Japanese Enterprises and Non-Japanese Enterprises

We made balance adjustments by the RAS method using the following data such as sales of intermediate goods to China by Japanese enterprises (row total column vector of  $X^{CjC}$ ), input from Japanese enterprises into Japanese enterprises and non-Japanese enterprises (column total row vector of  $X^{Cji}$  and  $X^{Cjc}$ ), and corresponding input coefficients in the LCJI-O determined in the preceding section. Then, we projected all factors in the matrix of input,  $X^{Cjc}$  and  $X^{Cji}$ , from Japanese enterprises into Japanese enterprises and non-Japanese enterprises.

e) Input Between Non-Japanese Enterprises in China and Input from Non-Japanese Enterprises in China into Japanese Enterprises

First, sales of intermediate goods to China by non-Japanese enterprises ( $X^{Ccc}$ : column vector) is calculated by subtracting “sales of intermediate goods to China by Japanese enterprises ( $X^{CjC}$ )” from intermediate demand of domestic China ( $X^{CC}$ ) by lateral row section. Next, input between non-Japanese enterprises in China ( $X^{Ccc}$ : row vector of column total) is calculated by subtracting “input from Japanese enterprises (row vector of column total of  $X^{Cjc}$ )” from input of non-Japanese enterprises from China by longitudinal column section. Similarly, input from non-Japanese enterprises into Japanese enterprises in China (row vector of column total of  $X^{Ccj}$ ) is calculated by subtracting “input from Japanese enterprises (row vector of column total of  $X^{Cji}$ )” from input of Japanese enterprises from China. Lastly, by using data such as corresponding input coefficients in the LCJI-O, we projected factors in the matrix of input from non-Japanese enterprises into non-Japanese enterprises and Japanese enterprises as well as non-Japanese enterprises, that is  $X^{Ccc}$  and  $X^{Ccj}$ , by the method similar to d).

It is important to note that we used  $X^{CC}$ ,  $X^{Cj}$ ,  $X^{jC}$  and  $X^{jj}$  in the LCJI-O for the coefficients in projecting the factors in the matrix of input,  $X^{Ccc}$ ,  $X^{Ccj}$ ,  $X^{Cjc}$  and  $X^{Cji}$ . It is because of the assumption that the input structures of non-Japanese enterprises and Japanese enterprises in China, between non-Japanese enterprises and between Japanese enterprises are similar to those of Chinese enterprises and Japanese enterprises, between Chinese enterprises and between Japanese enterprises in the LCJI-O.

#### (4) Input from Japanese Enterprises into Japan

a) Sales of Intermediate Goods to Japan by Japanese Enterprises

First, by lateral section, sales of intermediate goods by Japanese enterprises are separated from China's sales of intermediate goods to Japan and the separation method is as follows:

Sales of Intermediate Goods to Japan by Japanese Enterprises (row total column vector of  $X^{Cj}$ ) = China's Sales of Intermediate Goods to Japan (row total column vector of  $X^{Cj}$ ) × Ratio of Sales to Japan by Japanese Enterprises in China's Total Sales to Japan (column vector) (8)

b) Input from Japanese Enterprises into Japan

Next, by longitudinal section, input from Japanese Enterprises is separated from input from China into Japan. That is, Input from Japanese Enterprises into Japan (column total row vector of  $X^{Cj}$ ) = Input from China into Japan (column total row vector of  $X^{Cj}$ ) × Ratio of Purchase Amount of Japanese Enterprises' Goods in Japan's Total

Import of Chinese Goods (column vector)\* (9)

c) The Matrix of Input from Japanese Enterprises in Japan

Lastly, we made balance adjustments by the RAS method using the following data such as sales of intermediate goods to Japan by Japanese enterprises (row total column vector of  $X^{Cj}$ ), input from Japanese enterprises into Japan (column total row vector of  $X^{Cj}$ ), and corresponding input coefficients in the LCJI-O in the preceding sections a) and b). Then, we projected factors in the matrix of input from Japanese enterprises into Japan,  $X^{Cj}$ .

(5) *Calculation of Final Demand Section*

a) Sales of Final Goods to China by Japanese Enterprises and to Japan

Sales of final goods to China by Japanese Enterprises ( $F^{CjC}$ ) and sales of final goods to Japan ( $F^{CjJ}$ ) are calculated by subtracting sales of intermediate goods to China by Japanese enterprises ( $X^{CjC}$ ) and sales of intermediate goods to Japan ( $X^{CjJ}$ ) from sales to China by Japanese enterprises and sales to Japan.

b) Purchase of Final Goods by Items from Japanese Enterprises by China and Japan

We calculated sales of final goods to China by industrial sectors by Japanese enterprises and sales of final goods to Japan (row total column vector of  $F^{CjC}$  and  $F^{CjJ}$ ) in the preceding sections. Sales of final goods by final demand items to Japan, that is, the purchase of final goods by final demand items from Japanese enterprises by China and the purchase of final goods from Japanese enterprises by Japan (column total row vector of  $F^{CjC}$  and  $F^{CjJ}$ ) are calculated pro rata to the ratios by final demand items of China and Japan.

c) The Matrix of Final Demand of Japanese Enterprises

We projected factors in the matrix of final demand (sales) to China and Japan by Japanese enterprises,  $F^{CjC}$  and  $F^{CjJ}$ , using the following data such as sales of final goods by industrial sector by Japanese enterprises, sales of final goods to Japan (row total column vector), purchase of final goods by items from Japanese enterprises by China, purchase of final goods by items from Japanese enterprises by Japan (column total row vector), and final demand purchase factor (ratio of purchase by industrial sectors = purchase of final demand by industrial sectors / total final demand) of China and Japan in the LCJI-O.

(6) *Projection of Export to the Rest of the World*

It is necessary to divide enterprises in China involved in Export to the Rest of the World (excludes Japan) into Japanese enterprises and non-Japanese enterprises. Here, the Export to the Rest of the World of Japanese enterprises in the WKKJK are regarded as the Export to the Rest of the World in the LJEAI-O. The Export to the Rest of the World of non-Japanese enterprises is calculated by subtracting the Export to the Rest of World of Japanese enterprises from China's Export to the Rest of the World in the LCJI-O.

Based on the above-mentioned procedure, we projected the economic activities of Japanese enterprises in 1995 and 2000 and created the LJEAI-O dividing economic activities in China included in the LCJI-O of the same period into Japanese enterprises and non-Japanese enterprises. Table 6 shows the estimated LJEAI-O (one sector).

**Table 6: 1995-2000 Linked International Input-Output Table for Analysis of Japanese Enterprises in China (at 2000 prices, one sector)**  
(1000US\$)

**Table 6-1 (1995)**

		Intermediate Demand			Final Demand			Statistical Discrepancy	Total Output
		China		Japan	China	Japan	Export to the Rest of the World		
		Non-Japanese Enterprise	Japanese Enterprise						
China	Non-Japanese Enterprise	1043203176	1927486	14591942	701182656	14826393	139675235	-3142943	1912263945
	Japanese Enterprise	2012957	19974	762742	1237255	1182932	1741455	0	6957314
Japan		12379283	1771775	3589391412	7896363	4248001612	381660468	-6879786	8234221128
Freight and Insurance		3149484	338588	4376602	1099225	1345811			
Rest of World		97896535	1000175	255806530	42030011	120063405			
Tariff and Import Commodity Taxes		2673835	119060	16427241	732125	0			
Intermediate Input		1160604464	5887863	3881356469	754177634	4385420152			
Total Value-added		751659481	1069452	4352864659					
Total Input		1912263945	6957314	8234221128					

**Table 6-2: (2000)**

		Intermediate Demand			Final Demand			Statistical Discrepancy	Total Output
		China		Japan	China	Japan	Export to the Rest of the World		
		Non-Japanese Enterprise	Japanese Enterprise						
China	Non-Japanese Enterprise	1787621351	15370121	14280746	992610875	19301832	226086075	3054008	3058325008
	Japanese Enterprise	17604572	438958	6407614	7198792	9842449	11324653	0	52817038
Japan		14500703	6295656	3765944734	8366548	4598161631	493233502	11023996	8897526770
Freight and Insurance		27016059	6774937	30101821	10494992	13850643			
Rest of World		104943538	8003590	229782968	49514659	148268628			
Tariff and Import Commodity Taxes		6025057	1031501	30725952	1787168	0			
Intermediate Input		1957711281	37914763	4077243834	1069973035	4789425183			
Total Value-added		1100613727	14902275	4820282936					
Total Input		3058325008	52817038	8897526770					

### 3 Analysis of Economic Interdependence of Japanese Enterprises

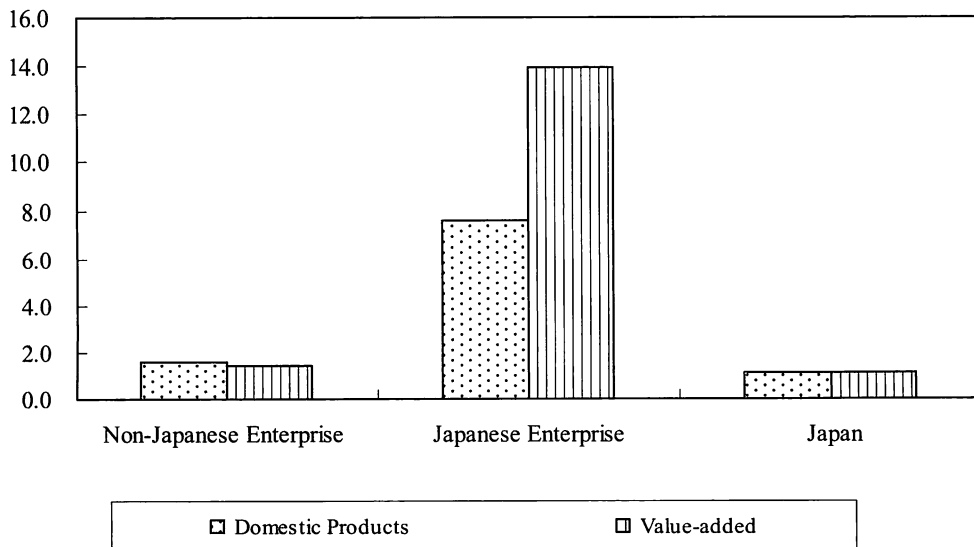
In this section, we look at the economic activities of Japanese enterprises in China and their recent change by using the LJEAI-O.

#### 3.1 Demand Structure and Cost Structure

The output value of Japanese enterprises increased approximately eightfold from 6.957 billion dollars in 1995 to 52.817 billion dollars, and the value added increased approximately 15 times from 1.069 billion dollars in 1995 to 14.902 billion dollars in 2000 (see Figure 1). These far exceed the growth rates of non-Japanese enterprises in China and that of Japan for the same period. This is because an increasing number of Japanese trading enterprises have expanded into Chinese market, and their working profits have improved. In order to join the WTO, China has phased out restrictions on the sales activities of foreign enterprises in China as well as on investment ratio of foreign enterprises in its distribution industry. As a result of this, the number of Japanese trading enterprises that were either established or made investments in China between 1995 and 2000 amounted to 212; a 43.2% increase from 148 enterprises between 1989 and 1994. Also, the fact that the operating profits of Japanese trading enterprises in China returned to the black in 2000 (533.97 million dollars) from the red in 1995 (- 6.54 million dollars) has made a great contribution to the growth of this section.

The amount of production for the demand to China of Japanese enterprises in 2000 is 25.2 billion dollars, which makes up 47.8% of the total amount (see Table 7). In addition, the amount for intermediate demand is 18.0 billion dollars (34.2%). It has

Figure 1: The Economic Growth Rates, 2000 (1995=1.00)



**Table 7: Gross Output Value and its Composition by Sectors, Japanese Enterprises**  
**Table 7-1 Gross Output Value**

	(1000US\$)											
	Demand to Chin				Demand to Japan				Export to the Rest of the World		Total Output	
	1995	2000	Intermediate Demand		1995	2000	Intermediate Demand		1995	2000	1995	2000
1995			2000	1995			2000					
Agriculture, Forestry and Fishery	75795	0	39922	0	67193	0	49317	0	4114	0	147102	0
Mining	128	0	116	0	6210	0	6146	0	0	0	6338	0
Food and Tobacco	82207	864962	29320	315031	23443	136921	13187	65674	3429	24524	109079	1026408
Textile, Clothing and Leather	61726	1326065	41404	874697	376190	1509697	51231	159869	13486	392920	451402	3228681
Timber, Furniture, Manufacture of Paper and Printing	26359	188568	23301	171726	1392	2598	973	1593	0	3693	27751	194859
Oil and Coal	15666	20933	15073	20363	13670	2765	13347	2687	0	2431	29336	26130
Chemical Products	147463	1406087	131244	1298159	16424	203656	11460	130210	69236	191203	233124	1800946
Smelting of Metals	89439	1617092	89907	1604104	8951	143333	8756	138167	4545	272367	102935	2032792
Machinery	61188	1114058	41222	790413	197562	2308834	71969	800552	171645	893013	430395	4315904
Electric Machinery	974341	9339362	694531	6815071	851829	7778027	424508	3670560	1034011	7268925	2860182	24386313
Transport Equipment	1381374	3980607	714839	2327267	85947	427948	31146	142472	104585	283845	1571905	4692400
Measuring Instruments	91700	818669	73361	670539	218573	1639120	39599	266162	223740	242433	534012	2700223
Other Manufacturing Goods	55180	1560898	49675	1438943	45283	694507	25151	296417	96069	464118	196533	2719523
Construction	34419	193737	3998	23632	643	1113	643	0	49	2171	35111	197021
Trade	39379	1153122	31799	918189	15885	856753	5436	447389	16474	924319	71738	2934195
Other Services and Others	133821	1658161	53217	775395	16479	544790	9873	285863	71	358690	150372	2561641
<b>Total</b>	<b>3270185</b>	<b>25242321</b>	<b>2032930</b>	<b>18043530</b>	<b>1945674</b>	<b>16250063</b>	<b>762742</b>	<b>6407614</b>	<b>1741455</b>	<b>11324653</b>	<b>6957314</b>	<b>52817038</b>

Table 7-2: Composition of Gross Output

Code No.	(Total output=100)											
	Demand to Chin				Demand to Japan				Export to the Rest of the World		Total Output	
	1995	2000	Intermediate Demand		1995	2000	Intermediate Demand		1995	2000	1995	2000
Agriculture, Forestry and Fishery	51.53	—	27.14	—	45.68	—	33.53	—	2.80	—	100.00	—
Mining	2.02	—	1.84	—	97.98	—	96.97	—	0.00	—	100.00	—
Food and Tobacco	75.36	84.27	26.88	30.69	21.49	13.34	12.09	6.40	3.14	2.39	100.00	100.00
Textile, Clothing and Leather	13.67	41.07	9.17	27.09	83.34	46.76	11.35	4.95	2.99	12.17	100.00	100.00
Timber, Furniture, Manufacture of Paper and Printing	94.98	96.77	83.97	88.13	5.02	1.33	3.51	0.82	0.00	1.90	100.00	100.00
Oil and Coal	53.40	80.11	51.38	77.93	46.60	10.58	45.49	10.28	0.00	9.30	100.00	100.00
Chemical Products	63.26	78.07	56.30	72.08	7.05	11.31	4.92	7.23	29.70	10.62	100.00	100.00
Smelting of Metals	86.89	79.55	87.34	78.91	8.70	7.05	8.51	6.80	4.42	13.40	100.00	100.00
Machinery	14.22	25.81	9.58	18.31	45.90	53.50	16.72	18.55	39.88	20.69	100.00	100.00
Electric Machinery	34.07	38.30	24.28	27.95	29.78	31.90	14.84	15.05	36.15	29.81	100.00	100.00
Transport Equipment	87.88	84.83	45.48	49.60	5.47	9.12	1.98	3.04	6.65	6.05	100.00	100.00
Measuring Instruments	17.17	30.32	13.74	24.83	40.93	60.70	7.42	9.86	41.90	8.98	100.00	100.00
Other Manufacturing Goods	28.08	57.40	25.28	52.91	23.04	25.54	12.80	10.90	48.88	17.07	100.00	100.00
Construction	98.03	98.33	11.39	11.99	1.83	0.57	1.83	0.00	0.14	1.10	100.00	100.00
Trade	54.89	39.30	44.33	31.29	22.14	29.20	7.58	15.25	22.96	31.50	100.00	100.00
Other Services and Others	88.99	64.73	35.39	30.27	10.96	21.27	6.57	11.16	0.05	14.00	100.00	100.00
Total	47.00	47.79	29.22	34.16	27.97	30.77	10.96	12.13	25.03	21.44	100.00	100.00

**Table 8: Composition of Gross Input, Japanese Enterprises**

		(Total Input=100)	
		1995	2000
China	Non-Japanese Enterprise	27.70	29.10
	Japanese Enterprise	0.29	0.83
Japan		25.47	11.92
Freight and Insurance		4.87	12.83
Rest of World		14.38	15.15
Tariff and Import Commodity Taxes		1.71	1.95
Intermediate Input		74.41	71.79
Total Value-added		25.59	28.21
Total Input		100.00	100.00

also shown a significant increase from 29.2% in 1995 to 33.3% in 2000. We can say that Japanese enterprises play a role of a supplier who provides intermediate goods and capital goods that are essential to industrialization in China. Compared to other developed countries, the main characteristic of Japanese industries until the mid-80s was the "Full Set", which means they had sufficient production capability ranging from raw materials, intermediate goods to final goods. Due to the sharp appreciation of the yen in the wake of the Plaza Accord in 1985, Japanese enterprises gradually shifted from domestic production to foreign production. Japanese enterprises, which have capability to produce a wide variety of industrial products under the "Full Set" industry structure, play the role of an important supplier who provides industrial goods to China. It is also important to mention that 30.8% of the production of Japanese enterprises is for the demand to Japan and 21.4% for export to the rest of the world (excludes export to Japan, same for the following).

By industrial sectors, the production of Japanese enterprises for China increased in most industrial sectors from 1995 to 2000. On the other hand, for production for Japan for the same period, the amount decreased for Food and Tobacco, Textile, Clothing and Leather, Timber, Furniture, Manufacture of Paper and Printing, and Oil and Coal, while it increased for Machinery, Electric Machinery, Transportation Equipment, Measuring Instruments, Trade, Other Services and Others<sup>4</sup>. Export to Japan is shifting from labor-intensive industries to more sophisticated capital/technology-intensive industries and service sectors.

The intermediate input ratio of Japanese enterprises in 2000 is 71.8%, 2.6 points down from 74.4% in 1995, while the value added ratio increased by the same amount (see Table 8). The intermediate input from Japan in particular decreased by 13.6 points from 25.5% to 11.9% for the same period. This is largely due to the increased ratio of international freight and insurance (from 4.87% in 1995 to 12.83% in 2000).<sup>5</sup>

<sup>4</sup> However, since no figures are available for the agriculture, forestry and fisheries industry and the mining industry, their changes are unknown.

<sup>5</sup> International freight and insurance in the LCJI-O is calculated by subtracting the demand of the LCJI-O (intermediate demand + final demand), that is, Rest of World (import from the world) and Tariff / Import Commodity Taxes from the demand of the Chinese I-O table and the Japanese I-O table (in-



### 3.2 Production Repercussion

In this section, we examine the production repercussion effect of economic activities of Japanese enterprises by using the inverse matrix coefficients of the LJEAI-O. The columns of the matrix indicate the production volume of each sector induced by one unit of final demand in the column sections. The subtotals of these column values (the induced production volume of each sector) indicate the total production volume induced by one unit of final demand (Total Repercussion Effect), and we can obtain the average induced production volume (Average Repercussion Effect) by dividing the total induced production volume by the number of industries.

The industry-wide average repercussion effect in 2000 is 2.7 for non-Japanese enterprises, 2.3 for Japanese enterprises, and 2.1 for Japan (see Table 9). Compared to 1995, we observe no significant change for non-Japanese enterprises (2.6) and Japan (2.1), while the repercussion effect (2.5) of Japanese enterprises decreased. The production repercussion of the final demand of Japanese enterprises on trading partners (0.1 billion dollars  $\times$  the inverse matrix coefficients) in 2000 is 84.41 million dollars for non-Japanese enterprises, 16.31 million dollars for Japan, and 12.04 million dollars for Export to the Rest of the World, all of which decreased compared to 1995.

**Table 9: Average Repercussion Effect, Japanese Enterprises**

		1995			2000		
		Non-Japanese Enterprise	Japanese Enterprise	Japan	Non-Japanese Enterprise	Japanese Enterprise	Japan
China	Non-Japanese Enterprise	2.408	0.927	0.015	2.477	0.844	0.016
	Japanese Enterprise	0.004	1.002	0.000	0.018	1.011	0.002
Japan		0.043	0.310	1.979	0.029	0.163	1.930
Rest of World		0.149	0.182	0.101	0.101	0.120	0.082
Average		2.612	2.484	2.104	2.654	2.260	2.054

### 3.3 Production Inducement Coefficients

While China has become the “Factory of the World” by expanding its production scale and improving productivity, it also attracts worldwide attention as the “Market of the

intermediate demand + final demand).

Freight and Insurance=Demand of China and Japan–Demand of the LCJI-O–Rest of World–  
Tariff /Import Commodity Taxes

Intermediate demand and final demand of China and Japan can be obtained from the Chinese I-O table and the Japanese I-O table.

International freight and insurance calculated as such may contain statistical discrepancies. In addition, it is possible that the projection of the LJEAI-O may be biased because we applied the ratio of international freight and insurance in the LCJI-O above in projecting the international freight and insurance of Japanese enterprises.

World” with the largest population in the world and rapid increases in income. Japanese enterprises also value the potential of China and are advancing into the Chinese market aggressively. Here, we divide final demand into three parts, “Final Demand of China”, “Final Demand of Japan”, and “Export to the Rest of the World”, and examine how much the domestic production values of which industry increases by one unit of final demand in some final demand by using the production inducement coefficients. Table 10 shows the induced production values of Japanese enterprises by 0.1 billion dollars of final demand (0.1 billion dollars  $\times$  production inducement coefficients, same for the following) by using the LJEAI-O. According to this table, the value of domestic products induced of Japanese enterprises by “Export to the Rest of the World” in 2000 is 2.58 million dollars, nearly six times the figure of 1995 (0.45 million dollars). The induced production by the “Final Demand of China” in 2000 is 1.79 million dollars, nearly five times the figure of 1995 (0.37 million dollars). The induced production by the “Final Demand of Japan” is significantly small compared to “Export to the Rest of the World” and the “Final Demand of China” but grew almost eightfold from 0.04 million dollars in 1995 to 0.31 million dollars in 2000.

**Table 10: Induced Production (per 0.1 Billion Final Demand), Japanese Enterprises**

	(10000US\$)		
	Final Demand of China	Final Demand of Japan	Export to the Rest of the World
1995	36.8	4.2	45.1
2000	178.5	31.0	257.8
Rates(1995=1.00)	4.85	7.45	5.72

Japanese enterprises advancing into China, the world’s huge production base, have recorded a significant increase in the production induced by the demand of “Export to the Rest of the World” and “Export to Japan (Reverse Import)”. At the same time, domestic demand in China as a huge consuming area of the world is greatly contributing to the expansion of the induced production of Japanese enterprises in China. Especially, capital- and technology-intensive industries in Japan with comparative advantage compete to enter into the Chinese market by establishing joint ventures with Chinese enterprises.

When we look at the induced production of Japanese enterprises by final demand in 2000 by industrial sectors, we find, for “Export to the Rest of the World”, the effect of Electric Machinery amounts to 1.54 million dollars, which makes up 60.0% of the entire industry (see Table 11). For the “Final Demand of China”, the induced amount is 0.24 million dollars for Electric Machinery and 0.13 million dollars for Transportation Equipment, the sum of which makes up 53% of the total induced amount by this final demand. The percentage of the sum of Electric Machinery and Transportation Equipment decreased from 73% in 1995 to 53%, but the induced production amount of these two industries by the “Final Demand of China” is predominantly large. For the induced amount by the “Final Demand of Japan”, Electric Machinery, Machinery, and Measuring Instruments make up 63~71% of the entire industry from 1995 to 2000. It should be also noted that the inducement effect on Textile, Clothing and Leather by the

**Table 11: Induced Production (Per 0.1 Billion Final Demand) by Sectors, Japanese Enterprises**

(10000US \$, Total sectors=100)

	Final Demand of China		Final Demand fo Japan		Export to the Rest of the World	
	Value	Ratio	Value	Ratio	Value	Ratio
	1995					
Agriculture, Forestry and Fishery	0.9	2.55	0.1	3.48	0.2	0.54
Mining	0.0	0.00	0.0	0.31	0.0	0.02
Food and Tobacco	1.0	2.83	0.1	1.29	0.1	0.30
Textile, Clothing and Leather	0.6	1.74	0.9	20.53	0.6	1.24
Timber, Furniture, Manufacture of Paper and Printing	0.3	0.76	0.0	0.13	0.1	0.20
Oil and Coal	0.2	0.44	0.0	0.71	0.1	0.17
Chemical Products	1.5	4.13	0.0	1.12	1.9	4.15
Smelting of Metals	0.9	2.45	0.0	0.52	0.5	1.11
Machinery	0.7	1.94	0.4	9.80	3.8	8.37
Electric Machinery	9.9	26.88	1.7	41.20	26.1	57.96
Transport Equipment	17.1	46.40	0.2	4.73	3.7	8.24
Measuring Instruments	0.7	1.81	0.5	11.83	5.1	11.29
Other Manufacturing Goods	0.6	1.54	0.1	2.34	2.1	4.72
Construction	0.4	1.13	0.0	0.09	0.0	0.09
Trade	0.4	1.11	0.0	0.92	0.5	1.03
Other Services and Others	1.6	4.28	0.0	1.00	0.3	0.57
Total	36.8	100.00	4.2	100.00	45.1	100.00
2000						
Agriculture, Forestry and Fishery	0.0	0.00	0.0	0.00	0.0	0.00
Mining	0.0	0.00	0.0	0.00	0.0	0.00
Food and Tobacco	2.9	4.28	0.3	0.96	0.8	0.32
Textile, Clothing and Leather	3.4	5.02	2.9	10.34	9.7	3.76
Timber, Furniture, Manufacture of Paper and Printing	0.5	0.72	0.0	0.08	0.6	0.22
Oil and Coal	0.1	0.09	0.0	0.02	0.1	0.04
Chemical Products	3.8	5.48	0.4	1.49	7.3	2.84
Smelting of Metals	4.3	6.24	0.3	0.92	10.1	3.92
Machinery	3.1	4.58	3.9	13.93	17.8	6.92
Electric Machinery	23.5	34.32	12.5	45.03	154.0	59.74
Transport Equipment	12.7	18.46	0.7	2.65	9.0	3.47
Measuring Instruments	1.7	2.49	3.1	11.18	8.3	3.23
Other Manufacturing Goods	4.0	5.79	1.3	4.51	12.9	5.00
Construction	0.6	0.93	0.0	0.06	0.2	0.06
Trade	3.0	4.40	1.5	5.30	17.9	6.96
Other Services and Others	5.0	7.22	1.0	3.53	9.0	3.51
Total	68.6	100.00	27.9	100.00	257.8	100.00

“Final Demand of Japan” is relatively large (10%~21%). This largely depends on the develop-and-import scheme of Japanese enterprises. The Japanese textile market must produce a big inducement effect on Japanese enterprises expanding into China’s textile industry such as UNIQLO (Unique Clothing Warehouse: UNI-CLO=UNI-QLO).

### 3.4 Production Inducement Distribution Ratios

#### *(1) Production Inducement Distribution Ratios by Country*

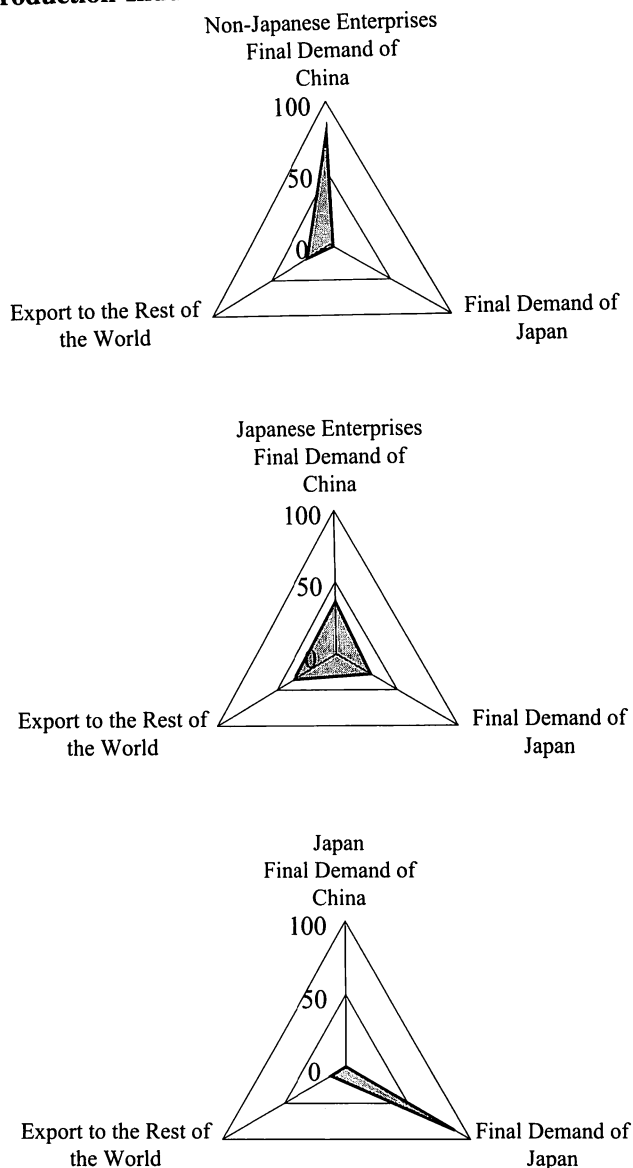
We look at what kind of final demand induces domestic production of Japanese enterprises by using production inducement distribution ratios (see Table 12). The production inducement distribution ratio of Japanese enterprises by the “Final Demand of China” in 2000 is 36.2%, half of that of non-Japanese enterprises (77.8%), while the production inducement distribution ratio by “Export to the Rest of the World” is 35.7%, twice that of non-Japanese enterprises (19.4%). This tells us that the production of Japanese enterprises in China has relatively high dependency on China’s “Export to the Rest of the World” (China as the “Factory of the World”) rather than “Final Demand of China” (China as the “Market of the World”) compared to non-Japanese enterprises. The production inducement distribution ratio of Japanese enterprises by the “Final Demand of Japan” is 28.1%, which far exceeds that of non-Japanese enterprises (2.8%). This is a distinctive characteristic of Japanese enterprises. Distribution ratios of Japanese enterprises by “Export to the Rest of the World” and the “Final Demand of Japan” amount to 63.8%, which makes it clear that the production of Japanese enterprises is export-dependent. We can draw a triangle using three kinds of production inducement distribution ratios of Japanese enterprises in 2000 as the three sides: the “Final Demand of China”, the “Final Demand of Japan”, and “Export to the Rest of the World” (see Figure 2). This figure indicates that non-Japanese enterprises are strongly pulled to the direction of the “Final Demand of China”, and Japan is strongly pulled to the direction of the “Final Demand of Japan”. Therefore, a scalene triangle is formed. On the other hand, Japanese enterprises form a regular triangle with almost equal degrees of dependence on the “Final Demand of China”, the “Final Demand of Japan”, and the “External Demand”. For the triangle graph for 1995, we can observe the same characteristics as that for 2000. However, when comparing 2000 and 1995, the degree of dependence on production inducement by the “Final Demand of China” for both non-Japanese and Japanese enterprises decreased (non-Japanese enterprises ▲ 1.9 points, Japanese enterprises ▲ 3.7 points), while “Export to the Rest of the World” increased (approximately 2 points up).

#### *(2) Production inducement distribution ratios by country and industrial sector*

When we look at the production inducement distribution ratios by country and industrial sector, we can say that many Japanese enterprises heavily depend on the “Final Demand of China” (exceeds the figure of the entire Japanese enterprises with 36.2%), which can be classified as the “Chinese Final Demand Dependent Type” (see Table 13). However, some industries e.g. Measuring Instruments, Machinery, and Textile, Clothing and Leather, have a high degree of dependence on the “Final Demand of Japan”, and Trade, Electric Machinery, and Smelting of Metals heavily depend on “Export to the Rest of the World”. These industries are all export-dependent types. The statistics in 1995 also show a high degree of dependence on the “Final Demand of

**Table 12: Production Inducement Distribution Ratios, Japanese Enterprises**

		(Total Final Demand=100)										
		Final Demand of China					Final Demand of Japan					Export to Rest of World
		Private Consumption	Other Consumption	Fixed Capital Formation	Change in Stock	Private Consumption	Other Consumption	Fixed Capital Formation	Change in Stock			
1995	China	79.72	36.96	10.63	27.86	4.27	3.33	2.36	0.14	0.80	0.02	16.95
	Non-Japanese Enterprises											
	Japanese Enterprises	39.93	18.64	2.41	15.68	3.20	26.18	18.58	0.43	7.00	0.18	33.89
	Japan	0.46	0.14	0.02	0.27	0.04	89.52	47.80	12.09	29.22	0.41	10.02
2000	China	77.80	38.23	9.83	29.84	-0.10	2.79	2.00	0.11	0.68	0.00	19.41
	Non-Japanese Enterprises											
	Japanese Enterprises	36.19	18.59	2.75	14.91	-0.06	28.11	18.50	0.54	9.25	-0.18	35.69
	Japan	0.49	0.16	0.02	0.32	0.00	87.60	48.74	13.92	24.91	0.02	11.91

**Figure 2: Production Inducement Distribution Ratios by Countries, 2000**

China” for many Japanese enterprises, which also indicates characteristics of the “Chinese Final Demand Dependent Type”. Mining and Petroleum and Coal had a high degree of dependence on the “Final Demand of Japan” in 1995, but the degree decreased in 2000. This may be attributable to the stricter regulations for these industries due to the tight energy demand and supply. Also, Other Manufacturing Goods, Measuring Instruments, Machinery, and Chemical Products had a high degree of dependence on “Export to the Rest of the World”, but the degree decreased in 2000.

### (3) Production Inducement Distribution Ratios by Final Demand Items

When we look at the production inducement distribution ratios by final demand items, the production inducement distribution ratio for “Private Consumption of China” is the highest (38.2%) for non-Japanese enterprises, which can be classified as the

**Table 13: Production Inducement Distribution Ratios by Sectors, Japanese Enterprises**

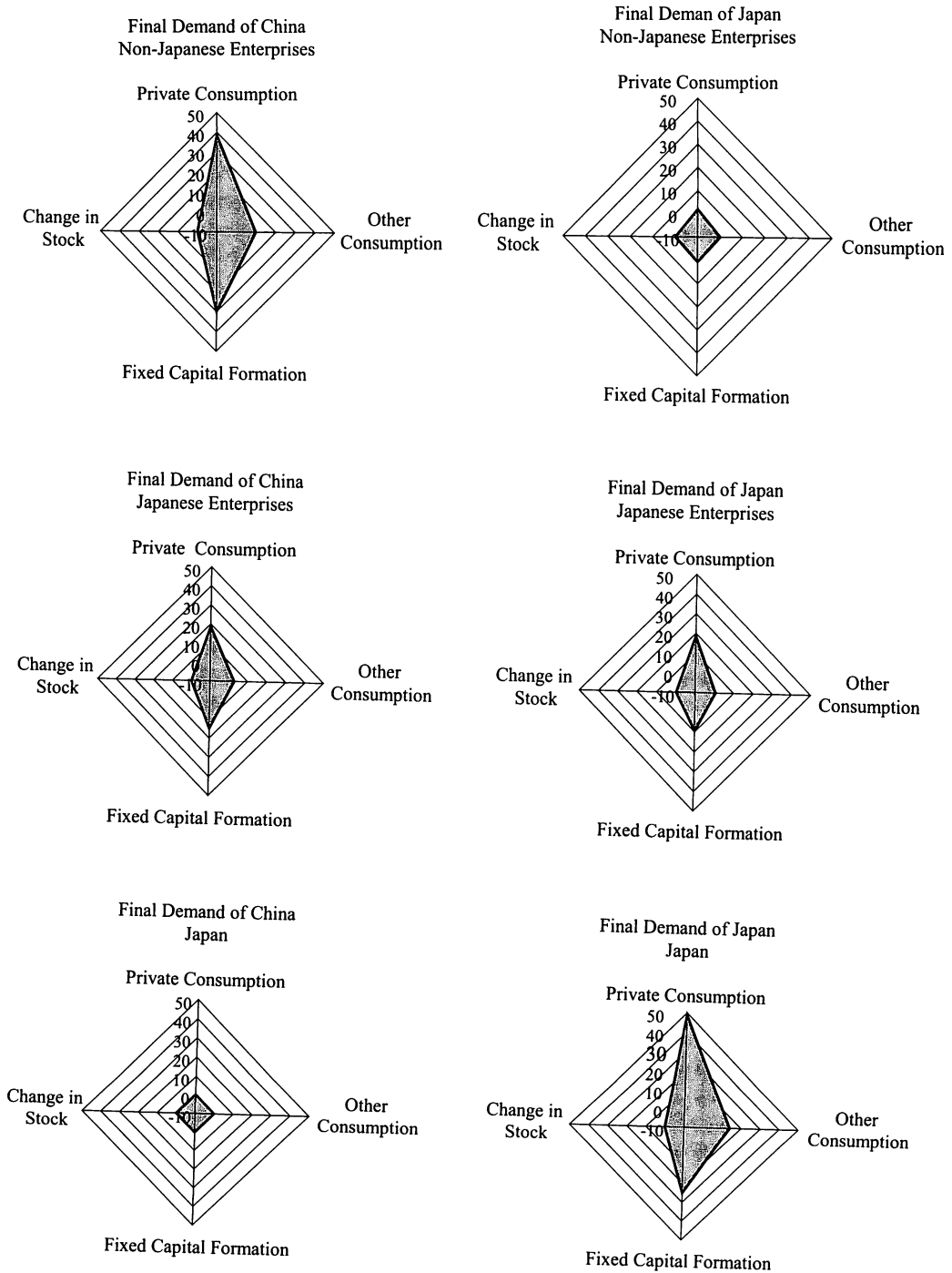
	(Total final demand=100)					
	Final Demand of China		Final Demand of Japan		Export to the Rest of the World	
	1995	2000	1995	2000	1995	2000
Agriculture, Forestry and Fishery	48.22	0.00	43.10	0.00	8.67	0.00
Mining	2.06	0.00	89.72	0.00	8.23	0.00
Food and Tobacco	72.00	80.13	21.57	13.98	6.43	5.89
Textile, Clothing and Leather	10.68	29.94	82.84	47.94	6.48	22.12
Timber, Furniture, Manufacture of Paper and Printing	75.12	71.98	8.28	5.94	16.60	22.08
Oil and Coal	42.09	64.88	44.10	9.63	13.81	25.49
Chemical Products	49.18	58.00	8.78	12.28	42.04	29.72
Smelting of Metals	65.61	57.66	9.14	6.60	25.25	35.74
Machinery	12.55	20.62	41.54	48.67	45.90	30.71
Electric Machinery	26.07	26.77	26.20	27.28	47.73	45.96
Transport Equipment	82.13	77.09	5.49	8.61	12.37	14.30
Measuring Instruments	9.47	17.31	40.51	60.48	50.02	22.21
Other Manufacturing Goods	21.78	40.71	21.69	24.63	56.53	34.67
Construction	89.72	89.90	4.41	4.43	5.87	5.67
Trade	42.81	28.60	23.26	26.75	33.92	44.65
Other Services and Others	79.01	53.80	12.08	20.44	8.91	25.76
Total	39.93	36.19	26.18	28.11	33.89	35.69

“Chinese private consumption dependent type” (see Figure 3). On the other hand, for Japanese enterprises, the production inducement distribution ratios for “Private Consumption of China” (18.6%) and “Private Consumption of Japan” (18.5%) in total (37.1%) exceed that by “Export to the Rest of the World” (35.7%), which can be classified as the “Chinese and Japanese private consumption dependent type”. Behind this background lies the system of international specialization where developing countries mass produce labor-intensive goods, and developed countries engage in R&D and produce goods with high added value. Japanese enterprises produce labor-intensive goods such as food item and textiles as well as some electronic goods that use obsolete technologies. They sell these goods in China and reverse import them to Japan. They play the role of a supplier who provides goods for private consumption in China and Japan. Figure 4 shows production inducement distribution ratios by Chinese and Japanese final demand items and the total ratio of Chinese and Japanese final demand items. According to this figure, the characteristics of Japanese enterprises are clear.

When we look at the Japanese enterprises of “Chinese and Japanese private consumption dependent type” by sectors (top eight sectors), they can be classified into four categories with regard to the production inducement distribution ratios (see Table 14).

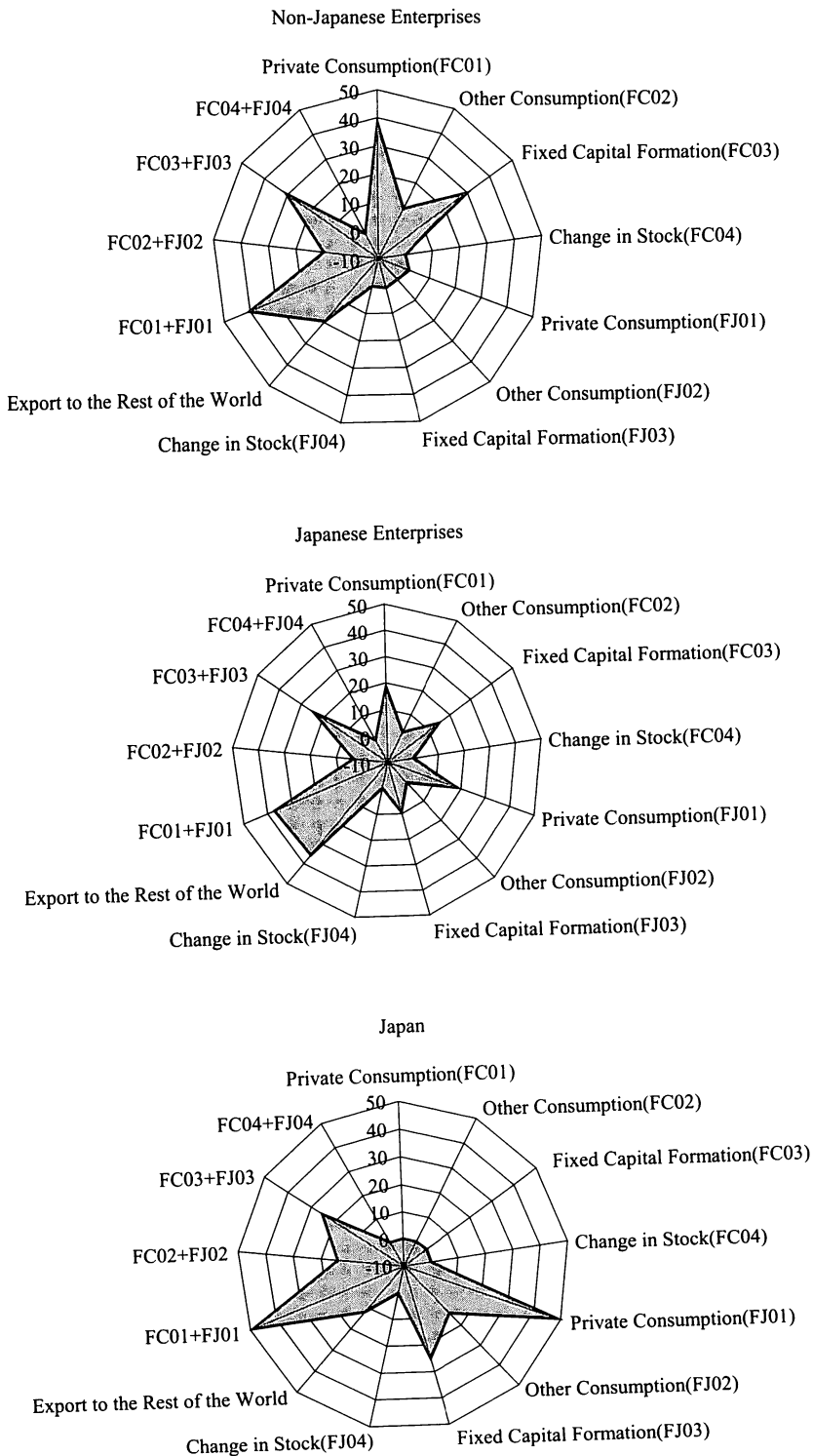
Type I (high degree of dependence on both Chinese and Japanese Private Consumption from 1995 to 2000): Food and Tobacco is the only industry that belongs to

**Figure 3: Production Inducement Distribution Ratios by Final Demand Item and Countries' Final Demand, 2000.**





**Figure 4: Production Inducement Distribution Ratios by Chinese and Japanese Final Demand Items, and the Total with Chinese and Japanese Final Demand Item, 2000**



this category, and its production is the most dependent on Chinese and Japanese Private Consumption.

Type II (high degree of dependence on either Chinese or Japanese Private Consumption in 1995, but high degree of dependence on both Chinese and Japanese Private Consumption in 2000): Textile, Clothing and Leather had a high degree of dependence on Japanese Private Consumption, while Other Services and Others had a high degree of dependence on Chinese Private Consumption in 1995. However, these two sectors had a high degree of dependence on both Chinese and Japanese Private Consumption in 2000. This means that production in these sectors shifted from the "Chinese or Japanese private consumption dependent type" to the "Chinese and Japanese private consumption dependent type".

Type III (high degree of dependence on both Chinese and Japanese Private Consumption in 1995 but high degree of dependence on either Chinese or Japanese Private Consumption in 2000): Oil and Coal had a high degree of dependence on both Chinese and Japanese Private Consumption in 1995, but in 2000 the degree of dependence on Chinese Private Consumption became higher while that on Japanese Private Consumption went down. Trade had a high degree of dependence on both Chinese and Japanese Private Consumption in 1995, but in 2000 the degree of dependence on Japanese Private Consumption remained high while that on Chinese Private Consumption went

**Table 14: Production Inducement Distribution Ratios of Japanese Enterprises by Private Consumption and Sectors (top eight sectors)**

				(%)		
		Private Consumption of China		Private Consumption of Japan		
1995	1	Food and Tobacco	67.4	1	Textile, Clothing and Leather	78.7
	2	Timber, Furniture, Manufacture of Paper and Printing	43.9	2	Mining	57.3
	3	Agriculture, Forestry and Fishery	42.7	3	Measuring Instruments	36.9
	4	Chemical Products	32.4	4	Agriculture, Forestry and Fishery	33.1
	5	Other Services and Others	32.4	5	Oil and Coal	28.8
	6	Transport Equipment	25.0	6	Trade	19.9
	7	Trade	24.2	7	Food and Tobacco	17.9
	8	Oil and Coal	18.0	8	Electric Machinery	16.1
2000	1	Food and Tobacco	75.2	1	Measuring Instruments	55.5
	2	Timber, Furniture, Manufacture of Paper and Printing	42.1	2	Textile, Clothing and Leather	46.0
	3	Chemical Products	38.2	3	Trade	19.5
	4	Oil and Coal	30.6	4	Other Manufacturing Goods	18.2
	5	Other Services and Others	25.1	5	Electric Machinery	16.9
	6	Textile, Clothing and Leather	24.8	6	Other Services and Others	15.0
	7	Other Manufacturing Goods	20.7	7	Machinery	11.7
	8	Smelting of Metals	17.8	8	Food and Tobacco	11.6
	8	Electric Machinery	17.8			

down. This means that Oil and Coal and Trade shifted from the “Chinese and Japanese private consumption dependent type” to the “Chinese or Japanese private consumption dependent type”.

Type IV (consistently high degree of dependence on either Chinese or Japanese Private Consumption): Timber, Furniture, Manufacture of Paper and Printing and Chemical Products had a high degree of dependence on Chinese Private Consumption from 1995 to 2000, and Measuring Instruments and Electric Machinery had a high degree of dependence on Japanese Private Consumption during the same period. This means that Timber, Furniture, Manufacture of Paper and Printing and Chemical Products are consistently the “Chinese private consumption dependent type”, while Measuring Instruments and Electric Machinery are consistently the “Japanese private consumption dependent type”.

## Conclusion

In this paper, we explained the process of creating the LJEAI-O and reviewed activities of Japanese enterprises in China by using the tables. We used the data of LCJI-O and WKKJK in order to create the LJEAI-O. In this paper, we also examined the activities of Japanese enterprises in China by using the LJEAI-O and our findings in this study can be briefly summarized as follows:

1. The gross output of Japanese enterprises kept growing from 1995 to 2000 at a pace far exceeding those of non-Japanese enterprises in China and Japan (enterprises in Japan).

2. The amount of production for the intermediate demand to China of Japanese enterprises shows a significant increase, and Japanese enterprises play the role of a supplier who provides intermediate goods and capital goods that are essential to industrialization in China. Export to Japan have a tendency to shift from labor-intensive industries to more sophisticated capital/technology-intensive industries and service sectors. For the cost structure of production, the intermediate input ratio decreased.

3. Both the industry-wide average production repercussion effect and the repercussion effect on the trading partners (non-Japanese enterprises, Japan, the Rest of the World) of Japanese enterprises decreased. The production of Japanese enterprises is export-dependent. The induced production of Japanese enterprises is largest in “Export to the Rest of the World” and grew most in the “Final Demand of Japan”.

4. The induced production of Japanese enterprises is prominent in machinery sectors such as Electric Machinery. However, the induced production by the “Final Demand of Japan” plays a large role for Textile, Clothing and Leather Japanese enterprises.

5. Production of non-Japanese enterprises in China shows characteristics of the “Chinese private consumption dependent type”, while that of Japanese enterprises is the “Chinese and Japanese private consumption dependent type”. They play the role of a supplier who provides goods for private consumption in China and Japan.

6. When we look at the production of “Chinese and Japanese private consumption dependent type” Japanese enterprises by sectors from 1995 to 2000, it is classified into

the following four categories: Type I (typical “Chinese and Japanese private consumption dependent type” such as Food and Tobacco), Type II (industries which shifted from the “Chinese or Japanese private consumption dependent type” to the “Chinese and Japanese private consumption demand dependent type” such as Textile, Clothing and Leather, Services and Others ), Type III (industries which shifted from the “Chinese and Japanese private consumption dependent type” to the “Chinese or Japanese private consumption dependent type” such as Petroleum and Coal and Trade), and Type IV (consistently the “Chinese private consumption dependent type” such as Timber, Furniture, Manufacture of Paper and Printing and the Chemical Products, or consistently the “Japanese private consumption dependent type” such as Measuring Instruments and Electric Machinery).

Consequently, the results are preliminary and as the next steps of our study, we have aimed to continue improving the LJEAI-O for exploring the theoretical/empirical issues behind the quantitative results with regard to Japanese enterprises.

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