Industrial Networks between China and Asian Countries

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Abstract

This paper investigates the changing structures of industrial networks occurred in the Asia-Pacific region in line with the rapid growth of China economy. The analyses using the international input-output tables revealed that Asian countries' manufacturing industries such as textiles and electronics significantly increased their dependence on China's industries during the 1990's, though industries in Japan and the U.S. remain important as the main suppliers to Asian countries' industries.

Key words: input-output analysis, backward linkage, industrial network

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1. Introduction

China succeeded in establishing a foundation of the industrialization because, unlike other nations in Asia, it fostered heavy and chemical industries in the era when the country was still under the planned economy. Since embarking on the reform and open door policies, the country has realized economic development by encouraging the growth of labor-intensive industries as the nation's leading export industries so as to demonstrate its comparative advantages in line with the transformation to the market economy. In the 1990s, China achieved economic growth at a nearly 2-digit rate, which was far greater than the economic growth in any other countries in Asia.

During the course of establishing the foundation of a heavy and chemical industrial country, China reformed state-owned enterprises and adopted capitals and technologies from abroad, becoming, both in name and reality, "the world market" and "world factory".

Where international trade is concerned, China (including Hong Kong) became the largest trading partner for Japan (in 2004), while Japanese firms have shifted their emphasis from ASEAN to China. In the meantime, China has been going ahead with free trade agreements (FTAs) with ASEAN, as well as its participation in the WTO in 2001, and boosting its presence steadily in the Asian economy.

In recent years, several articles have been devoted to the study of China's strategies for FTAs and economic integration in East Asia: outstanding studies include a series of studies in line with an intensive research project implemented by the Institute of Developing Economies (IDE), such as Ohnishi ed. (2006), Hiratsuka ed. (2006) and Tamamura ed. (2006), each having special features in its analysis on case studies, theoretical interpretations, and analysis in reference to the Japan-China relations, respectively.

What seems to be lacking in these studies, however, is that they fail to give clear, vivid pictures of industrial reorganization in East Asia, apart from the introduction of individual case studies and theoretical discussion. Based on this background, this paper aims to extract the characteristics of industrial networks in the Asia-Pacific region with special focus on the relationships between China and other Asian countries. More specifically, we will address the

following questions. First, is it possible to dynamically view the Chinese economy emerging in East Asia and subsequent changes in the form of industrial networks? Second, is it possible to grasp quantitatively and comprehensively the rise of Chinese economy and the reorganization of industries in Asia which are in progress in the region? In order to explore these questions, the input-output analysis will be employed as the analytical framework. We will use the Asian international input-output tables for the years of 1990 and 2000 consisting of 10 countries and 16 industrial sectors as the main data.[1]

The structure of the paper is as follows. In Section 2, the emergence of China's industries in the economy of the Asia-Pacific region will be confirmed. In Section 3 and Section 4 the industrial networks within the region will be analyzed by using two different methodologies, i.e. Leontief multipliers and qualitative input-output analysis, respectively. The final section is devoted to an attempt to interpret the findings, though hypothetically, of the empirical research deployed.

2. Emergence of China's industries in the economy of the Asia-Pacific region

Before analyzing the linkage structures between China and Asian countries, it is useful to grasp the relative importance of China's industries in the economy of the Asia-Pacific region. Normally, the share of gross domestic product (GDP) or trade volumes of the country in the region are used to evaluate the relative importance of a country (industry) in the region's economy. In this paper, it will be evaluated by measuring the influence of China's industries on gross output of the region that were not captured by the conventional methods. In order to measure the influence of China's industries on the economy of the Asia-Pacific region, the hypothetical extraction method (HEM) is employed. The basic concept of the HEM will be firstly introduced followed by the measurement results.

[1] See Appendix 1 for layout and member countries of the table and for sector description, see Appendix 2.

2.1 Hypothetical extraction method

The basic idea of HEM was originally presented by Strassert (1968) and Schultz (1976, 1977). Suppose that there exist two regions (1 and 2) and n industries. The basic interregional input-output model can be expressed as follows.[2]

$$(1)\quad X = (I - A)^{-1} F$$

where

$$\underset{2n\times 1}{X} = \begin{pmatrix} X^1 \\ X^2 \end{pmatrix}; \quad \underset{2n\times 2n}{I} = \begin{pmatrix} I_n & O \\ O & I_n \end{pmatrix}; \quad \underset{2n\times 2n}{A} = \begin{pmatrix} A^{11} & A^{12} \\ A^{21} & A^{22} \end{pmatrix}; \quad \underset{2n\times 1}{F} = \begin{pmatrix} F^1 \\ F^2 \end{pmatrix}$$

To measure the influence of industries in region 1, define the augmented matrix that extracts all three submatrices in which region 1 has an influence.

$$(2)\quad A^e = \begin{pmatrix} O & O \\ O & A^{22} \end{pmatrix}$$

The hypothetical output in which the industries in region 1 do not exist thus becomes

$$(3)\quad X^e = (I - A^e)^{-1} F$$

where $X^e = (X^{1e} \quad X^{2e})'$.

From (1) and (3), the change (decrease) of output by extracting the industries in region 1 is calculated as

[2] There are several variations in HEM. For detail discussions, see Miller and Lahr (2001). For our purpose, the variation of 'Case 1' in Miller and Lahr (2001) is employed in this paper.

(4) $\Delta X = X^e - X = [(I - A^e)^{-1} - (I - A)^{-1}]F$

ΔX is the decrease of gross output when country 1 does not exist in the region and thus indicates the magnitude of impact of country 1 on region's economy. Therefore, by calculating the values of (4) for each member country of the Asian table, the influence of China's industries on the economy in the region can be evaluated.

2.2 Results

The calculation results of the HEM measures defined by (4) for 1990 and 2000 are reported in Table 1. The column "Country extracted" indicates that the country removed from the system in the manner shown in (2). The column "Change of other countries' output" indicates that the percentage changes of total output of other nine countries by removing the country in the left column. For example, in 1990, the output of nine member countries of the Asian table reduces by 1.581% if the whole U.S. industries do not exist.

From the results presented in Table 1, two major facts are observed regarding the changes of industrial linkages in the Asia-Pacific region. First, overall linkages between member countries have strengthened between 1990 and 2000. It can be seen from the results of "all industries" that the impacts of each country's industries (except Japan) on other member countries increase from 1990 to 2000. Second, China's industries increased their influence on other countries' outputs. The impact of China's all industries on other member countries' output became nearly four times from 1990 (0.166%) to 2000 (0.653%), the largest growth among member countries in the Asian table. The ranking of China also climbed from the seventh in 1990 to the third in 2000. The same trend is observed at industry level. Especially, China's electric and electronics industry significantly increased its importance in the economy of the Asia-Pacific region. Its impact on other member countries' output increased from 0.033% in 1990 to 0.229% in 2000. Third, another important result is that the influence of China's textile industry on other countries exceeded that of Japan in 2000. It is obvious from Table 1 that the influences of the U.S. and Japan on economies in the Asia-Pacific region are outstanding in any

industries. However, in 2000, the impact of China's textile industry surpassed Japan and its impact became twice as large as that of Japan, a sharp contrast with the situation in 1990.

To sum up, as the increase of industrial linkages between countries in the Asia-Pacific region, the relative importance of China's industries in the region significantly increased during the 1990's. Especially, China's textile industry has become to play a major role in the region.

3. Industrial linkages between China and Asian countries

The results of HEM clearly showed that the increase of relative importance of China's industries in the economy of the Asia-Pacific region. In this section, it will be explored the changes of linkage structure between China and other Asian countries behind the rapid expansion of China's industries.

Although it is a common exercise to use trade volumes to capture the international linkage structures between industries (e.g.: Boon, 1998; Ernst and Guerrieri, 1998), the linkage structures are also formed through other channels such as foreign direct investments and technology transfers. The effects of these activities will be reflected to the structures of production. Therefore, the international trade flows can describe only a limited aspect of international industrial linkages. To make up for such limitations of conventional methods, this section attempts to identify the characteristics of industrial networks by calculating the Leontief multipliers. We will especially focus on three important industries, i.e. textile industry, electric and electronics industry and transport equipment industry.

3.1 Methodology

Measuring backward linkage effects

Various linkage measures have been proposed so far mainly to identify the sectors important for economic development.[3] Some of those measures are: (1) direct input coefficients (Chenery and

[3] Although there are two kinds of linkage effects, i.e. the forward linkage effects and the backward linkage effects, exist, we will only focus on the backward linkage effects as the forward linkage effect

Watanabe, 1958; Yotopoulos and Nugent, 1973), (2) Leontief multipliers (Rasmussen, 1957), (3) Variability index (Rasmussen, 1957), (4) hypothetical extraction method (Strassert, 1968; Shultz, 1977; Miller and Lahr, 2001). In this paper, the Leontief multiplier is employed as it is the most intuitive and easy to illustrate the diagrams of the industrial linkages among Asian countries. The definition of the Leontief multiplier is as follows:

$$(5)\quad L_j^{rs} = \sum_j b_{ij}^{rs}$$

where b_{ij}^{rs} is the element of the inverse matrix $(I-A)^{-1}$. i and j denote industries ($i, j = 1,2,\cdots,n$) and r and s are regions (countries). Therefore, L_j^{rs} can be interpreted as the 'interregional backward linkage effect' of industry j in region s on industries in region r. More intuitively, it indicates that the required level of industrial output in region r when one unit of additional final demand occurs on industry j in region s. The share of L_j^{rs} to the total backward linkage effect thus can be calculated as

$$(6)\quad l_j^{rs} = \frac{L_j^{rs}}{L_j^{s}} = \frac{\sum_j b_{ij}^{rs}}{\sum_r \sum_j b_{ij}^{rs}}$$

Diagrammatic expressions of backward linkage effects

In order to capture the characteristics of the linkage structures of industries among member countries, the backward linkage effects defined in (6) will also be illustrated diagrammatically as in Figure 1.

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measured from input-output analysis is based on the unrealistic assumptions.

Figure 1 Diagrammatic expression of backward linkage effects

(Textile industry)

The way of reading the diagram is as follows. Suppose that a broken arrow extends from country A to country B in the textile industry. The percentage figures in parentheses under the country name are the ratio of demand induced to domestic industries when one unit of final demand occurs to the textile industry in that country. In the above example, 86.5% of induced demand can be satisfied by industries in country A when one unit of additional final demand to the textile industry occurs. The remaining 13.5% of induced demand must be satisfied by industries in other countries. Between 3% and 5% of them is satisfied by industries in country B in the above example. If the arrow is a fine solid line, the rate of dependency on country B will be between 5% and 10%. It will be expressed by a thick solid arrow if the dependency rate is more than 10%.

The above described diagrammatic expressions of backward linkage effects provide us with very useful information. First, the degree of concentration of arrows identifies the international division of labor in the Asia-Pacific region. The country with many outgoing arrows indicates that it is highly dependent on other countries' industries to satisfy the induced demand. If the country has many incoming arrows, on the other hand, it indicates that the industries in that country play the role as suppliers to industries in other countries. Second, the changes of directions and thickness of arrows from 1990 to 2000 tell us how the linkage structures between countries change. Therefore, the diagrammatic representation as in Figure 1 will be a powerful tool to extract the characteristics of linkage structures of industries.

3.2 Results

The calculation results of l_j^{rs} for selected industries are summarized in Appendix 3. The diagrammatic expressions of these results are presented in Figures 2, 3, 4 and 5.

All industries

In order to grasp the general trend, we will firstly glance at the linkage structure of all industries. The diagram for all industries is presented in Figure 2. From Figure 2, following three features can be pointed out. First, in 1990, industries in Asian countries are highly dependent on industries in Japan and the U.S. as these two countries are the major destinations of arrows from Asian countries. The dependency on Japan is especially remarkable. Second, the dependency on Japan and the U.S. does not change even in 2000. No substantial changes are observed in diagrams from 1990 to 2000. Third, industries in China do not have strong linkages with any countries in the Asia-Pacific region. There are no incoming and outgoing arrows to/from China both in 1990 and 2000. As shown in the figures in parentheses, China's industries that are highly self-sufficient and most of the demand to industries are satisfied by domestic industries. This reflects the economic structure that was formed during the closed planned economy until 1978. From the results in Figure 2, it may lead to a conclusion that the linkage structures in the Asia-Pacific region are robust and no significant changes occur during the 1990's.

However, such aggregate pictures may overlook important structural changes and analyses at industry level will also be required.

Textile industry

Figure 3 reports the linkage structures of textile industry. In 1990, Japan, the U.S. and Taiwan attracted many arrows from other Asian countries. This indicates that the Asian countries were dependent upon industries in Japan, the U.S. and Taiwan to satisfy the demand to each country's textile industry. In other words, these three countries were the suppliers (directly and indirectly) to textile industries in other Asian countries. However, this structure changed during the 1990's. In 2000, the number of arrows going to Japan and the U.S. decreased compared with 1990, while China became the major destination of arrows from many countries. This indicates that textile industries in many Asian countries diverted their suppliers from Japan, the U.S. and Taiwan to China. For example, in 1990, the textile industry in the Philippines was highly dependent on industries in Japan (5.0%), the U.S. (7.9%) and Taiwan (9.1%) to satisfy the

induced final demand and its dependency on China' industries was only 1%. However, in 2000, its dependency on Japan and the U.S. was significantly dropped (3.7% and 4.4% respectively) and instead, the dependency on China increased to 4.3%. This implies that the industries in China replaced Japan and the U.S. and became a major supplier to Philippines' textile industry.

Electric and electronics industry

The electric and electronics industry presents a different picture from the textile industry (see Figure 4). In 1990, the network structure of the electric and electronics industry was simple, i.e. the electric and electronics industries in the Asian countries were highly dependent on Japan and the United States to satisfy the demand induced by the final demand to the electronics industry in each country. Although some countries such as the Philippines, Malaysia and Thailand also depended on industries in Singapore, the magnitudes of dependency are quite small compared with Japan and the U.S.

The diagram for 2000 shows three remarkable features in comparison with that for 1990. First, the network structure observed in 1990 is basically preserved even in 2000, i.e. many countries extend arrows to Japan and the U.S. in both 1990 and 2000. Second, in addition to Japan and the U.S., countries such as Korea and China emerged as new destinations of arrows from other Asian countries. Third, the share of dependency on domestic industries dropped in most of the countries. These imply the progress of diversification of procurement in the Asia-Pacific region. Industries in Japan and the U.S. remain major suppliers to electric and electronics industries in Asian countries, but diversification of procurement has progressed in many Asian countries and Korea and China have also become suppliers by replacing the domestic industries in each country. As a result, the linkage structure within the region has become complex.

Transport equipment

The transport equipment shows the most stable linkage structure among three industries analyzed in this section. In 1990, Japan and the U.S. were the only destination of arrows.

Especially, the dependency on industries in Japan is remarkable as thick solid lines that show the dependency of more than 10% of total induced demand are extended from most of the countries. In 2000, many countries came to depend not only on industries in Japan but on industries in the U.S. However, the structure that many countries depend mostly on Japan and the U.S. remain constant. Different from other two industries above, industries in China do not play the role as a supplier to other Asian countries. This result may imply that industries in China became to possess the capability to accommodate the technologies of textile and electronics industries, but not of the transport equipment that requires higher level of technologies than other two industries.

3.3 Summary

In this section, it was attempted to extract the linkage structures of industries in the Asia-Pacific region by measuring the backward linkage effects. The major findings can be summarized as follows.

The measurement results of backward linkage effects identified some important features regarding industrial networks in the Asia-Pacific region. First, from the measurement results on overall industry, it was observed a robust linkage structure throughout the 1990's that industries in most of the Asian countries highly depend upon industries in Japan and the U.S. to meet the domestic demand. However, industry level analyses revealed different pictures:

Textile industry: Textile industries in Asian countries shifted their dependency from industries in Japan, the U.S. and Taiwan in 1990 to those in China in 2000.

Electric and electronics industry: Electric and electronics industries in Asian countries diversified their suppliers. While electronics industries in all the Asian countries depended only on industries in Japan and the U.S. in 1990, industries in Korea, China and Singapore emerged as suppliers instead of domestic industries in 2000. This implies the progress of international division of labor in electric and electronics industry and the network structure within the region has become complex.

Transport equipment: It was observed a robust linkage structure that transport equipment

industries in the Asian countries highly depend on Japan and the U.S. throughout the 1990's. In 2000, it was observed some shifts of dependency from Japan to the U.S., the diagrams remain constant between 1990 and 2000 relative to those for other two industries. Industries in China do not play the significant role as a supplier in this industry.

These industry level analyses may imply the changing role of China's industries in the industrial networks in the Asia-Pacific region. Industries in China rapidly increased their importance as a supplier (production base) to textile and electronics industries in other Asian countries. However, they do not possess the sufficient level of technologies to supply the transport equipment industries and thus transport industries in Asian countries continuously depend on Japan and the U.S. For industries in China, therefore, upgrading the technological level will thus be the important task for further development.

4. Qualitative Input-Output Analysis

In Section 3, the industrial networks of some selected industries in the Asia-Pacific region were revealed by measuring the backward linkage effects. In this section, we will attempt to extract the industrial networks by using the alternative methodology, i.e. the qualitative input-output analysis (QIOA). Analyses by applying two different methodologies will provide us with more robust and comprehensive picture of industrial networks.

4.1 Methodology

We use the methodology of QIOA introduced by Aroche-Reyes (1996) to identify the structure of spatial input-output linkages. QIOA is intended to reveal the underlying structure of an input-output table by identifying the intermediate transactions that are important. The overall strategy of our analysis can be explained as follows: (1) Identify "important cells" in the technical coefficient matrix using a mathematical formula; (2) Convert the technical coefficient matrix into a corresponding binary matrix (i.e. adjacency matrix), in which entries of the important cells take value of unity and the unimportant ones, zero. The adjacency matrix shows

a structure of important linkages. However it only shows which sectors are directly linked together through the important linkages; (3) Take indirect linkages into consideration, too. Suppose that there exist important transaction flows from sector j to sector k, and from sector k to sector l. Therefore the linkages from sector j to sector k and from sector k to sector l are identified as important. Then suppose that there also exists an important linkage from sector j to sector l (through sector k). We also take into account such indirect linkages using a graph theoretical method; (4) Obtain a total structure of important linkages by taking both directly and indirectly important linkages into consideration. Compare the structures in different time points to elucidate how the skeleton of spatial input-output linkages has changed during the period of analysis.

We begin with a formula to identify important cells in the technical coefficient matrix A. Following Aroche-Reyes (1996), we adopt a formula introduced by Schintke and Stäglin (1988) and Jilek (1971). The formula aims at finding important cells in A judging by the impact on the elements of the Leontief inverse matrix when an element in A changes in a given proportion. The tolerable limit r_{ij} of change in each technical coefficient a_{ij} is computed by the following equation, so that the output in any related sector varies at most by 1%, while final demand remains fixed. The equation is

$$(3) \quad r_{ij} = \frac{100}{a_{ij}[b_{ji} + 100(b_{ii}/\tau_i)\tau_j]}$$

where b_{ji} denotes the corresponding entry in the Leontief inverse matrix, τ_i and τ_j denote the gross output of sector i and j respectively. If an technical coefficient a_{ij} increases by more than the tolerable limit r_{ij}, then output in a related sector will increase by more than 1 percent. Therefore the less r_{ij} is, the smaller is the change in a_{ij} required to have large effects on the output of related sectors. We identify such entries as important cells (to put it differently, the linkage from sector i to sector j is regarded to be important).

Conventionally an entry in A is identified as important when r_{ij} is not greater than 20 percent (Aroche-Reyes 1996, 2002; Ghosh and Roy 1998).

Next, we turn to the equation

$$(4) \quad (I - A)^{-1} = A^0 + A^1 + A^2 + A^3 \cdots$$

where $A^0 \equiv I$. We convert each matrix layer A^i ($i = 0, \ 1, \ 2, \ \cdots$) to the corresponding adjacency matrix W^i ($i = 0, \ 1, \ 2, \ \cdots$). The conversion of A into W is implemented based on the following equation

$$(5) \quad w_{ij} \begin{cases} = 1, & if \quad r_{ij} < 20 \\ = 0, & if \quad r_{ij} \geq 20 \end{cases}$$

where $W = (w_{ij})$ and r_{ij} is the tolerable limit of change for a_{ij} defined by equation (3). For the layer of which order is higher than 2, the following equation (6) is applied to convert A^k into W^k.

$$(6) \quad W^k = W^1 W^{k-1}$$

The last step is to obtain the qualitative Leontief inverse matrix Ψ. The derivation of the matrix is based on the following equation (7)

$$(7) \quad \Psi = W^0 + W^1 + W^2 + W^3 + \cdots$$

where $W^0 = I$. Note that the matrix multiplications in (6) and the summation of W^k in (7) should be done in Boolean fashion. An entry ψ_{ij} in Ψ will be unity if sectors i and j are connected through a path, regardless of the number of steps needed to go from i to j (Aroche-Reyes 1996). We regard them as important among all linkages in the following

analysis. The resulting structures of important linkages will be shown by digraphs in the next section.

In some cases, we will want to know about the role of a sector in the structures. For this purpose, we compute centrality index (CI) for each sector in each structure. Following Aroche-Reyes (1996), we define the CI of a sector as the ratio of the in-degree to the out-degree of the sector. A sector is categorized as a sink, central, or source if the CI is greater than, equal to, or less than unity, respectively. A sink sector has relatively more input linkages than output linkages. It is located at the top of the hierarchy of intermediate transactions between sectors and/or supplies more final goods rather than intermediate goods. A source sector has relatively more output linkages than input linkages. It is important as a supplier of intermediate goods (typically raw materials) to many sectors in the economy. The central sectors have intermediate character between the sink and the source.[4]

It is worthwhile pointing out that we work with the layers derived from the technical coefficient matrix A, not with the layers derived from the intermediate transaction matrix Z. In other words, we mainly see the technical relationship between production sectors in this present analysis. The latter approach arouse from the Minimal Flow Analysis introduced by Schnabl (1994), in which the volume and structure of final demands are also taken into consideration.[5]

4.2 Findings

4.2.1 The Number of Important Cells

The calculation results are presented in Table 2. As shown in Table 2, the number of important cells in all regions fell from 912 in 1990 to 854 in 2000, in line with which the number of important cells among regions fell from 162 to 142 over the same period. According to the measures of backward linkage effects conducted in Meng *et al*. (2006) and other studies, the degree of inter-regional dependence increased in each country, and the influential coefficient

[4] The in-degree and the out-degree of sector i are the i-th column sum and the i-th row sum of the adjacency Leontief inverse matrix respectively.

[5] For this application, see Hioki *et. al* (2005) and Okamoto and Tamamura (2005).

within some countries increased. These facts may suggest that the number of important cells fell because those exclusively linked to particular sectors have been linked to more than one sector. On the other hand, the number of important cells among manufacturing sectors, which are reported in Table 3, increased from 53 to 73. This implies that the technical relationship among production sectors in Asia has strengthened, though the number of important cells as a whole has fallen.

The number of important cells is overwhelmingly the greatest for China, increasing from 133 in 1990 to 135 in 2000; the linkage within China itself is fairly strong. This fact is also seen in the fact that the backward linkage effects of China are greater than that of any other countries (Meng *et al.*, 2006).

The total number of important cells is the greatest for Japan, and the number of incoming linkages as a recipient of linkages is also larger than in any other country, 79 in 1990 and 51 in 2000. The second largest incoming linkages are seen in the U.S.A. Observable here is a structure where various countries depend on intermediate goods of Japan and the U.S. as the recipients of the linkages in this region. Even so, the trends seen in the two countries are somewhat different. While the number of incoming linkages for Japan has reduced by 10% over the ten years, the figure for the U.S. has remained more or less the same over the same period, 44 and 42. The degree of dependence of the countries on Japan has been declining.

As the outgoing linkages are concerned, Malaysia and Singapore provided, as of 1990, some 40 percent of their linkages to other countries. In 2000, the countries other than Korea, Japan and the U.S. had some 30% of linkages with other countries. This allows us to interpret that the regional linkages among Asian countries have been strengthened.

4.2.2 Networks among Countries

Figure 6 shows the networks of individual countries on the basis of Table 2: it can be confirmed that, as of 1990, China and other countries in Asia with the exception of Korea and the U.S. depended on Japan. On the other hand, Taiwan and ASEAN except for Indonesia depended on the U.S. The figure also shows a network in Asia where the Philippines → Singapore →

Indonesia/Thailand, and another network among ASEAN where Singapore → Malaysia → Thailand.

By 2000, the number of countries having networks dependent on Japan has been reduced: Indonesia, Malaysia, the Philippines and Taiwan only. In the meantime, Korea and Indonesia began to depend on the U.S. The technological linkages concerning intermediate goods produced in the manufacturing sector have shifted from Japan to the U.S. Indonesia has been increasing its dependency on Malaysia, as well as on Northeast Asia such as Korea and China. Among ASEAN, a network of Indonesia / the Philippines / Thailand → Malaysia, and that of Indonesia / Thailand → Singapore are observable, indicating an increasing presence of the two countries in Malay Peninsula as recipients of the linkages.

4.2.3 Networks of the Manufacturing Sector in Asian Countries

Figure 7-10 show the networks in terms of each sector in the manufacturing industry. Outstanding features in 1990 are: (1) each country depended on various intermediate goods produces in the manufacturing sector in Japan; (2) A wide range of manufacturing sectors in Taiwan, the Philippines, Malaysia and Singapore depended on electric and electronics intermediate goods of the U.S.

The metal products, electric and electronics and other manufacturing sectors in Taiwan depend on products of the Japanese electric and electronics, and transport equipment industries. As for Indonesia, its various manufacturing sectors, metal products, and machinery sectors depend on the three industries in Japan, food processing, metal products, and machinery. The food processing, chemical and machinery sectors in Malaysia rely on intermediate goods of various light industries in Japan. It is also observed that the Singaporean metal products sector is dependent on the Japanese chemical, machinery, transport equipment and other manufacturing sectors.

As for sectors dependent on the U.S. electric and electronics sectors, they include metal products, electric and electronics and other manufacturing sectors in Taiwan; metal products, electric and electronics sectors in the Philippines; and six sectors – ranging from the

non-metallic mineral products to other manufacturing sectors – in Malaysia; and non-metallic mineral products, metal products, electric and electronics, and transport equipment sectors in Singapore.

Notable features in 2000, on the other hand, are: (1) increased concentration in the electric and electronics sector among dependence on the Japanese industries; (2) heightened linkages of various sectors in Korea to the electric and electronics sector in the U.S.; (3) linkages to the electric and electronics industry in Singapore and Malaysia are heightened within ASEAN; and (4) dependence of various light industries of Indonesia, and fabric and textile sector in Taiwan on China.

The linkages - dependence of the Philippine metal products sector on the Japanese metal products and machinery sectors; dependence of the Malaysian food processing, metal products, and machinery sectors on the Japanese other light manufacturing; and dependence of the Singaporean chemical sector on the Japanese chemical, metal products, transport equipment and other manufacturing - have disappeared over the ten years.

On the other hand, other light manufacturing, and chemical and non-metallic mineral products sectors of Taiwan have come to rely on the electric and electronics sectors of Japan and the U.S., while the chemical, non-metallic mineral products, metal products, electric and electronics, and other manufacturing sectors of Korea began to depend on the electric and electronics sector in the U.S., according to which, the concentration in linkages to the electric and electronics sectors of Japan and the U.S. has emerged.

ASEAN countries as a whole have come to rely on the metal products and the electric and electronics sectors in the Philippines, the machinery sector in Indonesia and the electric and electronics sector in Malaysia, that is, they are mutually dependent. The machinery sector in Indonesia began to rely on the electric and electronics sector in Singapore, and the electric and electronics sectors in Malaysia and Singapore are linked to each other.

As for China itself, its machinery sector was dependent on the Japanese chemical sector in 1990, but, in 2000, this linkage had disappeared. On the other hand, other light manufacturing in Indonesia came to depend on China's food processing, other light manufacturing, chemical,

non-metallic mineral products, and electric and electronics sectors, while the chemical sector of Taiwan began to depend on the textile sector of China, and the textile sector of Taiwan was linked to the textile, chemical and other manufacturing sectors in China.

Now let us have a closer look at stable networks. Stable networks may have an impact on the production unless intermediate goods produced in other countries are made technical use of; thus this suggests the presence of closer or more important technical linkages.

As sectors dependent on Japan are concerned, the metal products, electric and electronics, and other manufacturing sectors of Taiwan depend on the Japanese electric and electronics sector, and other light manufacturing and metal products sector of Indonesia on quite a few manufacturing sectors in Japan.

As for dependence on the electric and electronics sector in the U.S., the metal products and electric and electronics sectors of Taiwan, the Philippines, Malaysia and Singapore are linked to it.

The electric and electronics sectors in Malaysia and Singapore are mutually dependent, and are also linked to a number of sectors.

4.2.4 Summary

The findings from the QIOA described above can be summarized as follows.

(1) Linkages among manufacturing sectors have certainly strengthened. This shows in the form of dependence of Korea on the U.S., that of Indonesia on China, and that of Taiwan on China.

(2) The focus of linkages of manufacturing sectors is beginning to shift from Japan to the U.S. Some sectors in Malaysia, the Philippines, and Singapore have seen a reduction in the degree of dependence on Japan.

(3) Among ASEAN, the linkage between Singapore and Malaysia is intimate; it can be said that interdependence of the electric and electronics sectors of the countries is strong.

(4) There are few linkages showing China's dependence on others, instead, Taiwan and Indonesia have begun to create linkages to China so as to depend on it.

(5) The center of the linkages in manufacturing sectors lies in the electric and electronics sector, where Japan and the U.S. play the central roles.

5. Conclusions

The development of the Chinese economy is unique in some ways. Other countries in Asia, whose primary tasks after the war were to gain decolonization from advanced nations, and to break away from their monoculture economies, succeeded in industrialization via export-oriented strategies by shifting their focus from export of primary products to labor-intensive processing and assembling industries where they had comparative advantages. For their economic development, import of intermediate goods from Japan was indispensable, and the U.S. market was also necessary to export their own products. This process of development is called the "East Asian model". China, on the other hand, adopted large-scale projects with assistance of the former Soviet Union and promoted the industrialization of the heavy and chemical sectors after the war when the country newly established its new regime. It also sought rapidly for self-sufficient heavy and chemical industrialization through the Third Front Construction Program. Following the reform and "Open Door" policies, China began to follow the East Asian model of development, growing labor-intensive processing and assembling industries, where foreign-invested companies in special economic zones and local firms in the coastal area have equally comparative advantages. This trend was reinforced through the adoption of the "Coastal Area Development Strategy" in 1987. Then since 1990, the Chinese economy saw a rapid growth with an accelerating increase in export. Since China successfully grew its labor-intensive industries while retaining the heavy and chemical industries, it will have a great advantage for further economic development in the future so long as it can manage to strike a balance between the heavy and the light industries.

The process of the self-sufficient industrialization is obvious from the findings of the analysis shown above. In 1990, its important linkages are all within the country. In its vast land, the export strategy deployed in some coastal areas did not immediately lead to the creation of

linkages to abroad. Linkages affecting the production lay within the domestic industries only.

In 2000, however, the situation began to change substantially. The Chinese industries were now technologically important for textile products of Taiwan and those manufactured in other light manufacturing in Indonesia. These changes suggest that the level of industrial technologies in China is now superior to that in Indonesia, which is relatively backward among ASEAN countries. Moreover, the Chinese industrial technology became necessary in labor-intensive industries in Taiwan as a result of a large amount of investment in China.

In Asia as a whole, the center of the network is the electric and electronics sector. Since the technological levels of Japan and the U.S. are superior, the industries in other countries need to import electronic components with high value added from these developed countries. On the other hand, Singapore and Malaysia, while depending on Japan and the U.S., manufacture electric and electronics components with their medium-level technologies, and serve as cores at the other end of the industrial networks.

An Information Technology Outlook 2006 published by OECD reports that exports of IT-related goods and services from China exceeded those from Japan and EU in 2003, and those from the U.S. in 2004, so that China became the largest supplier in the world (Evening edition of Nihon Keizai Shimbun, October, 23, 2006). Since China focuses on added-profit trade, it may have been already integrated into the industrial networks linked to the electrical and electronic sectors in Japan and the U.S., or to the same sectors in Malaysia and Singapore.

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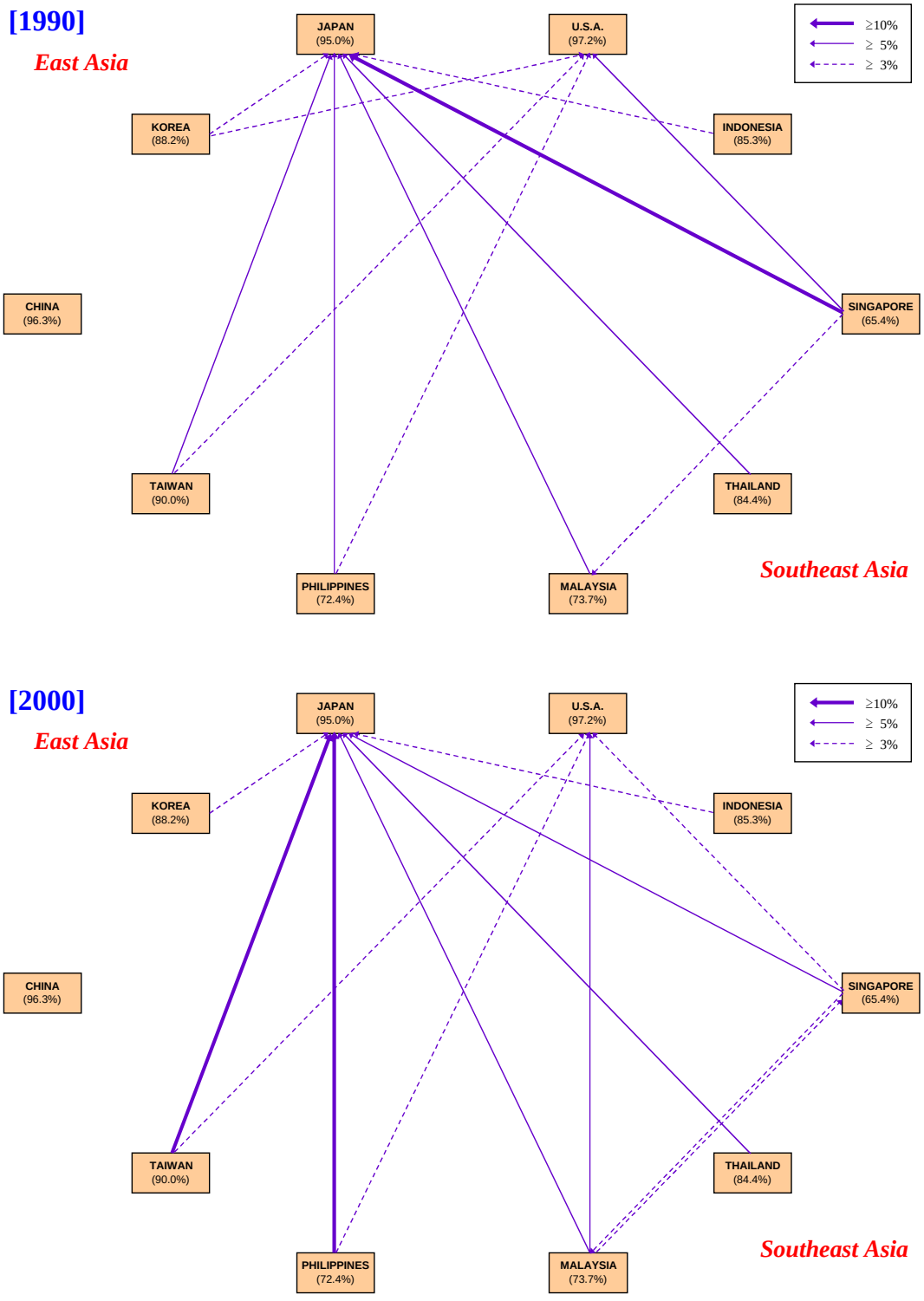
Table 1 Results of HEM

1990			2000		
Rank	Country extracted	Change of other countries' outputs	Rank	Country extracted	Change of other countries' outputs
[All industries]					
1	U.S.A.	-1.581%	1	U.S.A.	-2.514%
2	Japan	-1.121%	2	Japan	-0.914%
3	Korea	-0.350%	3	China	-0.653%
4	Taiwan	-0.280%	4	Korea	-0.426%
5	Singapore	-0.221%	5	Taiwan	-0.405%
6	Thailand	-0.168%	6	Malaysia	-0.310%
7	China	-0.166%	7	Singapore	-0.251%
8	Malaysia	-0.101%	8	Thailand	-0.189%
9	Indonesia	-0.075%	9	Philippines	-0.112%
10	Philippines	-0.061%	10	Indonesia	-0.079%
[Textile industry]					
1	U.S.A.	-0.091%	1	U.S.A.	-0.100%
2	Japan	-0.077%	2	China	-0.071%
3	Korea	-0.043%	3	Japan	-0.036%
4	China	-0.036%	4	Korea	-0.032%
5	Taiwan	-0.027%	5	Taiwan	-0.025%
6	Thailand	-0.026%	6	Thailand	-0.019%
7	Philippines	-0.017%	7	Indonesia	-0.016%
8	Indonesia	-0.017%	8	Malaysia	-0.015%
9	Malaysia	-0.016%	9	Philippines	-0.012%
10	Singapore	-0.013%	10	Singapore	-0.008%
[Electronics industry]					
1	U.S.A.	-0.317%	1	U.S.A.	-0.706%
2	Japan	-0.192%	2	Japan	-0.276%
3	Philippines	-0.177%	3	China	-0.229%
4	Singapore	-0.114%	4	Taiwan	-0.225%
5	Korea	-0.105%	5	Malaysia	-0.202%
6	Taiwan	-0.090%	6	Korea	-0.195%
7	Thailand	-0.042%	7	Singapore	-0.151%
8	Malaysia	-0.041%	8	Thailand	-0.089%
9	China	-0.033%	9	Philippines	-0.065%
10	Indonesia	-0.011%	10	Indonesia	-0.014%
[Transport equipment]					
1	U.S.A.	-0.323%	1	U.S.A.	-0.561%
2	Japan	-0.115%	2	Japan	-0.113%
3	Korea	-0.050%	3	China	-0.058%
4	Thailand	-0.041%	4	Korea	-0.054%
5	Taiwan	-0.035%	5	Taiwan	-0.032%
6	China	-0.026%	6	Thailand	-0.030%
7	Indonesia	-0.021%	7	Malaysia	-0.017%
8	Singapore	-0.017%	8	Indonesia	-0.014%
9	Malaysia	-0.015%	9	Singapore	-0.013%
10	Philippines	-0.010%	10	Philippines	-0.011%

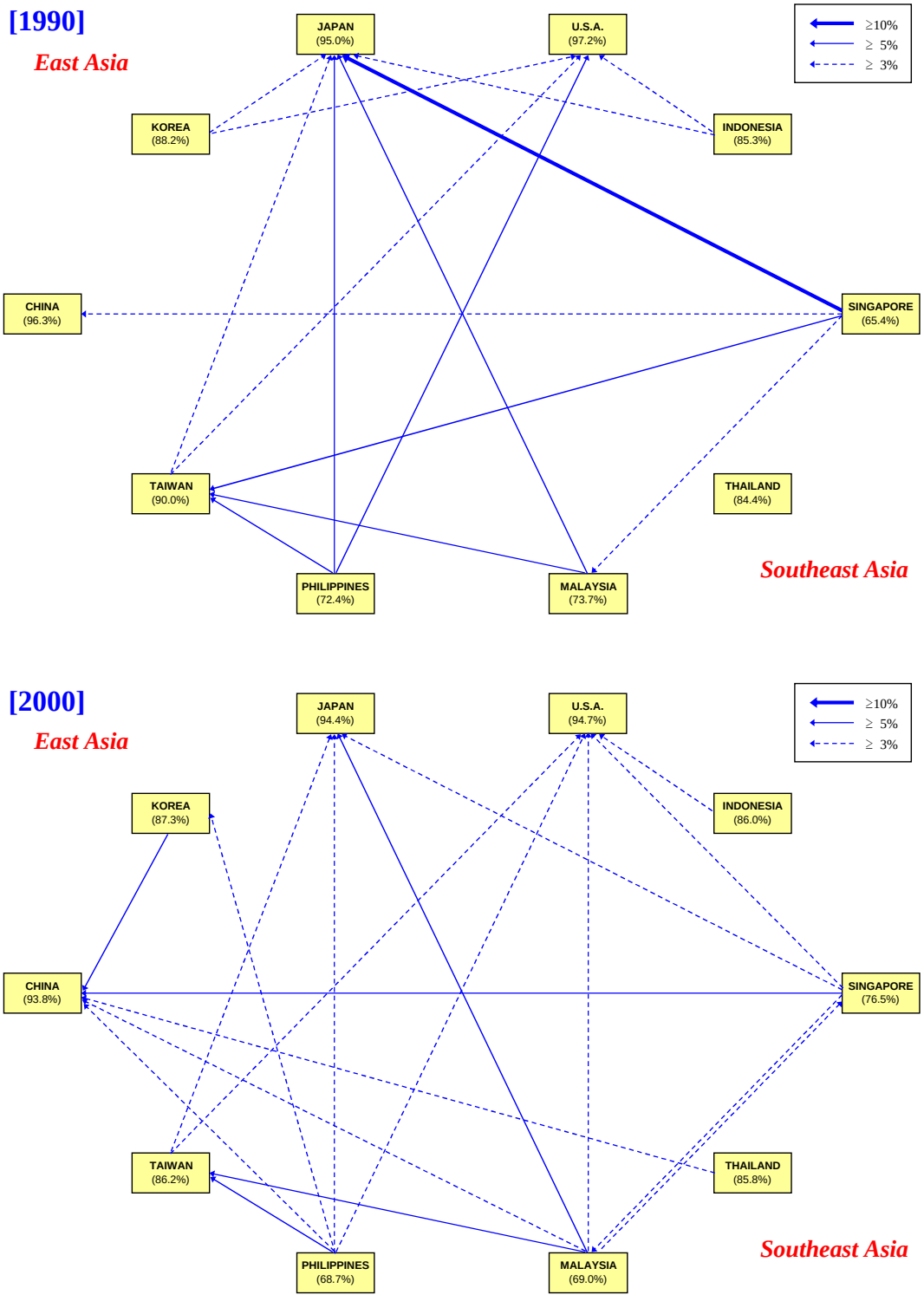
Source: Caluculated from the Asian international input-output tables.

Figure 2 Linkage structures (all industries)



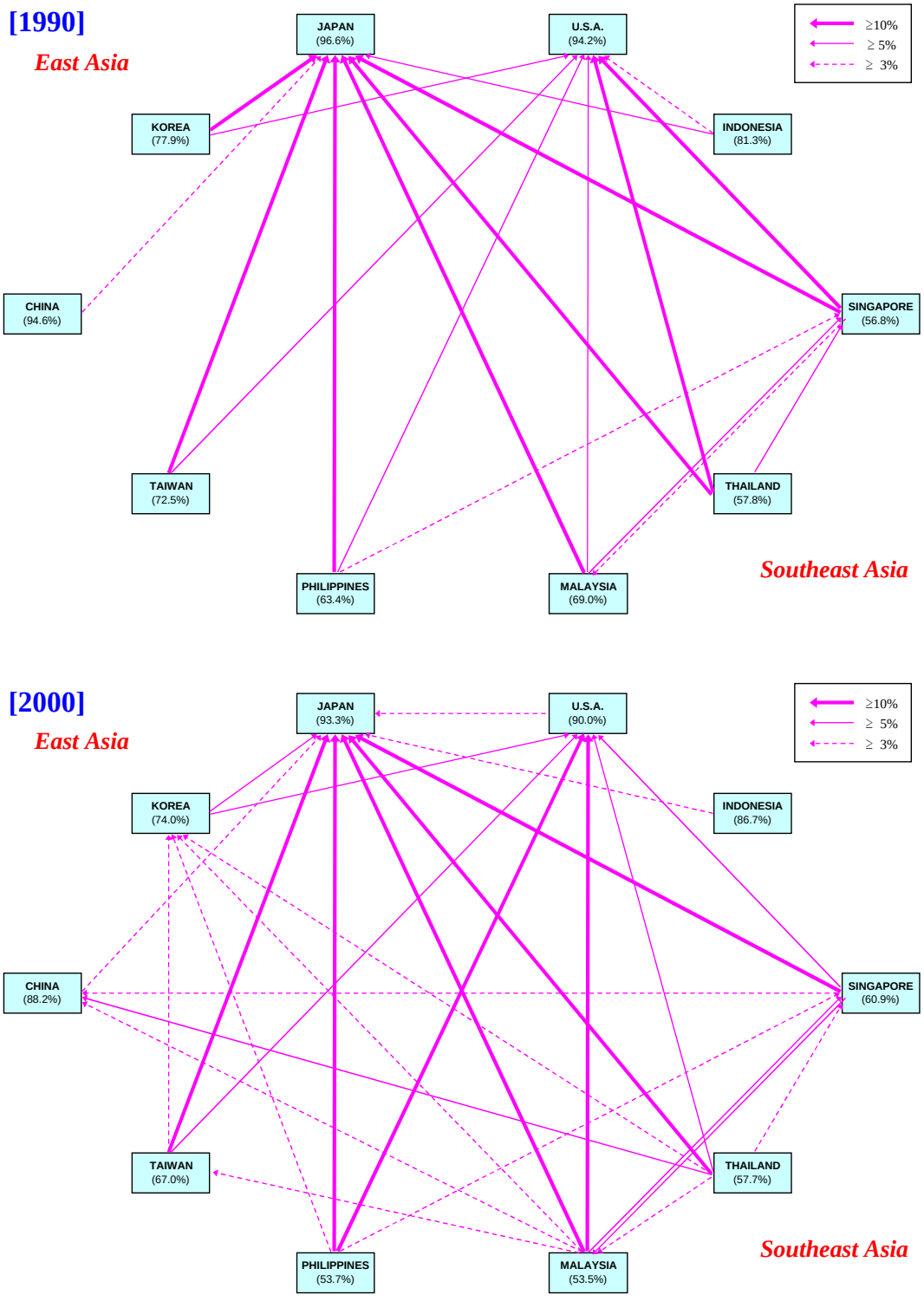
Sources: Calculated from the Asian International Input-Output Tables for 1990 and 2000.

Figure 3 Linkage structures of textile industry



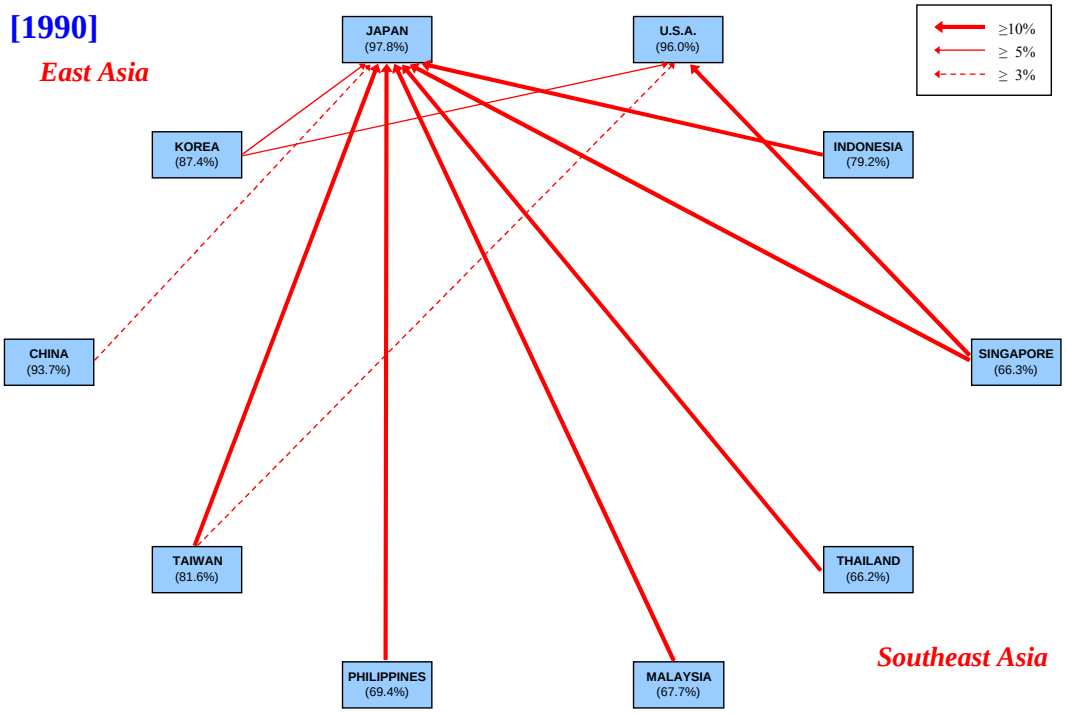
Sources: Calculated from the Asian International Input-Output Tables for 1990 and 2000.

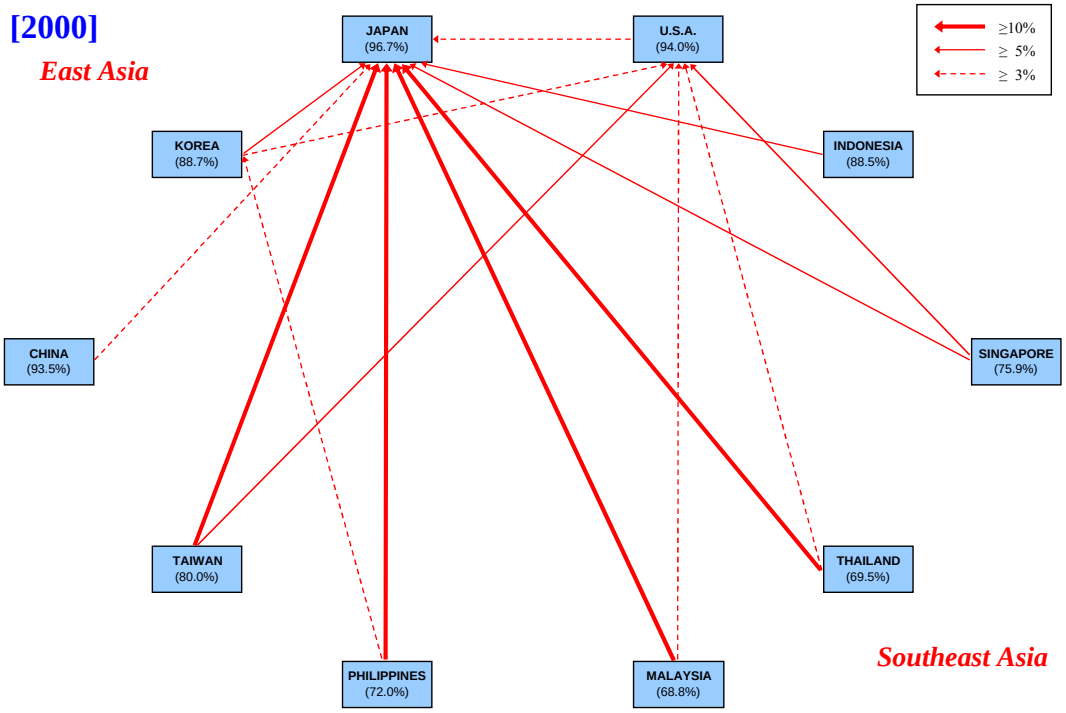
Figure 4 Linkage structures of electronics industry



Sources: Calculated from the Asian International Input-Output Tables for 1990 and 2000.

Figure 5 Linkage structures of transport equipment industry





Sources: Calculated from the Asian International Input-Output Tables for 1990 and 2000.

Table 2 Number of Important Cells (all industries)

1990	China	Indonesia	Japan	Korea	Malaysia	Taiwan	Philippines	Singapore	Thailand	U.S.A.	Total	Outgoing	Out./Intra.
China	133		9								**142**	9	6%
Indonesia		64	22								**86**	22	26%
Japan			78								**78**		0%
Korea				76							**76**		0%
Malaysia			21	6	77			9	5	16	**134**	57	43%
Taiwan			4			65				5	**74**	9	12%
Philippines			10				67	2		6	**85**	18	21%
Singapore		6	8		6			51	4	12	**87**	36	41%
Thailand			5					1	67	5	**78**	11	14%
U.S.A.										72	**72**		0%
Total	**133**	**70**	**157**	**82**	**83**	**65**	**67**	**63**	**76**	**116**	**912**	**162**	**18%**
Incoming		6	79	6	6			12	9	44	**162**		
In./Intra.	0%	9%	50%	7%	7%	0%	0%	19%	12%	38%	**18%**		

2000	China	Indonesia	Japan	Korea	Malaysia	Taiwan	Philippines	Singapore	Thailand	U.S.A.	Total	Outgoing	Out./Intra.
China	135										**135**		0%
Indonesia	8	63	21	6	1			1		1	**101**	38	38%
Japan			81								**81**		0%
Korea				77						5	**82**	5	6%
Malaysia			13	5	60			7		10	**95**	35	37%
Taiwan	4		9			64				9	**86**	22	26%
Philippines			8		2	2	54	1		6	**73**	19	26%
Singapore					9			54		8	**71**	17	24%
Thailand					2			1	61	3	**67**	6	9%
U.S.A.										63	**63**		0%
Total	**147**	**63**	**132**	**88**	**74**	**66**	**54**	**64**	**61**	**105**	**854**	**142**	**17%**
Incoming	12		51	11	14	2		10		42	**142**		
In./Intra.	8%	0%	39%	13%	19%	3%	0%	16%	0%	40%	**17%**		

Source: Author's calculation from the *Asian International Input-Output Tables 1990, 2000* .

Table 3 Number of Important Cells (manufacturing)

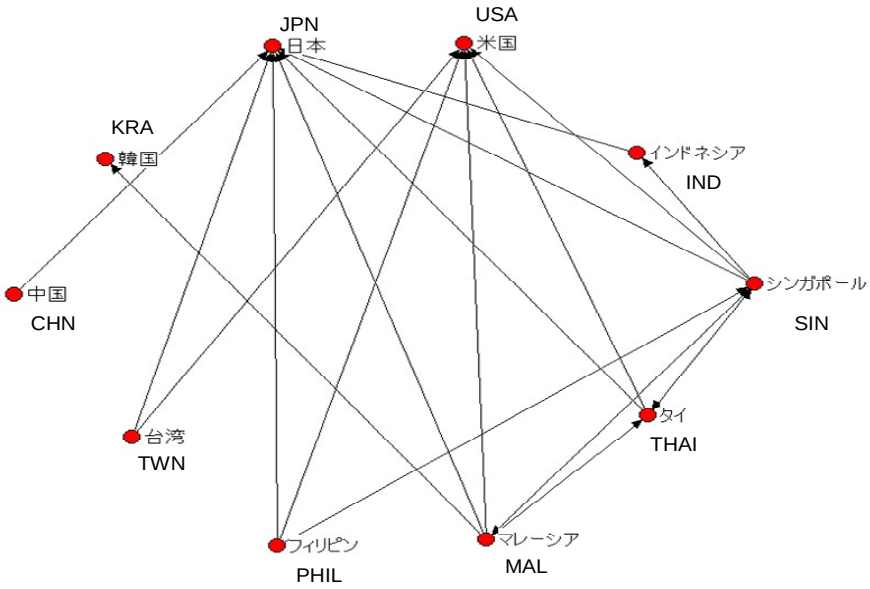
1990	Manufacturing	Agr. & Services
Manufacturing	53	31
Agr. & Services	44	34

2000	Manufacturing	Agr. & Services
Manufacturing	73	22
Agr. & Services	33	14

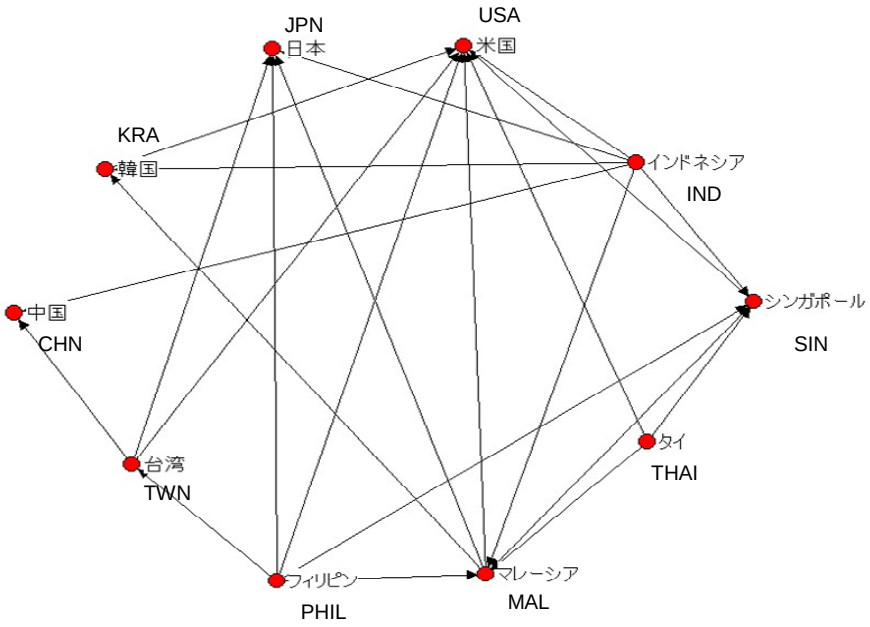
Source: Author's calculation from the *Asian International Input-Output Tables 1990, 2000* .

Figure 6 Networks among Countries

1990

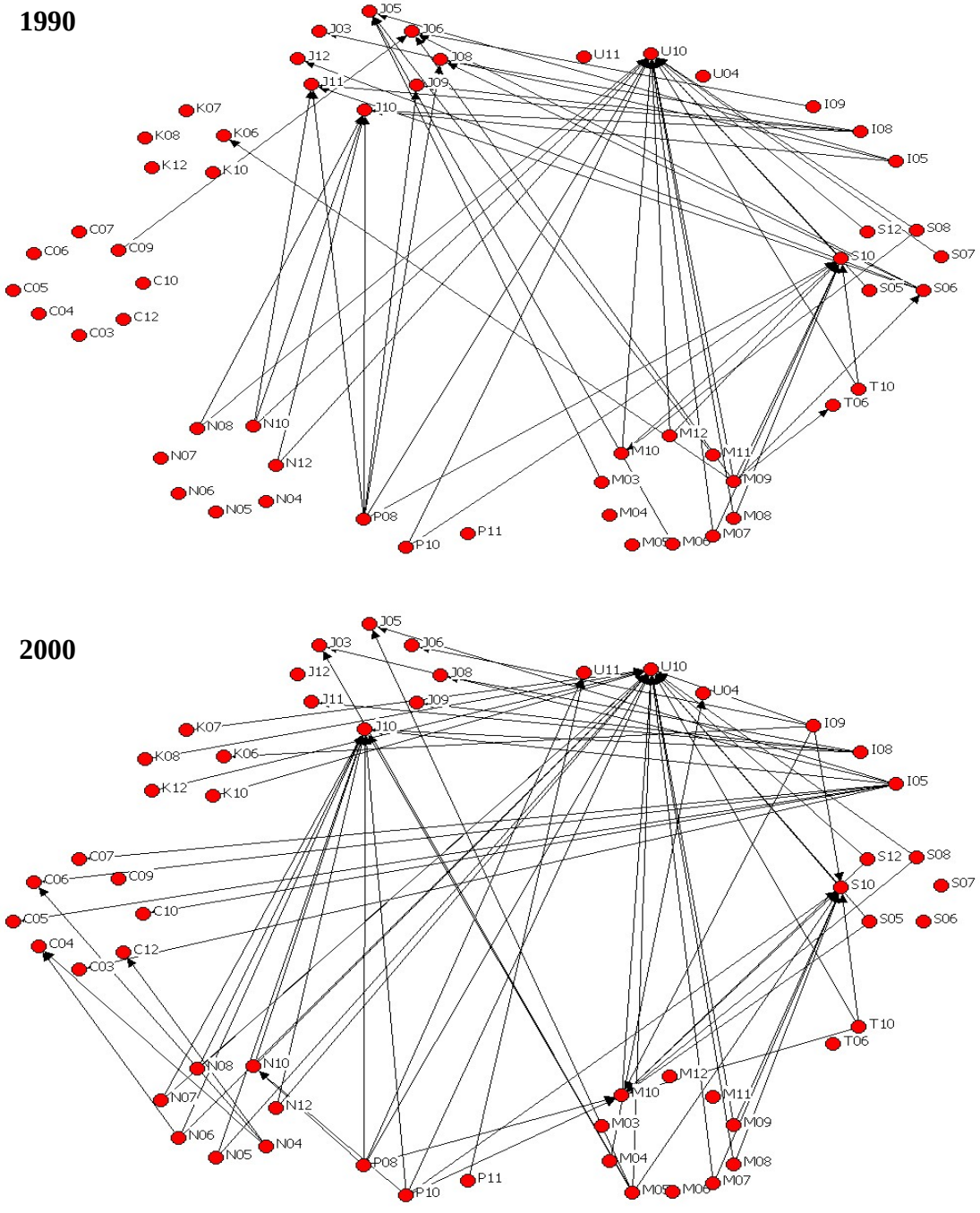


2000



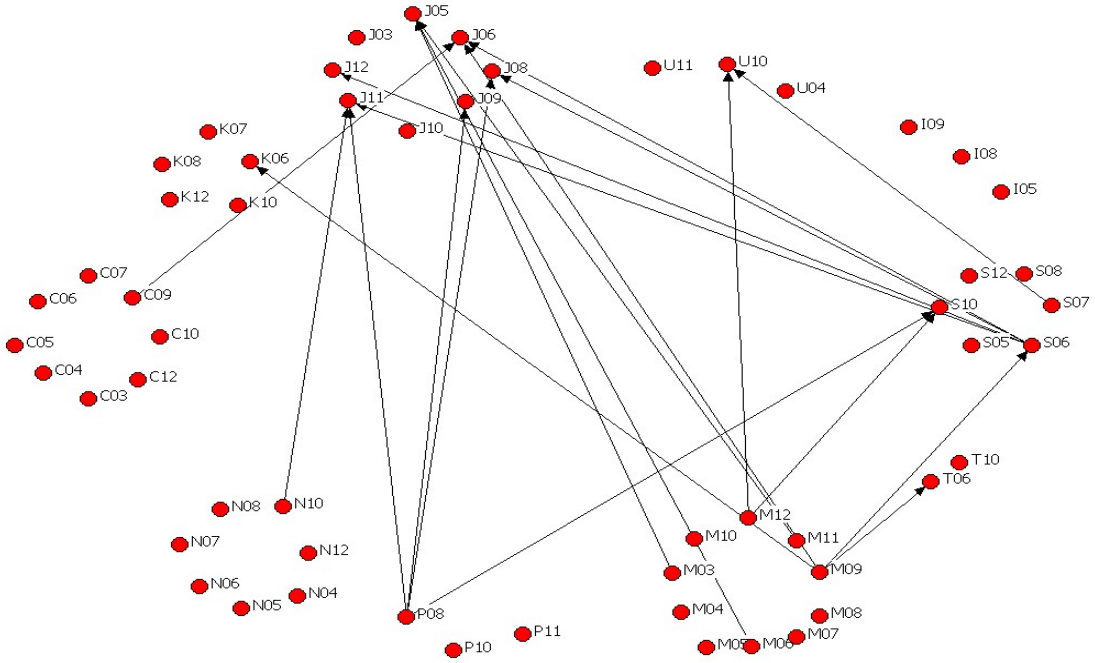
Source: Drawn by the author.

Figure 7 The Networks of Manufacturing Sectors



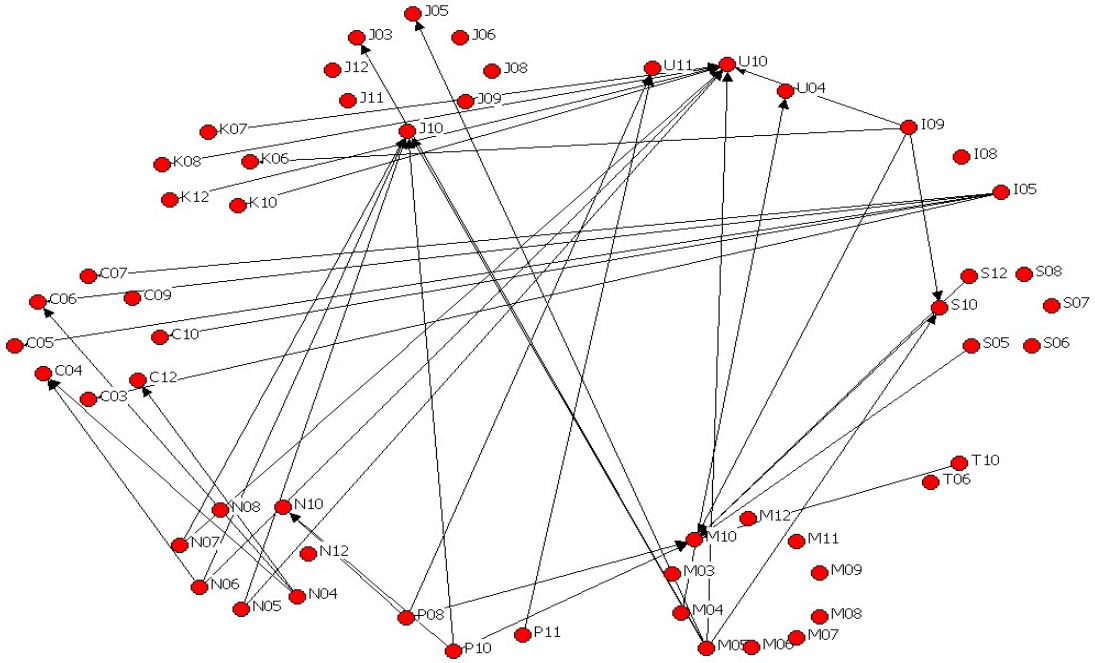
Source: Drawn by the author.

Figure 8 Disappeared Networks



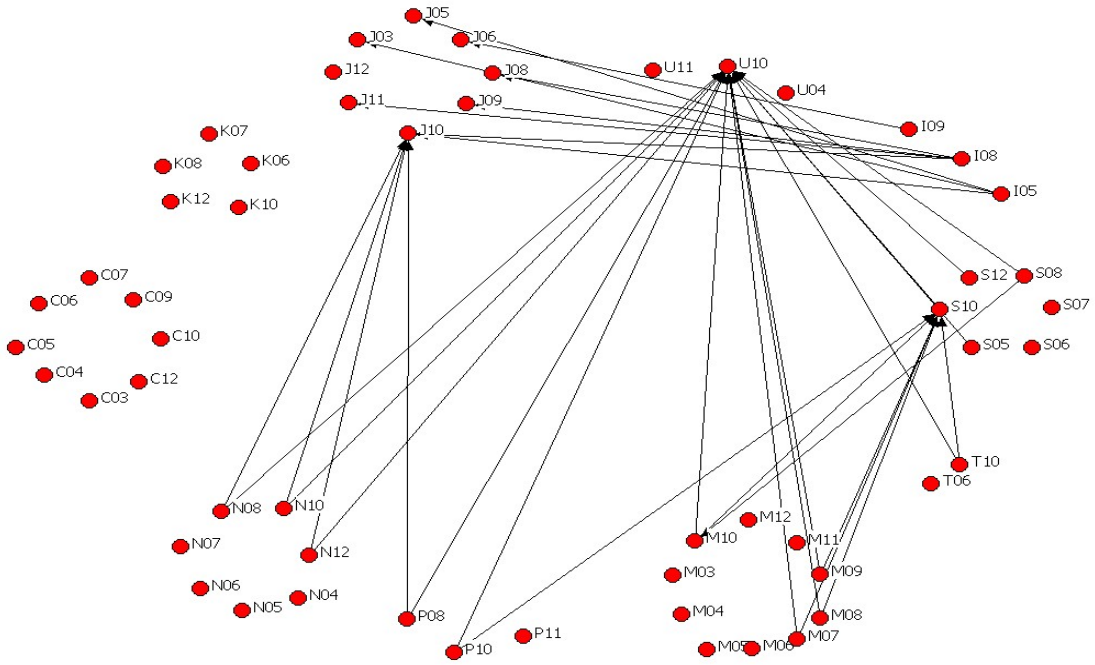
Source: Drawn by the author.

Figure 9 Newly Created Networks



Source: Drawn by the author.

Figure 10 Stable Networks



Source: Drawn by the author.

Appendix 1 Layout of the Asian International Input-Output Table

			Intermediate Demand (A)										Final Demand (F)										Export (L)				
		code	Indonesia (AI)	Malaysia (AM)	Philippines (AP)	Singapore (AS)	Thailand (AT)	China (AC)	Taiwan (AN)	Korea (AK)	Japan (AJ)	U.S.A. (AU)	Indonesia (FI)	Malaysia (FM)	Philippines (FP)	Singapore (FS)	Thailand (FT)	China (FC)	Taiwan (FN)	Korea (FK)	Japan (FJ)	U.S.A. (FU)	Export to H.Kong (LH)	Export to EU (LO)	Export to R.O.W. (LW)	Discrepancy (QX)	Total Outputs (XX)
	Indonesia	(AI)	A^{II}	A^{IM}	A^{IP}	A^{IS}	A^{IT}	A^{IC}	A^{IN}	A^{IK}	A^{IJ}	A^{IU}	F^{II}	F^{IM}	F^{IP}	F^{IS}	F^{IT}	F^{IC}	F^{IN}	F^{IK}	F^{IJ}	F^{IU}	L^{IH}	L^{IO}	L^{IW}	Q^{I}	X^{I}
	Malaysia	(AM)	A^{MI}	A^{MM}	A^{MP}	A^{MS}	A^{MT}	A^{MC}	A^{MN}	A^{MK}	A^{MJ}	A^{MU}	F^{MI}	F^{MM}	F^{MP}	F^{MS}	F^{MT}	F^{MC}	F^{MN}	F^{MK}	F^{MJ}	F^{MU}	L^{MH}	L^{MO}	L^{MW}	Q^{M}	X^{M}
	Philippines	(AP)	A^{PI}	A^{PM}	A^{PP}	A^{PS}	A^{PT}	A^{PC}	A^{PN}	A^{PK}	A^{PJ}	A^{PU}	F^{PI}	F^{PM}	F^{PP}	F^{PS}	F^{PT}	F^{PC}	F^{PN}	F^{PK}	F^{PJ}	F^{PU}	L^{PH}	L^{PO}	L^{PW}	Q^{P}	X^{P}
	Singapore	(AS)	A^{SI}	A^{SM}	A^{SP}	A^{SS}	A^{ST}	A^{SC}	A^{SN}	A^{SK}	A^{SJ}	A^{SU}	F^{SI}	F^{SM}	F^{SP}	F^{SS}	F^{ST}	F^{SC}	F^{SN}	F^{SK}	F^{SJ}	F^{SU}	L^{SH}	L^{SO}	L^{SW}	Q^{S}	X^{S}
	Thailand	(AT)	A^{TI}	A^{TM}	A^{TP}	A^{TS}	A^{TT}	A^{TC}	A^{TN}	A^{TK}	A^{TJ}	A^{TU}	F^{TI}	F^{TM}	F^{TP}	F^{TS}	F^{TT}	F^{TC}	F^{TN}	F^{TK}	F^{TJ}	F^{TU}	L^{TH}	L^{TO}	L^{TW}	Q^{T}	X^{T}
	China	(AC)	A^{CI}	A^{CM}	A^{CP}	A^{CS}	A^{CT}	A^{CC}	A^{CN}	A^{CK}	A^{CJ}	A^{CU}	F^{CI}	F^{CM}	F^{CP}	F^{CS}	F^{CT}	F^{CC}	F^{CN}	F^{CK}	F^{CJ}	F^{CU}	L^{CH}	L^{CO}	L^{CW}	Q^{C}	X^{C}
	Taiwan	(AN)	A^{NI}	A^{NM}	A^{NP}	A^{NS}	A^{NT}	A^{NC}	A^{NN}	A^{NK}	A^{NJ}	A^{NU}	F^{NI}	F^{NM}	F^{NP}	F^{NS}	F^{NT}	F^{NC}	F^{NN}	F^{NK}	F^{NJ}	F^{NU}	L^{NH}	L^{NO}	L^{NW}	Q^{N}	X^{N}
	Korea	(AK)	A^{KI}	A^{KM}	A^{KP}	A^{KS}	A^{KT}	A^{KC}	A^{KN}	A^{KK}	A^{KJ}	A^{KU}	F^{KI}	F^{KM}	F^{KP}	F^{KS}	F^{KT}	F^{KC}	F^{KN}	F^{KK}	F^{KJ}	F^{KU}	L^{KH}	L^{KO}	L^{KW}	Q^{K}	X^{K}
	Japan	(AJ)	A^{JI}	A^{JM}	A^{JP}	A^{JS}	A^{JT}	A^{JC}	A^{JN}	A^{JK}	A^{JJ}	A^{JU}	F^{JI}	F^{JM}	F^{JP}	F^{JS}	F^{JT}	F^{JC}	F^{JN}	F^{JK}	F^{JJ}	F^{JU}	L^{JH}	L^{JO}	L^{JW}	Q^{J}	X^{J}
	U.S.A.	(AU)	A^{UI}	A^{UM}	A^{UP}	A^{US}	A^{UT}	A^{UC}	A^{UN}	A^{UK}	A^{UJ}	A^{UU}	F^{UI}	F^{UM}	F^{UP}	F^{US}	F^{UT}	F^{UC}	F^{UN}	F^{UK}	F^{UJ}	F^{UU}	L^{UH}	L^{UO}	L^{UW}	Q^{U}	X^{U}
Freight and Insurance		(BF)	BA^{I}	BA^{M}	BA^{P}	BA^{S}	BA^{T}	BA^{C}	BA^{N}	BA^{K}	BA^{J}	BA^{U}	BF^{I}	BF^{M}	BF^{P}	BF^{S}	BF^{T}	BF^{C}	BF^{N}	BF^{K}	BF^{J}	BF^{U}					
Import from H. Kong		(CH)	A^{HI}	A^{HM}	A^{HP}	A^{HS}	A^{HT}	A^{HC}	A^{HN}	A^{HK}	A^{HJ}	A^{HU}	F^{HI}	F^{HM}	F^{HP}	F^{HS}	F^{HT}	F^{HC}	F^{HN}	F^{HK}	F^{HJ}	F^{HU}					
Import from EU		(CO)	A^{OI}	A^{OM}	A^{OP}	A^{OS}	A^{OT}	A^{OC}	A^{ON}	A^{OK}	A^{OJ}	A^{OU}	F^{OI}	F^{OM}	F^{OP}	F^{OS}	F^{OT}	F^{OC}	F^{ON}	F^{OK}	F^{OJ}	F^{OU}					
Import from the R.O.W.		(CW)	A^{WI}	A^{WM}	A^{WP}	A^{WS}	A^{WT}	A^{WC}	A^{WN}	A^{WK}	A^{WJ}	A^{WU}	F^{WI}	F^{WM}	F^{WP}	F^{WS}	F^{WT}	F^{WC}	F^{WN}	F^{WK}	F^{WJ}	F^{WU}					
Duties & Import Taxes		(DT)	DA^{I}	DA^{M}	DA^{P}	DA^{S}	DA^{T}	DA^{C}	DA^{N}	DA^{K}	DA^{J}	DA^{U}	DF^{I}	DF^{M}	DF^{P}	DF^{S}	DF^{T}	DF^{C}	DF^{N}	DF^{K}	DF^{J}	DF^{U}					
Value Added		(VV)	V^{I}	V^{M}	V^{P}	V^{S}	V^{T}	V^{C}	V^{N}	V^{K}	V^{J}	V^{U}															
Total Inputs		(XX)	X^{I}	X^{M}	X^{P}	X^{S}	X^{T}	X^{C}	X^{N}	X^{K}	X^{J}	X^{U}															

Source: IDE (2006), p.12.

Appendix 2 Sector classification

Code	Description
001	Agriculture, forestry, fishery
002	Mining and quarrying
003	Food processing
004	Textile
005	Other light manufacturing
006	Chemicals
007	Non-metallic mineral products
008	Metal products
009	Machinery
010	Electric and electronics
011	Transport equipment
012	Other manufacturing
013	Electricity, gas and water
014	Construction
015	Trade and transport
016	Services

Appendix 3 Backward linkage effects (in percentage share)

[1990]

	China	Indonesia	Japan	Korea	Malaysia	Taiwan	Philippines	Singapore	Thailand	U.S.A.
[All industries]										
China	96.637%	0.633%	0.452%	0.047%	1.016%	0.074%	0.495%	2.349%	1.299%	0.137%
Indonesia	0.170%	90.400%	0.430%	0.609%	0.398%	0.475%	0.360%	1.004%	0.224%	0.051%
Japan	1.366%	4.560%	96.818%	4.644%	7.825%	5.962%	7.030%	11.740%	7.555%	0.982%
Korea	0.150%	0.847%	0.290%	89.209%	0.792%	0.548%	1.397%	1.055%	0.898%	0.190%
Malaysia	0.182%	0.304%	0.195%	0.523%	83.130%	0.424%	0.658%	3.424%	1.085%	0.064%
Taiwan	0.379%	0.867%	0.206%	0.404%	1.515%	87.371%	1.806%	1.834%	1.092%	0.239%
Philippines	0.016%	0.044%	0.049%	0.054%	0.073%	0.087%	83.355%	0.136%	0.075%	0.027%
Singapore	0.105%	0.610%	0.076%	0.150%	2.531%	0.397%	0.927%	71.921%	1.259%	0.078%
Thailand	0.057%	0.100%	0.081%	0.097%	0.337%	0.132%	0.130%	0.616%	83.939%	0.039%
U.S.A.	0.938%	1.636%	1.403%	4.264%	2.384%	4.529%	3.841%	5.921%	2.573%	98.193%
Total	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**
[Textile industry]										
China	96.320%	1.498%	0.440%	0.074%	2.814%	0.082%	1.046%	3.631%	2.058%	0.379%
Indonesia	0.068%	85.277%	0.216%	0.390%	1.117%	0.415%	0.628%	2.731%	0.330%	0.138%
Japan	1.075%	3.175%	95.529%	4.919%	6.943%	4.497%	5.012%	10.028%	4.308%	0.761%
Korea	0.294%	1.899%	0.282%	88.216%	1.972%	1.016%	2.852%	1.202%	1.802%	0.653%
Malaysia	0.104%	0.436%	0.118%	0.331%	73.668%	0.208%	0.467%	3.123%	0.457%	0.091%
Taiwan	0.819%	2.730%	0.322%	1.309%	7.896%	90.048%	9.075%	9.537%	2.662%	0.569%
Philippines	0.007%	0.028%	0.087%	0.033%	0.059%	0.032%	72.048%	0.052%	0.022%	0.072%
Singapore	0.060%	0.685%	0.058%	0.088%	2.273%	0.223%	0.646%	65.379%	0.787%	0.067%
Thailand	0.056%	0.259%	0.191%	0.098%	0.843%	0.127%	0.359%	1.175%	84.447%	0.116%
U.S.A.	1.195%	4.013%	2.757%	4.544%	2.415%	3.352%	7.866%	3.144%	3.128%	97.154%
Total	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**
[Electric and electronics industry]										
China	94.632%	0.620%	0.266%	0.072%	0.744%	0.098%	0.213%	0.767%	0.723%	0.178%
Indonesia	0.102%	81.329%	0.193%	0.218%	0.349%	0.216%	0.143%	0.431%	0.242%	0.034%
Japan	3.193%	8.475%	96.648%	14.224%	13.151%	16.372%	18.508%	21.077%	17.904%	3.290%
Korea	0.403%	1.461%	0.421%	77.880%	1.392%	1.184%	1.844%	2.230%	1.646%	0.536%
Malaysia	0.133%	0.416%	0.137%	0.489%	69.030%	0.781%	0.654%	3.786%	1.237%	0.271%
Taiwan	0.549%	2.236%	0.443%	0.873%	2.247%	72.477%	2.161%	2.723%	2.562%	0.760%
Philippines	0.016%	0.082%	0.053%	0.107%	0.270%	0.240%	63.449%	0.517%	0.193%	0.077%
Singapore	0.103%	1.855%	0.115%	0.446%	5.719%	1.000%	3.306%	56.821%	5.491%	0.525%
Thailand	0.036%	0.259%	0.084%	0.114%	0.460%	0.215%	0.237%	1.214%	57.842%	0.108%
U.S.A.	0.833%	3.267%	1.640%	5.577%	6.639%	7.416%	9.486%	10.435%	12.160%	94.221%
Total	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**
[Transport equipment]										
China	93.741%	0.419%	0.203%	0.044%	0.385%	0.062%	0.158%	1.285%	1.402%	0.157%
Indonesia	0.086%	79.166%	0.174%	0.218%	0.272%	0.223%	0.124%	0.656%	0.221%	0.034%
Japan	3.749%	16.884%	97.802%	8.024%	27.604%	12.614%	24.999%	16.942%	26.146%	2.898%
Korea	0.185%	0.616%	0.203%	87.430%	0.367%	0.626%	2.046%	1.057%	0.827%	0.285%
Malaysia	0.115%	0.214%	0.078%	0.213%	67.666%	0.203%	0.317%	1.544%	0.648%	0.091%
Taiwan	0.348%	0.509%	0.165%	0.351%	0.655%	81.611%	0.838%	1.160%	0.967%	0.388%
Philippines	0.016%	0.035%	0.041%	0.044%	0.026%	0.069%	69.370%	0.095%	0.098%	0.028%
Singapore	0.095%	0.479%	0.046%	0.136%	0.935%	0.306%	0.367%	66.256%	0.890%	0.099%
Thailand	0.049%	0.092%	0.042%	0.046%	0.155%	0.055%	0.179%	0.354%	66.198%	0.040%
U.S.A.	1.616%	1.585%	1.246%	3.494%	1.934%	4.230%	1.602%	10.653%	2.604%	95.981%
Total	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**

Source: Calculated from the Asian international input-output table 1990.

[2000]

	China	Indonesia	Japan	Korea	Malaysia	Taiwan	Philippines	Singapore	Thailand	U.S.A.
[All industries]										
China	94.022%	1.295%	0.742%	1.817%	1.893%	1.576%	1.678%	2.413%	1.812%	0.551%
Indonesia	0.239%	90.151%	0.385%	0.701%	1.052%	0.746%	1.263%	0.884%	0.644%	0.091%
Japan	1.957%	3.320%	96.464%	3.402%	7.747%	5.925%	5.744%	7.019%	6.970%	1.119%
Korea	1.180%	1.099%	0.399%	89.883%	1.583%	1.324%	2.419%	1.213%	1.027%	0.356%
Malaysia	0.212%	0.678%	0.250%	0.413%	77.222%	0.662%	1.463%	3.744%	1.048%	0.163%
Taiwan	1.043%	0.652%	0.269%	0.407%	1.874%	84.861%	1.910%	1.030%	1.099%	0.362%
Philippines	0.046%	0.039%	0.062%	0.082%	0.243%	0.194%	79.796%	0.154%	0.178%	0.081%
Singapore	0.184%	0.489%	0.073%	0.242%	3.245%	0.533%	1.491%	77.562%	0.907%	0.126%
Thailand	0.139%	0.385%	0.135%	0.164%	1.157%	0.370%	0.774%	1.106%	83.718%	0.118%
U.S.A.	0.978%	1.891%	1.221%	2.890%	3.984%	3.808%	3.462%	4.875%	2.598%	97.035%
Total	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**
[Textile industry]										
China	93.804%	2.347%	2.017%	5.008%	4.594%	1.286%	4.336%	5.257%	3.448%	1.196%
Indonesia	0.208%	85.956%	0.594%	1.056%	2.728%	1.111%	1.639%	0.582%	0.699%	0.445%
Japan	2.066%	2.592%	94.397%	2.579%	7.102%	4.703%	3.992%	3.666%	2.826%	0.879%
Korea	1.475%	2.309%	0.602%	87.259%	2.075%	1.707%	4.852%	2.276%	1.650%	0.753%
Malaysia	0.128%	0.742%	0.204%	0.300%	68.976%	0.592%	0.591%	4.754%	0.562%	0.274%
Taiwan	1.501%	1.683%	0.500%	0.995%	5.747%	86.153%	9.076%	1.890%	2.330%	1.025%
Philippines	0.020%	0.036%	0.033%	0.030%	0.173%	0.111%	68.659%	0.220%	0.085%	0.125%
Singapore	0.087%	0.427%	0.042%	0.120%	3.329%	0.333%	0.621%	76.495%	1.027%	0.100%
Thailand	0.113%	0.584%	0.289%	0.401%	1.582%	0.589%	1.812%	1.606%	85.763%	0.475%
U.S.A.	0.598%	3.325%	1.323%	2.252%	3.695%	3.417%	4.421%	3.253%	1.611%	94.729%
Total	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**
[Electric and electronics industry]										
China	88.232%	1.683%	0.952%	2.272%	3.045%	2.354%	1.528%	3.665%	5.076%	1.130%
Indonesia	0.201%	86.701%	0.241%	0.307%	0.926%	0.526%	0.437%	0.858%	0.931%	0.106%
Japan	3.554%	4.450%	93.251%	9.710%	13.642%	13.678%	18.248%	14.464%	14.540%	3.607%
Korea	2.116%	1.562%	0.987%	74.022%	3.245%	3.996%	4.837%	2.501%	3.358%	1.453%
Malaysia	0.625%	0.866%	0.528%	1.400%	53.463%	2.063%	1.840%	5.851%	3.332%	0.810%
Taiwan	2.214%	0.819%	1.191%	2.069%	3.785%	67.037%	2.834%	2.267%	2.686%	1.328%
Philippines	0.209%	0.064%	0.260%	0.570%	1.293%	1.126%	53.727%	0.319%	0.707%	0.410%
Singapore	0.572%	1.022%	0.329%	1.228%	7.449%	1.961%	3.585%	60.860%	3.586%	0.855%
Thailand	0.318%	0.545%	0.218%	0.466%	2.332%	0.859%	1.337%	1.351%	57.665%	0.328%
U.S.A.	1.959%	2.289%	2.044%	7.955%	10.821%	6.399%	11.629%	7.864%	8.119%	89.972%
Total	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**
[Transport equipment]										
China	93.542%	1.781%	0.565%	1.475%	1.819%	1.731%	2.380%	2.135%	1.674%	0.873%
Indonesia	0.121%	88.541%	0.181%	0.355%	0.788%	0.358%	2.061%	1.166%	0.525%	0.076%
Japan	2.960%	6.204%	96.672%	5.249%	18.391%	10.054%	11.456%	8.897%	20.635%	3.250%
Korea	1.040%	0.623%	0.311%	88.702%	1.678%	1.423%	3.483%	1.262%	1.209%	0.560%
Malaysia	0.147%	0.394%	0.147%	0.263%	68.845%	0.473%	1.574%	2.184%	0.884%	0.224%
Taiwan	0.956%	0.447%	0.263%	0.353%	1.713%	80.041%	2.165%	0.754%	1.084%	0.533%
Philippines	0.033%	0.057%	0.070%	0.061%	0.150%	0.130%	72.018%	0.107%	0.636%	0.146%
Singapore	0.147%	0.311%	0.057%	0.220%	2.133%	0.352%	1.247%	75.937%	0.646%	0.168%
Thailand	0.109%	0.379%	0.271%	0.118%	0.959%	0.218%	0.971%	0.660%	69.532%	0.142%
U.S.A.	0.945%	1.263%	1.464%	3.203%	3.524%	5.221%	2.645%	6.899%	3.176%	94.028%
Total	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**	**100.000%**

Source: Calculated from the Asian international input-output table 2000.