

CHANGING PATTERNS OF DIRECT INVESTMENT  
AND THE IMPLICATIONS FOR TRADE AND DEVELOPMENT

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No. 9202

December 1992

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An earlier version of the paper was presented at the 20 th PAFTAD Conference at the Institute for International Economics, Washington, D.C, September 10-12, 1992. The author is grateful for the comments from Edward M. Graham, Somsak Tambunlertchai, Marc Noland and other participants at the conference. This research was partially supported by Waseda University Grant for Special Research Projects.

## I. Introduction

The economies of the Pacific Asia region have been outperforming the rest of the world in the economic growth race for the last few decades. In the 1950s and 1960s Japan achieved remarkable economic growth, while in the 1970s and 1980s the developing economies in Pacific Asia, namely the Asian NIEs (the NIEs, hereafter), ASEAN, and China, have shown impressively high growth performance. Favorable economic performance in the recent years by these economies has not been achieved without difficulties, however. In the early 1980s a number of economies faced serious balance of payments problems, but with structural adjustment policies most of the economies have overcome the problems and regained growth momentum.

Rapid export expansion contributed significantly to economic growth of the economies in Pacific Asia, as export earnings enabled them to import important items for promoting economic development such as capital goods and foreign technology. Although foreign trade is still very important for these economies to maintain rapid growth, foreign direct investment (FDI) has become to play an important role in promoting economic development in the 1980s, especially in the second half of the 1980s. FDI is argued to contribute to economic development through various ways, since FDI transfers not only financial resources, which would be used to

expand production facilities, but also technology and management know-how, which would improve technical and managerial efficiency. Moreover, it has been recognized that FDI promotes economic development by expanding various types of networks such as marketing network and information network.

In light of the increasing importance of FDI in economic development in Pacific Asia, we attempt to achieve two objective in this paper. One is to examine the pattern of FDI in Pacific Asia (section II) and the other is to analyze the impact of FDI on the economic development of the countries in Pacific Asia (section III). In section IV some concluding comments will be presented.

## II. Changing Pattern of Foreign Direct Investment in Asia

Foreign direct investment (FDI) in the world increased rapidly in the 1980s, and the rate of increase was accelerated in the second half of the 1980s. Among various regions of the world, Asia has been an active investor as well as an increasingly important recipient of FDI. In this section, we first examine the changes in the importance of Asia in world FDI. We then study the changing patterns of FDI in Asia closely by focusing separately on Japan, the NIEs, ASEAN and China.

### II.1 Rapid Increase of Foreign Direct Investment in Asia

Table 1 shows the changing patterns of both outward and inward

FDI for selected Asian countries and regions in the second half of the 1980s. As an investor, Japan and the NIEs increased their importance. Between 1985 and 1990 the magnitude of outward FDI for Japan and the NIEs increased 7.5 fold and 16.5 fold, respectively. As the rate of increase of outward FDI by Japan and by the NIEs respectively exceeded the corresponding rate for world outward FDI in the second half of the 1980s, their respective shares in world outward FDI increased from 11.2 and 0.6 percent in 1985 to 22.1 and 3.0 percent in 1990. In 1990 outward FDI by Japan and by the NIEs amounted respectively to 48.0 and 6.6 billion dollars. In 1990 Japan was the world largest investor, and it was followed by the U.S. (\$33.4 billion), France (\$24.2 billion) and Germany (\$22.3 billion). In terms of cumulative outward FDI for the 1970-90 period, the U.S. is by far the largest investor at \$421.5 billion, followed by the U.K. (\$233.6) and Japan (\$201.4).

As a recipient of FDI, the NIEs and ASEAN countries attracted substantial amount of FDI in the second half of the 1980s, as the magnitude of inward FDI for these two regions increased respectively 4.3 and 5.7 fold during the period. Since the rate of world inward FDI increased more slowly by 3.3 times over the 1985-90 period, the shares of the NIEs and ASEAN in world inward FDI increased respectively from 3.4 and 2.4 percent in 1985 to 4.3 percent in 1990. As the relative share of developing countries in

world inward FDI declined in the second half of the 1980s, the fact that the NIEs and ASEAN increased their respective shares in world inward FDI is particularly noteworthy.

Similar to other Asian countries, China was successful in attracting FDI in the second half of the 1980s, as the magnitude of inward FDI doubled in five years from \$1.7 billion in 1985 to \$3.5 billion in 1990. As an individual country in Asia, China is second only to Singapore in the magnitude of inward FDI.

It is to be noted that Japan's inward FDI is quite limited, not only in terms of absolute value, as shown in Table 1, but also in relation to the size of its economy. According to one estimate, the ratio of stock of inward FDI to GNP at the end of 1989 was mere 0.3 percent for Japan, while the corresponding ratios for the U.S., the U.K.(1988), and West Germany (1988) were respectively 7.7, 14.1, and 3.0 percent.(Japan Development Bank, 1991) A number of obstacles for undertaking FDI in Japan have been raised by foreign firms. Some of them are tough comeptition, high land prices, high wages, high demand by consumers, high material costs, government regulation and difficulty in entering keiretsu dominated market.(Japan Development Bank, 1991) Costs of undertaking FDI in Japan went up with the yen appreciation. Although the obstacles noted above are pointed out by foreign investors, it is important to note that most of these are equally faced by Japanese potential

entrants to the existing markets.

We saw in this section that in the second half of the 1980s, Japan and the NIEs increased their position as FDI supplier in the world, while the NIEs, ASEAN and China increased their position as FDI recipient among developing countries. In the next section we examine the patterns of outward as well as inward FDI in Asia by focusing on Japan, the NIEs and ASEAN.

## II.2 Foreign Direct Investment in Asia: Cases of Japan, NIEs, and ASEAN

### A. Japan: An Active Foreign Direct Investor

Japanese FDI started to increase rapidly in 1986, and the rapid increase continued until 1989. The speed of the increase during the 1986-89 period was unprecedentedly high, as the average annual growth rate for the period was as high as 53.3 percent. In 1990 the magnitude of annual Japanese FDI declined from the previous year for the first time in eight years, and the declining trend continued in 1991.

Although the rapid increase of Japanese FDI was mainly led by FDI in non-manufacturing sectors such as financial services and real estate in developed countries, Japanese FDI in Asia has been increasing significantly in various sectors including manufacturing and non-manufacturing. The magnitude of Japanese FDI in manufacturing in Asia on annual basis increased from \$460

million in 1985 to \$3,068 million in 1990. The substantial appreciation of the yen in the mid-1980s led Japanese firms to undertake FDI in Asian countries, especially in the NIEs, to take advantage of low production cost. In 1987, however, Japanese firms started to shift their location of FDI from the NIEs to ASEAN countries, as the NIEs lost cost advantages because of rising wages and the appreciation of their currencies.<sup>1</sup> In addition, the fact the NIEs were graduated from the US GSP (generalized system of preferences) scheme further reduced their attractiveness as a host to FDI.

The shift in the Japanese manufacturing FDI from the NIEs to ASEAN can be seen clearly in Table 2, where the cumulative FDI values are shown. Between 1985 and 1987 the value of Japanese manufacturing FDI to the NIEs was at \$1.5 billion, significantly higher than that to the ASEAN countries at \$0.9 billion. The situation changed drastically after 1987, as for the period over 1987-90 the value of Japanese manufacturing FDI in the NIEs at \$2.9 billion was substantially lower than the corresponding value for ASEAN at \$5.0 billion. It is also to be noted that Japanese manufacturing FDI to China increased significantly after 1987.

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<sup>1</sup> MITI(1991) reports the results of survey indicating 39.5 percent of the surveyed Japanese firms investing in the NIEs said low wages was a motive behind FDI, while the corresponding value for the firms investing in ASEAN was significantly higher at 52.3 percent.

As for the sectoral distribution of Japanese FDI to Asia, the share of non-manufacturing sector is increasing in the NIEs. Within manufacturing, the electric sector captured a large share and moreover its share increased significantly during the second half of the 1980s. The rate of increase was particularly notable for ASEAN and China. The share of electric sector in overall manufacturing FDI in cumulative value from 1951 in respective groups of countries increased from 4.9 and 10.1 percent in 1985 to 20.6 and 35.8 percent in 1990. As the electric sector increased its share, a number of sectors lost their shares. Among them, the textiles sector experienced a remarkable decline in the NIEs and ASEAN, while the food sector lost its share in China. The decline in the share of textiles in Japanese FDI to the NIEs and ASEAN indicate that these countries lost a comparative advantage in labor intensive production such as that in textiles, because their factor endowment changed as a result of economic development. More specifically, with accumulation of physical and human capital, capital-labor ratio increased rapidly in the NIEs and ASEAN, resulting in the loss of a comparative advantage in labor-intensive production. A similar argument may be made for the decline in the share of the food sector in Japanese manufacturing FDI in China.

The pattern of Japanese FDI observed above was realized by the interaction of supply-side factors in Japan and demand-side factors



in the recipient countries.<sup>2</sup> As for the factors in Japan promoting Japanese FDI, the most important factor is the rapid and substantial yen appreciation, which reduced the international competitiveness of Japanese products by increasing the cost of production in Japan. To overcome the unfavorable situation, Japanese firms have adopted various strategies including globalization, rationalization and diversification. Globalization has been pursued not only through FDI but also through forming alliance with foreign firms. Alliance has taken various forms such as technology tie-up, production cooperation, original equipment manufacturing (OEM) and others.

Rationalization is pursued to increase competitiveness by improving productive efficiency, while diversification is undertaken to increase profitability by upgrading the quality of the products and/or by moving into a new line of business where higher profitability may be realized. One of the important developments observed in the latter half of the 1980s was that a number of firms pursued these three strategies simultaneously in coherent fashion in order to facilitate industrial restructuring, in responding to drastic changes in their environment. Such strategy was most apparent in the electric industry. Take a case of color TV production as an example. A number of Japanese TV

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<sup>2</sup> Urata (1991a) discussed in some detail the factors that promoted FDI in the second half of the 1980s.

producers shifted their production of standard color TVs such as small and medium sized TVs to the NIEs and to ASEAN, where production of such standardized TVs was efficiently performed with low wage labor, while in Japan they concentrated on the production of high-quality TVs such as those capable of receiving satellite broadcasting and/or large screen color TVs. (Urata, 1991b)

Although there is no doubt that the significant yen appreciation precipitated globalization of Japanese firms, there were other factors at work. The "bubble economy" created by excessively expansionary monetary policy, which was conducted in order to deal mainly with recessionary pressure brought forth by the yen appreciation, promoted domestic and foreign investment. Under the bubble economy, the prices of stocks and land skyrocketed, facilitating the firms with appreciated assets to obtain loans for investment. Another factor promoting Japanese FDI was the reaction by Japanese firms to FDI undertaken by other Japanese firms. There were two different types of motivations leading to such reaction. One motivation was to keep up with the investing rival firms in business performance, while the other motivation is to follow the investing trading partners to maintain business. Furthermore, the overseas experiences accumulated by Japanese firms also contributed to rapid FDI in the latter half of the 1980s.

As a result of rapid increase in FDI by Japanese firms,

overseas production by Japanese firms expanded rapidly. In manufacturing, the overseas production ratio, defined as the ratio of overseas production to total (overseas and domestic) production, grew from 3.0 percent in 1985 to 5.7 percent in 1989. (MITI, 1991) Despite the notable increase, the overseas production ratio by Japanese manufacturing firms is still much lower than the corresponding ratio for the firms in other developed countries as the U.S. and German firms respectively recorded the overseas production ratios of around 20 percent. Among the manufacturing sub-sectors, the overseas production ratio is particularly high for transport machinery and electric machinery subsectors, for which the overseas production ratios in 1989 were respectively 14.3 and 11.0 percent. The overseas production ratios for most sectors are likely to increase in the future, as FDI undertaken in the latter half of the 1980s is going to get fully operated in the near future.

#### B. The NIEs: Active Participants in Inward and Outward FDI

We already saw that inward as well as outward FDI for the NIEs increased significantly in the second half of the 1980s<sup>3</sup>. We also found that Japanese FDI in the NIEs increased during the period.

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<sup>3</sup> Among the NIEs, the patterns of FDI for Korea and Taiwan are analyzed respectively by Lee and Ramstetter (1991) and Shive and Tu (1991).

The speed of increase as well as the magnitude of FDI from Japan to the NIEs was particularly notable in non-manufacturing and the electric and electronics industry in manufacturing. In this section, therefore, we examine the factors in the NIEs that attracted inward FDI first, and then turn to the discussion on their outward FDI.

The composition of inward FDI in the NIEs changed drastically in the second half of the 1980s. In total inward FDI the share of non-manufacturing, especially that of services, increased and among the manufacturing subsectors inward FDI shifted from labor-intensive subsectors to technology-intensive sectors. Various factors promoted inward FDI in non-manufacturing in the NIEs. Demand for services increased as the income level grew with economic development. A typical example may be active FDI in commercial sectors such as retail services such as department stores and super-markets, responding to increased demand for a variety of products by consumers. Furthermore, deregulation and liberalization contributed to increasing inward FDI. For example, deregulation and liberalization in the insurance sector in Korea led to active FDI in that sector.

The shift in inward FDI in the NIEs toward technology-intensive sector was attributable to the FDI promotion policies in high-technology sectors adopted by the governments of

the NIEs. Such policy was pursued because they felt a need to improve competitive advantage in high-tech sectors, in order to deal with the situation where they are losing competitive advantage in low-technology products to the ASEAN countries. To gain competitive advantage in high-tech products, the policy makers in the NIEs thought foreign technology was necessary and they thought FDI would be an important means for technology import.

Outward FDI has been actively undertaken by the NIEs since the mid-1980s, in particular by Taiwan. Destinations of outward FDI differ among the NIEs, but the shares of ASEAN and China are increasing in recent years.(Table 3) The factors that led to outward FDI by the NIEs are similar to those observed for the rapid FDI by Japan. A sharp increase in wages due to shortage of labor, the appreciation of their currencies, and trade frictions with developed countries are major factors. As such, the sectors actively undertaken outward FDI are those losing a comparative advantage, such as toys, apparel, sporting goods, and other labor-intensive products, and those subject to trade frictions such as electronics.

There are some similarities as well as differences in the pattern of FDI by the NIEs and that by Japanese firms. One important similarity is the motive of FDI. In both cases, FDI was undertaken to promote industrial restructuring in these countries,

which would lead to further economic growth. Indeed, outward FDI promotion policies have been adopted not only in Japan, but also in Korea, Taiwan, and Singapore. For example, the Export-Import Bank of Japan provides preferential loans for undertaking FDI. As for the differences, one may note the difference in the size of the firms undertaking FDI in Japan and in the NIEs, although there are substantial differences in this regard among the firms in the NIEs. In general, the NIEs firms undertaking FDI are smaller in size than the Japanese counterpart, as reflected in the sectoral distribution of FDI in these two groups of countries. Having said that, compared to the case of the U.S. firms, the share of small and medium firms in total investing firms is significantly higher for Japan.

#### C. ASEAN: An Increasingly Attractive Recipient of FDI

It was shown earlier that inward FDI in ASEAN on the balance of payments basis increased remarkably toward the end of the 1980s.<sup>4</sup> The same observation may be made from the statistics on approval basis. (Table 3) As a source of FDI in ASEAN the NIEs expanded their importance rapidly. In 1990 Japan was the largest investor in Thailand but in other ASEAN countries, Malaysia, Indonesia, and the Philippines, the NIEs were the largest

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<sup>4</sup> Pangestu (1991) and Tambunlerchai and Ramstetter (1991) respectively examines the cases of foreign direct investment in Indonesia and Thailand.

investors. Even in Thailand, the amount of Japanese FDI was only slightly greater than that of NIEs.

We have already discussed the factors in investing countries, Japan and the NIEs, that led to active FDI in the ASEAN countries. As for the factors in the ASEAN countries that attracted FDI, it is important to point out the change in trade and FDI policies from inward-oriented to outward-oriented ones. For example, in order to expand exports, export-processing zones, where preferential tax treatment is applied to attract FDI, have been established in some ASEAN countries. The shift from the inward-looking policies to outward-looking ones such as export and FDI promotion policies by the ASEAN countries appears to have been prompted by the successful experiences of outward-oriented policies of the NIEs.

By sectors the increase in FDI is noticeable in manufacturing, hotels, commerce and other services. Although there are substantial differences among ASEAN countries, among manufacturing electric sector, and chemicals sector attracted significant amount of FDI in ASEAN countries. In recent years, automobiles and automobile parts sectors are experiencing an increase in FDI. The increase of FDI in automobiles is mainly due to the increased demand for automobiles in ASEAN, resulting from favorable economic development. Since the automobile market in ASEAN is virtually closed from imports because of strict protection for foreign

producers, FDI is the only means for serving the local market.

### III. Foreign Direct Investment and Economic Development

Foreign direct investment transfers from the home country to the host country not only financial resources but also other factors of production such as technology and management know-how. In the host country inflow of financial resources leads to construction of production facilities, which in turn increases employment and production, while inflow of foreign technology would improve production and management efficiency. In addition, FDI helps the host country to build and expand various networks including procurement and marketing networks, which would promote economic development by enabling the host country to widen the scope of procurement sources and sales destinations. Furthermore, if FDI leads to export expansion or import reduction by substituting imports by local production, FDI contributes to economic development of the host country by increasing foreign exchange earnings.

Against these favorable effects of FDI on the host country, unfavorable effects such as exploitation and domination of the host country by foreign firms have been raised. In recent years, environmental issues related to FDI have received attention, as some foreign firms have been allegedly exporting pollution to the host countries. Despite the criticisms of FDI in some particular



cases, favorable effects of FDI have been emphasized by the host countries, as inflow of FDI contributed to economic development of the host countries. Indeed, a number of governments of the countries in Asia have adopted various types of measures to promote inflow of FDI. In this section we examine the impact of FDI inflow on the host countries in Asia.

### III.1 The Impact of FDI Inflow on Capital Formation, Employment, Production and Exports of Host Countries

The impact of FDI on host countries varies widely among Asian countries. For example, the ratios of FDI to domestic capital formation are quite different among the NIEs, ASEAN, and China. In 1990 Singapore and Malaysia recorded high ratios of 36.6 and 21.2 percent respectively, while Korea registers a significantly lower ratio of 0.8 percent.<sup>5</sup> For other countries, the ratios are between 2.5 percent (Indonesia) and 8.3 percent (Thailand); the ratios for the remaining sample countries are Taiwan (3.8 %), China (5.3 %),

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<sup>5</sup> The ratios of FDI to domestic capital information reported here may not describe the contribution of foreign firms in the host countries accurately. The figures used here may underestimate the true figure. As the FDI figures used here only accounts for financial resources recieved from foreign countries, they do not take into account of capital formation by foreign firms with financial resources obtained in the host country. On the other hand, there is a reason that the figures may overestimate the true figure if the amount of FDI transferred were not used for capital fomration, but used for other purposes such as payments for workers.

and the Philippines (5.5 %). These differences in the importance of FDI in domestic capital formation among the countries are mainly attributable to the differences in the policies toward FDI in these countries. Singapore and Malaysia actively pursued the policies of attracting FDI, while Korea limited FDI and relied on other means such as foreign borrowing and technology imports for obtaining resources from foreign countries.

As for the impact of FDI on employment in host countries, Table 4 shows the magnitude of employment at all foreign subsidiaries and at Japanese subsidiaries in the Asian countries. The largest number of workers employed by foreign firms in Asia was in the Philippines as more than a half of a million workers were working for foreign firms there. The Philippines is followed by Korea at 416,000. Even the smallest number of employment at foreign firms, which was recorded in Hong Kong (only in manufacturing), was greater than 100,000. For the sample Asian countries as a whole, as many as 2 million workers are employed by foreign firms.

Based on the statistics from a different source, we obtain information on employment at Japanese subsidiaries. In 1988 the number of workers at Japanese subsidiaries in Asia amounted to 797,117, of which 685,011, or 86 percent of total are employed in manufacturing. By groups of countries, there are 456,000 workers

at Japanese subsidiaries in the NIEs, and 278,000 workers in ASEAN. The number of workers employed at the subsidiaries in the NIEs, ASEAN, and China amounted to 763,779, or 95.8 percent of total employment at Japanese subsidiaries in overall Asia. Among the NIEs, Korea and Taiwan hold a large number of workers employed at Japanese firms, respectively recording approximately 170,000, while among the ASEAN countries Thailand registers a large employment at Japanese firms, amounting to 110,000.

To assess the impact of FDI on the host country employment, we examine the share of workers working for foreign firms in overall employment. Such information is available for manufacturing employment for some Asian countries. According to the estimates provided by the United Nations Center on Transnational Corporations (UNCTC), which are shown in Table 5, the pattern of importance of foreign firms in the host countries regarding manufacturing employment is similar to that found for capital formation. In Singapore almost 60 percent of manufacturing workers are employed by foreign firms, and in Malaysia one out of two workers is employed at foreign firms. Following these two countries, the Philippines has a large share of workers employed at foreign firms in total manufacturing employment, as one out of four workers in manufacturing is employed at foreign firms. By contrast, the proportion of workers employed at foreign firms in total employment

is rather limited for Korea (9.9 %) and Thailand (8.8 %).

If the sectoral pattern of employment at foreign subsidiaries is similar to that observed for Japanese subsidiaries, where manufacturing employment amounts to 86 percent of overall employment, then the importance of employment at foreign subsidiaries in total employment observed for manufacturing overstates the importance of foreign subsidiaries in overall employment. This is because the share of manufacturing employment in total employment for these countries is significantly smaller than 86 percent.

It would be interesting to compare the differences in the contribution of foreign firms to host countries in capital formation and in employment, as such comparison would tell us the pattern of technologies (labor-capital intensity) employed at foreign subsidiaries vis-a-vis local firms, possibly providing an empirical evidence on one of the hotly debated issues on characteristics of technologies adopted by foreign firms. A lack of information precludes one from pursuing such analysis for most sample countries. For China, where data are available, foreign firms are shown to adopt more capital-intensive production method than local firms, as the share foreign firms in domestic capital formation (5.3%) was significantly higher than the corresponding value in total domestic employment (0.1%). This seems to indicate

that foreign firms in China do not adapt their technologies to local conditions. One should note that factor intensity comparison using aggregate figures as conducted above have to be complemented by sectoral comparison to draw more solid results.<sup>6</sup>

It was pointed out earlier that foreign direct investment in Asia responded actively to export promotion policies such as setting up of export processing zones. One would therefore expect that FDI contributed significantly to export expansion. This assertion is born out by the statistics given in Table 5. The shares of exports conducted by foreign firms in total exports are significantly higher than the corresponding shares for total sales in most of the sample countries, indicating high export propensity of foreign firms.<sup>7</sup> This pattern is particularly notable in Singapore and in Malaysia, as in these countries foreign firms are credited with as large as 88 and 60 percent of their respective manufactured exports. Following Singapore and Malaysia, the share of exports carried out by foreign firms in total exports is high for the Philippines, Korea, Indonesia, Taiwan, and China, each registering the share greater than 10 percent.

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<sup>6</sup> For a brief review on the findings from earlier results on the comparison of the methods of production by local and foreign firms, which are mixed, see Reddy and Zhao (1990).

<sup>7</sup> A similar observation is made by Pangestu (1991), Tambunlertchai and Ramstetter (1991), and Plummer and Ramstetter (1991).

One apparent exception to the high export propensity of foreign firms is the case of Thailand. In the case of Thailand the definitions of foreign firms, or foreign affiliates to be more precise, used in sales statistics and export statistics are different, making direct comparison difficult. Specifically, in the sales statistics foreign firms are defined as the firms, 10 percent of which is owned by foreigners, whereas in the export statistics 25 percent foreign ownership is used to define foreign firms. Accordingly, the coverage of foreign firms for sales is wider than that for exports. Such difference in the definition of foreign firms leads to underestimation of the contribution of foreign affiliates in export sales.

We have examined the contribution of foreign firms to the host countries in a variety of economic activities. There we found that foreign firms contribute significantly to the economic development of the host countries, especially in the manufacturing sector and in export activities. In the examination we only dealt with direct effect of foreign firms. If indirect effect such as backward and forward linkages is included, the overall effect would be significantly greater.

### III.2 Technology Transfer through Foreign Direct Investment

Importation and assimilation of foreign technologies have been an important factor contributing to economic development. In

general foreign technology is imported through three different channels, importation of capital goods, technology trade such as patents and licensing, and foreign direct investment. In the post WWII Japan importation of capital goods and patents played an important role in upgrading technological level of Japan, while FDI has become an important vehicle for technology transfer in recent years.<sup>8</sup> FDI has contributed significantly to technology transfer in countries such as Taiwan and Thailand, which adopted FDI promotion policies. According to a questionnaire survey carried out by the NIKKEI Research Institute of Industry and Markets (1992), 67 percent of total number of technology transfer cases in Taiwan undertaken by Japanese firms was carried out through FDI, while the corresponding share for the case of Korea was significantly lower at 32 percent. These differences in the importance of FDI as a channel of technology transfer between Taiwan and Korea are attributable to the differences in the FDI and technology policies.

Various factors have led to the increase in the importance of FDI as a channel of technology transfer. As for the technology recipient, inflow of FDI provides not only technology but also other benefits such as financial resources, managerial know-how, and well organized network. There are also reasons for technology

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<sup>8</sup> For the experiences of technology imports for Japan and for Korea, see Urata (1990) and Kim and Lee (1990), respectively.

supplier to prefer FDI to other channels.<sup>9</sup> Firstly, it is well known that technology trade suffers from imperfect market caused mainly by imperfect information. As a technology recipient is likely to underestimate the true value of the technology in question, market transaction of that technology fails to take place. Secondly, technology, being an intangible asset, has a characteristic of public good, making it difficult to protect the right of technology inventor. These special characteristics of technology makes firms with technology rely more on non-market channels such as FDI for transferring technology.

It is difficult to quantify the extent of technology transfer being performed. Therefore, one frequently utilizes questionnaire surveys to answer the question about technology transfer.<sup>10</sup> A questionnaire survey recently performed by the NIKKEI Research Institute of Industry and Markets regarding technology transfer by 133 Japanese firms in Asia brings out a number of interesting findings. In response to the question asking to what extent (percentage terms) of your expectation on technology transfer your

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<sup>9</sup> Caves (1982) provides a concise discussion on this point.

<sup>10</sup> The share of worders from the parent firm in total employment is often used to quantify the extent of technology transfer. However, the indicator suffers from the shortcomings mainly because it does not take into account of the differences in the importance of the positions or roles that personels from parent offices and local workers play. For example, the low ratio does not necessarily indicate that technology transfer has been performed, if an entire operation depends on a few personels from the parents.



firm has completed so far, the average completion rate for rather simple technology such as operation of machinery and equipment was greater than 70 percent but the corresponding rate for more advanced technologies such as development of new products was as low as 25 percent.(Figure 1) It should be noted from the figure that Japanese firms expect to increase substantially technology transfer in three years. Such technology transfer strategy envisaged by Japanese firms is consistent with a recent shift in their global strategy from the one emphasizing inter-process production to the one constructing a self-sufficient production system in the Asian region.(Urata, forthcoming)

A number of obstacles to efficient technology transfer have been pointed out by both technology suppliers and technology recipients. Technology suppliers attribute limited technology transfer to a lack of technical skills of workers, a lack of aspiration for "Kaizen(improvement)" by local workers, job-hopping, myopic management style among others, while technology recipients point out unwillingness on the part of investor in technology transfer, lack of communication with local workers, and expensive equipment and machinery embodying technology, as obstacles to efficient technology transfer.<sup>11</sup>

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<sup>11</sup> Although technology transfer is undoubtedly one of the most important contributions that FDI provides to the host countries, there have been only a small number of empirical studies on the subject, because of apparent difficulty in quantifying the extent

### III.3 Expansion of Networks through Foreign Direct Investment

Through foreign direct investment, host countries not only obtain resources such as financial capital and technology but also gain access to various networks that foreign firms possess. For example, foreign subsidiaries may utilize marketing channels established by parent firms to export their products and to purchase intermediate goods as well as capital goods for their production. The contribution of foreign firms to the host economies in this respect is important, since establishing these networks entails enormous amount of financial and human resources. In this section we examine the contribution of foreign firms to the host economies in expanding their sales and procurement networks. Because of data availability, we confine our analysis to the case of Japanese firms, and where possible a comparison will be made to the practices of the U.S. firms.

Table 6 shows the changes in the pattern of sales and procurement of the Asian affiliates of Japanese manufacturing firms in the 1980s. Before analyzing the figures shown in the table, it should be noted that the magnitude of sales and procurement by the Asian affiliates of Japanese manufacturing firms appeared to have increased substantially during the 1980s. Although the accurate figures are not available, the sample surveys conducted by the

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of technology transfer performed. See Reddy and Zhao (1990) for a survey on the literature on technology transfer.

MITI(1991) indicate that manufacturing sales and procurement by these affiliates increased respectively from 6.1 and 4.9 trillion yen in 1980 to 14.3 and 11.6 trillion yen in 1989, indicating the expansion of sales and procurement networks of the host countries by the Japanese firms in Asia.

Turning to the changes in the destinations of the sales of the Asian affiliates in the 1980s, one finds that the share of exports in total sales (the export-total sales ratio) remained the same at 36.1 percent. However, there is a notable shift in the export destinations toward Japan, as the share of Japan in total manufacturing sales increased from 9.8 percent in 1980 to 15.8 percent in 1989. Export orientation intensified mainly in the machinery sectors over 1980-89. This tendency is particularly noticeable for the electric machinery sector, where the export-total sales ratio increased from 48.4 percent to 62.6 percent over the period. The increase in the export-total sales ratio in the electric machinery sector was attributable to rapid export expansion to the Japanese market, as the share of the exports to Japan in total electric machinery sales increased from 16.2 percent in 1980 to 26.9 percent in 1989. Other sectors that experienced a large increase in the share of exports to Japan in total sales include textiles, non-ferrous metals, general machinery and precision machinery. Indeed, the exports from the

affiliates of Japanese firms to Japan, or so called "reverse imports" from the view point of Japan, are reported to have increased remarkably since the mid-1980.(JETRO, 1990) The remarkable shift in export destinations toward Japan from the rest of the world is obviously due to the substantial yen appreciation. Furthermore, export promotion policies by host country governments contributed to overall export expansion.

It is often asserted that expansion of exports to Japan from Asia was carried out mainly in the form of intra-firm trade, accordingly exports to the "closed" Japanese market are only possible through the use of Japanese distribution channels. Considering that the shares of exports by Japanese subsidiaries in total manufacturing exports from the NIEs and ASEAN to Japan are estimated respectively at 12.5 and 19.1 percent by Hirata and Yokota (1991), this assertion appears to be rejected despite the fact that the share of intra-firm trade in the Asian affiliates' exports to Japan was as high as 60 percent.(Table 7) Although the importance of intra-firm trade in the Asian affiliates' exports to Japan declined substantially in three years from 1986 to 1989, it is still much higher compared to the case where products are sold in other markets.

An international comparison is useful to see if Japanese firms' behavior is exceptionally closed in their sales to home

market. Information necessary for such comparison is very limited and available only for the U.S. firms for all affiliates, not for those in Asia only. According to the statistics given in U.S. Department of Commerce (1990), the share of intra-firm trade in total manufacturing exports of the affiliates of U.S. firms to the U.S. was 82.2 percent in 1988, while the corresponding share for Japanese firms in 1989 was 61.6 percent. These findings indicate that the U.S. firms are more closed than Japanese firms in their export transactions. This is somewhat surprising because Japanese firms are frequently criticized for its closed minded business practices.<sup>12</sup> Several reasons may be noted for high share of intra-firm trade for the U.S. firms. One is a special arrangement that the U.S. government imposes tariffs only on the value added portion of the value of imported products when the components used for the production at foreign affiliates are exported from the parents. This arrangement promotes intra-firm trade. Another reason may be that the U.S. imports from their foreign affiliates are more technology-intensive than the Japanese counterparts,

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<sup>12</sup> Using the information on intra-firm imports from foreign subsidiaries to the parents for the U.S., European and Japanese trade, Lawrence (1991) finds that the share of intra-firm imports in overall imports (not just those related to multinationals) is significantly higher for Japanese imports than the corresponding share for other imports. These findings appear to indicate relatively closed nature of the Japanese market compared to other markets, but not necessarily closed nature of behavior of Japanese firms, which is a point discussed in the main text.

leading to high intra-firm trade for the U.S. trade, to avoid market imperfections often associated with technology.

What appears to be most important for the host countries is the fact that exports are carried out and not so much as to the channels of exports. Indeed, it is the consumers, in this case consumers in home countries, that are affected unfavorably from the closed channels.

Before closing the discussion on the sales pattern of foreign affiliates, we examine if foreign affiliates of Japanese firms are more export-oriented than those of U.S. firms, an issue often debated. Lack of information on the sales behavior of Asian affiliates of U.S. firms precludes us from conducting a comparison of the behavior of Asian affiliates of U.S. and Japanese firms. Instead, we compare the behavior of all affiliates. For manufacturing the export propensity of all affiliates of Japanese firms in 1989 was 20.6 percent, while the corresponding value for the U.S. firms in 1988 was significantly higher at 37 percent. From these findings we conclude that the affiliates of the U.S. firms have higher propensity to export than those of the Japanese firms in general. This result is extraordinary. However, before providing a conclusive statement more careful comparison is needed by taking account of the factors such as areas of operation, sectoral distribution, and length of operation.

We now turn to the pattern of procurement of intermediate goods by the Asian affiliates of Japanese firms. (Table 7) For the manufacturing sector, the share of local procurement in total procurement (the local-supply ratio) increased from 42.2 percent in 1980 to 49.8 percent in 1989, resulting in lower dependency on foreign supply. Considering that there is positive correlation between the length of operation and dependence on local supply because it takes time to develop local procurement network, and considering also that a large number of Asian affiliates have a short history, one would conclude that the local supply ratio for the Asian affiliate established before the 1980s increased substantially in the 1980s. Over 1980-89, most of the manufacturing subsectors experienced an increase in the local-supply ratio as a result of an increase in the capacity as well as improvement in the capability of local firms in the production of intermediate goods.<sup>13</sup> One exception is electric machinery sector whose local supply ratio declined over the same

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<sup>13</sup> It would be interesting to compare the procurement pattern of Japanese subsidiaries with that of other subsidiaries. But a lack of data availability prevents one from conducting such analysis. In this regard, one should note that Kreinin (1988) found that dependence in procurement of capital equipments on home country, not intermediate goods as we discuss in the paper, is significantly high for Japanese firms in his survey of approximately 20 firms from Japan, the U.S. and Europe in Australia. One of the problems of his study is small sample size. In order to shed more light on the procurement practices of foreign affiliates, more information is required.

period. This may be due to the physical as well as technological inability of local producers of intermediate goods to catch up with rapidly growing demand resulting from active FDI as well as rapidly advancing technological progress in that industry.

Among the foreign supply sources for the Asian affiliates, Japan has been most important. In particular, dependence on Japan for intermediate goods was high for the four machinery sectors and iron and steel, respectively relying on Japan for more than 40 percent of total procurement. Coupled with the observation that export-total sales ratio is high for electric machinery and precision machinery, high foreign-supply ratio for these sectors indicates that intra-industry trade, probably inter-process trade, is taking place in these sectors.<sup>14</sup> Moreover, a large increase in the share of other Asia in sales as well as procurement in the electronics industry indicates that intra-Asia trade in electronics components expanded in the 1980s.

Importance of intra-firm trade for the Asian affiliates of Japanese firms is greater for procurement than for sales. The share of intra-firm trade in total procurement is particularly high in procurement from parent firms in Japan. This may be understandable as a large portion of parts and components are often

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<sup>14</sup> Although presence of inter-process trade is shown in company documents, statistical support is hard to obtain. Urata (forthcoming) found some statistical evidence to support that inter-process trade takes place for electric machinery.



produced according to the specific designs which are shared with parent firms. It may be important, however, to point out that the importance of intra-firm procurement declined in the 1980s, leading to more open trading practices.

Finally, it is interesting to note that intra-firm trade in the procurement from the home country is significantly higher for the case of the affiliates of the U.S. firms, compared to the affiliates of Japanese firms. Concerning procurement for overall sectors, for which the statistics are available, as high as 92.9 percent of imports from the U.S. by the Asian affiliates is conducted in the form of intra-firm trade, while the corresponding figure for the Asian affiliates of Japanese firms is significantly lower at 63.2 percent in 1989. These observations once again point to "closed" behavior of the U.S. firms. Here the same explanations that were given to explain the high intra-firm export ratio for the U.S. subsidiaries earlier are applied.

#### IV. Conclusions

The substantial realignment of the currencies of the Asian countries precipitated foreign direct investment in the region in the mid-1980s. Japan and the NIEs actively undertook FDI, while the NIEs and ASEAN countries received FDI hungrily. Through FDI Japan and the NIEs achieved industrial adjustment by relocating overseas the industries and production processes that had lost

comparative advantage. At the same time, the NIEs attempted to promote high-tech industries by attracting FDI. By contrast, the ASEAN countries and China pursued industrialization by attracting FDI mainly from Japan and the NIEs. Since the flow of FDI was accelerated as a result of liberalization of trade regimes, the pattern of production in Asia, which is realized by relocating production facilities through FDI, appears to be more or less consistent with the pattern of comparative advantage of the countries in the region.

FDI contributed to economic development of host countries not only by promoting capital formation, production and employment, but also by upgrading technological capability through technology transfer. In addition, FDI contributed to export expansion by involving the host country in sales network of the parent firms. FDI also contributed to upgrading industrial structure of the home countries, as relocation of industries losing comparative advantage was carried out with rationalization and diversification in the home countries.

Because FDI was undertaken actively in a short period of time, the shortage of social capital such as transportation services and the shortage of human resources such as engineers and middle management have become acute problems in the host countries. These problems have to be solved not only to attract more FDI but also to

promote economic development. Construction of social overhead capital and improvement of human capital through education should be carried out mainly by the public sector, as the social rate of return from such investment generally exceeds the private rate of return. Under the tight budget situation of most host country governments, foreign economic assistance plays an important role in the construction of social capital and upgrading educational services. Recognizing the importance of the magnitude and quality of social capital and those of human resources in determining the contribution of FDI on the host countries, coordination between the public sector providing such services and the private sector undertaking FDI may prove effective in promoting economic development.

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Table 1 Foreign Direct Investment in Asia

	<u>1985</u>		<u>1987</u>		<u>1990</u>	
	<u>Out</u>	<u>In</u>	<u>Out</u>	<u>In</u>	<u>Out</u>	<u>In</u>
Japan	6.4 (11.2)	0.6 ( 1.3)	19.5 (14.3)	1.2 ( 1.1)	48.0 (22.1)	1.8 ( 1.1)
NIEs	0.4 ( 0.6)	1.6 ( 3.4)	1.1 ( 0.8)	4.2 ( 3.8)	6.6 ( 3.0)	6.9 ( 4.3)
ASEAN	0.0 ( 0.0)	1.2 ( 2.4)	0.1 ( 0.1)	1.5 ( 1.4)	0.1 ( 0.0)	6.8 ( 4.3)
China	0.6 ( 1.1)	1.7 ( 3.4)	0.6 ( 0.5)	2.3 ( 2.1)	0.8 ( 0.0)	3.5 ( 2.2)
World	57.4 (100)	48.3 (100)	136.4 (100)	110.5 (100)	217.2 (100)	159.2 (100)

Notes: The numbers are in billion US dollars and the numbers in parentheses are percentage shares in world total.

Source: IMF, International Financial Statistics, various issues and Statistical Yearbook of the Republic of China, Executive Yuan, Republic of China, various issues.



Table 2 Japanese FDI in Asia

	Amount		Share of Manufacturing (%)								
	In \$U.S. billion										
	Total	Manu- factur- ing	Food	Tex- tiles	Wood	Chemi- cals	Metals	Elec Hachi-Hachi- nery	Trans Hachi-Hachi- nery	Others	
World											
1985	83.7	24.4	4.5	8.5	4.6	16.3	21.3	8.1	15.4	13.8	7.5
1987	139.3	36.0	4.3	6.5	4.1	14.6	17.5	9.1	19.9	15.7	8.3
1990	310.8	81.6	5.0	4.9	3.6	13.4	12.6	9.7	24.9	13.3	12.4
NIEs											
1985	7.6	3.3	2.4	10.7	0.9	25.4	5.8	14.4	19.0	8.6	12.9
1987	11.7	4.8	3.4	7.9	0.7	22.4	6.2	13.0	23.2	9.9	13.3
1990	23.3	7.7	9.5	7.1	0.9	18.5	6.9	10.9	24.0	8.7	13.4
ASEAN											
1985	11.2	4.0	3.8	20.4	3.9	10.7	36.8	2.3	4.9	9.2	8.2
1987	12.8	4.9	4.7	17.1	3.5	9.8	35.3	3.0	7.7	10.2	8.8
1990	20.8	9.9	3.7	11.8	4.4	11.3	22.4	7.0	20.6	9.5	9.3
China											
1985	0.3	0.05	26.7	4.4	5.1	22.3	8.3	6.0	10.1	1.1	16.0
1987	1.7	1.0	15.0	4.8	2.8	15.1	9.5	5.3	36.3	0.4	10.7
1990	2.8	2.8	8.4	7.7	1.5	7.5	6.1	15.6	35.8	1.1	16.2

Source: Ministry of Finance, Japan.

**Table 3 Inward Foreign Direct Investment in ASEAN and China**  
(\$US million and percentage)

Recipient/ Investor		Japan	NIEs	U.S.	World
Malaysia	1987	284(34.7)	236(28.9)	65( 7.9)	818(100)
	1988	467(25.1)	607(32.6)	204(11.0)	1863(100)
	1989	993(31.1)	1335(41.8)	119( 3.7)	3194(100)
	1990	657(28.5)	1100(47.8)	69( 3.0)	2302(100)
Thailand	1987	965(36.6)	501(19.0)	172( 6.5)	2634(100)
	1988	3045(48.7)	1684(26.9)	673(10.8)	6249(100)
	1989	3524(44.1)	2011(25.2)	550( 6.9)	7996(100)
	1990	2706(33.7)	2696(33.6)	1091(13.6)	8031(100)
Philippines	1987	29(17.4)	38(22.8)	36(21.6)	167(100)
	1988	96(20.3)	141(29.8)	153(32.3)	473(100)
	1989	158(19.7)	323(40.2)	131(16.3)	804(100)
	1990	306(31.8)	384(39.9)	59( 5.2)	961(100)
Indonesia	1987	532(36.5)	172(11.8)	73( 5.0)	1457(100)
	1988	247( 5.6)	1588(36.0)	672(15.2)	4409(100)
	1989	769(16.3)	1197(25.4)	348( 7.4)	4719(100)
	1990	2241(25.6)	2598(29.7)	153( 1.7)	3750(100)
China	1987	220( 9.5)	1620(70.0)	263(11.4)	2314(100)
	1988	515(16.1)	2123(66.5)	236( 7.4)	3194(100)
	1989	356(10.5)	2162(63.7)	284( 8.4)	3393(100)
	1990	503(14.4)	1963(56.3)	456(13.1)	3487(100)

Notes: For Malaysia and Indonesia, approval data for manufacturing, and for the Philippines and Indonesia, approval data for the whole sector, and for China executed data.

Sources: Country Official Sources

**Table 4 Employment at Foreign Subsidiaries in Selected Asian Countries**  
(in numbers)

		All Foreign Subsidiaries	Japanese Subsidiaries(1988)	
			Total	Manufacturing
Hong Kong	1988	108,032*	38,494	18,306
Taiwan	1986	266,837	171,851	166,424
Korea	1986	416,000	179,269	162,386
Singapore	1988	235,130	67,441	54,087
Malaysia	1988	251,823	70,324	57,456
Philippines	1982	502,835	36,183	24,414
Thailand	1985	182,635	109,831	96,115
Indonesia		n.a	61,611	52,257
China		n.a	28,775	21,283

Note: "\*" indicates manufacturing only

Source: World Investment Directory 1992, vol. 1, Asia and the Pacific, U.N., 1992, and Kaigai Shinshutsukigyo Soran [Statistics on Foreign Subsidiaries], Toyo Keizai Shinpo-sha, 1989.

**Table 5 Importance of Foreign Firms in Host Countries**  
(percent share in overall activities in host countries)

		Employment	Sales	Exports
Korea	1986	9.5	21.5	29.0*
Hong Kong	1987	13.5(1990)	17.5	n. a.
Taiwan	1986	10.0	13.9	18.5
Singapore	1988	59.5	53.0	88.1
Malaysia	1988	48.7	44.8	59.6
Indonesia	1990	18.8	n. a.	22.3*
Thailand	1986	8.8	48.6	5.8
Philippines	1987	27.3	40.8	34.7*
China	1990	0.1*	n. a.	12.6*

Note: The values are for the manufacturing sector except for those with "\*", where the values are for overall sectors.

Source: World Investment Directory 1992, vol. 1, Asia and the Pacific, the U.N., 1992, and estimates by the Sanwa Research Institute based on data from country sources.

**Table 6 Sales and Procurement of Asian Affiliates of Japanese Firms**  
(percentage shares in total sales or procurement)

Industry	1980				1989			
	Local Market	Other Japan	Non- Asia	Non- Asia	Local Market	Other Japan	Non- Asia	Non- Asia
<b>Sales</b>								
Manufacturing	63.9	9.8	12.8	13.5	63.9	15.8	9.7	10.6
Food	40.5	30.2	14.4	14.9	66.9	16.1	9.8	7.2
Textiles	61.1	4.0	21.0	13.9	70.5	14.9	8.1	6.5
Wood & pulp	33.1	30.8	10.8	25.3	34.4	35.9	20.2	9.5
Chemicals	85.0	8.9	3.8	2.3	78.1	10.3	8.8	2.8
Iron & steel	85.4	10.1	1.3	3.2	87.7	4.2	4.2	3.9
Non-ferrous metals	74.5	2.6	17.2	5.7	73.3	12.1	12.8	1.8
General machinery	65.5	5.5	7.1	21.9	56.9	18.2	5.9	19.0
Electric machinery	51.6	16.2	10.2	22.0	37.4	26.9	16.7	19.0
Transport machinery	89.7	1.9	2.9	5.5	92.1	1.6	2.2	4.1
Precision machinery	56.3	9.1	25.3	9.3	55.0	22.2	7.8	15.0
Petro and coal products	--	--	--	--	100.0	0.0	0.0	0.0
Others	60.9	6.0	22.3	10.8	78.5	12.1	4.3	5.1
<b>Procurement</b>								
Manufacturing	42.2	41.5	8.7	7.6	49.8	38.9	6.1	2.4
Food	75.4	1.6	3.1	19.9	87.7	3.3	4.3	5.2
Textiles	38.9	29.3	14.0	17.8	43.1	22.4	6.4	28.1
Wood & pulp	65.2	1.8	24.2	8.8	92.8	2.3	4.4	0.5
Chemicals	53.3	30.8	1.8	14.1	56.3	34.7	1.9	7.1
Iron & steel	26.6	53.3	5.2	14.9	36.0	56.1	4.3	3.6
Non-ferrous metals	20.6	42.1	2.7	34.6	59.3	18.1	4.3	18.3
General machinery	44.5	54.8	0.0	0.7	53.6	42.5	3.2	0.7
Electric machinery	49.6	46.0	3.8	0.6	42.4	44.6	12.5	0.5
Transport machinery	38.2	61.1	0.0	0.7	57.7	41.8	0.1	0.4
Precision machinery	12.1	74.8	12.3	0.8	42.1	45.2	11.0	1.7
Petro and coal products	--	--	--	--	89.5	10.5	0.0	0.0
Others	40.5	27.8	27.9	3.8	36.0	48.4	7.3	8.3

Source: Kaigai Toshi Tokei Soran [Statistics on Foreign Investment], Ministry of International Trade and Industry, no.1, 1981, and no.4, 1991.

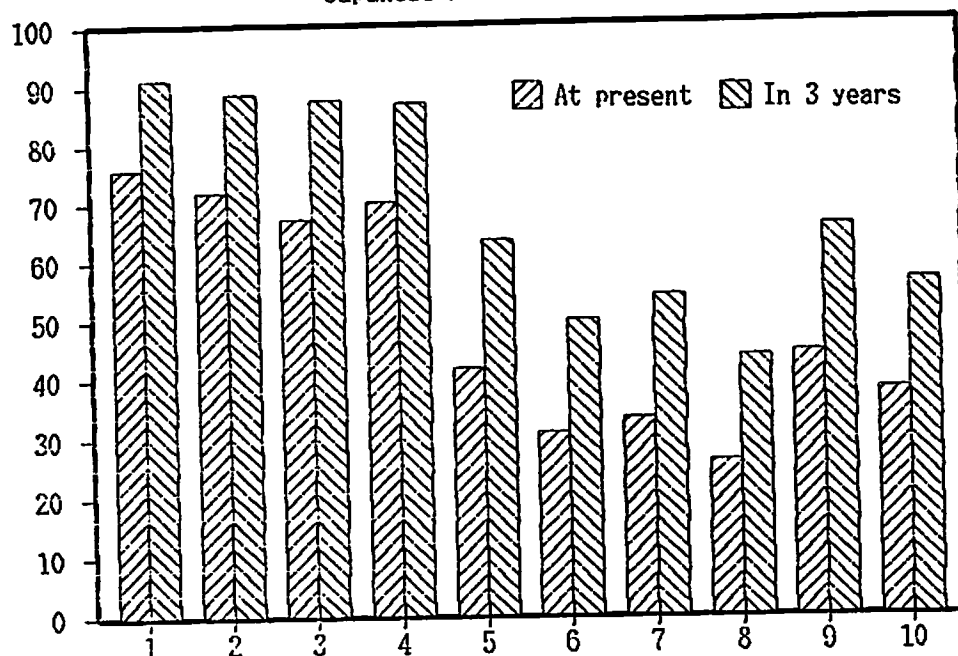
Table 7 Importance of Intra-Firm Trade for Asian Affiliates of Japanese Firms

Industry	1986				1989			
	Local Market	Japan	Others	Total	Local Market	Japan	Others	Total
<u>Sales</u>								
Manufacturing	8.9	76.5	23.7	24.0	6.5	58.9	37.2	21.0
Food	0.0	37.8	0.0	27.5	0.6	70.8	17.5	14.8
Textiles	8.0	57.7	2.5	10.7	4.8	50.4	17.2	13.4
Wood & pulp	0.0	27.7	0.0	7.1	16.6	65.1	15.2	33.6
Chemicals	2.6	83.9	1.5	5.8	4.2	40.2	35.1	11.5
Iron & steel	3.2	100.0	0.0	8.2	3.1	13.8	13.9	4.4
Non-ferrous metals	15.1	99.2	0.6	36.3	4.4	16.5	6.5	6.2
General machinery	29.9	94.7	46.6	54.3	0.6	98.5	45.4	29.6
Electric machinery	9.6	73.0	32.1	31.6	12.9	60.3	43.9	36.7
Transport machinery	9.1	46.0	62.8	22.0	6.2	35.7	8.5	6.8
Precision machinery	59.8	86.1	59.5	65.4	16.2	50.8	55.4	32.8
Petro and coal products	0.0	0.0	0.0	0.0	64.0	0.0	0.0	64.0
Others	0.0	88.5	13.9	8.9	2.6	85.2	34.5	15.6
<u>Procurement</u>								
Manufacturing	6.8	66.6	34.3	37.3	4.1	62.6	23.9	29.1
Food	0.0	100.0	0.0	3.1	1.6	87.6	44.5	8.3
Textiles	15.5	46.7	12.2	18.0	4.7	19.3	23.7	14.5
Wood & pulp	27.9	93.8	0.0	23.5	2.6	0.0	0.0	2.4
Chemicals	5.5	24.4	67.5	20.9	2.8	83.8	33.6	33.7
Iron & steel	16.5	40.2	3.5	32.1	4.0	64.1	0.0	37.4
Non-ferrous metals	0.0	65.1	0.0	6.9	4.5	42.0	3.0	10.9
General machinery	15.8	80.0	96.8	52.7	0.6	79.1	32.3	35.3
Electric machinery	6.2	78.1	55.9	49.9	5.1	65.3	29.8	35.1
Transport machinery	4.0	56.1	67.9	42.0	2.3	48.9	0.7	21.8
Precision machinery	26.1	95.8	62.7	84.6	3.6	95.1	86.2	55.9
Petro and coal products	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Others	7.9	81.5	9.7	33.2	13.9	69.7	16.7	41.4

Note: The figures are percentage proportion of intra-firm transaction in overall transaction for the type of transaction specified in each cell.

Source: Kaigai Toshi Tokei Soran [Statistics on Foreign Investment], Ministry of International Trade and Industry, no.3, 1987, and no.4, 1991.

Figure 1 Technology Transfer by  
Japanese Firms in Asia: 1991



- |   |                                 |
|---|---------------------------------|
| 1. Operation Technology                 | 6. Adaptation of New Technology |
| 2. Maintenance & Repair                 | 7. Design Technology            |
| 3. Quality Management                   | 8. Development of New Product   |
| 4. Production Process                   | 9. Development of Tools         |
| 5. Improvement of Production Technology | 10. Development of Machinery    |

Source: NIKKEI Industrial Research Institute

<u>Number</u>	<u>Author</u>	<u>Title</u>	<u>Date</u>
9201	Nakamura, Shinichiro	An Adjustment Cost Model of Long Term Employment in Japan	09/92
9202	Urata, Shujiro	Changing Patterns of Direct Investment and the Implications for Trade and Development	12/92