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The structure of international division of labor in the Asia-Pacific region

——An empirical study using IDE international IO tables——

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Abstract

In the modern economy, occasionally, a commodity passes through several countries while in the processing stage. This reflects the progress of the international division of labor; it also indicates that value-added will be generated in the region that participates in the division of labor corresponding to the production stage. However, recently, the structure appears to have changed considerably in accordance with a change in the international environment including the rapid growth of China.

It is necessary to simultaneously examine the domestic economy and international trade by industry simultaneously in order to obtain a bird's-eye view of the structure of international division of labor. However, initially, there existed no such statistics that provided information for both aspects on a common standard basis. In this situation, the Institute of Developing Economies (IDE) initiated the compilation of the international input-output (IO) tables in the Asia-Pacific region in 1975; since then it has published three such IO tables-1985, 1990, and 1995-that include China as an endogenous country. Last year, Bank of Japan (BOJ) estimated an extended table for the year 2000 since it has an interest in the recent trade trend in the Asia-Pacific region. Utilizing this opportunity, we attempted to review the historical change in the division of labor in this region.

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It is confirmed that Japan and the United States, which were hitherto known as comparatively autarky economies, have maintained the same trend. On the other hand, the "value-added acquisition rate" in the home country (home production rate) tended to decrease in most of the East Asian nations. Moreover, it is surprising to note that they have strengthened their dependence on the Rest of the World (ROW) rather than intradependency in the East Asian region. In brief, the income leakage of East Asia beyond the border has been increasing. In the current situation, it appears slightly premature to regard the East Asian region as an independent economic bloc.

Key Words: International division of labor, Asia-Pacific region,
International input-output table, Value-added acquisition rate,
Home production rate
JEL Classification: C67, F14, F15

1 Introduction

The ASEAN summit was held in Vientiane in November 2004 where the "Vientiane action plan" was adopted. This plan declared that ASEAN aims for further unity and seeks to abolish import duty on all products by 2015. At the ASEAN+3 conference with Japan, China, and South Korea, which was held at the same time, it was decided that the "East Asian summit" would be held in 2005 in Kuala Lumpur in order to fulfill the aim of the foundation of the "East Asia Economic Community." It was also disclosed that China and ASEAN would begin the Free Trade Agreement (FTA) negotiations. It appears that such an effort will contribute to the strengthening of the sense of unity in East Asia.(1)

For Japan, the East Asian region is rather important both as parts suppliers and product markets. Although a commodity is labeled "Made in Japan," it is ex-

(1) Recently, the Japanese government has begun researches on not only FTA but also Economic Partnership Agreement (EPA). See websites of METI or JETRO,
http://www.meti.go.jp/policy/trade_policy/index.html or
http://www.jetro.go.jp/biz/wto_fta/
http://www.jetro.go.jp/biz/world/international/

tremely rare to find the entire production process being completed in Japan. Taking the examples of computers and household appliances, it often happens that a semi-finished product is manufactured in ASEAN and some of its parts are manufactured in China. Thus, in the modern economy, occasionally, a commodity passes through several countries while in the processing stage. This reflects the progress of international division of labor; it also indicates that value-added will be generated in the region that participates in the division of labor corresponding to the role.

It is necessary to simultaneously examine the domestic economy and international trade by industry in order to obtain a bird's-eye view of the structure of international division of labor. However, initially there existed no such statistics that provided information for both aspects on a common standard basis. In this situation, the Institute of Developing Economies (IDE) initiated the compilation of the international input-output (IO) tables in the Asia Pacific region in 1975; since then it has published three such IO tables—1985, 1990, and 1995—that include China as an endogenous country. Further, last year, Bank of Japan (BOJ) estimated an extended table for the year 2000 since it is interested in the recent trade trend in the Asia-Pacific region. Utilizing this opportunity, we attempted to review the historical change in the division of labor in this region.

As will be seen later, we confirmed that Japan and the United States, which were hitherto known as comparatively autarky economies, have maintained the same trend. The "value-added acquisition rate" in the United States is almost flat but on a slightly declining trend-from 96.3% in 1985 to 95.1% in 2000; and in Japan too it is almost flat but on a slightly upward trend-from 94.0% in 1985 to 96.2 % in 2000. On the other hand, the value-added acquisition rate in the home country tends to decrease in most of the East Asian nations. Malaysia has

the most striking value-added acquisition rate that declined from 86% in 1985 to 80% in 2000. The value-added acquisition rates in China, the Philippines, and Thailand declined from approximately 95% in 1985 to approximately 85% in 2000. Moreover, it is surprising to note that they have become more dependent on the Rest of the World (ROW) rather than becoming mutually intradependent in the East Asian region. In brief, the income leakage of East Asia beyond the border has been increasing. In the current situation, it appears slightly premature to regard the East Asian region as an independent economic bloc.

2 Overview of Growth and Trade in the Asia-Pacific Region

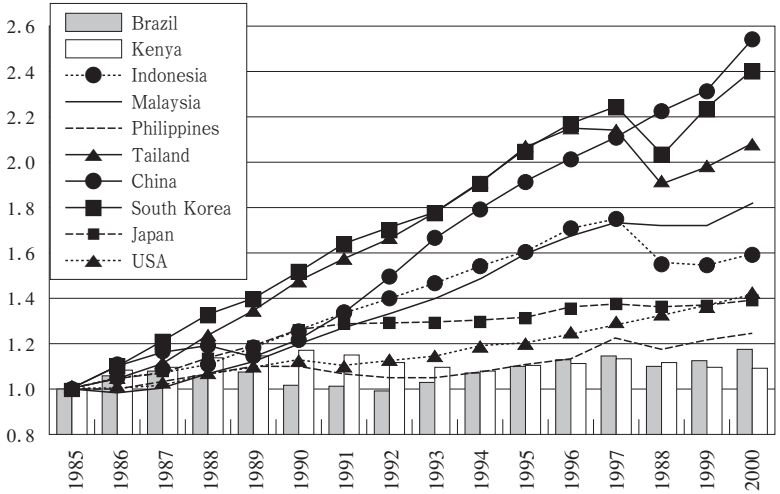
2-1 Per capita GDP

The Asia-Pacific region considered in this paper comprises the following 10 countries/regions: Japan, the United States, China, NIEs (South Korea, Taiwan, and Singapore), ASEAN (the Philippines, Malaysia, Thailand, and Indonesia). Before examining the international division of labor in this region, let us present an overview of the economic performance in each country.

The line charts in **Figure 1** show the indices of per capita GDP in the Asia-Pacific region with 1985 as the base year; we added two bar charts of Brazil in South America and Kenya in Africa as reference cases to the figure.(2) Comparing the values during the years 1985 to 2000, China and Korea recorded the highest growth, 2.5 times and 2.4 times, respectively. Although we could not include it in the chart due to the lack of the latest data, the per capita GDP of Taiwan also increased as rapidly as that of Korea until 1997. With regard to the growth pattern in the time series, Korea and Taiwan have maintained a relatively constant

(2) Source: Penn-World Table (http://pwt.econ.upenn.edu/php_site/pwt61_form.php)

Figure 1　Index of GDP per capita (Constant Prices)

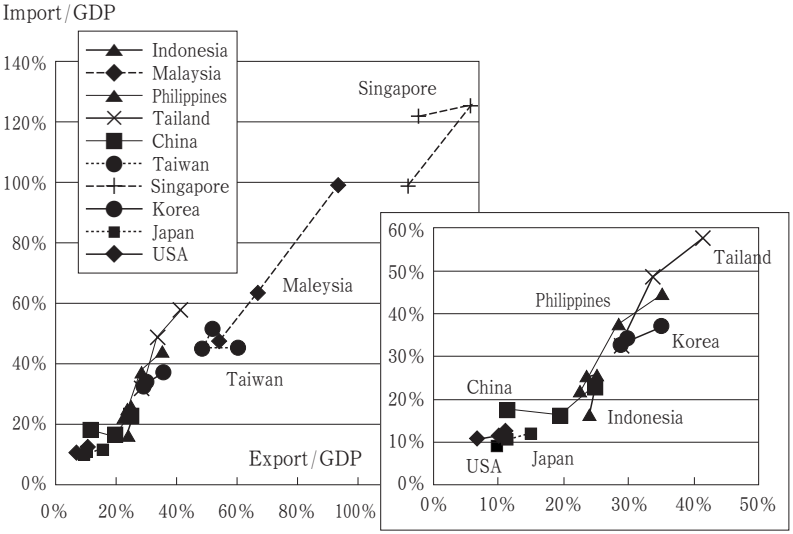


Source of Data: Penn-World Table

growth since the 1980s whereas rapid growth began in China in the 1990s. Most ASEAN countries have had a smooth increase in their per capita GDP, although not as much as Korea, Taiwan, and China. For example, the per capita GDP of Thailand, Malaysia, and Indonesia became 2.1, 1.8, and 1.6 times, respectively, during the period from 1985 to 2000. However, in 1997 and 1998, at the onset of the Asia Currency Crisis, the economies of numerous ASEAN countries—in particular, Korea, Thailand, and Indonesia—were gravely impacted.

Despite the smooth growth of most of these Asian countries, the Philippines did not gain as much in terms of growth as compared with other countries. The per capita GDP of the Philippines increased merely 1.2 times during the same 15-year period. Since even industrialized countries such as the United States and Japan recorded a growth of 1.4-times, it may be justifiable to have a pessimistic view regarding the Philippine economy. However, the situations in Brazil and

Figure 2　Ratio of import and export to GDP



Source of Data: IDE, *Asian International Input-Output Table* for each year

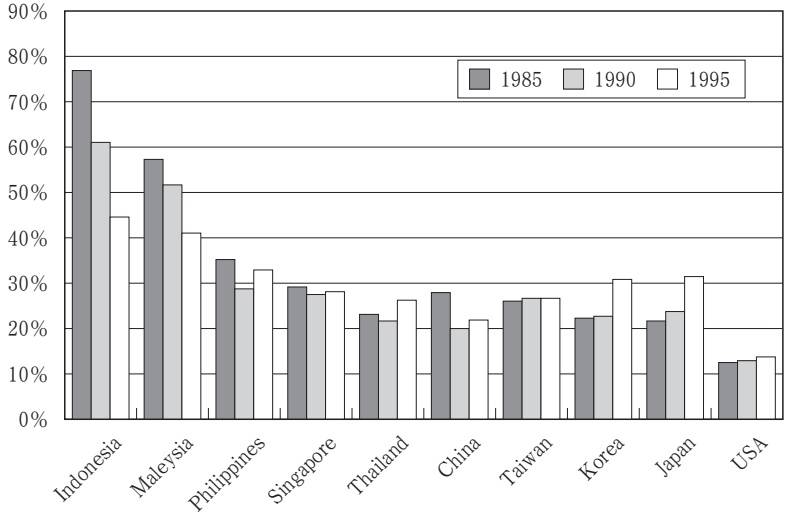
Kenya provide us with another viewpoint. The economic growth in the Philippines was indeed the lowest in the Asia-Pacific region; however, surprisingly, the growths in Brazil and Kenya were even worse than that of the Philippines. This fact also reveals how rapidly the Asia-Pacific region has grown since the 1980s.

2-2 Trend of Import and Export

In this section, we will examine the trade trend.[(3)] **Figure 2** is a scatter diagram

(3) The data provided in this section is based on the Asian International Input-Output Tables compiled by IDE. GDP is the total value-added. Intermediate export implies the off-diagonal row sum, and intermediate import implies the off-diagonal column sum. The same manipulation was performed for the final goods.

Figure 3　Share of intermediate goods in export



Source of Data: IDE, *Asian International Input-Output Table* for each year

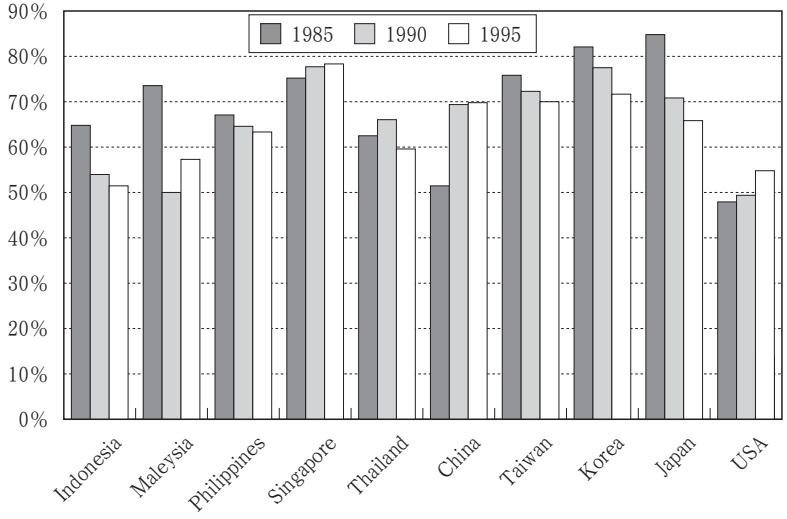
showing the relationship between the shares of export and import in the GDP. Most of the samples are located around the forty-five degrees line. This proportional relationship between the two variables shows that economic growth in the East Asian region has been closely related with trade. However, the ratios of trade to GDP are different between developed countries (Japan and the United States) and the others. Singapore has the highest ratio, followed by Malaysia and Taiwan in the second and third places, respectively. Thailand, the Philippines, and Korea appear at positions thereafter. With regard to the time-series change, the ratio displays an increasing trend in most of the Asian countries, particularly in Malaysia. On the other hand, in Japan and the United States, the trade ratios in the GDP are approximately 20%, which is not only substantially smaller than that in the other Asian countries but also more stable.

Next, let us review the composition of export and import. **Figure 3** shows the

share of intermediate goods in export. Examining the share of each country, we find that it is prominently high in Indonesia and Malaysia, which reflects the fact that both countries are oil producers. However, the share of intermediate goods for these countries has declined because of the recent diversification of export commodities. For other East Asian countries, except Japan and Korea, the share of intermediate goods has been relatively stable over time. In contrast with these countries, the share of intermediate goods for Japan and Korea has clearly increased by 10 points from approximately 20% in 1985 to 30% in 1995. It appears that such a change has been caused by the enlargement of the demand for parts and semi-finished products from East Asian countries in accordance with the recent increasing trend in foreign direct investment in these countries. In our view, these movements are regarded as the development of international division of labor.

Figure 4 shows the share of intermediate goods in import. The country with the lowest share in 1985 is the United States (47.8%), which is abundant in natural resources. In the same period, Japan and Korea have the highest share of intermediate goods in import, that is, 85% and 81%, respectively. This is because the trade patterns of both countries were termed as "processing trade," which implies the export of finished products while importing primary goods such as natural resources. However, the share of intermediate goods for the two countries has declined, particularly for Japan—it fell by approximately 20%, from 84.6% in 1985 to 65.7% in 1995. Here, we can also confirm that the trade patterns have changed due to the increase in foreign direct investment and so on.

Figure 4　Share of intermediate goods in import



Source of Data: IDE, *Asian International Input-Output Table* for each year

3 Model

3-1 Total value-added coefficient and total import coefficient

This paper aims to understand how the structure of international division of labor has changed in the Asia-Pacific region. We regard international division of labor as the "distribution of the value-added among countries." In other words, if we define the "international division of labor rate," we believe that the most suitable explanation would be given by the share of each country in the value-added acquisition that is contained in the final products. Therefore, in this paper, the international division of labor rate implies the value-added acquisition rate of each country. This idea is originally derived from the concepts of "total value-added coefficient" and "total import coefficient," which are usually used in the IO analysis. Thus, at first, let us explain these two coefficients.

The total value-added coefficient is the ultimate amount of value-added in one unit of final demand, and the total import coefficient is the ultimate amount of import in one unit of final demand. The following two supply-demand balance equations hold for both domestic and imported goods, respectively, in the IO tables of noncompetitive import type.

$$\mathbf{x}=\mathbf{A}^{\mathrm{D}}\mathbf{x}+\mathbf{f}^{\mathrm{d}} \qquad (1)$$

$$\mathbf{m}=\mathbf{A}^{\mathrm{m}}\mathbf{x}+\mathbf{f}^{\mathrm{m}} \qquad (2)$$

In the above equations, $\mathbf{x}$ and $\mathbf{m}$ are vectors of domestic outputs and imports, respectively; $\mathbf{A}^{\mathrm{d}}$ and $\mathbf{A}^{\mathrm{m}}$ are matrices of domestic input coefficient and import input coefficient, respectively; and $\mathbf{f}^{\mathrm{d}}$ and $\mathbf{f}^{\mathrm{m}}$ are vectors of final demands for domestic goods and imported goods, respectively. Solving equation (1) with domestic output x gives the following equilibrium output determination equation:

$$\mathbf{x}=(\mathbf{I}-\mathbf{A}^{\mathrm{d}})^{-1}\mathbf{f}^{\mathrm{d}} \qquad (3)$$

The inverse matrix in the right side of equation (3) is termed as Leontief's inverse matrix, and the j-th column of the matrix shows how much the production of each industry is ultimately induced when the final demand for the j-th industry increases by one unit. Therefore, pre-multiplying Leontief's inverse matrix by the value-added ratio vector, we obtain the amount of the value-added generated directly and indirectly in one unit of final demand for each industry.

$$\mathbf{t}^{\mathrm{d}}=\mathbf{v}(\mathbf{I}-\mathbf{A}^{\mathrm{d}})^{-1}$$

Equation (4) can be rewritten as equation (5) using a diagonal matrix with value-added ratio and an aggregation row vector, $\boldsymbol{\iota}$, whose elements are all one. This is termed as the total value-added coefficient.

$$\mathbf{t}^{\mathrm{d}}=[1\ \cdots\ 1]\begin{bmatrix} v_1 & & 0 \\ & \ddots & \\ 0 & & v_{\mathrm{n}} \end{bmatrix}(\mathbf{I}-\mathbf{A}^{\mathrm{d}})^{-1}=\boldsymbol{\iota}\hat{\mathbf{v}}(\mathbf{I}-\mathbf{A}^{\mathrm{d}})^{-1} \qquad (5)$$

On the other hand, the amount of imports that are required directly and indirectly by one unit of final demand for each industry can also be obtained by pre-multiplying Leontief's inverse matrix by the import IO coefficient matrix. This is termed as the total import coefficient.

$$\mathbf{t}^{m}=[1 \ \cdots \ 1]\mathbf{A}^{m}(\mathbf{I}-\mathbf{A}^{d})^{-1}=\boldsymbol{\iota}\mathbf{A}^{m}(\mathbf{I}-\mathbf{A}^{d})^{-1} \quad (6)$$

Here, let us confirm whether the sum of the total value-added coefficient and the total import coefficient is equal to one. It is not surprising to find that the sum of domestic input coefficients, import input coefficients, and the value-added ratio in each column is equal to one.

$$\boldsymbol{\iota}(\mathbf{A}^{d}+\mathbf{A}^{m}+\hat{\mathbf{v}})=\boldsymbol{\iota} \quad (7)$$

We can obtain $\boldsymbol{\iota}(\mathbf{A}^{m}+\hat{\mathbf{v}})=\boldsymbol{\iota}(\mathbf{I}-\mathbf{A}^{d})$ by a slight modification, which then gives us the following equation.

$$\boldsymbol{\iota}(\mathbf{A}^{m}+\hat{\mathbf{v}})(\mathbf{I}-\mathbf{A}^{d})^{-1}=\boldsymbol{\iota} \quad (8)$$

The left side of equation (8) is the same as the sum of equations (5) and (6); therefore, the sum of the total value-added coefficient and total import coefficient is one. This implies that the value of final goods is divided into domestic value-added and import. Furthermore, the former corresponds to the "home production rate" and the latter to the "import rate." We will examine these in the next section.

3-2 The Difference among the Three Types of Home Production Rates

In this section, we confirm that there are three types of home production rates: self-sufficient home production rate, direct technological home production rate, and value-added home production rate.

The term "self-sufficient rate" is often seen in newspapers. Self-sufficient rate (SSR) is the share of the domestic production in total demand. SSR of rice in

Japan, for instance, is almost 100% and that of crude oil is almost 0%. Taking the i-th industry as an example, the total demand in the domestic market is the summation of the domestic production x_i and the import m_i. Then, SSR_i is defined as follows:

$$SSR_i = x_i/(x_i + m_i) \qquad (9)$$

The term "local content ratio" is also used often these days, mainly in the context of arguments pertaining to FTA. Local content ratio (LCR) is the share of domestic input in the total input in a production process. In practice, there are two cases for the calculation of LCR: one is the case in which the total input includes value-added, and the other is the case in which it does not. In the case in which value-added is included, the LCR of the j-th industry, LCR_j, is expressed as follows.

$$LCR_j = \left(\sum_i x_{ij}^d + V_j\right)/x_j \qquad (10)$$

Here, V_j is the value-added of the j-th industry and x_{ij}^d is the domestic goods input from the i-th industry to the j-th industry. This ratio can be termed as "direct technological home production rate" ($DTHPR$) since this reflects technological relations pertaining to the production side where a certain amount of raw material or labor force is required to produce a certain amount of output. Unlike SSR, the $DTHPR$ of rice in Japan, for example, is much lower than 100% since certain amounts of imported raw materials are used to produce rice; the $DTHPR$ of crude oil is much higher than 0% since a certain amount, although very small, of domestic labor forces are used in Japanese crude oil mines.

One problem associated with the LCR is that it focuses only on the "direct" relation between domestic and total inputs. However, domestically produced input cannot be produced without indirectly imported parts or raw materials.

Focusing on this aspect, we can define the "value added home production rate" ($VAHPR$) as the share of ultimate domestic input in the total input. This criterion is explained as follows. Generally, input in a production process is divided into three categories—domestic goods, imported goods, and value-added. However, the production of domestic goods also requires the three types of inputs mentioned above: domestic goods, imported goods, and value-added. Thus, the infinite repetition of this division will ultimately result in a dichotomy of input: ultimate imported input and ultimate value-added. This implies that the "ultimate domestic input" is equivalent to the "ultimate value-added."

Now, let us confirm that $VAHPR$ is equivalent to the total value-added coefficient. As seen in the previous section, the total value-added coefficient of the j-th industry is the amount of value-added generated ultimately by an increase in one unit of the final demand for the j-th industry. Thus, the overall value-added coefficient indicates the ultimate amount of value-added included in one unit of output, which is exactly the same as $VAHPR$. In the following section, we will use the term home production rate to mean value-added home production rate, and define it in terms of equation (5).

3-3 Value-added International Division of Labor Rate

In this section, we define the international division of labor rate, which is an extended version of the total value-added and total import coefficients explained in section 3-1. Although several types of definitions are proposed for the international division of labor rate, in this paper, we adopt the abovementioned "ultimate acquisition rate of value-added." Therefore, we refer to this index as "value-added international division of labor" in order to distinguish it from the other types.

The basic tool for dealing with international division of labor is the international IO tables. Let us consider a table with n sectors and r endogenous areas. Then, the international division of labor rate for endogenous areas is defined as follows:

$$\mathbf{T}=\hat{\mathbf{v}}(\mathbf{I}-\mathbf{A})^{-1} \tag{11}$$

where $\hat{\mathbf{v}}=\begin{bmatrix}\mathbf{v}_1 & & 0\\ & \ddots & \\ 0 & & \mathbf{v}_r\end{bmatrix}$, $\mathbf{v}_k=[v_k^1 \cdots v_k^n]$ $(k=1, \cdots, r)$

$\mathbf{T}$ is $(r\times nr)$ a matrix, and each row shows the division of labor rate for a corresponding country. In international IO tables, an input coefficient matrix $\mathbf{A}$ becomes a large square matrix of $(nr\times nr)$, showing not only domestic intermediate transaction but also international intermediate input/output among endogenous countries. $\hat{\mathbf{v}}$ is a diagonal block matrix of $(r\times nr)$ whose diagonal elements are row vectors of the value-added rate of the corresponding country.

Next, the international division of labor rate for an exogenous area (ROW) is expressed as follows:

$$\mathbf{t}_R=\mathbf{a}_R(\mathbf{I}-\mathbf{A})^{-1} \tag{12}$$

In this equation, $\mathbf{a}_R$ is a $(1\times nr)$ row vector with an input coefficient from ROW. Equation (12) shows the leakage rate of value-added to ROW.

Since the sum of the total value-added and total import coefficients always become one, the column sum of the international division of labor rate defined by equations (11) and (12), always becomes one.

3-4 Total Input International Division of Labor Rate

Hasebe (2002) proposes a different type of index to measure international division of labor. He adopts the following definitions and names for the "total input

international division of labor rate":

$$\text{for endogenous areas: } \mathbf{JA}(\mathbf{I}-\mathbf{A})^{-1} \tag{13}$$

$$\text{for exogenous areas: } \mathbf{a}_R(\mathbf{I}-\mathbf{A})^{-1} \tag{14}$$

Here, $\mathbf{J}$ is a $(r \times nr)$ aggregation matrix defined as $\mathbf{J}=\begin{bmatrix} \iota & & 0 \\ & \ddots & \\ 0 & & \iota \end{bmatrix}$.

With regard to the division of labor rate for exogenous areas, equation (14) is the same as equation (11). With regard to the endogenous areas, represented by equation (13), each column sum in the matrix represents only the amount of production indirectly induced by one unit of final demand for the corresponding industry of the corresponding country. This is because $\mathbf{A}(\mathbf{I}-\mathbf{A})^{-1}$ is equivalent to $(\mathbf{I}-\mathbf{A})^{-1}-\mathbf{I}$. Thus, each column of $\mathbf{JA}(\mathbf{I}-\mathbf{A})^{-1}$ shows how much input is required to produce one unit of final goods.(4)

Let us summarize the difference between the total input international division of labor rate given by Hasebe (2002), which is one of the major previous researches that shares the same interest with ours, and the value-added international division of labor rate that we apply in this paper. The total input criterion focuses on the intermediate goods that are required in each production process; in other words, value-added is not recognized as a part of inputs. On the other hand, our value-added criterion places emphasis on income distribution as a result of international trade; in other words, value-added is the key input factor in each production process.

(4) Unlike the value-added international division of labor defined in equations (11) and (12), the column sum of equations (13) and (14) is not equal to one. Thus, in order to obtain the shares for each country, the figures calculated in equations (13) and (14) should be normalized.

Table 1 International Division of Labor (based on one sector tables) (Unit: %)

	Own acquisition				Leakage to ROW				Share of East Asia in total value added outflow			
	1985	1990	1995	2000	1985	1990	1995	2000	1985	1990	1995	2000
Indonesia	90.9	88.6	89.3	90.0	5.2	7.3	6.6	6.9	29.8	29.1	29.6	24.4
Malaysia	75.0	77.3	66.0	53.2	14.2	10.7	15.0	20.2	34.3	42.0	43.8	46.6
Philippines	89.7	82.7	80.8	78.2	5.4	9.4	9.7	11.5	28.5	32.3	35.8	38.8
Singapore	52.6	51.1	56.6	58.4	24.9	24.5	16.6	17.1	38.7	37.6	48.7	46.2
Thailand	84.9	78.6	77.5	73.5	8.9	10.5	10.5	14.5	33.6	41.3	42.3	35.2
China	92.4	90.5	86.6	86.5	4.8	6.4	8.4	9.4	27.8	22.1	29.1	24.2
Taiwan	76.1	76.3	74.6	73.7	14.5	12.9	13.3	14.0	23.1	28.0	33.6	32.6
Korea	78.6	81.2	81.6	75.6	11.8	9.9	10.0	14.5	27.4	28.4	29.9	29.0
Japan	91.2	93.4	94.9	94.2	6.0	4.5	3.3	3.8	17.6	16.6	18.8	20.6
USA	95.3	94.8	93.7	93.7	3.7	4.2	4.8	4.9	19.6	18.3	23.4	22.4

Remark: East Asia means the nine countries/regions excluding the USA.

4 Results

In the following sections, we will show the results of the calculations of the international division of labor rate in the Asia-Pacific region. The data source is the Asian International Input-Output Table published by IDE for the years 1985, 1990, and 1995. We also use an extended table estimated by Takagawa and Okada (2004) pertaining to the year 2000.

4-1 International Division of Labor Rate by One-sector Tables

Table 1 shows a macro of value-added international division of labor rate, which is defined as the ultimate acquisition rate of value-added of each country that is generated in the transboundary production process. The "own acquisition" in the table is the own acquisition rate of value-added and corresponds to

the home production rate. In general, an increase in the home production rate causes an increase in the autonomy of the economy.

Now, let us examine the results. The United States and Japan recorded the highest home production rate, marking over 90% throughout the entire period. With regard to the change over time, the home production rate of the United States has a slightly declining trend from 95.3% in 1985 to 93.7% in 2000, whereas that of Japan is on a slightly upward trend from 91.2% in 1985 to 94.9% in 1995. Although Japan's home production rate dropped slightly in 2000, it remained at a level of over 94% and has been exceeding the rate of the United States since 1995.

Following Japan and the United States, China and Indonesia form the second highest group with consistent home production rates of over 80% throughout the entire period. This is because the two countries are abundant in natural resources, and overseas value-added leakage due to the import of raw materials is relatively low. Although China's home production rate was sufficiently high at over 90% in the first half of the period (1985 and 1990), it decreased to approximately 87% in the second half of the period (1995 and 2000). This downward trend can be considered to be reflective of the increasing amount of import due to the rapid inflow of foreign capital since the 1990s.

The Philippines, Thailand, Taiwan, and Korea form a middle group with their home production rates being approximately between 75% and 85%. Taiwan and Korea's home production rates hover at approximately 75% and 80%, respectively, with relatively flat movements; meanwhile, the home production rates in the Philippines and Thailand display a declining trend.

The most striking is the drastic decline in Malaysia's home production rate; it fell from approximately 75% in the first half of the period to 66% in 1995 and

further to 53% in 2000. Singapore has recorded the lowest home production rate-lower than 60%—except for that in 2000. Singapore and Malaysia, as can be seen from **Figure 2,** have a common feature in that the ratios of export and import in GDP are extremely high. Singapore has an entrepot economy that strongly depends on trade, for which the ratios of both export and import to GDP have exceeded 100%. With regard to Malaysia, the ratios of export and import have been rising year on year. Although Malaysia is a country that adopts an export-oriented development policy like the Asia NIEs in order to achieve a high GDP growth, it still does not have an economic structure whereby it is able to retain the value-added within the domestic economy. As seen in the above account, the home production rate in the Asian countries-excluding Japan, Indonesia, and Singapore-has been declining for the last 15 years as a whole. Next, let us review the trends from the perspective of "value-added leakage rate to ROW," which implies that the share of leakage of value-added to ROW and is referred to as "Leakage to ROW" in the table.

Our calculation shows that the leakage to ROW of the United States and Japan is relatively small. The leakage rate for the United States has a moderately upward trend, from 3.7% in 1985 to 4.9% in 2000. On the other hand, for Japan, the leakage rate displays a downward trend: 6.0%, 4.5%, 3.3%, and 3.8% in the years 1985, 1990, 1995, and 2000, respectively. Although Japan and the United States have the opposite trend, the leakage rates of both countries have remained stable at a low level.

In contrast with the abovementioned two countries, many other Asian countries show a relatively high leakage rate to ROW with an upward trend. In particular, the leakage rate of Malaysia once dropped from 14% in 1985 to 11% in 1990; however, since then, it increased to 20% in 2000. The leakage rates of the

Philippines, Thailand, and China have also increased by 5% to 15%. Although the leakage rates of Taiwan and Korea do not show a clear upward trend, they have remained between the 10% and 15% levels. With regard to Singapore, the leakage rate is on a declining trend: approximately 25% in the first half of the period and 17% in the second half. Nevertheless, it is still higher than most of the other countries.

Here, for the purpose of examining the independence of the Asian region as an economic bloc, let us examine the "Share of East Asia in the total value-added outflow" in the table that shows the share of value-added acquired by other East Asian countries in the total value-added outflow from a particular country. (Hereafter, we refer to it as the "share of East Asia.")

According to the figures, the overall trends seem to be ambiguous; the share of East Asia with regard to Malaysia and the Philippines continued to increase throughout the entire period; meanwhile, that for other countries shows an upward and downward trend. With regard to Japan, it was merely 20% or lower, which implies that 80% of the value-added outflow from Japan was not acquired by the other East Asian countries but by the United States and ROW. The highest share of value-added outflow for East Asia—48.7%—was that pertaining to Singapore in 1995, which implies that more than half of the value-added outflow from Singapore went outside the East Asian region. For another country among the Asia NIEs, namely Taiwan, the share of value-added outflow of East Asia increased by approximately 10%—from 23.1% in 1985 to 32.6% in 2000. Nevertheless, the ratio of value-added outflow outside the East Asian region remained at the level of approximately 70%. Korea's share, which was stable between 27% and 30% throughout the entire period, was almost as high as that of Taiwan in the year 2000.

4-2 International Division of Labor Rate by Three-sector Tables

In the previous section, we calculated the international division of labor rate based on one-sector tables. Here, we apply the same calculation to three-sector tables that consist of the primary, secondary, and tertiary industries.(5) In this section, we focus only on the secondary industry because exports of industrial products have been a crucial driving force to achieve high growth in East Asian countries. All descriptions in the following section pertain to the secondary industry, unless otherwise specified.

The calculation results based on three-sector tables are provided in **Table 2**, which follows the same format as that in **Table 1** with the exception of the number of sectors.

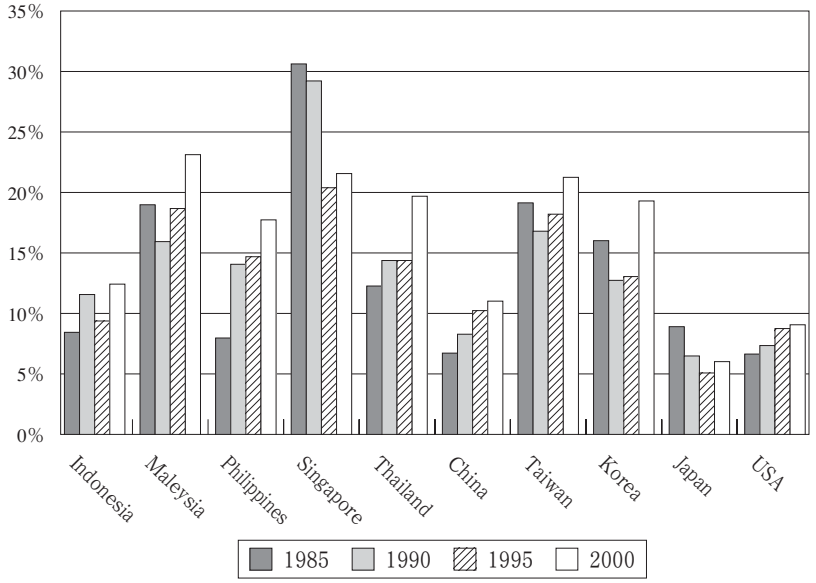
First, let us examine the home production rate. As far as Japan and the United States are concerned, the overall trends are roughly the same as that in the case of one sector; the home production rates of both Japan and the United States hover at approximately 90%, which have been higher than most of the other countries. Further, Japan has exceeded the United States since 1995. Indonesia and China are placed in the second highest group, followed by the Philippines whose home production rate reached 84% in 1985. With regard to the others, the home production rates were low and remained between 40% and 80%. For Singapore, the home production rate increased from 39.7% in 1985 to 46.7% in 2000. However, this is still low because it implies that more than half the value-added in the manufacturing process leaked out of the home country. Furthermore, the home production rates of the Philippines, Thailand, and Taiwan have declined throughout the entire period. The home production rates of

(5) See Appendix A-2.

Table 2 International Division of Labor (based on three sector tables) (Unit: %)

		Own acquisition				Leakage to ROW				Share of East Asia in total value added outflow			
		1985	1990	1995	2000	1985	1990	1995	2000	1985	1990	1995	2000
Indonesia	Primary	98.0	97.3	97.5	97.5	1.2	1.9	1.7	1.9	24.4	24.2	23.3	17.7
	Secondary	84.7	81.7	84.1	81.0	8.4	11.6	9.4	12.3	31.2	29.4	31.4	27.7
	Tertiary	94.7	92.9	93.9	93.1	3.8	4.9	4.5	5.4	18.8	24.6	20.1	16.9
Malaysia	Primary	90.9	89.9	88.2	89.4	5.2	4.5	5.7	5.5	33.8	44.1	40.5	36.9
	Secondary	65.4	67.7	59.0	54.2	18.9	15.9	18.6	23.1	35.3	40.1	42.8	37.8
	Tertiary	83.2	88.4	84.5	83.3	12.4	5.6	7.4	8.7	21.2	38.4	38.2	34.7
Philippines	Primary	95.4	92.4	93.0	93.7	2.2	3.7	3.3	4.1	33.4	34.8	36.0	23.7
	Secondary	84.2	75.0	71.9	73.0	7.9	14.1	14.7	17.7	29.9	30.3	34.4	24.0
	Tertiary	94.3	90.1	88.3	89.8	3.6	5.2	6.0	7.1	22.0	34.1	36.0	21.7
Singapore	Primary	68.0	59.1	65.1	65.2	14.7	21.7	14.9	14.9	46.6	35.1	43.6	44.6
	Secondary	39.7	38.5	44.9	46.7	30.6	29.1	20.3	21.6	40.0	39.6	49.8	46.8
	Tertiary	76.6	71.7	74.0	74.8	16.0	18.2	12.6	12.5	24.7	26.9	39.9	39.0
Thailand	Primary	90.9	89.8	88.9	87.1	5.4	5.5	5.9	7.7	32.5	37.2	35.9	31.4
	Secondary	79.1	70.5	69.3	63.8	12.3	14.4	14.3	19.7	33.6	40.9	42.3	35.1
	Tertiary	90.5	89.8	90.8	88.6	5.8	5.7	5.0	7.1	31.0	35.8	36.0	30.0
China	Primary	96.6	95.2	92.8	92.6	2.3	3.4	4.8	5.4	18.0	15.2	21.2	18.3
	Secondary	89.4	87.7	83.3	84.1	6.7	8.3	10.3	11.0	27.9	22.1	29.9	24.3
	Tertiary	96.4	94.9	91.3	91.6	2.3	3.4	6.0	6.3	26.5	21.7	23.9	19.7
Taiwan	Primary	84.6	85.3	83.4	80.3	9.9	8.5	9.6	11.2	20.8	26.4	29.6	29.8
	Secondary	68.0	67.2	62.2	55.7	19.1	16.8	18.3	21.3	23.5	30.4	36.5	36.3
	Tertiary	91.1	87.7	88.2	86.9	6.4	8.4	8.3	9.0	16.4	17.1	20.4	20.9
Korea	Primary	91.5	92.2	92.0	88.7	4.7	4.6	4.9	7.7	25.3	25.0	24.7	20.7
	Secondary	70.4	75.2	75.0	68.7	16.0	12.7	13.0	19.2	28.5	29.8	32.2	26.2
	Tertiary	90.6	91.0	91.2	88.4	5.9	5.7	6.2	8.7	20.4	19.0	17.6	15.4
Japan	Primary	94.8	95.9	96.5	95.6	3.4	2.6	2.2	2.8	17.0	15.9	18.2	20.2
	Secondary	86.6	90.3	92.0	90.4	8.8	6.4	5.0	6.0	19.4	18.2	20.8	23.0
	Tertiary	95.9	96.5	97.2	96.9	3.1	2.6	2.1	2.4	13.4	12.0	13.4	15.2
USA	Primary	96.5	95.6	92.3	91.4	3.0	3.8	6.6	7.5	15.4	13.9	14.4	12.6
	Secondary	91.8	91.1	88.7	88.6	6.6	7.3	8.7	9.0	19.8	18.2	22.6	21.5
	Tertiary	97.8	97.0	96.1	96.0	1.8	2.5	3.0	3.1	17.3	17.0	23.0	22.0

Figure 5　Leakage of value added to ROW (in manufacturing)



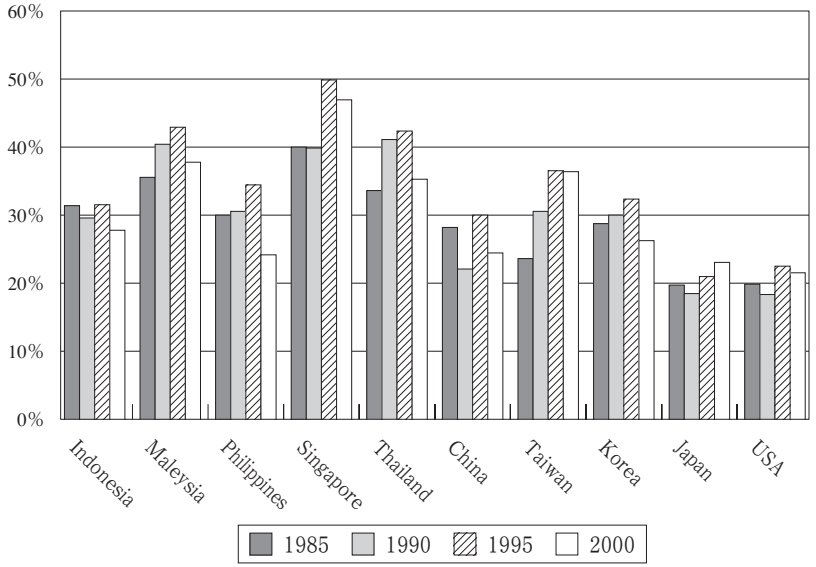
Source of Data: IDE, *Asian International Input-Output Table* for each year

Malaysia and Korea reached the highest in 1990; however, these rates have declined since then.

Next, let us confirm how much of the value-added leaked to ROW. **Figure 5**, for which the original data is presented in **Table 2**, shows the value-added leakage rate to ROW in the manufacturing process. The results are similar to those obtained with one sector; the value-added leakage rates of the United States and Japan are relatively low, and those of most of the East Asian countries are high, with upward trends. Although Singapore caused the leakage rate to decline exceptionally, it is still at a high level.

Figure 6 shows the share of East Asia in the total value-added outflow. As a whole, the share of East Asia did not necessarily increase. The shares in East

Figure 6　Share of East Asia in total value added outflow (in manufacturing)



Source of Data: IDE, *Asian International Input-Output Table* for each year

Asia pertaining to Malaysia and the Philippines decreased in 2000, although those calculated by one-sector tables continued to increase throughout the entire period. The shares of Malaysia and the Philippines declined from 42.8% in 1995 to 37.8% in 2000 and from 34.4% to 24.0% in 1995 and in 2000, respectively.

Table 3 shows the intradependency for manufacturing in the Asia-Pacific region by time series. The row cells for a particular country are value-added acquisition rates of that particular country from corresponding countries. For example, the cell, 80.96%-for Indonesia in the column and Indonesia in the row for the year 2000—implies Indonesia's value-added acquisition rate from Indonesia; in other words, it indicates Indonesia's home production rate. Similarly, each diagonal cell shows the home production rate of a corresponding

Table 3 International Division of Labor in manufacturing (Unit: %)

↓ To	From→	Indonesia	Malaysia	Philippines	Singapore	Thailand	China	Taiwan	Korea	Japan	USA
Indonesia	1985	84.67	0.60	0.53	3.64	0.18	0.15	0.70	0.98	1.05	0.21
	1995	84.13	0.72	0.78	1.55	0.37	0.29	0.89	0.71	0.38	0.08
	2000	80.96	0.65	0.54	1.45	0.32	0.40	1.11	1.02	0.55	0.08
Malaysia	1985	0.13	65.42	0.89	5.07	1.56	0.07	0.60	1.20	0.38	0.06
	1995	0.26	58.97	0.70	3.65	1.19	0.21	0.79	0.43	0.19	0.16
	2000	0.48	54.20	0.63	4.46	1.57	0.22	1.16	0.64	0.29	0.20
Philippines	1985	0.04	0.35	84.20	0.35	0.07	0.03	0.14	0.11	0.09	0.04
	1995	0.02	0.19	71.87	0.53	0.25	0.03	0.19	0.09	0.06	0.08
	2000	0.03	0.29	73.01	0.67	0.43	0.04	0.31	0.12	0.09	0.11
Singapore	1985	0.38	1.90	0.10	39.68	0.37	0.02	0.16	0.11	0.06	0.03
	1995	0.30	1.85	0.50	44.93	0.75	0.13	0.45	0.17	0.06	0.10
	2000	0.40	2.01	0.41	46.72	0.85	0.13	0.57	0.18	0.07	0.09
Thailand	1985	0.06	0.86	0.13	0.56	79.13	0.08	0.13	0.15	0.08	0.03
	1995	0.13	0.73	0.23	2.34	69.28	0.14	0.33	0.14	0.12	0.09
	2000	0.18	0.80	0.19	2.13	63.78	0.11	0.43	0.14	0.14	0.09
China	1985	0.39	0.93	1.02	6.36	0.45	89.36	0.07	0.06	0.58	0.08
	1995	0.46	0.97	0.82	1.36	0.88	83.33	1.10	1.23	0.40	0.22
	2000	0.70	1.32	0.71	1.88	1.24	84.05	1.89	1.49	0.58	0.32
Taiwan	1985	0.30	0.59	0.36	1.10	0.46	0.17	68.00	0.29	0.15	0.16
	1995	0.38	1.29	1.40	1.40	0.94	0.42	62.24	0.34	0.16	0.23
	2000	0.28	0.97	0.72	0.92	0.72	0.25	55.74	0.24	0.13	0.16
Korea	1985	0.24	0.57	0.39	0.58	0.33	0.01	0.16	70.43	0.21	0.12
	1995	0.66	1.37	1.25	2.79	0.91	0.95	1.20	75.02	0.30	0.26
	2000	0.71	1.55	0.89	2.66	1.00	0.83	1.54	68.75	0.36	0.27
Japan	1985	3.25	6.43	1.30	6.49	3.60	2.44	5.56	5.54	86.62	0.90
	1995	2.76	10.48	3.98	13.82	7.69	2.82	8.86	4.92	92.03	1.33
	2000	2.48	9.71	2.41	10.78	6.58	1.89	9.06	4.36	90.40	1.14
USA	1985	2.13	3.46	3.20	5.55	1.58	0.97	5.41	5.16	1.94	91.77
	1995	1.52	4.83	3.76	7.33	3.40	1.41	5.70	3.98	1.33	88.73
	2000	1.43	5.35	2.82	6.76	3.77	1.07	6.93	3.88	1.43	88.55
ROW	1985	8.41	18.90	7.87	30.63	12.26	6.71	19.07	15.98	8.85	6.60
	1995	9.38	18.62	14.70	20.31	14.33	10.28	18.26	12.97	4.98	8.73
	2000	12.34	23.15	17.68	21.58	19.74	11.00	21.27	19.19	5.96	8.99

country, and those cells are framed in a bold line. The cell—0.48%—for Indonesia in the column and Malaysia in the row for the year 2000 implies that Malaysia's value-added acquisition rate from Indonesia for manufacturing is 0.48%. In other words, 0.48% of value-added leaked to Malaysia out of Indonesia. Similarly, on examining the table, it is revealed that, for example, the value-added leakage rate from Indonesia to ROW for manufacturing is 12.34%.(6)

Here, let us focus on the United States. The home production rate of the United States in 2000 was 88.55% and the leakage rate to ROW was 8.99%. This implies that a large amount of value-added outflow leaked to ROW. The column cells for the United States show that the value-added acquisition rates for most Asian countries from the United States are lower than 1%, and that for Japan is 1.14% at most. In summary, most value-added from the manufacturing process in the United States is not acquired by the East Asian countries but probably by the NAFTA members (Canada and Mexico), as pointed out by Matsumura and Fujikawa (1998).

We can also examine the time-series change of the international division of labor rate from the table. The shaded cells in the table indicate that the value-added leakage has an upward trend. The example of Korea's value-added acquisition from Japan—0.21% in 1985, 0.26% in 1990, 0.30% in 1995, and 0.36% in 2000—shows that Japan's value-added leakage to Korea has increased slightly. Thailand exhibits the same relation with Japan. This implies that Japan has gradually strengthened its dependency on Korea and Thailand, even though the degree of dependency continues to be low. On the other hand, the amount of Japan's value-added leakage to the United States is large as compared with those

(6) The diagonal and the bottom row elements are the same as the home production rate and leakage rate to ROW, respectively, in Table 2.

of the other East Asian countries, although the overall leakage rate to the United States has declined. It appears to be appropriate to generally conclude that a large amount of Japan's value-added in the manufacturing process leaks to the United States and ROW, rather than staying within the East Asian region.

We also find some interesting features with regard to other East Asian countries. They are summarized as follows.

1) A large amount of value-added is acquired by ROW rather than by the East Asian countries, excluding Japan. Japan and the United States have also acquired a large amount of value-added from the East Asian countries.

2) Korea, one of the major nations among the Asia NIEs, follows the abovementioned two countries, acquiring a certain amount of value-added. Although the value-added acquisition rate from the Philippines, Singapore, and China fell slightly in 2000, the acquisition rate from the East Pacific region, including Japan and the United States, displays an upward trend throughout the entire period.

3) With regard to Singapore, the level of value-added leakage to Malaysia is as high as that to the United States due to geographical closeness.

4) The home production rates of Thailand and Taiwan have decreased and their value-added leakages to ROW have increased. At the same time, the value-added leakages to other East Asian countries have increased slightly. China also displays the same trends as Thailand and Taiwan.

As seen above, the trends of value-added movement differ among the East Asian countries. In some countries, like Thailand and Taiwan, the value-added outflow to the Asian region increased gradually; however, in other countries, like Korea, the amount of value-added acquisition from the Asian region increased. Overall, we can conclude that, for many East Asian countries, a large amount of

value-added has leaked to ROW and the United States. As far as Japan is concerned, it has not provided a large amount of value-added to the other East Asian countries, although it receives a large amount of value-added from them.

Finally, let us briefly review the study of Hasebe (2002), which also calculated the international division of labor rate based on the "Asian International Input-Output Table" compiled by IDE for the years 1985, 1990, and 1995. His procedure is slightly different from ours in that he used 24-sector tables and calculated total input international division of labor rate. However, the main findings are almost the same as ours; Japan and the United States have relatively higher home production rates than the other Asian countries. ASEAN and NIEs, as a whole, have strengthened their dependency on Japan, the United States, and ROW, although some of them have increased their home production rates. In addition, he pointed out that these movements were more significant in the machinery, metal products, and chemicals sectors.

In this paper, we did not calculate the value-added international division of labor by using more than three-sector tables. However, if we did, we may obtain a conclusion similar to that of Hasebe (2002): the East Asian countries increased the degree of dependency on the United States and ROW, rather than intradependency within the East Asian region.

5 Concluding Remarks

Since the 1980s, the East Asian nations have achieved high economic growth by means of attracting foreign direct investment from industrial countries including Japan and the United States. Meanwhile, as confirmed in the previous sections, for the East Asian nations, the home production rate in terms of value-added acquisition is not as high as compared with that for Japan and the United

States. Furthermore, the East Asian countries have increased the degree of dependency on the United States and ROW rather than the degree of intra-dependency in the Asian region.

As we described in section 1, Japan's recent movements to create an economic partnership with East Asian nations are discussed in line with the conclusion of FTA. The Cabinet Office (2004), for example, estimated the economic effects of the conclusion of FTA (trade liberalization by eliminating tariffs) among Japan, China, Korea, and ASEAN using the Global Trade Analysis Project (GTAP) model, and confirmed its benefit for consumers.(7) The Ministry of Economy, Trade and Industry (METI) also points out the importance of regional economic integration, referring to some studies that show that the establishment of partnerships between Japan and Asian countries would bring about various forms of economic benefits to the participants.(8) Recently, the Japanese government has taken an active initiative to promote an external economic policy that aims at establishing an East Asian economic community. Japan appears to have the intention of facilitating economic reforms, revitalizing the economy, and establishing a position as a leader of the East Asian nations by making economic partnerships such as FTA.

Although it is important to establish economic communities among East Asian nations in order to develop the East Asian economy, a very optimistic view about this possibility is not probable. Hasebe (2002) concluded, based on his estimation results, that "it would still be unwise to regard the East Asian economy as an 'independent' or 'self-circulating' economy immediately." Our conclusion is similar to that of Hasebe (2002): Most of the East Asian countries have de-

(7) See Cabinet Office (2003), Section 3 in Chapter 3.
(8) See Ministry of Economic, Trade and Industry (2003), Chapter 4.

creased the home production rate, and a large amount of their value-added has not remained within the East Asian region. Therefore, it would still be premature to regard the East Asian region as an independent economic community.

Recently, aiming at further development, economic integration within the East Asian region is discussed in the framework of ASEAN or the ASEAN Free Trade Area (AFTA). However, some hurdles must be overcome in order to achieve sustainable economic growth in the East Asian regions or for ASEAN members.[9] With regard to effective measures to realize sustainable growth, many suggestions have been proposed, mainly from the viewpoint of revitalizing the economy in the wake of the Asian economic crisis. For example, Aoki (2003) mentions that the ASEAN members should seek improvement in technological innovation ability; in order to fulfill this aim, they should attempt to increase the efficiency of investment and production. Urata (2004) also points out that the East Asian nations should aim for effective utilization of funds, a proactive approach to information technology, and stabilization of currencies.[10] Krugman (1994) asserted that the growth pattern in East Asia had been "input driven" and that this type of growth (input-driven growth) would not be sustainable.[11] It can be said that Aoki (2003) and Urata (2004) suggest, in line with Krugman (1994), that the East Asian nations should change their growth pattern from "input-driven growth" to "efficiency-driven growth" in order to achieve sustain-

(9) Kawata (2002) pointed out some problems on Common Effective Preferential Tariff (CEPT) of AFTA. The trade based on the CEPT scheme continued to be small partially because trading firms either do not recognize the advantages or do not know the procedures involved in applying for CEPT and partially because the procedure to apply for certificates of origin is complicated.

(10) For currency unification, see Kamata (2002) and Ohno and Fukuda (2003).

(11) See P. Krugman (1994).

able growth. Since East Asian nations have had "input-driven" economic structures thus far, there has been an outflow of their value-added to other regions, as shown in the previous sections. Thus, it is crucial for East Asia's sustainable growth to transform the "input driven" structures into "efficiency driven" ones in which a large amount of value-added remains within the region.

In addition to the abovementioned strategies, East Asian nations have many challenges to overcome, such as mobility of labor force, establishment of a social security system, and the prevention of global environmental deterioration.(12) While Japan has been experiencing an economic slump since the 1990s, it is still one of the largest industrial powers. Thus far, Japan has extended various technological functions and economic cooperation to the East Asian region through direct investment and Official Development Assistance (ODA). Furthermore, it will play more important roles in the economic development of the East Asian region; its strong leadership will be required for this. Depending on the degree of its responsibility, Japan should maintain a consistent policy toward the East Asian regions such that it contributes to the sound economic development and establishment of the East Asian economic community.

Data Appendix

A-1 International IO Tables

Japan is a major provider of international IO tables. In Japan, there exist two major bases that have compiled international IO tables: one is IDE and the other is METI.

It was IDE that initiated the compilation of the international IO tables. In 1970, IDE preliminarily compiled a small-scale international IO table for Japan, Korea, Taiwan, the Philippines, India, Pakistan, the United States, and EC for the year 1963. After this pioneer-

(12) For mobility of labor force and environmental issues, see Imai (2004) and Takenaka (2004).

Table 4 Back issues of International I-O table

Institute of Developing Economies	1970	1975	1985	1990	1995
Japan-the USA	No. 24				
Japan-South Korea	No. 18	No. 34	No. 58	No. 71	
Japan-Philippines	No. 23		No. 63	No. 72	
Japan-Thailand		No. 35	No. 59	No. 73	
Japan-Indonesia		No. 33	No. 57	No. 70	
Japan-China			No. 60	No. 76	
Japan-Singapore			No. 61	No. 77	
Japan-Malaysia			No. 62	No. 79	
Japan-Taiwan			No. 64	No. 78	
ASEAN		No. 39			
Asia			No. 65	No. 81	No. 82

Note: the number is that of "statistical data series"

Ministry of Economy and Trade	1970	1975	1985	1990	1995
Japan-the USA			○	○	○
Japan-England			○	○	
Japan-Germany			○	○	
Japan-France			○	○	
Japan-the USA-EC-Asia			○	○	

ing work, as shown in **Table 4,** IDE has continuously reported international IO tables as a part of the "Statistical Data Series." In 1982, integrating bilateral IO tables between Japan and other countries, IDE published the "International Input-Output Table for ASEAN Countries, 1975," which has eight endogenous countries (Japan, Thailand, Malaysia, Singapore, the Philippines, Indonesia, Korea, and the United States). Furthermore, in 1992 and 1998, adding Taiwan and China to the abovementioned eight countries, IDE compiled the "Asian International Input-Output Table" for the years 1985 and 1990, respectively. Since the publication of the table for the year 1995, IDE stopped compiling bilateral tables and continued to publish only the "Asian International Input-Output Table." IDE has already begun to estimate the table for the year 2000, which is scheduled to be published in

Table 5 Industry Classification

(a) ASIAN INTERNATIONAL INPUT-OUTPUT TABALE 1985, 90 and 95 by Institute of Developing Economies (IDE)

Sector	Code	Description
primary industry	001	Agriculture, livestock, forestry and fishery
primary industry	002	Mining and quarrying
secondary industry	003	Manufacturing
secondary industry	004	Electricity, gas, and water supply
secondary industry	005	Construction
tertiary industry	006	Trade and transport
tertiary industry	007	Services

(b) ASIAN INTERNATIONAL INPUT-OUTPUT TABALE 2000 by Takagawa and Okada (2004)

Sector	Code	Description
primary industry	001	Agriculture, livestock and forestry
primary industry	002	Fishery
primary industry	003	Mining and quarrying
secondary industry	004	Food, beverage and Tobacco
secondary industry	005	Fabrics and leather
secondary industry	006	Wooden producers
secondary industry	007	Paper, pulp and printing
secondary industry	008	Chemicals
secondary industry	009	Petroleum products
secondary industry	010	Rubber products
secondary industry	011	Non metal products
secondary industry	012	Metal products
secondary industry	013	Machinery
secondary industry	014	Transport machinery
secondary industry	015	Other manufacturing
secondary industry	016	Electricity, gas, and water supply
secondary industry	017	Construction
tertiary industry	018	Trade and transport
tertiary industry	019	Services

March 2006.

The "Asian International Input-Output Table" is a powerful and indispensable tool for analyzing the structure of international trade and production among the Asian countries. However, a long compilation time (usually five years or more) makes it impossible to analyze recent events by using fresh IO data. If one wants to utilize recent data, one is required to somehow estimate an extended table by the RAS method. However, the accuracy of such an estimated table would be questionable in the context of the related analysis. In short, we have a trade-off between speed and accuracy. It was Takada and Okada (2004) who found a solution to this dilemma. They succeeded in estimating an extended Asian International IO table that is likely to meet the requirements of both speed and accuracy by developing a new RAS method termed as the "Trade-RAS method." This method uses trade data as well as input coefficients. In reality, Takada and Okada (2004) confirmed that the Trade-RAS method showed a better performance than ordinary RAS methods by estimating the IO table for the year 1995, which had already been published. We greatly appreciate their study and express special thanks to them for providing us with the extended table.

A-2 Industry Classification

The original IO tables that we used were the "Asian International Input-Output Table" (7 sectors) for the years 1985, 1990, and 1995, compiled by IDE; and the extended Asian International IO table for the year 2000 (19 sectors), estimated by Takada and Okada (2004). We readjusted these tables to three-sector aggregated ones with a common industry classification. **Table 5** shows the correspondence of industry classification for the original and aggregated tables.

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