Analyses of Industrial Interdependency of the Asian Pacific Countries

By

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Ⅰ. Introduction

International Input-Output Table refers to statistics in which the Input-Output Tables of each included country are consolidated into the subtotal in one I/O table using Import-Export Statistics as a bridge, so that production and distribution of goods and services in a country as well as its transactions with other countries can be examined. The Table makes it possible to compare industrial structures of countries, in accordance with a unified sector classification, and it is used to analyze flows of goods and services, demand structures, and the industrial interdependency(interlinkages) of countries.

Industrial interdependency of countries is rising as trade and economic cooperations grow deeper and deeper, and the gloval division of labor changes rapidly in response to differences in development on a national scale. In this context, the International Input-Output Table becomes more and more important. Korea, in particular, should compile and utilize the Table because its external dependence is relatively high.

The Bank of Korea compiled the Asian International Input-Output Table in 1995[1], collaborating with IDE-JETRO(Institute of Developing Economies - Japan External Trade Organization). The Table was based on the imports and exports of ten countries -Korea, Japan, the U.S.A., China, Taiwan, Indonesia, Malaysia, the Philippines, Singapore, and Thailand- in the years of 1985, 1990 and 1995.[2]

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1) The Bank of Korea compiled International Bilateral Input-Output Table together with Japan's IDE-JETRO, based on the imports and exports of both Korea and Japan in 1970, 1975, 1985 and 1990. IDE-JETRO undertook the planning of the compilation of the International Input-Output Table.

2) The Asian International Input-Output Table gives a minute picture of input compositions and output distributions of each domestic industry vis-à-vis other home country as well as foreign countries' industries. With the assumption of stable(or Linear) technical correlations between input and output, the table also serves as an effective analytical tool for the study of economic repercussion and forward and backward linkages among the countries of concern. The Table also shows only import-export vectors for other countries such as Hongkong, Britain, France and Germany.

There has not been much research on the interdependency of countries using International Input-Output Table. The Bank of Korea analyzed the interdependency of Korea and Japan, using the two countries' International Input-Output Table. In addition, The Bank of Korea analyzed the interdependency of major Southeast and East Asian countries and advanced countries with the updated International Input-Output Tables of 1990 and 1995 comprising thirteen countries[3] that were compiled by Japan's Mitsubishi Research Institute in August 1998. However, it was not able to analyze the interdependency by industry or product because the updated Input-Output table had only one vector for each country.

If regional I-O studies are to qualify as general equilibrium analysis, then interregional[4] I-O models rather than single-region ones must be developed. The theoretical structure of interregional I-O models was first discussed by Isard(1951) five decades ago, but apart from impressive pioneering work by Moses(1955) little progress was made in applying interregional models at that time, primarily because of data limitations and computer capacity constraints[5]. Interest in interregional models revived particularly with the ambitious forty-four-regions-seventy-eight-industry model which was developed at Harvard under the direction of Dr. Karen R. Polenske(HERP, Harvard Economic Research Project). From this time, there has been growing recognition of the value and utility of interregional models. One U.S. economist said that the contribution of I-O to regional analysis would not reach anywhere near its full potential until a comprehensive system of interregional I-O table could be developed. Polenske expressed this rather more strongly, when commenting on a regional I-O study of the standard type: 'The refinement of the horse

3) Eight Southeast and East Asian countries - Korea, Taiwan, China, Singapore, Indonesia, Malaysia, the Philippines and Thailand, plus the U.S.A., Japan, Britain, France and Germany.

4) The terms 'interregional model' and 'multiregional model' are used interchangeably.

5) Five years ago, the computations needed for implementing an interregional model were unthinkable. However, nowadays it takes only a few minutes to manage a twenty-four-sector matrix of ten countries with the recent development of computer processing speeds.

and buggy should be discouraged when the need is for an entirely new vehicle. The emphasis should now be shifted to constructing multiregional I-O table.

Against this backdrop, this paper seeks to examine industrial and trade structure by country, using the International Input-Output Table of 1995, and to analyze production inducement coefficients(output multiplier), value added inducement coefficients(value added multiplier) and imports inducement coefficients(import multiplier).

This paper consists of four sections. Section Ⅰ depicts the purpose of the study; In SectionⅡ, I attempt to review the structure and analysis models of International Input-Output Tables; Section Ⅲ explains the interdependency of countries by industry and product, using production inducement coefficients, value added inducement coefficients and imports inducement coefficients; and finally Section Ⅳ draws some conclusion from the study.

Ⅱ. Structure and Analysis Model

1. Structure of International Input-Output Tables

The International Input-Output Table takes the form of a input-output table of a country. However, the table includes import and export transactions of intermediate goods and final goods. It classifies the transactions of intermediate goods as an endogenous sector, and those of final goods as an exogeneous sector.[6)]

Figure 1 Simplified International Input-Output Tables

		Intermediate Demand										Expenditures: Final Demand				Exports of other countries (LW)	Statistical discrepancy (QX)	Output Totals (XX)
		K	J	U	C	N	I	T	S	M	P	K	J		M	P		
endogenous sector (Intermediate Input)	K	A^{KK}	A^{KJ}	·	·	·	·	·	·	A^{KM}	A^{KP}	F^{KK}	F^{KJ}		F^{KM}	F^{KP}	LW^{K}	Q^{K}	X^{K}
	J	A^{JK}	A^{JJ}	·	·	·	·	·	·	A^{JM}	A^{JP}	F^{JK}	F^{JJ}		F^{JM}	F^{JP}	LW^{J}	Q^{J}	X^{J}
	U																	
	C	·	·	·						·	·	·	·	·	·	·	·	·	·
	N	·	·		·					·	·	·	·		·	·	·	·	·
	I	·	·			·				·	·	·	·		·	·	·	·	·
	T	·	·				·			·	·	·	·		·	·	·	·	·
	S																	
	M	A^{MK}	A^{MJ}	·	·	·	·	·	·	A^{MM}	A^{MP}	F^{MK}	F^{MJ}		F^{MM}	F^{MP}	LW^{M}	Q^{M}	X^{M}
	P	A^{PK}	A^{PJ}	·	·	·	·	·	·	A^{PM}	A^{PP}	F^{PK}	F^{PJ}		F^{PM}	F^{PP}	LW^{P}	Q^{P}	X^{P}
exogenous sector	International freight and insurance	BA^{K}	BA^{J}	·	·	·	·	·	·	BA^{M}	BA^{P}	BF^{K}	BF^{J}		BF^{M}	BF^{P}			
	Imports of other countries	WA^{K}	WA^{J}	·	·	·	·	·	·	WA^{M}	WA^{P}	WF^{K}	WF^{J}		WF^{M}	WF^{P}			
	Tariff and import tax	DA^{K}	DA^{J}	·	·	·	·	·	·	DA^{M}	DA^{P}	DF^{K}	DF^{J}		DF^{M}	DF^{P}			
	Added values	V^{K}	V^{J}	·	·	·	·	·	·	V^{M}	V^{P}								
Input Totals		X^{K}	X^{J}	·	·	·	·	·	·	X^{M}	X^{P}								

Note : *K*: Korea, *J*: Japan, *U*: U.S.A., *C*: China, *N*: Taiwan, *I*: Indonesia, *T*: Thailand, *S*: Singapore, *M*: Malaysia and *P*: the Philippines

6) The International Input-Output Table assesses all transactions of goods between countries at producer prices converted to a U.S. dollar basis excluding imports from other countries, which are counted at CIF prices. The table compiles and uses a benchmark sector classification in order to link up with the International Input-Output Table of countries.

Figure 1 represents the output structure of goods and services horizontally and the input structure of industries vertically. The term A^{ij} denotes either input of country i's goods imported as intermediate goods by country j or country i's goods exported as intermediate goods to country j. For instance, a column vector, $A^{JK},\cdots,A^{PK}$ show the input structure details of intermediate goods that Korea imports from its trade partners such as Japan, the U.S.A. and so on; a row vector $A^{KJ},\cdots,A^{KP}$ describe the intermediate goods and services that Korea exports to its trade partners. A^{KK} represents the input structure details of domestic intermediate goods within Korea, i.e. internal transactions from Korea to Korea; thus it is the same as the endogeneous sector in Korea's domestic transactions table.

Meanwhile, F^{ij} denotes the direction of flow from country i to country j. In other words, $F^{JK},\cdots,F^{PK}$ denote final goods that Korea's trade partners export to Korea; $F^{KJ},\cdots,F^{KP}$ mean the final goods that Korea exports to its trade partners. $F^{KK},\cdots,F^{PP}$ represent domestic demand details of final goods and services.

$BA^{K},\cdots,BA^{P}$ and $BF^{K},\cdots,BF^{P}$ refer to international freight price and insurance fee; $DA^{K},\cdots,DA^{P}$ and $DF^{K},\cdots,DF^{P}$ to tariff and import tax; $V^{K},\cdots,V^{P}$ to added values; and $X^{K},\cdots,X^{P}$ to total output or input.

2. Analysis Model

Inverse matrix coefficients of the input-output tables indicate induced production coefficients. In the matrix of induced production coefficients, the column vector of the i sector indicates the degree of production induced in all sectors by a one unit of increase in the final demand for the i sector. By contrast, the row vector of the i sector shows the level of production induced in the i sector by a one unit of increase in the final demand for each sector.

For example, L_{ij} tells the level of production induced in the i sector by one unit of increase in the final demand of the each j sector.

Figure 2 Inverse Matrix

	1	2	3	‥‥	i	‥‥	n	
1	L_{11}	L_{12}	L_{13}		L_{1i}		L_{1n}	$\sum_{j=1}^{n} L_{1j}$
2	L_{21}	L_{22}	L_{23}		L_{2i}		L_{2n}	$\sum_{j=1}^{n} L_{2j}$
:					:			
i	L_{i1}	L_{i2}	L_{i3}	--	L_{ii}	--	L_{in}	$\sum_{j=1}^{n} L_{ij}$
:					:			
n	L_{n1}	L_{n2}	L_{n3}		L_{ni}		L_{nn}	$\sum_{j=1}^{n} L_{nj}$
	$\sum_{i=1}^{n} L_{i1}$	$\sum_{i=1}^{n} L_{i2}$	$\sum_{i=1}^{n} L_{i3}$		$\sum_{i=1}^{n} L_{ii}$		$\sum_{i=1}^{n} L_{in}$	

Note : I-O(Leontief) multipliers can be identified as L_{ij} where
$L_{ij}=(I-A_{ij})^{-1}$ A_{ij} : Intermediate input coefficients

This rule can be applied to the simplified international input-output tables in the same way, if each sector is regarded as a country. In Figure 3, the column vector shows the effects of the final demand for a specific country on the production of other countries including itself. For a one unit increase in the final demand for Korea, L^{KK} means the degree of the production induced in Korea, L^{JK} indicates the degree of the production induced in Japan, L^{PK} the degree of the production induced in the philippines, and so on. Conversely, the row vector indicates the effects of a one unit increase in the final demand for all countries on the level of production of a specific country. The first row vector(L^{KK}, L^{KJ} · · , L^{KP}) shows the total production induced in Korea by a one unit increase in the final demand for the ten countries.

Figure 3 Simplified Inverse Matrix of International Input-Output Tables

	K	J	U	C	N	I	T	S	M	P
K	L^{KK}	L^{KJ}	L^{KU}	L^{KC}	L^{KN}	L^{KI}	L^{KT}	L^{KS}	L^{KM}	L^{KP}
J	L^{JK}	L^{JJ}		·	·	·	·		L^{JM}	L^{JP}
U	L^{UK}									
C	L^{CK}	·		·					·	·
N	L^{NK}	·			·				·	·
I	L^{IK}	·				·			·	·
T	L^{TK}	·					·		·	·
S	L^{SK}									
M	L^{MK}	L^{MJ}		·	·	·	·		L^{MM}	L^{MP}
P	L^{PK}	L^{PJ}		·	·	·	·		L^{PM}	L^{PP}

A. Production Inducement Effects

The International Input-Output Table of 1995 represents the transactions of ten countries. However, as a matter of convenience, an bilateral analysis model of Korea and Japan is used here.

An analysis model of International Input-Output Table states that total demand necessary for intermediate goods and expenditures such as consumption, investments and exports is satisfied by total supply, including domestic production and imports. The model can be set, beginning with the following material balance equation.

Korea: $$\sum_{j=1}^{n} a_{ij}^{KK} \cdot X_j^K + \sum_{j=1}^{n} a_{ij}^{KJ} \cdot X_j^J + F_i^{KK} + F_i^{KJ} + F_i^{KR} = X_i^K \quad \cdots\cdots (1)$$

Japan: $$\sum_{j=1}^{n} a_{ij}^{JK} \cdot X_j^K + \sum_{j=1}^{n} a_{ij}^{JJ} \cdot X_j^J + F_i^{JK} + F_i^{JJ} + F_i^{JR} = X_i^J \quad \cdots\cdots (2)$$

where,

$a_{ij}^{XY} = \frac{A_{ij}^{XY}}{X_j^Y}$, $i = 1, 2, \cdots, n$, i, j : industry

A^{XY} : intermediate input coefficients matrix,

X : vector of total outputs,

F : vector of final demand,

F^{KJ} : vector of Korean exports to Japan,

F^{KR} : vector of Korean exports to the rest of the world.

Letting $F^K = F^{KK} + F^{KJ} + F^{KR}$ and $F^J = F^{JJ} + F^{JK} + F^{JR}$, the above material balance equation can be described as a form of matrix.

$$\left[\begin{array}{c|c} A^{KK} & A^{KJ} \\ \hline A^{JK} & A^{JJ} \end{array}\right]\left[\begin{array}{c} X^K \\ \hline X^J \end{array}\right] + \left[\begin{array}{c} F^K \\ \hline F^J \end{array}\right] = \left[\begin{array}{c} X^K \\ \hline X^J \end{array}\right] \quad \cdots\cdots\cdots \quad (3)$$

$$\left[\begin{array}{c} X^K \\ \hline X^J \end{array}\right] - \left[\begin{array}{c|c} A^{KK} & A^{KJ} \\ \hline A^{JK} & A^{JJ} \end{array}\right]\left[\begin{array}{c} X^K \\ \hline X^J \end{array}\right] = \left[\begin{array}{c} F^K \\ \hline F^J \end{array}\right] \quad \cdots\cdots\cdots \quad (4)$$

From equation (4), output matrix(X) is derived as follows:

$$\left[\begin{array}{c} X^K \\ \hline X^J \end{array}\right] = \left[\left[\begin{array}{c|c} I & 0 \\ \hline 0 & I \end{array}\right] - \left[\begin{array}{c|c} A^{KK} & A^{KJ} \\ \hline A^{JK} & A^{JJ} \end{array}\right]\right]^{-1}\left[\begin{array}{c} F^K \\ \hline F^J \end{array}\right] \quad \cdots\cdots \quad (5)$$

The inverse matrix coefficient $(I-A)^{-1}$ in equation (5) can be written as:

$$(I-A)^{-1} = \left[\left[\begin{array}{c|c} I & 0 \\ \hline 0 & I \end{array}\right] - \left[\begin{array}{c|c} A^{KJ} & A^{KJ} \\ \hline A^{JK} & A^{JJ} \end{array}\right]\right]^{-1} = \left[\begin{array}{c|c} I-A^{KK} & -A^{KJ} \\ \hline -A^{JK} & I-A^{JJ} \end{array}\right]^{-1} \quad \cdots \quad (6)$$

Letting $\left[\begin{array}{c|c} I-A^{KK} & -A^{KJ} \\ \hline -A^{JK} & I-A^{JJ} \end{array}\right]^{-1} = \left[\begin{array}{c|c} L^{KK} & L^{KJ} \\ \hline L^{JK} & L^{JJ} \end{array}\right]$,

equation (5) is transformed into the form of equation (7).

$$\left[\begin{array}{c} X^K \\ \hline X^J \end{array}\right] = \left[\begin{array}{c|c} L^{KK} & L^{KJ} \\ \hline L^{JK} & L^{JJ} \end{array}\right]\left[\begin{array}{c} F^K \\ \hline F^J \end{array}\right] \quad \cdots\cdots\cdots\cdots \quad (7)$$

Since $\left[\begin{array}{c|c} I-A^{KK} & -A^{KJ} \\ \hline -A^{JK} & I-A^{JJ} \end{array}\right]\left[\begin{array}{c|c} L^{KK} & L^{KJ} \\ \hline L^{JK} & L^{JJ} \end{array}\right] = I,$

elements of L in equation (7) can be translated into as follows:

First, $L^{KK} = (I-A^{KK})^{-1}(I+A^{KJ}L^{JK}) = (I-A^{KK})^{-1}+(I-A^{KK})^{-1}A^{KJ}L^{JK}$.

$(I-A^{KK})^{-1}$ refers to the production inducement effect that a one unit increase of Korea's domestic final demand has on each of its industries; $(I-A^{KK})^{-1}A^{KJ}L^{JK}$ represents the production inducement effect generated in Korea, as Japan imports intermediate goods from Korea in order to satisfy Japan's production caused by a unit of Korea's final demand.

Second, $L^{KJ} = (I-A^{KK})^{-1}A^{KJ}L^{JJ}$ refers to the production inducement effect brought about in Korea, as Japan imports intermediate goods from Korea in order to meet Japan's production driven by a unit of Japan's final demand.

Third, $L^{JJ} = (I-A^{JJ})^{-1}(I+A^{JK}L^{KJ}) = (I-A^{JJ})^{-1}+(I-A^{JJ})^{-1}A^{JK}L^{KJ}$.

$(I-A^{JJ})^{-1}$ represents the production inducement effect that a one unit increase of Japan's final demand has on each of its industries; $(I-A^{JJ})^{-1}A^{JK}L^{KJ}$ means the production inducement effect generated in Japan, as Korea imports intermediate goods from Japan in order to satisfy Korea's production led by a unit of Japan's final demand.

Finally, $L^{JK} = (I-A^{JJ})^{-1}A^{JK}L^{KK}$ refers the production inducement effect in Japan, as Korea imports intermediate goods from Japan in order to meet Korea's production driven from by a unit of its own final demand.

To sum up,

L^{KK} Production inducement effect on each Korean industry by a one unit increase in Korea's final demand	L^{KJ} Production inducement effect on each Korean industry by a one unit increase in Japan's final demand
L^{JK} Production inducement effect on each Japanese industry by a one unit increase in Korea's final demand	L^{JJ} Production inducement effect on each Japanese industry by a one unit increase in Japan's final demand

Accordingly, the vector of Korea's induced output values(X^K) are described as follows:

$$X^K = (L^{KK} \mid L^{KJ}) \begin{bmatrix} F^{KK} & F^{KJ} & F^{KR} \\ F^{JK} & F^{JJ} & F^{JR} \end{bmatrix},$$

where,

$L^{KK}F^{KK}$: Korea's production inducement values led by Korea's domestic final demand,

$L^{KJ}F^{JK}$: Korea's production inducement values led by Japan's imports of intermediate goods and services from Korea for Japan's exports of final goods to Korea(Korea's imports of final goods),

$L^{KK}F^{KJ}$: Korea's production inducement values led by Korea's exports of final goods and services to Japan(Japan's imports of final goods),

$L^{KJ}F^{JJ}$: Korea's production inducement values led by Japan's imports of intermediate goods and services from Korea to meet the domestic final demand of Japan,

$L^{KK}F^{KR}$: Korea's production inducement values led by Korea's exports of final goods and services to other countries,

$L^{KJ}F^{JR}$: Korea's production inducement values led by Japan's exports of final goods and services to other countries.

Therefore, $L^{KK}F^{KK} + L^{KJ}F^{JK}$, $L^{KK}F^{KJ} + L^{KJ}F^{JJ}$, and $L^{KK}F^{KR} + L^{KJ}F^{JR}$ are respectively Korea's production inducement values caused by a one unit increase in the final demand of Korea, Japan, and other countries.

Likewise, the vector of Japan's production inducement values(X^J) can be described as follows:

$$X^J = (L^{JK} \mid L^{JJ}) \begin{bmatrix} F^{KK} & F^{KJ} & F^{KR} \\ F^{JK} & F^{JJ} & F^{JR} \end{bmatrix},$$

where,

$L^{JJ}F^{JJ}$: Japan's production inducement values led by Japan's domestic final demand,

$L^{JK}F^{KJ}$: Japan's production inducement values led by Korea's imports of intermediate goods from Japan for Korea's exports of final goods to Japan(Japan's imports of final goods),

$L^{JJ}F^{JK}$: Japan's production inducement values led by Japan's exports of final goods and services to Korea,

$L^{JK}F^{KK}$: Japan's production inducement values led by Korea's imports of intermediate goods and services from Japan to meet the final demand of Korea,

$L^{JJ}F^{JR}$: Japan's production inducement values led by Japan's exports of final goods and services to other countries,

$L^{JK}F^{KR}$: Japan's production inducement values led by Korea's exports of final goods and services to other countries.

Therefore, $L^{JK}F^{KK}+L^{JJ}F^{JK}$, $L^{JK}F^{KJ}+L^{JJ}F^{JJ}$, and $L^{JK}F^{KR}+L^{JJ}F^{JR}$ respectively refer to Japan's induced output values generated by a one unit increase in the final demand of Korea, Japan, and other countries.

B. Value Added Inducement Effects

Korea's value added inducement values(V^{KJ}) takes the form :

$$V^{K}=(\hat{A}_{v}^{K}L^{KK} \mid \hat{A}_{v}^{K}L^{KJ}) \begin{bmatrix} F^{KK} & F^{KJ} & F^{KR} \\ F^{JK} & F^{JJ} & F^{JR} \end{bmatrix}$$

where,

$\hat{A}_{v}^{K}$: a diagonal matrix of value added ratios by sector in Korea,

$\hat{A}_{v}^{K}L^{KK}$: Korea's value added inducement coefficient due to a one unit increase in Korea's final demand,

$\hat{A}_{v}^{K}L^{KJ}$: Korea's value added inducement coefficient due to Korea's exports of intermediate goods and services to Japan,

Thus,

$\hat{A}_v^K L^{KK} F^{KK} + \hat{A}_v^K L^{KJ} F^{JK}$, $\hat{A}_v^K L^{KK} F^{KJ} + \hat{A}_v^K L^{KJ} F^{JJ}$, and $\hat{A}_v^K L^{KK} F^{KR} + \hat{A}_v^K L^{KJ} F^{JR}$ respectively refer to Korea's value added inducement values arising from the final demand of Korea, Japan, and other countries.

Likewise, Japan's induced value added values(V^J) takes the form:

$$V^J = (\hat{A}_v^J L^{JK} \mid \hat{A}_v^J L^{JJ}) \begin{bmatrix} F^{KK} & F^{KJ} & F^{KR} \\ F^{JK} & F^{JJ} & F^{JR} \end{bmatrix}$$

where,

$\hat{A}_v^J$: a diagonal matrix of value added ratios by sector in Japan,

$\hat{A}_v^J L^{JK}$: Japan's value added inducement coefficient due to Japan's exports of intermediate goods and services to Korea,

$\hat{A}_v^J L^{JJ}$: Japan's value added inducement coefficient due to one unit increase of Japan's final demand

Thus,

$\hat{A}_v^J L^{JK} F^{KK} + \hat{A}_v^J L^{JJ} F^{JK}$, $\hat{A}_v^J L^{JK} F^{KJ} + \hat{A}_v^J L^{JJ} F^{JJ}$, and $\hat{A}_v^J L^{JK} F^{KR} + \hat{A}_v^J L^{JJ} F^{JR}$ respectively refer to Japan's induced value added values led by a one unit increase in the final demand of Korea, Japan and other countries.

C. Import Inducement Effects

Import inducement effects are analyzed by dividing imports into two parts, imports of intermediate goods and those of final goods and services. Korea's induced import values are summed up induced import values of intermediate goods and services(m^K) plus those of final goods and services(f^K) :

$$m^K = (\hat{A}^{MK} L^{KK} \mid \hat{A}^{MK} L^{KJ}) \begin{bmatrix} F^{KK} & F^{KJ} & F^{KR} \\ F^{JK} & F^{JJ} & F^{JR} \end{bmatrix}$$

$$f^K = F^{MK} + BF^K + WF^K + DF^K$$

where,

$\hat{A}^{\wedge KK}$: a diagonal matrix of import coefficients by sector in Korea,

$\hat{A}^{\wedge KK}L^{KK}$: Korea's import inducement coefficient due to a one unit increase in Korea's final demand,

$\hat{A}^{\wedge KK}L^{KJ}$: Korea's import inducement coefficient due to Korea's exports of intermediate goods and services to Japan,

BF^{K}: International freight price and insurance fees due to imports of final goods and services,

WF^{K}: Imports of final goods and services from other countries, and

DF^{K}: Customs duties and commodity taxes on imports of final goods and services.

Therefore,

$\hat{A}^{\wedge KK}L^{KK}F^{KK} + \hat{A}^{\wedge KK}L^{KJ}F^{JK}$, $\hat{A}^{\wedge KK}L^{KK}F^{KJ} + \hat{A}^{\wedge KK}L^{KJ}F^{JJ}$, and $\hat{A}^{\wedge KK}L^{KK}F^{KR} + \hat{A}^{\wedge KK}L^{KJ}F^{JR}$ respectively represent Korea's import inducement values arising from the final demand of Korea, Japan, and other countries.

Likewise, Japan's import inducement values are calculated:

Japan's import inducement values : $m^{J} + f^{J}$

by intermediate goods $m^{J} = (\hat{A}^{\wedge JJ}L^{JK} \mid \hat{A}^{\wedge JJ}L^{JJ}) \begin{bmatrix} F^{KK} & F^{KJ} & F^{KR} \\ F^{JK} & F^{JJ} & F^{JR} \end{bmatrix}$

by final goods $f^{J} = F^{KJ} + BF^{J} + WF^{J} + DF^{J}$

where,

$\hat{A}^{\wedge JJ}$: a diagonal matrix of import coefficients by sector in Japan,

$\hat{A}^{\wedge JJ}L^{JK}$: Japan's import inducement coefficient due to Japan's exports of intermediate goods and services to Korea

$\hat{A}^{\wedge JJ}L^{JJ}$: Japan's import inducement coefficient due to a one unit increase of Japan's final demand

BF^{J}: International freight price and insurance fees due to imports of final goods and services,

WF^{J}: Imports of final goods from other countries,

DF^{J}: Customs duties and commodity taxes on imports of final goods.

Therefore,
$\widehat{A^{JJ}}L^{JK}F^{KK}+\widehat{A^{JJ}}L^{JJ}F^{JK}$, $\widehat{A^{JJ}}L^{JK}F^{KJ}+\widehat{A^{JJ}}L^{JJ}F^{JJ}$, and $\widehat{A^{JJ}}L^{JK}F^{KR}+\widehat{A^{JJ}}L^{JJ}F^{JR}$ respectively refer to Japan's import inducement values led by a one unit increase in the final demand of Korea, Japan, and other countries.

Ⅲ. Analysis of Interdependency [7]

1. Production Inducement Effects

A. Production Inducement Coefficients

Figure 4 shows the output multiplier[8] that represents the output induced in each country when a country sees a one unit increase of final demand for a product. In 1995, viewing the production inducement coefficient of countries, only led by the own increase in final demand, Korea recorded 1.748, slightly lower than China(2.246), Japan(1.785) and the U.S.A.(1.780), but higher than Taiwan and the other countries.

The induced output multiplier(row bound) and the inducing output multiplier(column bound) are, respectively, the row sum and the column sum of output multipliers except for its own output multiplier.

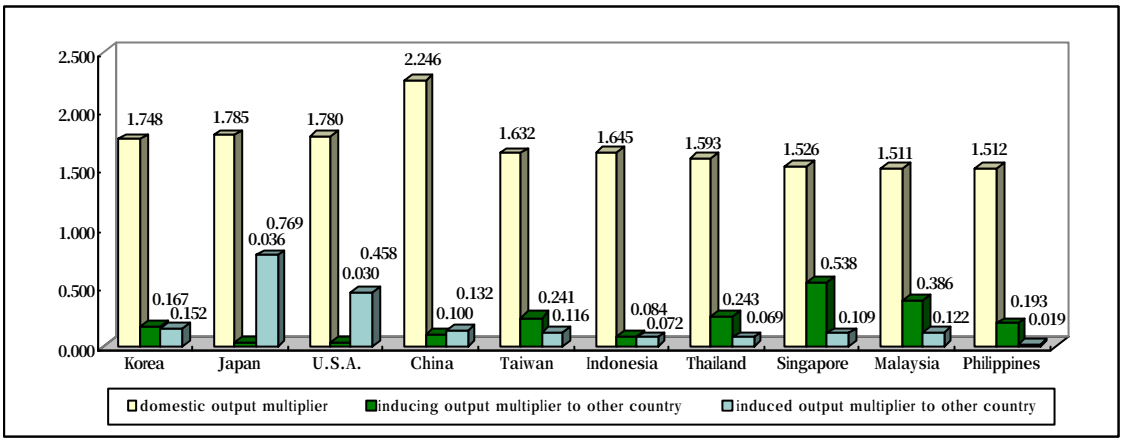
The induced output multipliers of Japan and the U.S.A. are relatively high at 0.769 and 0.458, but those of most of the Asian countries are less than 0.2. On the other hand, the inducing output multipliers are large in Asian countries such as Singapore(0.538) and Malaysia(0.386). From this result, it is inferred that the production effect of Asian countries due to

7) This paper covers the interdependency of ten countries(refer to Note 2). Thus interdependency between these ten and other countries, or that between other countries is not analyzed here.

8) Since the amount of production inducement is represented by nominal values, its size is dependent on the economic scale of the country that induces the final demand. Thus, in order to compare the extent of its effects on each country, the production inducement coefficient, which represents the production inducement effect per final demand unit, should be used.

the growth of Japan and the U.S.A. is not as large as expected, and instead most of the Asian countries except for Japan have a positive influence on the economies of Japan and the U.S.A..

Figure 4 **Output Multiplier(1995)**



Seeing figures aligned vertically in Table 1, Korea's one unit increase in final demand induced a rise in Japan's production by 0.064, one of 0.054 for the U.S.A., one of 0.021 for China, and so on. In the case of Japan and the U.S.A., it is striking that they induced the largest production rise in each other, with Japan's inducing a rise of 0.015 in the U.S.A. and the U.S.A.'s inducing one of 0.014 in Japan.

Meanwhile, figures placed on each row in Table 1 or the fourth column('95) in Table 2, show the degree of Korea's influence from a one unit increase in final demand on the part of its trade partners in 1995. According to the figures, Korea is the most influenced by Singapore(0.045), and the least affected by the U.S.A.(0.003) and Japan(0.004). As Korea expands its trade in industrial products with Asian countries thanks to the continuing industrialization in the region, its production inducement effects tend to grow steadily with the increases in final demand of China, Taiwan and the five origianl ASEAN countries, rather than those of Japan or the U.S.A.. Therefore, it is desirable that Korea should extend its economic relationship with these Asian countries.

Table 1 Production Inducement Coefficients(1995)

	Korea	Japan	U.S.A.	China	Taiwan	Indonesia	Thailand	Singapore	Malaysia	Philippines
Korea	**1.748** <**1.827**>	0.004 <0.004>	0.003 <0.002>	0.016 <0.003>	0.016 <0.009>	0.009 <0.007>	0.015 <0.013>	0.045 <0.020>	0.025 <0.011>	0.018 <0.014>
Japan	0.064 <0.078>	**1.785** <**1.853**>	0.014 <0.010>	0.040 <0.023>	0.103 <0.100>	0.032 <0.037>	0.103 <0.097>	0.195 <0.192>	0.161 <0.102>	0.057 <0.056>
U.S.A.	0.054 <0.066>	0.015 <0.018>	**1.780** <**1.743**>	0.022 <0.019>	0.068 <0.077>	0.018 <0.014>	0.047 <0.039>	0.108 <0.111>	0.077 <0.046>	0.049 <0.043>
China	0.021 < - >	0.006 <0.005>	0.003 <0.001>	**2.246** <**2.243**>	0.017 <0.001>	0.007 <0.007>	0.016 <0.018>	0.028 <0.038>	0.020 <0.013>	0.013 <0.005>
Taiwan	0.006 <0.007>	0.002 <0.003>	0.003 <0.003>	0.008 <0.007>	**1.632** <**1.751**>	0.006 <0.008>	0.017 <0.017>	0.027 <0.028>	0.026 <0.021>	0.022 <0.018>
Indonesia	0.008 <0.008>	0.004 <0.005>	0.001 <0.001>	0.004 <0.003>	0.009 <0.007>	**1.645** <**1.594**>	0.005 <0.003>	0.022 <0.013>	0.010 <0.006>	0.009 <0.005>
Thailand	0.002 <0.002>	0.002 <0.001>	0.001 <0.001>	0.002 <0.001>	0.004 <0.002>	0.002 <0.001>	**1.593** <**1.596**>	0.039 <0.014>	0.013 <0.007>	0.003 <0.002>
Singapore	0.004 <0.003>	0.001 <0.001>	0.002 <0.001>	0.004 <0.002>	0.010 <0.007>	0.007 <0.007>	0.020 <0.024>	**1.526** <**1.348**>	0.050 <0.046>	0.011 <0.010>
Malaysia	0.006 <0.008>	0.002 <0.002>	0.002 <0.001>	0.004 <0.003>	0.011 <0.007>	0.003 <0.004>	0.018 <0.016>	0.066 <0.071>	**1.511** <**1.608**>	0.009 <0.008>
Philippines	0.001 <0.001>	0.001 <0.001>	0.001 <0.000>	0.000 <0.000>	0.002 <0.002>	0.000 <0.001>	0.003 <0.001>	0.007 <0.004>	0.003 <0.002>	**1.512** <**1.611**>

Note: Figures in brackets refer to those in 1990.

Table 2 Induced Output Multiplier in Korea

	'85	'90	'95
Japan	0.003	0.004	0.004
U.S.A.	0.002	0.002	0.003
China	-	0.003	0.016
Taiwan	0.003	0.009	0.016
Indonesia	0.003	0.007	0.009
Thailand	0.006	0.013	0.015
Singapore	0.010	0.020	0.045
Malaysia	0.009	0.011	0.025
Philippines	0.006	0.014	0.018

In 1995, seeing figures in Table 3, a one unit increase in Japanese final demand induced a rise of the Korean production by 0.015 in machinery, electricity and electronics, 0.014 in metals, and 0.014 in textile and leather goods. A one unit increase in final demand in the U.S.A. expanded the production of Korea's assembly and processing sectors, for example, raising production by 0.019 in machinery, electricity and electronics, 0.012 in textile and leather goods and 0.010 in transport equipment. Meanwhile, a one unit increase of Chinese final demand boosted the production of Korea's assembly and processing industries together with that of basic materials and consumer goods, inducing for

instance, a rise of 0.049 in textiles and leather goods, one of 0.038 in pulp, paper and printing, and one of 0.033 in chemicals.

Table 3 Korea's Induced Output Multiplier by Industry

	Korea			Japan			U.S.A.			China
	'85	'90	'95	'85	'90	'95	'85	'90	'95	'95
Agricultural, forest and fishery	1.576	1.580	1.558	0.003	0.004	0.003	0.001	0.002	0.003	0.006
Mining and quarrying	1.696	1.585	1.519	0.002	0.004	0.003	0.001	0.001	0.002	0.012
Manufacturing	1.990	2.030	1.898	0.006	0.008	0.009	0.004	0.004	0.008	0.026
Basic materials	1.844	1.948	1.866	0.006	0.009	0.009	0.002	0.003	0.003	0.022
Petroleum products	1.236	1.303	1.205	0.001	0.001	0.002	0.000	0.001	0.001	0.013
Chemicals	1.834	1.861	1.806	0.007	0.006	0.008	0.001	0.002	0.002	0.033
Rubbers	1.922	1.980	1.807	0.005	0.010	0.007	0.003	0.003	0.003	0.024
Non-metallic minerals	1.939	1.863	1.920	0.005	0.005	0.003	0.002	0.001	0.002	0.014
Metals	2.269	2.211	2.127	0.008	0.014	0.014	0.006	0.005	0.006	0.019
Assembly and processing	1.882	1.980	1.874	0.005	0.007	0.012	0.005	0.007	0.014	0.028
Machinery, electricity and electronics	1.885	1.912	1.801	0.005	0.008	0.015	0.007	0.008	0.019	0.029
Transport equipment	1.988	2.138	2.064	0.004	0.006	0.006	0.004	0.006	0.010	0.023
Consumer goods	2.134	2.122	1.956	0.008	0.007	0.006	0.003	0.004	0.005	0.028
Food, beverage and tobacco	2.107	2.160	2.053	0.007	0.006	0.004	0.001	0.001	0.002	0.007
Textiles and leather goods	2.221	2.191	1.898	0.020	0.016	0.014	0.015	0.014	0.012	0.049
Timber and wooden products	1.666	1.693	1.741	0.003	0.004	0.003	0.002	0.003	0.003	0.017
Pulp, paper and printing	2.073	2.007	1.887	0.001	0.002	0.002	0.001	0.001	0.002	0.038
Others	2.043	2.046	1.946	0.006	0.008	0.009	0.004	0.006	0.009	0.032
Electricity, gas, water and construction	1.951	1.909	1.933	0.003	0.005	0.004	0.002	0.002	0.003	0.018
Services	1.512	1.546	1.512	0.002	0.002	0.002	0.001	0.001	0.002	0.009
average	1.797	1.827	1.748	0.003	0.004	0.004	0.002	0.002	0.003	0.016

B. Contribution of Production Inducement

Table 4 shows the dependency of production inducement that represents the contribution ratio of production inducement values created by production activities with each country's increase in final demand. In 1995, the dependency ratio of Korea's production inducement values on its own final demand was 74.9 percent, that on the final demand of the

U.S.A. was 4.2 percent, that on Japan's 2.7 percent, that on China's 1.3 percent, but that on other Asian countries was less than 0.5 percent. Compared with the figures in 1990, however, the dependency ratios on the U.S.A. and Japan had declined.

The dependency ratios of production inducement on a country's domestic final demand are 89.6 percent in the U.S.A., followed by 89.3 percent in Japan, 80.5 percent in Indonesia, and 79.2 percent in China.

Viewing Table 4 vertically, the contribution ratio of Korea's increase in final demand to production inducement in Malaysia and Singapore registered 1.5 percent and 1.0 percent, respectively, but was less than one percent to those of the other countries.

Table 4 **Dependency of Production Inducement(1995)**
(Distribution Ratio)

unit: %

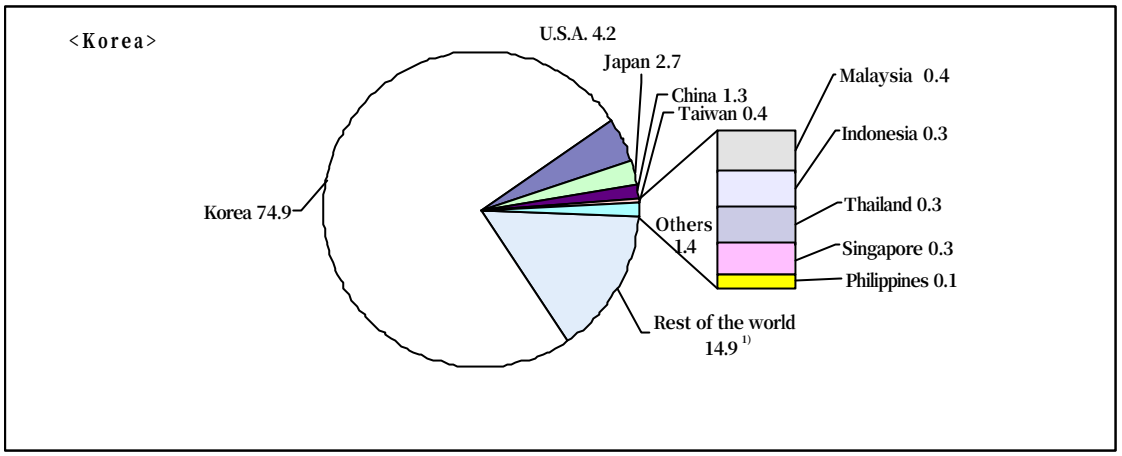
	Korea	Japan	U.S.A.	China	Taiwan	Indonesia	Thailand	Singapore	Malaysia	Philippines
Korea	74.90 <74.87>	2.72 <3.60>	4.22 <6.30>	1.31 <0.20>	0.41 <0.26>	0.33 <0.23>	0.34 <0.28>	0.29 <0.20>	0.41 <0.19>	0.13 <0.13>
Japan	0.50 <0.47>	89.34 <87.81>	2.82 <3.48>	0.53 <0.25>	0.39 <0.36>	0.19 <0.18>	0.35 <0.32>	0.17 <0.21>	0.31 <0.19>	0.09 <0.07>
U.S.A.	0.30 <0.23>	0.97 <0.91>	89.59 <89.76>	0.20 <0.11>	0.17 <0.15>	0.06 <0.03>	0.09 <0.05>	0.08 <0.07>	0.13 <0.07>	0.04 <0.04>
China	0.60 <0.02>	3.68 <2.76>	3.23 <2.01>	79.18 <82.43>	0.21 <0.02>	0.16 <0.13>	0.21 <0.26>	0.17 <0.18>	0.14 <0.11>	0.08 <0.04>
Taiwan	0.54 <0.51>	3.83 <4.24>	7.33 <12.05>	1.47 <0.95>	61.56 <60.82>	0.48 <0.40>	0.70 <0.71>	0.41 <0.45>	0.75 <0.59>	0.37 <0.34>
Indonesia	0.79 <0.83>	4.28 <7.56>	2.85 <2.86>	0.61 <0.52>	0.44 <0.38>	80.46 <78.63>	0.19 <0.15>	0.45 <0.33>	0.26 <0.17>	0.19 <0.13>
Thailand	0.33 <0.31>	4.02 <3.35>	5.18 <4.84>	0.73 <0.28>	0.46 <0.28>	0.33 <0.14>	68.04 <73.67>	0.73 <0.47>	0.62 <0.43>	0.18 <0.12>
Singapore	1.04 <0.94>	4.45 <4.45>	11.77 <13.96>	1.62 <0.99>	1.09 <1.15>	1.24 <1.23>	1.53 <2.09>	34.97 <33.71>	3.48 <3.84>	0.49 <0.53>
Malaysia	1.47 <1.64>	6.83 <7.72>	12.88 <9.52>	1.77 <1.33>	1.16 <0.87>	0.60 <0.47>	1.50 <1.65>	2.27 <3.13>	40.89 <49.97>	0.57 <0.36>
Philippines	0.50 <0.36>	2.99 <3.09>	7.67 <5.86>	0.27 <0.16>	0.41 <0.23>	0.11 <0.08>	0.27 <0.15>	0.19 <0.14>	0.39 <0.22>	74.04 <79.51>

Note: If other countries are included, the row total is 100.0. Figures in brackets refer to those of 1990.

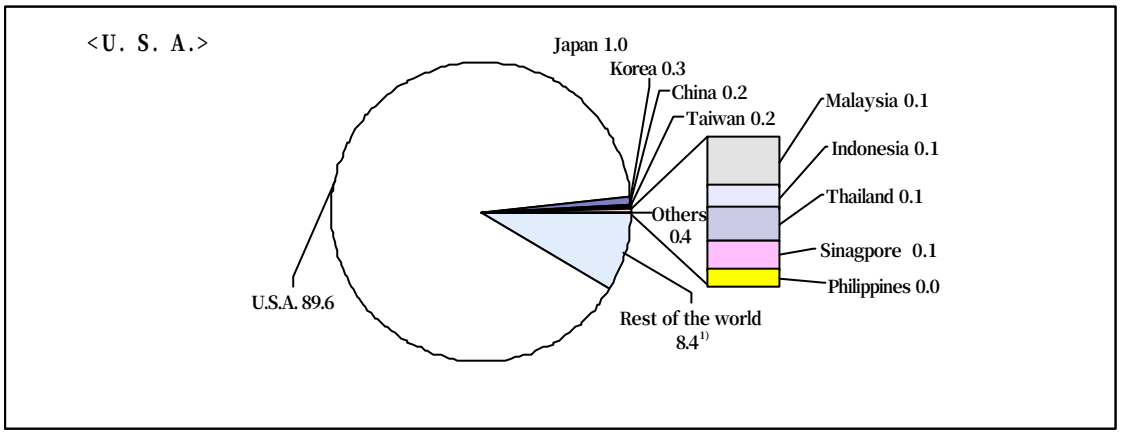
Compared with the economic scale of Korea, Korea is comparatively important to those countries like Malaysia and Singapore.

Figure 5 Contribution of Production Inducement Values by Country(1995)

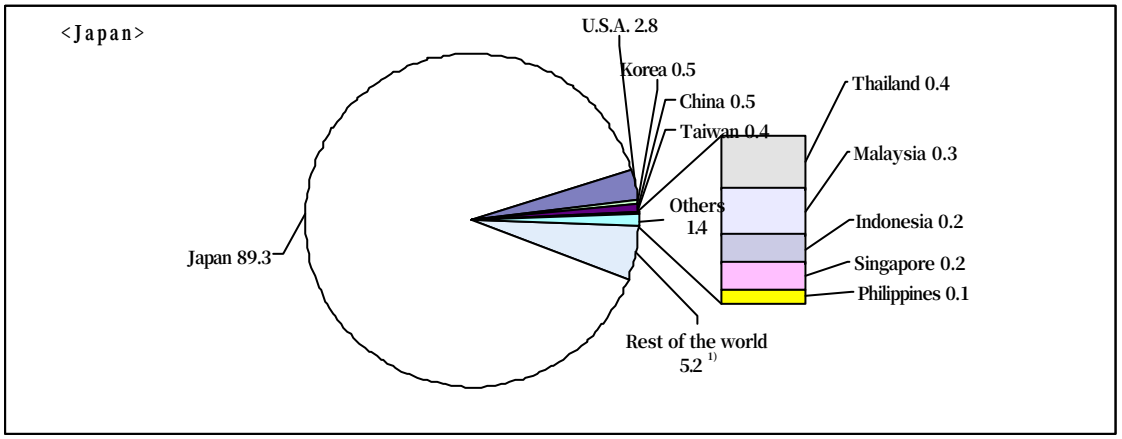
unit : %



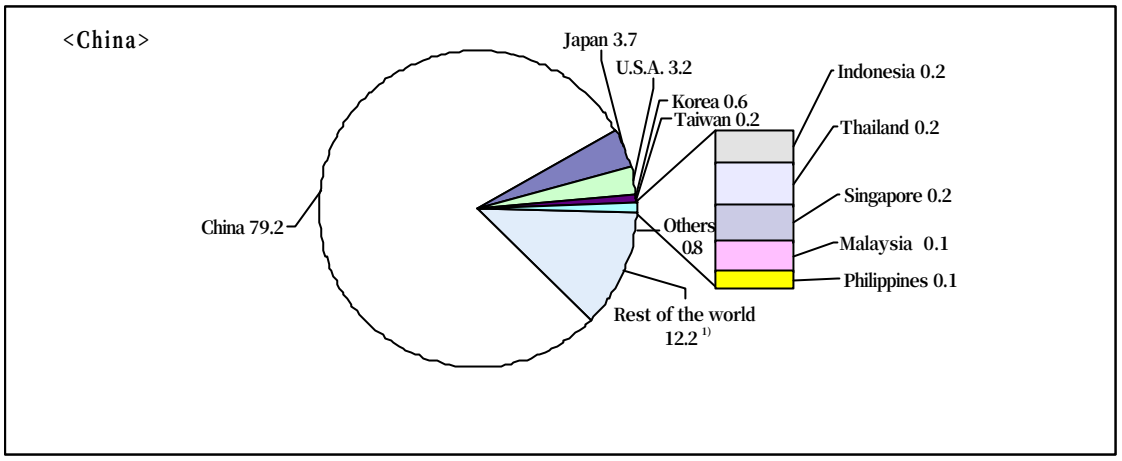
Note: 1) Hongkong 2.1, U.K. 0.5, France 0.3, Germany 0.9 etc.



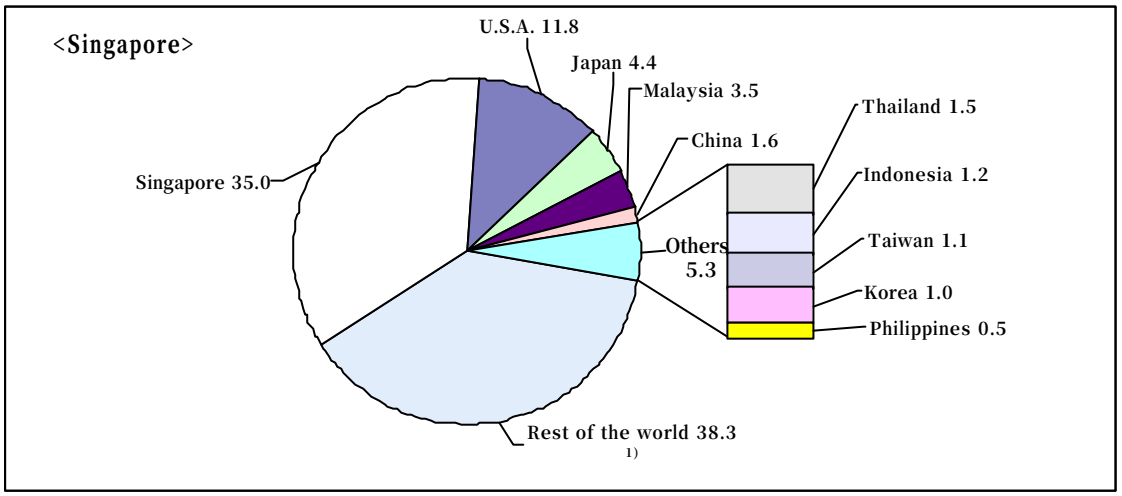
Note: 1) Hongkong 0.2, U.K. 0.4, France 0.2, Germany 0.3 etc.



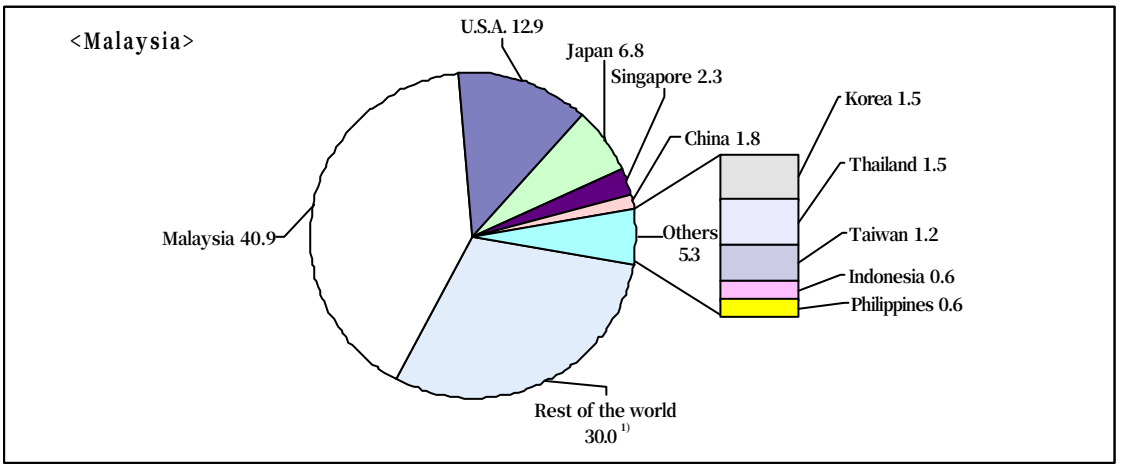
Note: 1) Hongkong 0.7, U.K. 0.4, France 0.2, Germany 0.5 etc.



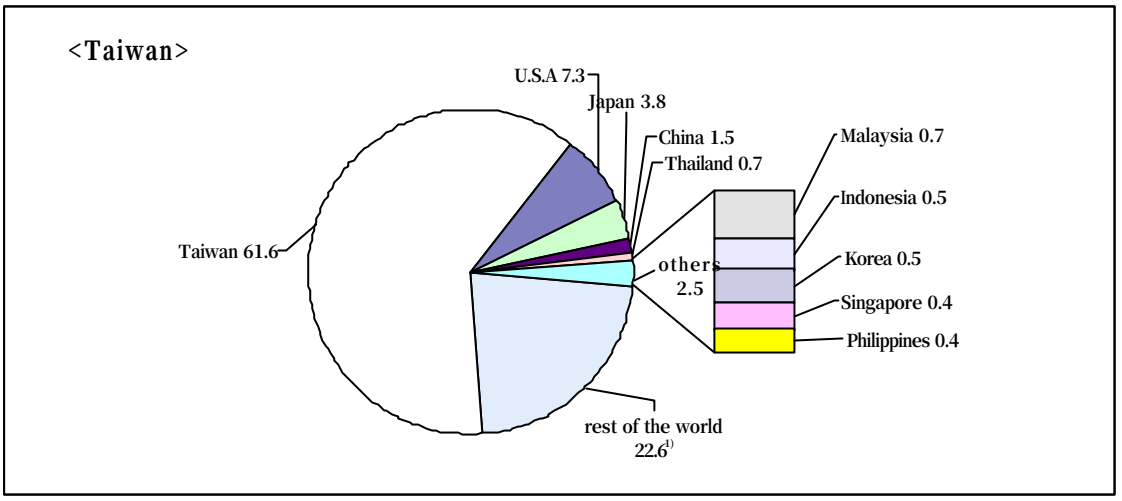
Note: 1) Hongkong 4.6, U.K. 0.4, France 0.3, Germany 0.8 etc.



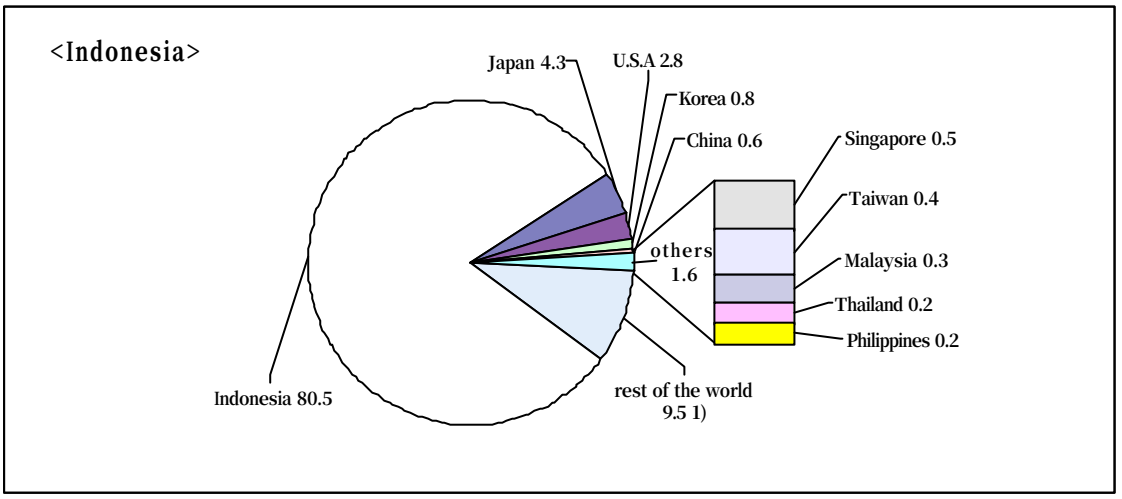
Note: 1) Hongkong 4.5, U.K. 1.8, France 1.1, Germany 1.9 etc.



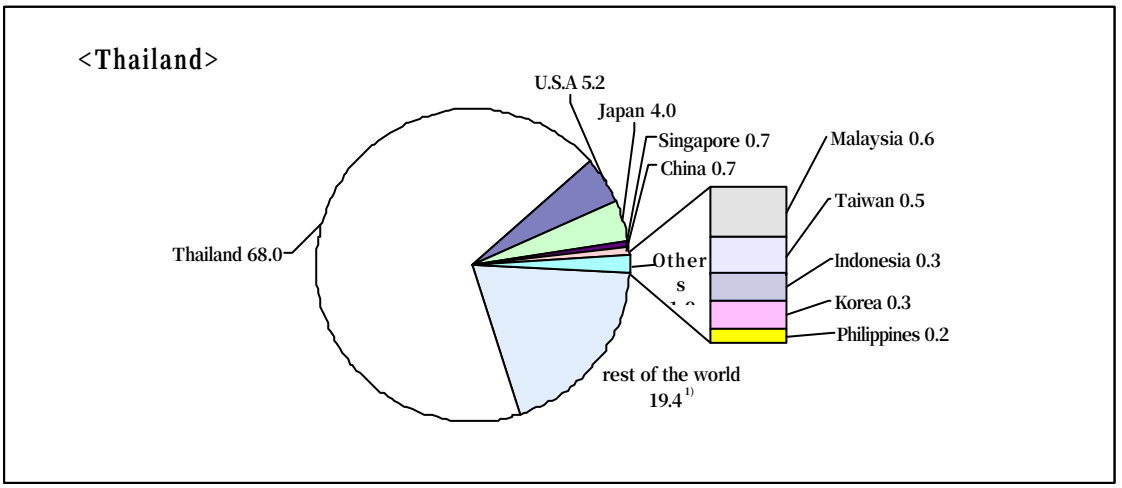
Note: 1) Hongkong 3.5, U.K. 2.7, France 0.7, Germany 2.0 etc.



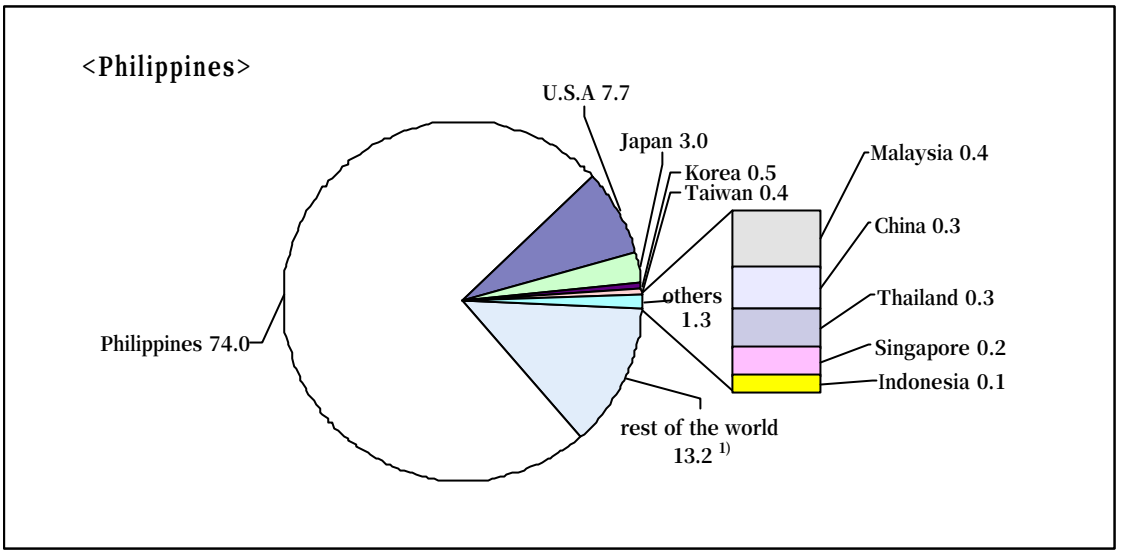
Note: 1) Hongkong 8.5, U.K. 0.9, France 0.4, Germany 1.3 etc.



Note: 1) Hongkong 0.8, U.K. 0.5, France 0.2, Germany 0.6 etc.



Note: 1) Hongkong 1.5, U.K. 0.8, France 0.5, Germany 0.9 etc.



Note: 1) Hongkong 1.3, U.K. 0.9, France 0.3, Germany 0.7 etc.

2. Forward and Backward Linkage Effects

The power of dispersion index and the degree of sensitivity represent relative figures based on average figures of the product multiplier of all the countries included in order to describe the extent of interdependency of countries, by using the production inducement coefficient(output multiplier) table.

The power of dispersion index shows the backward linkage effect on other countries when one unit of final demand for a certain product takes place in a country. The degree of sensitivity exhibits the forward linkage effect on a certain country when one unit of final demand for products of other countries takes place.

Table 5 Power of Dispersion Index and Degree of Sensitivity[1](1995)

	Power of Dispersion[2] Index	Degree of Sensitivity[3]
Korea	0.9845 <1.0206>	0.9650 <0.9670>
Japan	1.0248 <1.0399>	1.4008 <1.4089>
U.S.A.	1.0296 <0.9937>	1.2599 <1.2245>
China	1.1968 <1.1936>	1.2254 <1.2114>
Taiwan	1.0191 <1.0461>	0.9460 <0.9987>
Indonesia	0.8990 <0.9023>	0.8861 <0.8718>
Thailand	0.9363 <0.9309>	0.8398 <0.8292>
Singapore	1.0500 <0.9595>	0.8719 <0.7704>
Malaysia	0.9454 <0.9828>	0.8454 <0.9135>
Philippines	0.9145 <0.9301>	0.7599 <0.8046>

Notes: 1) Figures in brackets refer to those in 1990.
2) Power of dispersion index is backward linkage effect.
3) Degree of sensitivity is forward linkage effect.

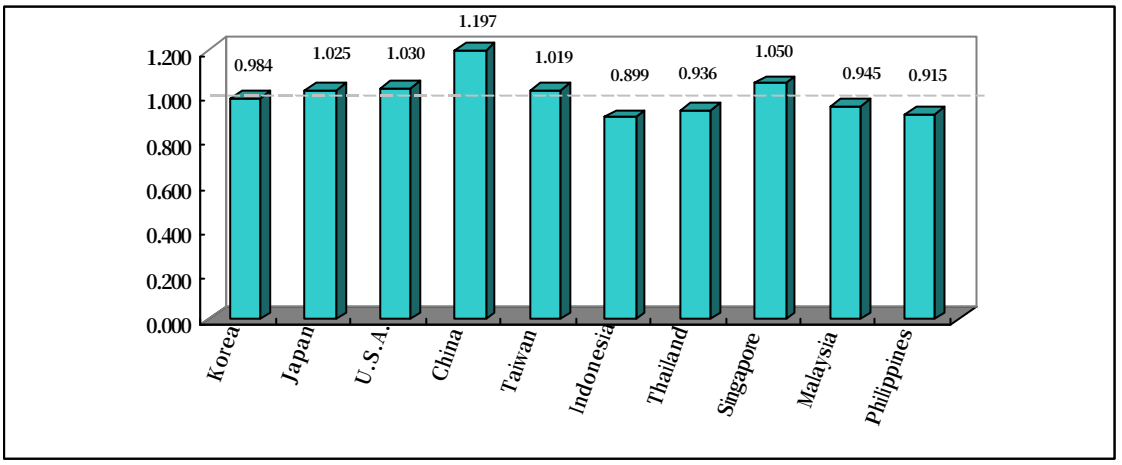
Table 5 shows that China registered the largest power of dispersion index of 1.197, Japan the highest degree of sensitivity of 1.401 and U.S.A. the second highest degree of sensitivity of 1.260 in 1995. This indicates that China was the most influential country and served as the most important

market in the Asian Pacific economy as a whole, and Japan was the most affected by the Asian Pacific economy. The U.S.A. was found to be the second most influenced by the Asia Pacific economy next to Japan. This finding from the analysis implies that the economic recovery of the nations in the Asian Pacific region would be one of critical factors to that of Japan.

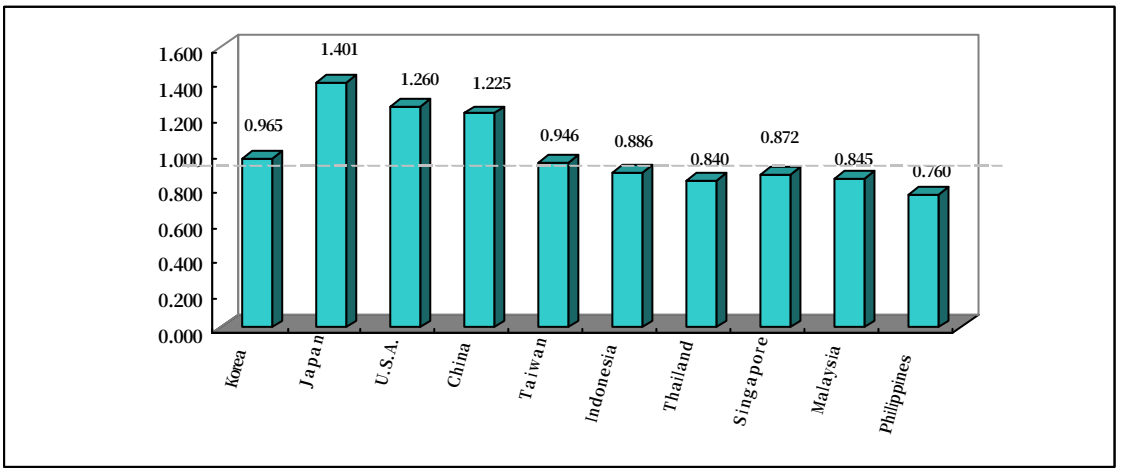
Both Korea's power of dispersion index and its degree of sensitivity registered less than one in 1995. Taiwan's power of dispersion index was higher than Korea's but its degree of sensitivity was lower.

Figure 6 Power of Dispersion Index and Degree of Sensitivity(1995)

<Power of Dispersion Index>



<Degree of Sensitivity>



3. Value Added Inducement Effects

A. Value Added Inducement Coefficients

Table 6 shows the value added inducement coefficients that represent the extent of value added induced in each country when one unit of final demand for a product increases in a country. In 1995, Korea's value added inducement coefficient, produced by its increase in final demand stood at 0.805, slightly lower than that of Japan(0.946), the U.S.A.(0.936) and Indonesia(0.886), but higher than Taiwan(0.736) and the remaining of countries.

Table 6 **Value Added Inducement Coefficients(1995)**

	Korea	Japan	U.S.A.	China	Taiwan	Indonesia	Thailand	Singapore	Malaysia	Philippines
Korea	**0.805** <**0.800**>	0.002 <0.002>	0.002 <0.001>	0.007 <0.001>	0.008 <0.004>	0.004 <0.003>	0.007 <0.006>	0.021 <0.009>	0.011 <0.005>	0.008 <0.006>
Japan	0.034 <0.039>	**0.946** <**0.930**>	0.007 <0.005>	0.021 <0.012>	0.055 <0.050>	0.017 <0.019>	0.055 <0.049>	0.103 <0.097>	0.086 <0.051>	0.030 <0.028>
U.S.A.	0.029 <0.036>	0.008 <0.010>	**0.936** <**0.947**>	0.011 <0.010>	0.036 <0.042>	0.009 <0.008>	0.025 <0.021>	0.057 <0.060>	0.041 <0.025>	0.026 <0.023>
China	0.008 <0.000>	0.002 <0.002>	0.001 <0.001>	**0.862** <**0.899**>	0.007 <0.000>	0.003 <0.003>	0.006 <0.007>	0.011 <0.015>	0.008 <0.005>	0.005 <0.002>
Taiwan	0.003 <0.003>	0.001 <0.001>	0.001 <0.001>	0.003 <0.003>	**0.736** <**0.753**>	0.003 <0.003>	0.008 <0.007>	0.012 <0.012>	0.012 <0.009>	0.010 <0.008>
Indonesia	0.004 <0.004>	0.002 <0.003>	0.000 <0.000>	0.002 <0.002>	0.005 <0.004>	**0.886** <**0.878**>	0.002 <0.002>	0.012 <0.007>	0.006 <0.003>	0.005 <0.003>
Thailand	0.001 <0.001>	0.001 <0.001>	0.001 <0.000>	0.001 <0.001>	0.002 <0.001>	0.001 <0.001>	**0.745** <**0.758**>	0.018 <0.007>	0.006 <0.003>	0.002 <0.001>
Singapore	0.001 <0.001>	0.000 <0.000>	0.001 <0.000>	0.001 <0.001>	0.004 <0.003>	0.003 <0.003>	0.008 <0.009>	**0.565** <**0.508**>	0.018 <0.017>	0.004 <0.004>
Malaysia	0.003 <0.004>	0.001 <0.001>	0.001 <0.000>	0.002 <0.002>	0.004 <0.003>	0.001 <0.002>	0.008 <0.007>	0.028 <0.034>	**0.640** <**0.761**>	0.004 <0.004>
Philippines	0.001 <0.001>	0.000 <0.000>	0.000 <0.000>	0.000 <0.000>	0.001 <0.001>	0.000 <0.000>	0.002 <0.001>	0.004 <0.002>	0.001 <0.001>	**0.781** <**0.804**>

Note: Figures in brackets refer to those in 1990.

In 1995, the effects of value added inducement on other countries, led by one unit increase in final demand in Korea, registered 0.034 in Japan, 0.029 in the U.S.A. and 0.008 in China. A one unit increase in final

demand in Japan induced 0.008 of a unit of value added in the U.S.A., while bringing about an increase of less than 0.002 in Korea, China, and other Asian countries. In addition, a one unit increase in final demand in the U.S.A. induced the largest value added of 0.007 of a unit in Japan while inducing less than 0.005 in Korea, China, and other Asian countries.

The effects of value added inducement, boosted by a one unit increase in final demand in Korea's trade partners, stood at 0.021 in Singapore, 0.011 in Malaysia, 0.008 in the Philippines, 0.008 in Taiwan, 0.007 in China, 0.007 in Thailand, 0.004 in Indonesia, 0.002 in Japan, and 0.002 in the U.S.A.

B. Dependency of Value Added Inducement

Table 7 shows the dependency of value added inducement that represents the contribution ratio of value added inducement values created by production activities in line with the final demand increase in each country. The dependency of value added inducement on a country's own final demand stood at 91.3 percent in Japan, followed by 90.6 percent in the U.S.A., 80.2 percent in Indonesia, and 80.1 percent in China.

Viewing the dependency of other countries' increase in final demand on Korea's value added, increase in final demand boosted 78.4 percent of Korea's value added, the U.S.A. 3.4 percent, Japan 2.2 percent, and China 1.1 percent.

On the other hand, Korea's increase in final demand contributed 1.6 percent to boosting value added in Malaysia, but less than one percent to raising value added in the other countries.

Table 7 Dependency of Value Added Inducement by Country(1995)

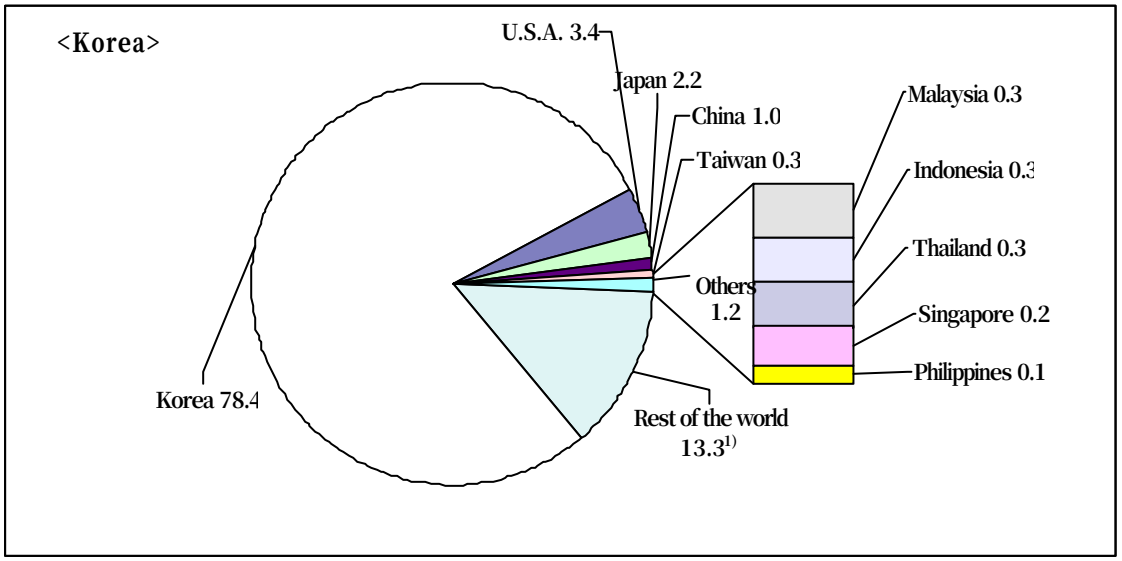
unit: %

	Korea	Japan	U.S.A.	China	Taiwan	Indonesia	Thailand	Singapore	Malaysia	Philippines
Korea	78.40 <79.00>	2.24 <2.84>	3.44 <4.95>	1.05 <0.15>	0.33 <0.21>	0.27 <0.18>	0.27 <0.22>	0.23 <0.16>	0.33 <0.15>	0.11 <0.10>
Japan	0.41 <0.39>	91.29 <89.91>	2.19 <2.72>	0.43 <0.20>	0.31 <0.29>	0.15 <0.14>	0.28 <0.25>	0.14 <0.17>	0.25 <0.16>	0.07 <0.06>
U.S.A.	0.26 <0.20>	0.83 <0.79>	90.56 <90.66>	0.17 <0.09>	0.15 <0.13>	0.05 <0.03>	0.08 <0.05>	0.06 <0.06>	0.11 <0.06>	0.04 <0.04>
China	0.57 <0.02>	3.56 <2.66>	2.95 <1.73>	80.08 <84.11>	0.19 <0.02>	0.15 <0.13>	0.19 <0.23>	0.16 <0.17>	0.13 <0.10>	0.07 <0.04>
Taiwan	0.39 <0.38>	2.91 <3.37>	5.45 <8.92>	1.17 <0.69>	68.57 <68.15>	0.36 <0.31>	0.51 <0.53>	0.30 <0.33>	0.56 <0.43>	0.28 <0.25>
Indonesia	0.92 <1.00>	4.90 <9.07>	2.56 <2.85>	0.65 <0.54>	0.49 <0.45>	80.20 <76.82>	0.19 <0.15>	0.44 <0.29>	0.24 <0.17>	0.18 <0.12>
Thailand	0.29 <0.30>	3.46 <3.07>	4.18 <4.05>	0.67 <0.27>	0.40 <0.26>	0.30 <0.13>	71.27 <75.90>	0.56 <0.40>	0.51 <0.39>	0.16 <0.11>
Singapore	0.77 <0.65>	3.30 <3.00>	8.62 <10.66>	1.23 <0.66>	0.81 <0.76>	0.94 <0.87>	1.15 <1.24>	42.47 <43.56>	2.60 <2.66>	0.39 <0.42>
Malaysia	1.64 <2.01>	7.84 <9.80>	11.79 <8.00>	1.75 <1.28>	1.20 <0.91>	0.64 <0.55>	1.72 <1.92>	2.15 <2.70>	41.99 <51.37>	0.56 <0.44>
Philippines	0.43 <0.33>	2.78 <3.14>	6.38 <5.04>	0.22 <0.14>	0.32 <0.19>	0.09 <0.07>	0.21 <0.13>	0.15 <0.13>	0.32 <0.20>	76.59 <80.52>

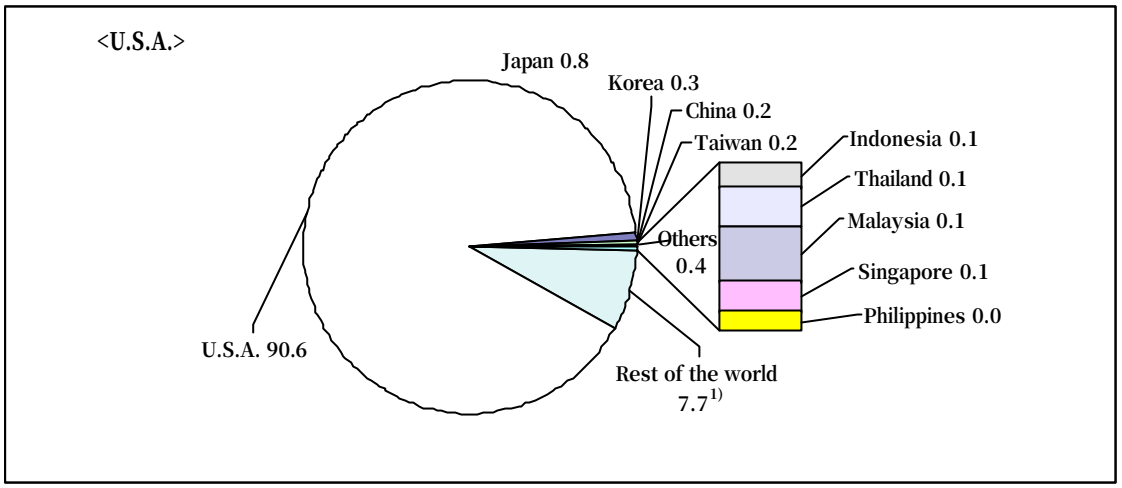
Note: If other countries are included, row total will become 100.0. Figures in brackets refer to those in 1990.

Figure 7 Contribution of Value Added Inducement by Country(1995)

unit : %



Note : 1) Hongkong 1.7, U.K. 0.4, France 0.2, Germany 0.7 etc.



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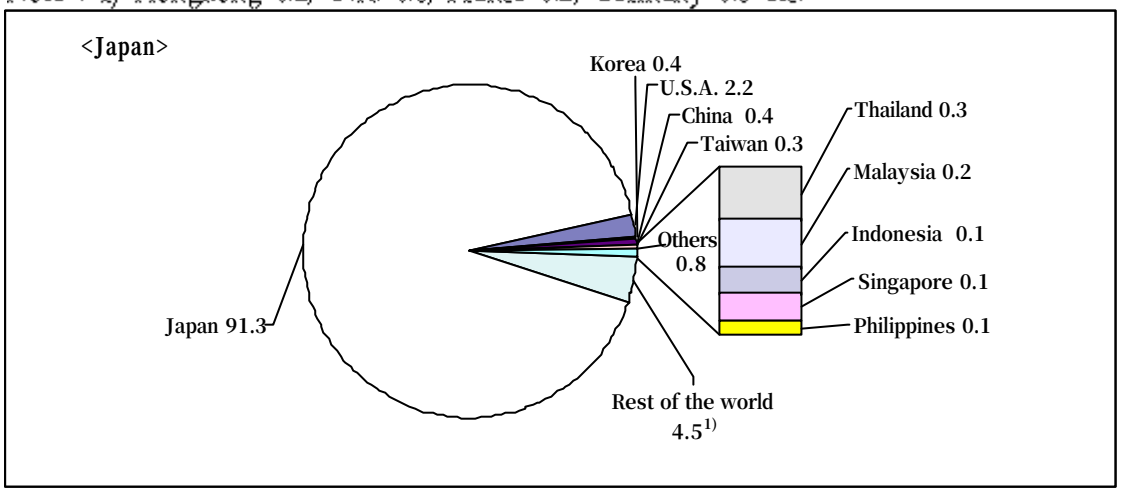
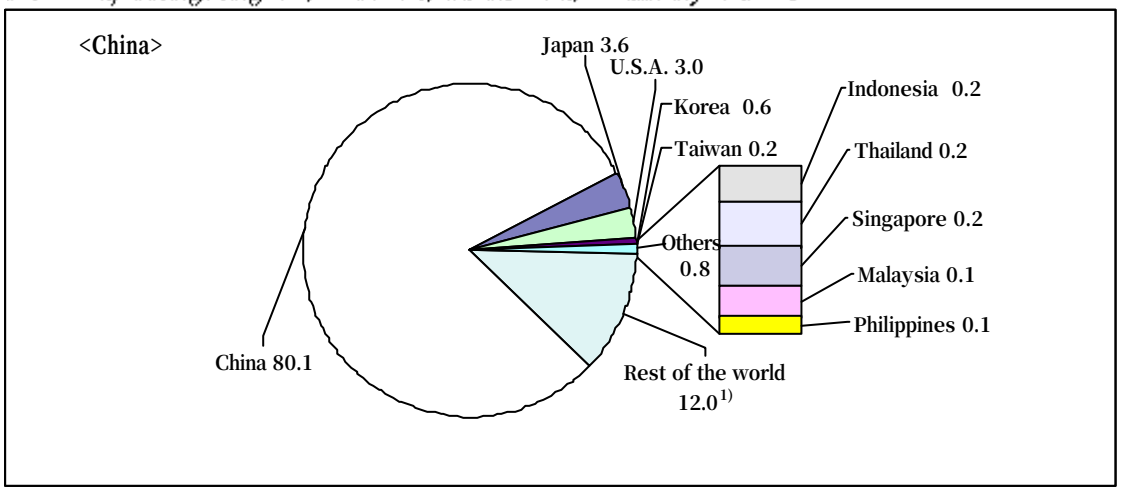


Note : 1) Hongkong 0.6, U.K. 0.3, France 0.1, Germany 0.4 etc.



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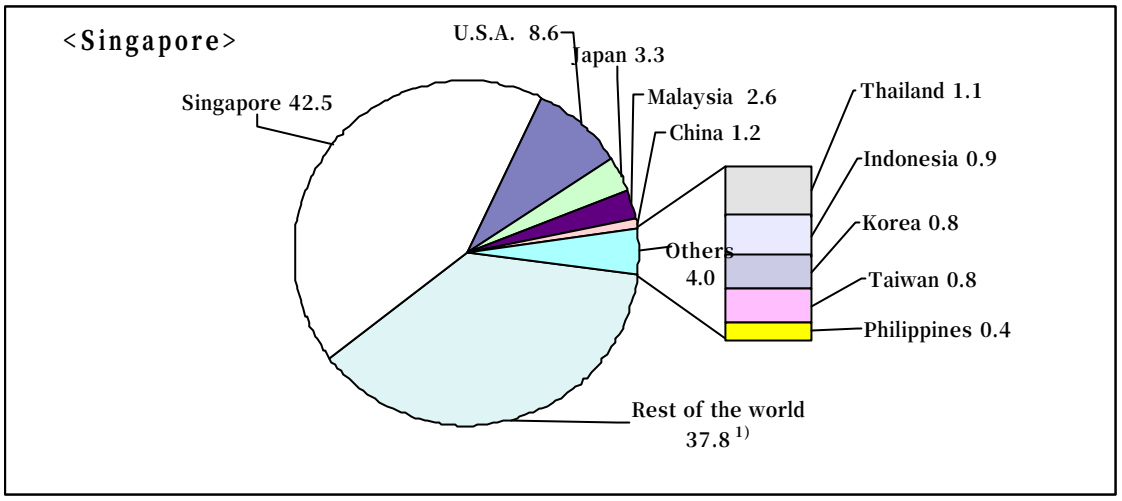

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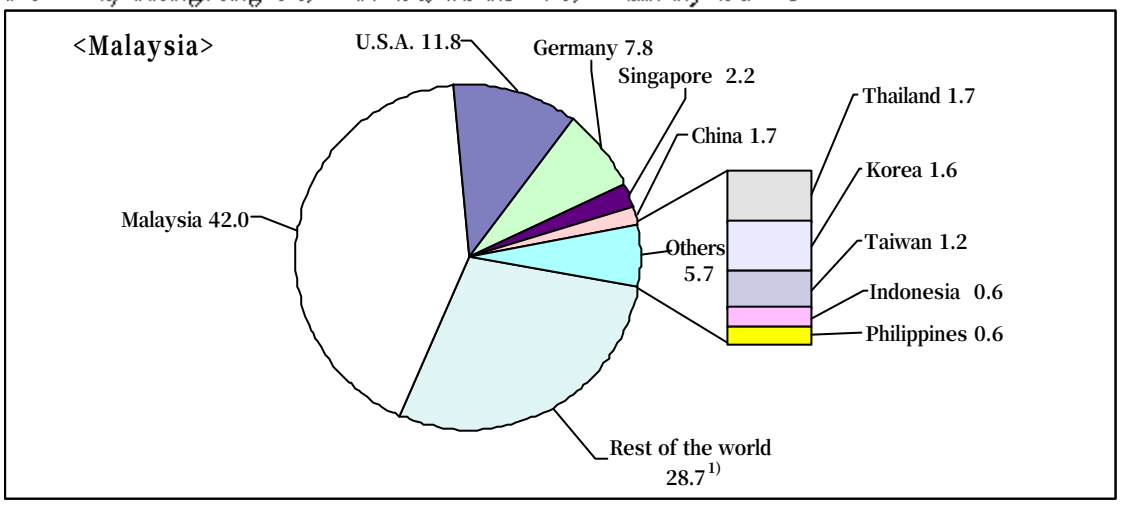

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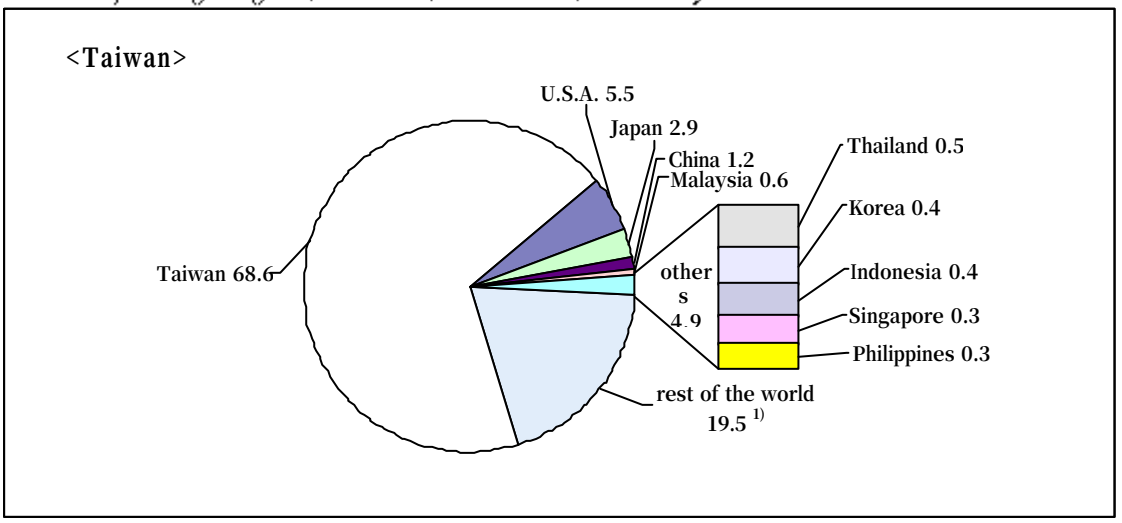
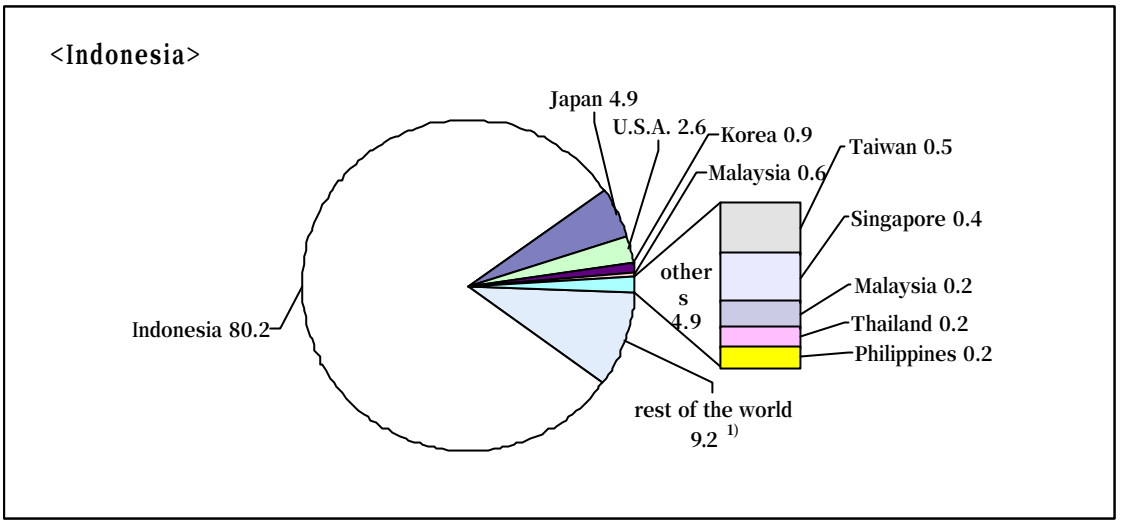


Note: 1) Hongkong 6.3, U.K. 0.6, France 0.3, Germany 1.0 etc.



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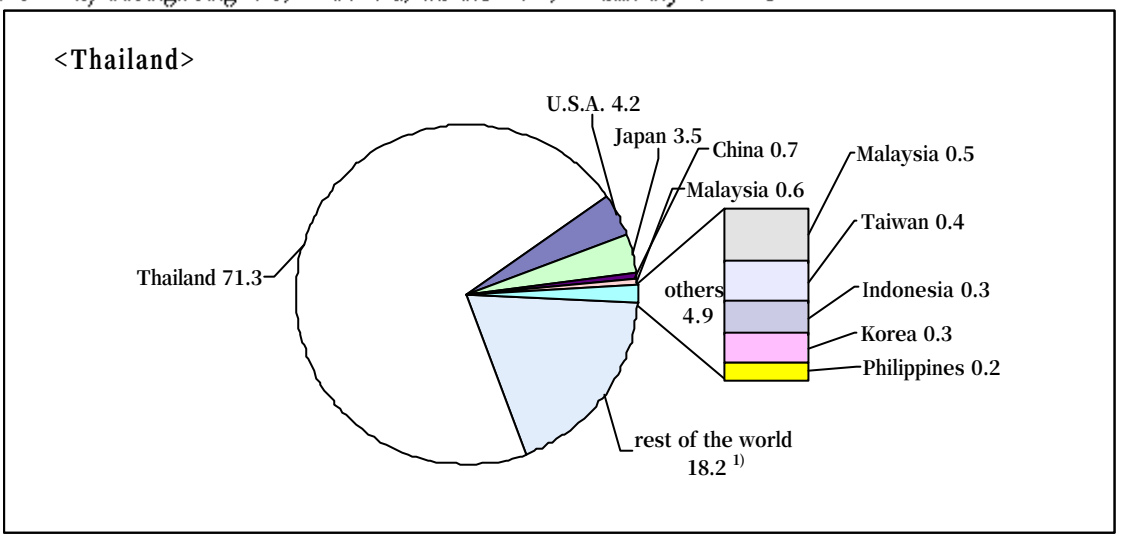

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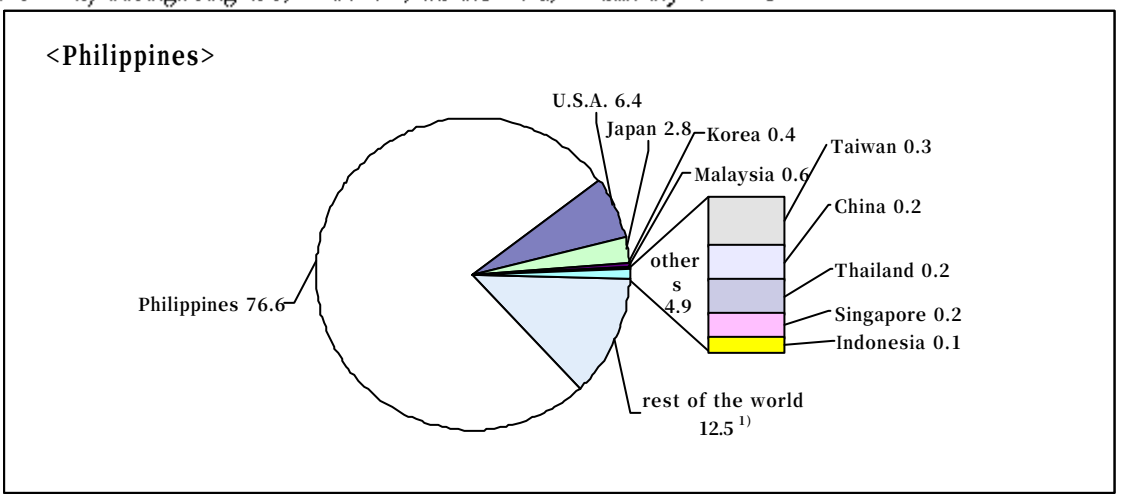


Note: 1) Hongkong 1.1, U.K. 0.7, France 0.2, Germany 0.6 etc.

4. Import Inducement Effects

A. Import Inducement Coefficients

The import inducement coefficients of Table 8 show the imports of intermediate goods induced in each country as one unit of final demand for a product increases in a country. In the case of Korea, the import inducement coefficient caused by its increase in final demand was 0.195, higher than Japan(0.055), the U.S.A.(0.064), China(0.138), and Indonesia(0.114), but lower than Singapore(0.438) and the other countries.

The inducement effects on other countries driven by a one unit increase in final demand in Korea, registered 0.002 in Japan and the U.S.A. in 1995. On the other hand, import inducement coefficients, boosted by a one unit increase in final demand in trade partners of Korea was 0.005 in Singapore and 0.003 in Malaysia.

Table 8 **Import Inducement Coefficients(1995)**

	Korea	Japan	U.S.A.	China	Taiwan	Indonesia	Thailand	Singapore	Malaysia	Philippines
Korea	**0.195** <**0.201**>	0.000 <0.000>	0.000 <0.000>	0.002 <0.000>	0.002 <0.001>	0.001 <0.001>	0.002 <0.001>	0.005 <0.002>	0.003 <0.001>	0.002 <0.002>
Japan	0.002 <0.003>	**0.055** <**0.070**>	0.000 <0.000>	0.001 <0.001>	0.003 <0.004>	0.001 <0.001>	0.003 <0.004>	0.006 <0.007>	0.005 <0.004>	0.002 <0.002>
U.S.A.	0.002 <0.002>	0.001 <0.001>	**0.064** <**0.053**>	0.001 <0.001>	0.002 <0.002>	0.001 <0.000>	0.002 <0.001>	0.004 <0.003>	0.003 <0.001>	0.002 <0.001>
China	0.001 <0.000>	0.000 <0.000>	0.000 <0.000>	**0.138** <**0.101**>	0.001 <0.000>	0.000 <0.000>	0.001 <0.001>	0.002 <0.002>	0.001 <0.001>	0.001 <0.000>
Taiwan	0.001 <0.001>	0.000 <0.000>	0.000 <0.000>	0.001 <0.001>	**0.264** <**0.247**>	0.001 <0.001>	0.003 <0.002>	0.004 <0.004>	0.004 <0.003>	0.004 <0.002>
Indonesia	0.001 <0.001>	0.000 <0.000>	0.000 <0.000>	0.000 <0.000>	0.001 <0.001>	**0.114** <**0.122**>	0.000 <0.000>	0.002 <0.001>	0.001 <0.000>	0.001 <0.000>
Thailand	0.000 <0.000>	0.000 <0.000>	0.000 <0.000>	0.000 <0.000>	0.001 <0.000>	0.000 <0.000>	**0.256** <**0.243**>	0.006 <0.002>	0.002 <0.001>	0.001 <0.000>
Singapore	0.001 <0.001>	0.000 <0.000>	0.001 <0.000>	0.001 <0.001>	0.003 <0.003>	0.002 <0.003>	0.006 <0.009>	**0.438** <**0.494**>	0.014 <0.017>	0.003 <0.004>
Malaysia	0.002 <0.001>	0.001 <0.000>	0.001 <0.000>	0.001 <0.000>	0.003 <0.001>	0.001 <0.001>	0.004 <0.002>	0.016 <0.011>	**0.362** <**0.241**>	0.002 <0.001>
Philippines	0.000 <0.000>	0.000 <0.000>	0.000 <0.000>	0.000 <0.000>	0.000 <0.000>	0.000 <0.000>	0.000 <0.000>	0.001 <0.001>	0.000 <0.000>	**0.220** <**0.196**>

Note: Figures in brackets refer to those in 1990.

B. Dependency of Import Inducement

The dependency of import inducement in Table 9 represents the contribution ratio of import inducement values made by production activities with an increase in final demand in each country.

In Korea, the dependency of import inducement on its own final demand was 46 percent, which means that more than half of Korean imports was induced by other countries. Besides, viewing the contribution ratio in the horizontal direction, Korea's import inducement dependency was large on the U.S.A.(9.7%) and Japan(9.0%). This is mainly because Korea imported intermediate goods for export to the U.S.A. and Japan. Accordingly, it may be said that Korea's imports are more influenced by the U.S.A. and Japan than by any other country.

Table 9 **Dependency of Import Inducement by Country(1995)**

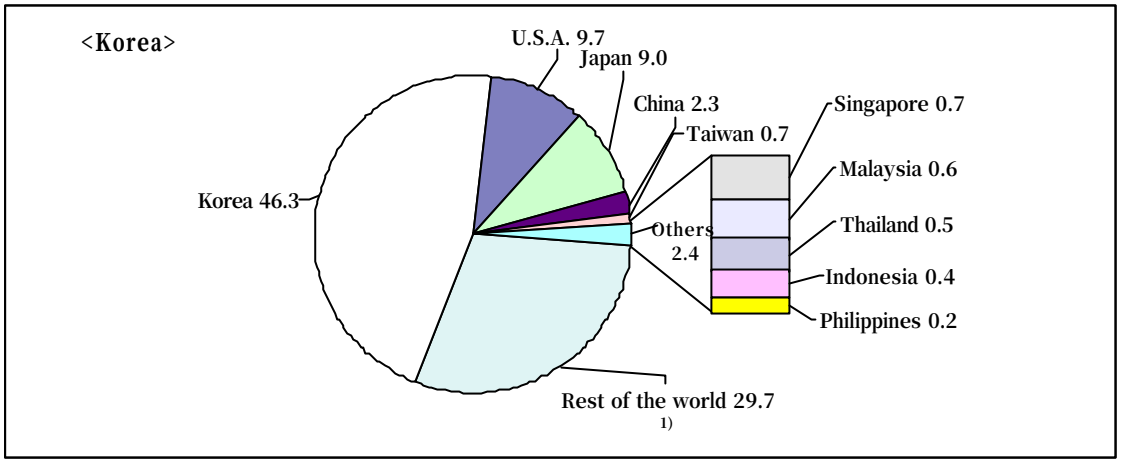
unit: %

	Korea	Japan	U.S.A.	China	Taiwan	Indonesia	Thailand	Singapore	Malaysia	Philippines
Korea	**46.32** <50.47>	9.01 <9.79>	9.67 <11.57>	2.34 <0.24>	0.73 <0.64>	0.41 <0.29>	0.47 <0.36>	0.65 <0.45>	0.58 <0.13>	0.22 <0.21>
Japan	1.72 <1.96>	**57.09** **<61.23>**	8.17 <7.95>	4.36 <1.48>	1.47 <1.25>	0.55 <0.43>	1.16 <0.73>	0.83 <0.44>	0.86 <0.30>	0.33 <0.22>
U.S.A.	1.44 <2.17>	8.14 <9.85>	**46.36** **<42.13>**	1.88 <0.70>	1.39 <2.32>	0.48 <0.23>	0.75 <0.61>	1.02 <0.96>	1.03 <0.44>	0.44 <0.36>
China	1.61 <0.20>	8.86 <6.76>	5.95 <5.33>	**52.43** **<53.06>**	1.24 <1.07>	0.19 <0.11>	0.45 <0.25>	0.52 <0.42>	0.43 <0.15>	0.08 <0.05>
Taiwan	1.37 <0.98>	10.68 <10.14>	11.99 <15.70>	1.73 <0.95>	**34.05** **<37.25>**	0.60 <0.41>	1.17 <0.90>	0.90 <0.79>	1.22 <0.77>	0.49 <0.36>
Indonesia	1.67 <1.22>	8.86 <11.17>	5.48 <4.61>	1.23 <0.97>	1.53 <1.22>	**39.27** **<43.10>**	0.86 <0.37>	1.65 <1.43>	0.77 <0.35>	0.25 <0.13>
Thailand	1.00 <0.82>	11.07 <11.96>	8.08 <7.45>	0.98 <0.71>	1.44 <1.69>	0.33 <0.12>	**35.36** **<45.63>**	1.48 <1.09>	1.16 <0.61>	0.15 <0.12>
Singapore	2.02 <1.76>	8.97 <12.01>	16.30 <17.81>	2.47 <2.00>	1.76 <2.34>	2.07 <1.81>	2.83 <3.36>	**19.92** **<18.41>**	5.55 <6.35>	0.52 <0.57>
Malaysia	2.23 <1.86>	13.51 <14.76>	17.12 <17.30>	1.49 <1.18>	2.52 <3.30>	0.69 <0.55>	1.81 <1.82>	5.77 <8.91>	**19.69** **<19.60>**	0.60 <0.50>
Philippines	1.19 <0.84>	9.18 <7.30>	12.38 <14.16>	0.93 <0.48>	2.17 <2.02>	0.70 <0.35>	1.07 <0.55>	1.02 <0.76>	1.53 <0.36>	**37.27** **<44.58>**

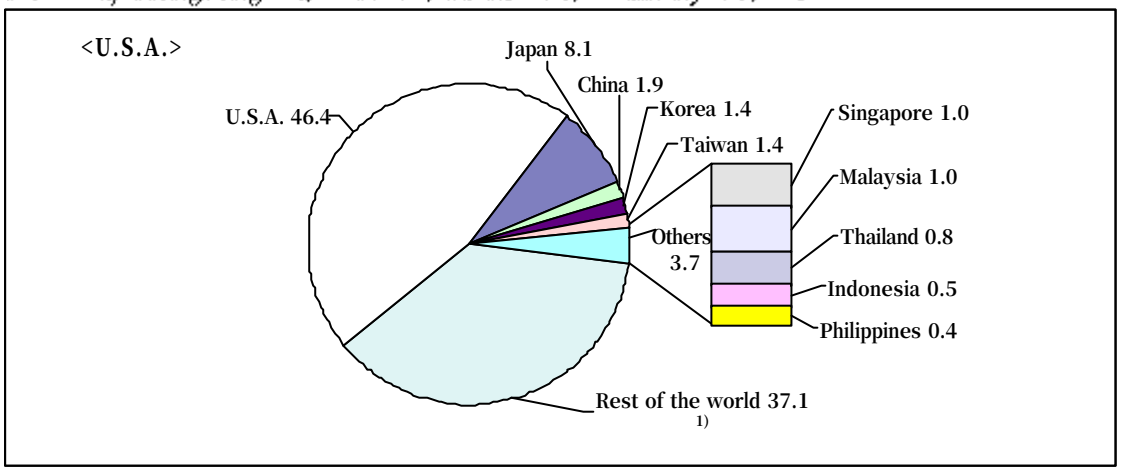
Note: If other countries are included, the row total will become 100.0. Figures in brackets refer to those in 1990.

Figure 8 Contribution of Import Inducement by Country(1995)

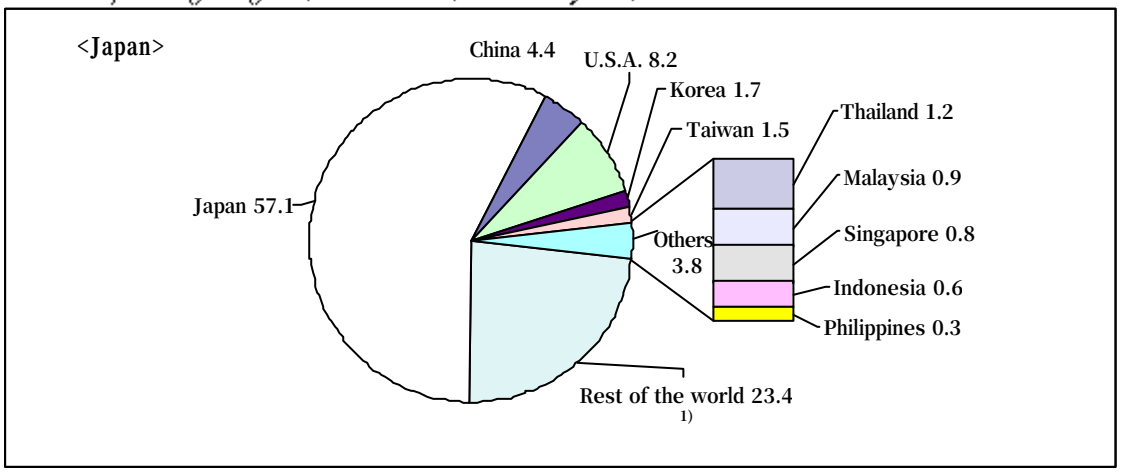
unit : %



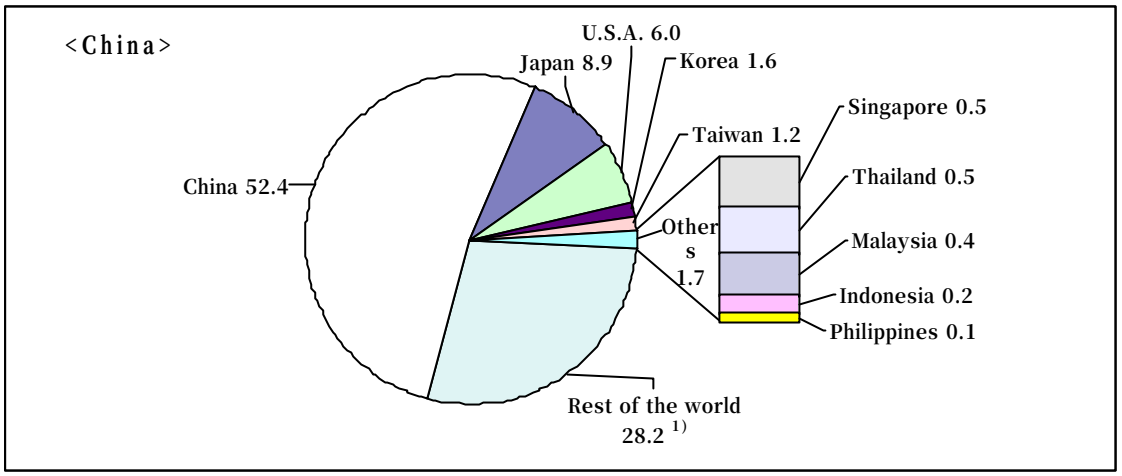
Note : 1) Hongkong 2.4, U.K. 0.6, France 0.3, Germany 0.9, etc.



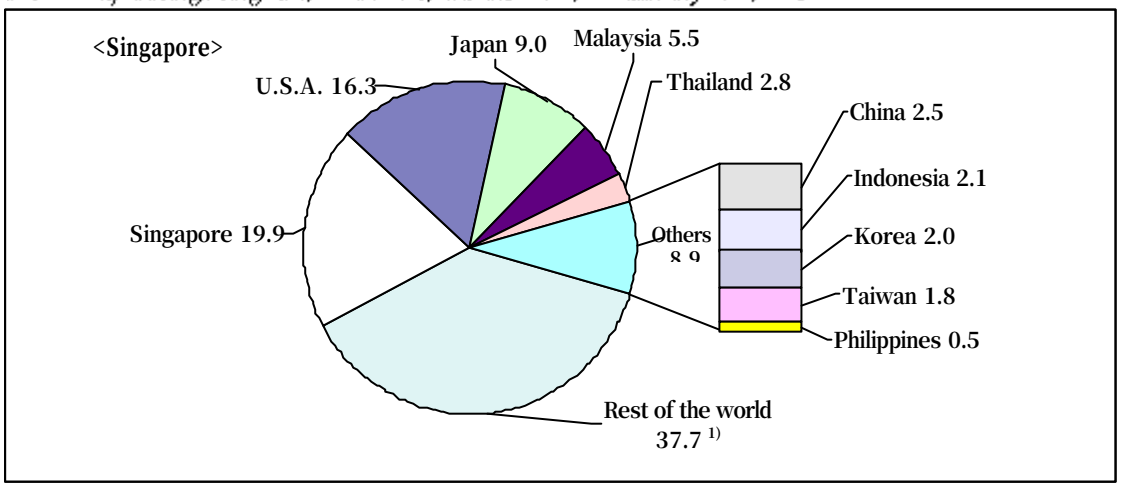
Note : 1) Hongkong 0.3, France 0.2, Germany 0.3, etc.



Note : 1) Hongkong 0.7, U.K. 0.3, France 0.1, Germany 0.4, etc.



Note : 1) Hongkong 4.0, U.K. 0.3, France 0.2, Germany 0.7, etc.



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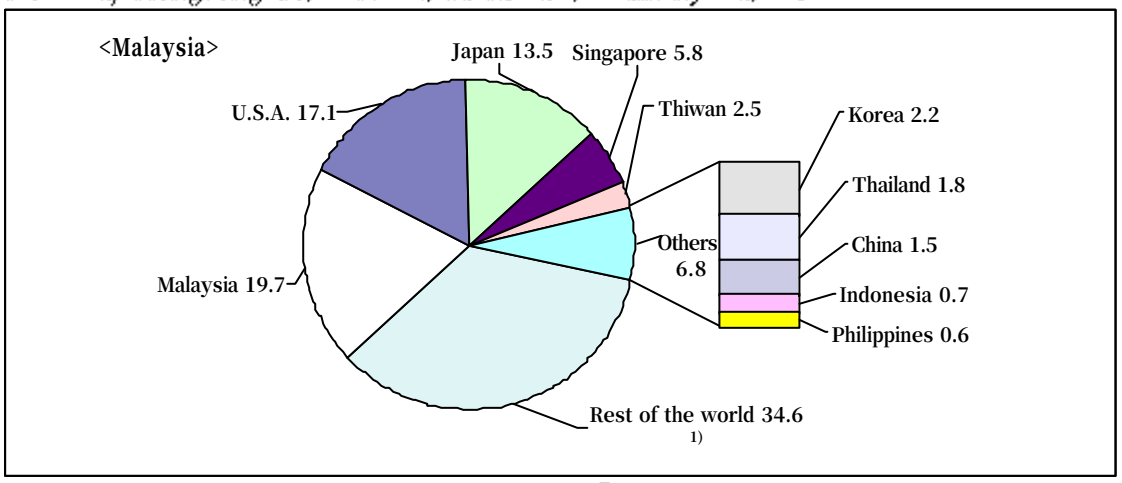

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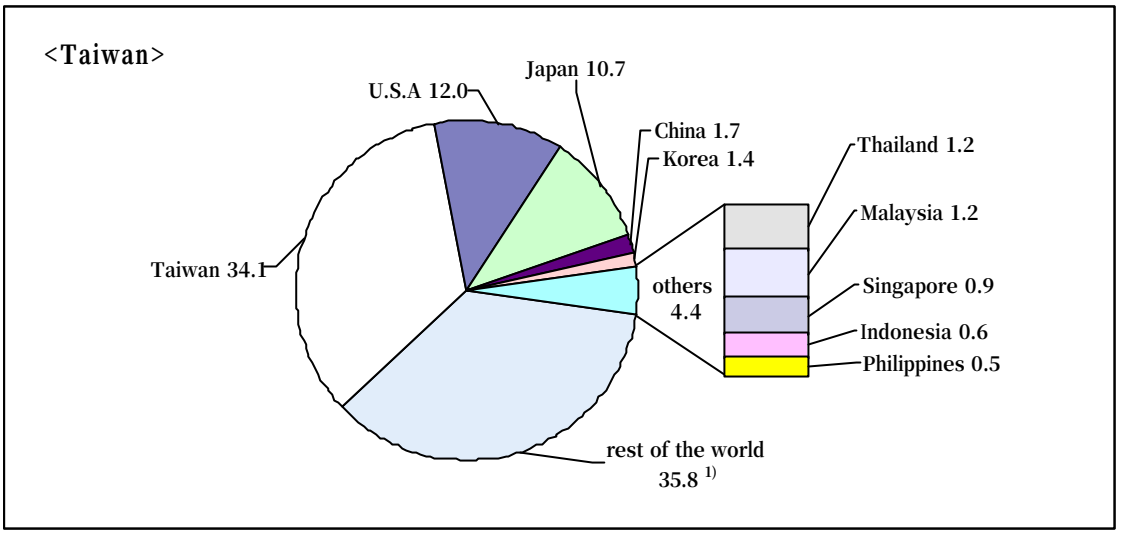

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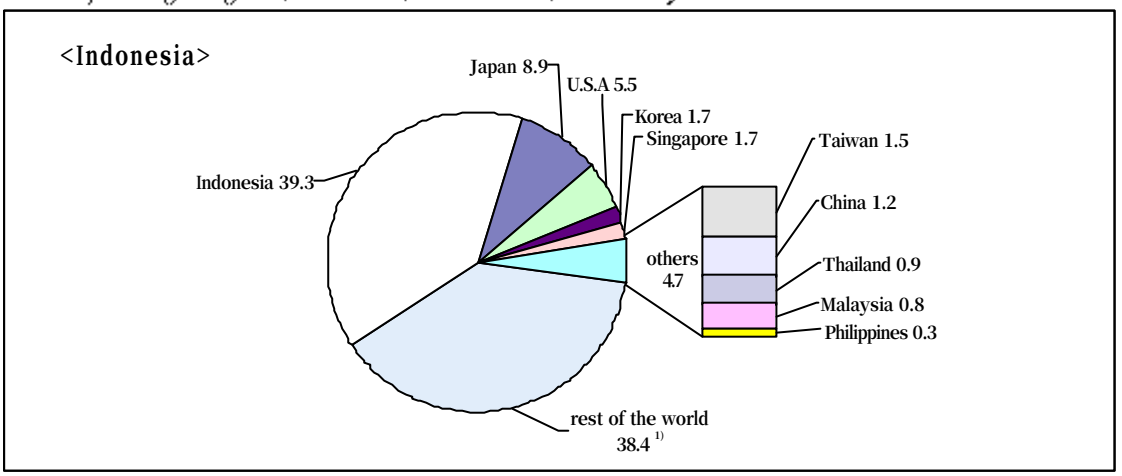

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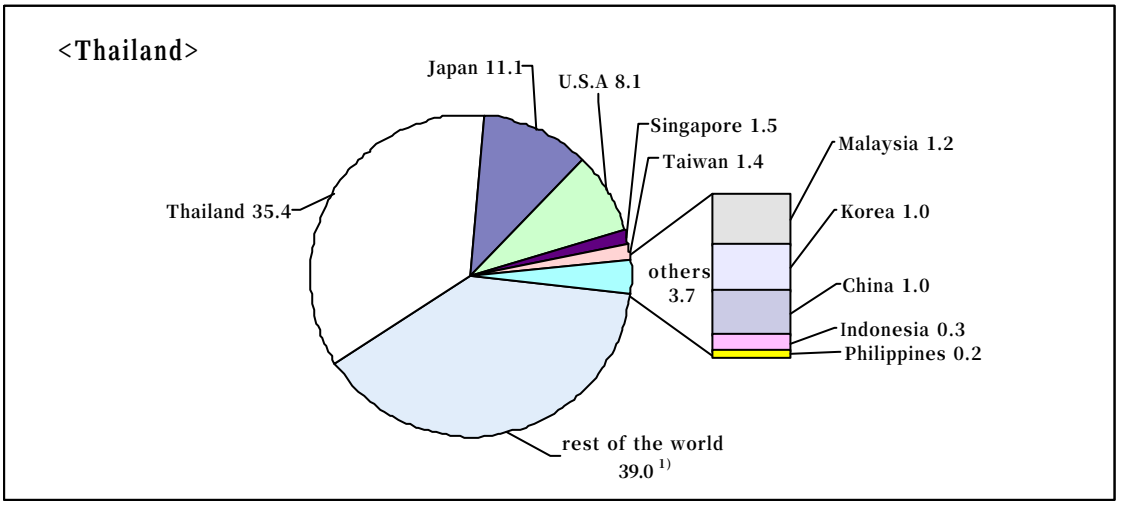

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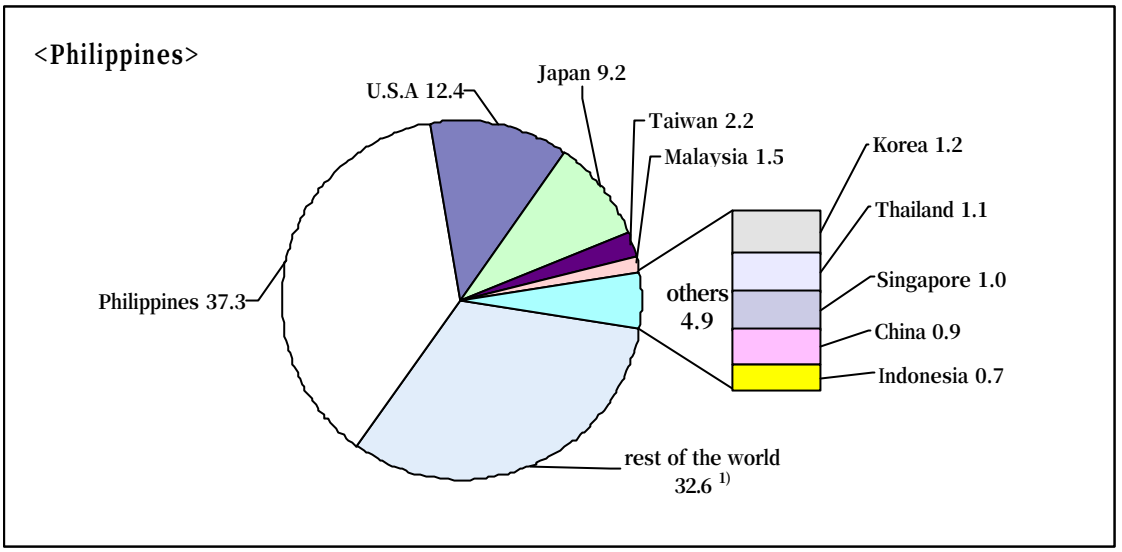

Note: 1) Hongkong 1.4, U.K. 1.1, France 0.3, Germany 0.9 etc.

Ⅳ. Conclusions

This paper set out to analyze the industrial interdependency of the countries in the Asian Pacific region, by using the International Input-Output Table. Major findings[9] are as follows:

First, the Korean's external dependency is higher than that of the U.S.A. and Japan, thus leaving it vulnerable to the changes in the overseas environment.

Second, analysis of production inducement effects of countries in the Asian Pacific region shows that Korea's interdependency with China, Taiwan and five South East Asian countries has grown much more than that with the U.S.A. and Japan because of the rapid growth of Korea's heavy industry, including the nation's basic materials industry and assembly and processing industry. This implies that Korea has been evolving a one of the most important suppliers of intermediate and final goods and services necessary for the industrialization of many other Asian countries, expecially China.

Third, Korea's production inducement is found to be the most affected by an increase in final demand in the U.S.A., followed by that in Japan. This is due to the large volume of trade with those two countries despite their small inducement coefficients per unit of final demand.

Finally, the study finds that China has the largest power of dispersion index representing backward linkage effects, while Japan shows the largest degree of sensitivity showing forward linkage effects. This means that China functions as the most important market for

9) **Empirical Results (1985~1995)**

	Induced > Inducing	Induced < Inducing
Output multiplier	Japan, U.S.A.	8 countries
Value added multiplier	Japan, U.S.A.	8 countries
Import multiplier	8 countries *	Japan, U.S.A.

* : China, Taiwan, Indonesia, Thailand, Singapore, Malaysia, Korea, the Philippines

Korea in the Asian Pacific region while Japan is the most influenced by the other economies in the region.

To sum up the implications, Korea should nurture the basic materials and parts industry and advanced industry in order to reduce its dependency on the U.S.A. and Japan on a long-term basis. It should also establish an independent industrial structure through continuous efforts to diversify its trade partners and expand domestic demand. Therefore, it is critical to strengthen its economic fundamentals to the level of advanced countries by increasing productivity.

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<Appendix> The Classification of Sectors

Agriculture, forestry, and fisheries	Crops, Livestock breeding, Forestry products, Fishery products
Mining and quarrying	Coal mining, Crude petroleum and natural gas, Metal ores, Nonmetallic minerals
Manufacturing	
Consumer Goods	
Food, beverages and tobacco	Food, beverages and tobacco
Textile and leather products	Fiber yarn and fabrics, Wearing apparels and apparel accessories, Leather and fur products
Wood and paper products	Wood and wooden products, Pulp and paper
Printing, publishing	Printing, publishing and reproduction of recorded media
Furniture and other manufacturing products	Furniture, Toys and sporting goods, Other manufacturing products
Basic Material Manufacturing	
Petroleum and coal products	Coal products, Petroleum refinery products
Chemicals and allied products	Organic and inorganic basic chemical products, Synthetic resins and rubber, Chemical fibers, Fertilizers and agricultural chemicals, Plastic and rubber products
Nonmetallic mineral products	Glass products, Pottery and clay products, Cement and concrete products
Primary metal products	Pig iron and crude steel, Primary iron and steel products, Nonferrous metal ingots and primary nonferrous metal products
Assembly and Processing	
Fabricated metal products	Metal products for construction, Metal containers, Handtools and wire products
General machinery and equipment	Conveying equipment, Cooling and heating machinery, Metalworking machinery, Agricultural and construction machinery

Electronic and other electric equipment	Electronic machinery, components and accessories, Communications equipment, Computer and office equipment
Precision instruments	Medical, optical, measuring, analyzing and controlling instruments, Watches
Transportation equipment	Motor vehicles and parts, Ship building and repairing
Electric, gas, and water services	Electric services, Gas and water supply
Construction	Building construction and repair, Civil Engineering
Services	
Wholesale and retail trade	Wholesale and retail trade
Eating, drinking and lodging	Eating and drinking places, and hotels and other lodging places
Transportation and warehousing	Railroad, road, water, and air transportation, Warehousing and storage
Communications and broadcasting	Postal services, Telegraph and telephone, Value added communication, Broadcasting
Finance and insurance	Finance and insurance
Real estate and business services	Real estate agencies and rental, Business services
Public administration and defense	Public government, Local government
Educational and health service	Educational and research services, Medical and health services, and social security
Social and other services	Cultural and recreational services