

# The changing pattern of Japanese foreign direct investment in the electronics industry in East Asia

---

Sylvia Ostry and Farid Harianto\*

**The electronics industry is a critical part of Japanese foreign direct investment in East Asia. About half of all exports of Japanese affiliates in the region were electronics products. The intra-firm trade within the industry—as indicated by the trade statistics between the affiliates in the region and their parent firms in Japan—suggests that Japanese transnational corporations have created a Japan-centred production network, but with Japanese parent firms still controlling the core technologies. With the growing United States trade deficit with the region, the development of these production networks raises a number of questions of regional and, indeed, global significance. For example, do these new forms of industrial organization create new barriers to entry? What do these networks imply for technology transfer?**

**A longitudinal analysis of Japanese foreign direct investment shows that one significant feature of Japanese investment in the industry is the combination of decreasing capital intensity and average plant size with efficient organizing principles. It is the diffusion of production technologies embedded in the organizing principles together with disembodied know-how and technical training that can be singled out as the dominant contribution of Japanese transnational corporations in the host countries' industrial development.**

**Many Japanese transnational corporations started their investment catering to domestic markets and concentrated mainly in consumer electronics. Later, affiliates increasingly moved to exports, including to Japan, and produced more and more sophisticated products and components, depending on the host country's resource endowment and Government policy. This signalled that Japanese transnational corporations have pursued a strategy that accommodates sequenced industrial development of the host countries.**

---

\* The authors are, respectively, Chairperson, Centre for International Studies, and visiting Professor, University of Toronto, Toronto, Ontario, Canada. The authors gratefully acknowledge financial support from the Centre for Global Partnership of the Japan Foundation and research assistance provided by Johnson Ongking.

---

## Introduction

East Asia<sup>1</sup> stands out as the only region in the world with a consistently high trade surplus and strong growth. Government policies in the region are surprisingly diverse, ranging from *laissez-faire* in Hong Kong to managed capitalism in the Republic of Korea. Economic integration and the rapid diffusion of technology have proceeded in the absence of intergovernmental institutional arrangements, although efforts to change this are now under active consideration. For the present, however, regional development is being driven by foreign direct investment (FDI) and the rapid diffusion of technology through cross-border, inter-firm networks that generate trade and growth.

Aggregate data on trade and FDI give a very incomplete picture of the region's evolution, in part because they obscure the qualitative relationships between firms and local economies that give East Asia its distinctive industrial dynamism. Indeed, aggregate data cannot shed light on the forces that are driving integration, namely FDI and the strategic decisions of the region's major transnational corporations (TNCs). An analysis of aggregate data must therefore be supplemented by an analysis of FDI and technology strategies of the major TNCs in the region. As a first step following this approach, a survey of corporate strategies of Japanese TNCs in the electronics industry was undertaken in January 1994. The results, combined with published corporate data, are presented in this article. (Similar surveys of United States and European electronics TNCs will also be undertaken in the future to assess the similarities and differences among TNC strategies from different home countries.) Getting "inside the black box" of corporate decision-making should enhance the understanding of the role of FDI and technology—the twin drivers of integration—for both regional and host country development patterns.

The article first identifies the strategies of Japanese electronics TNCs and discusses the relative importance of locational and firm-specific factors in affecting the choice of specific investment strategies. It then addresses how Japanese FDI and corporate strategies have evolved over time by examining longitudinally the industrial and locational distribution of Japanese FDI, and by identifying the types of networks of value-adding activities that

---

<sup>1</sup> East Asia is defined to include Japan, the four first-tier newly industrializing economies (NIEs) (Hong Kong, Republic of Korea, Singapore and Taiwan Province of China), four members of the Association of South-East Asian Nations (ASEAN) (Indonesia, Malaysia, the Philippines and Thailand), China and Viet Nam.

---

Japanese TNCs have developed in the region. Of particular interest here is to examine whether Japanese TNCs have expanded and upgraded their technological sourcing in the region. The following section deals with "the state of mind" and "future intentions" of Japanese electronics TNCs in terms of their strategic orientations, regional linkages and the way in which they organize their regional operations. This is followed by a discussion of policy implications.

## Data and data sources

Investment data are compiled from the Electronics Industry Association of Japan (EIAJ), published in the *Handbook on Overseas Operations* (1993) and the *Nihon Kezai Handbook* (1991). This investment database contains detailed information on the date of the establishment, location, capital invested, ownership share, employment and product descriptions of firms at the three-digit International Standard Industrial Classification (ISIC) level. The database covers all investments of a sample of the 14 largest Japanese electronics TNCs in East Asia from 1958 to 1993. The combined output of the 13 largest Japanese electronics TNCs in the sample in 1992 accounted for 72 per cent of the total output of the Japanese electrical machinery industry (ISIC 383). Although a complete census of all the Japanese electronics firms is not available, the database portrays well Japanese FDI in the region.<sup>2</sup>

Data on the strategies of TNCs were obtained directly from these firms through a customized questionnaire with common questions on firm-specific data. The questionnaire consisted of four parts:

- the strategic intention of TNCs in each of their investments;
- various "driving forces" that led to the choice of a specific investment strategy in the past;
- the current and future strategic orientation of the TNCs; and
- changes occurring in the nature of the linkages that TNCs have developed, and the way they organize their operations in the region.

---

<sup>2</sup> In 1990, the five largest firms in the sample had a market share of 63 per cent in total shipments of colour television sets, 76 per cent of VCRs, and 88 per cent of camcorders. Five firms accounted for 60 per cent of shipments of mainframe computers, while three firms commanded 77 per cent of personal computer shipments. In the semiconductor industry, five of the firms in the sample held a dominant position, with a share of 74 per cent of total shipments in Japan in 1990. These estimates were calculated from Hsu (1994).

---

The above data sets were augmented with data on wages and labour productivity of the electrical machinery industry (ISIC 383) from the United Nations Development Programme industrial statistics database and with qualitative information obtained from interviews with 14 parent firms in Japan and 8 Japanese affiliates in Indonesia and Malaysia.

Several precautions are in order in interpreting these data. The investment database covers only data of each investment at its original date of establishment, except employment data that were available only for the year 1992. No new data on subsequent changes, if any, were available regarding changes in capital or types of products being produced. There are also a number of limitations as regards the coverage of the sample. Out of the 14 firms in the sample, 8 responded, yielding a response rate of 57 per cent. However, the combined investment of these 8 responding firms represented about 51 per cent of the total employment of the full sample of 14 firms. Since the questionnaire was retrospective in nature, there was a limit as to what could be assessed about the behaviour of these firms decades ago. Finally, in an attempt to identify the various factors that drove certain TNC strategies in the past, data were obtained at the firm level, but not for every investment that each TNC had undertaken in the past. Some valuable information on the relative importance of each driving force across individual establishments over time was therefore lost.

## **Static analysis of the strategies of Japanese TNCs**

The gist of the static analysis rests on a general approach of TNC plant location (Dunning, 1980; McFetridge, 1989; Eaton, Lipsey and Safarian, 1994) and business strategy (Kogut, 1988). From the supply side, changes in relative factor prices can affect the choice of location. So can changes in the home country's production costs which are not fully compensated for by changes in exchange rates. Technological changes in production and distribution can also influence location decisions. From the demand side, it has been documented that market size, growth and composition of demand affect FDI decisions (Dunning, 1993, chapter 3, pp. 58-59). In addition to locational factors, FDI is also driven by firm-specific factors (i.e., "ownership-specific advantage" in John H. Dunning's terms), including the possession of proprietary assets, innovatory capacity, distribution and marketing systems and organization of work. Faced by common locational factors, there is still ample room for discretionary decisions by TNCs in terms of the timing, ownership control, size and capital intensity of their overseas operations.

---

Three types of firm-specific strategies are examined here: export-market—as opposed to domestic-market—penetration;<sup>3</sup> low-cost suppliers; and product and technology upgrading. The first strategy refers to the geographic orientation of the investment, which basically resembles Dunning's (1993, p. 58) market-seeking motive for FDI. The second strategy, low-cost suppliers, resembles efficiency-seeking FDI, while the third one refers to strategic asset seeking in Dunning's nomenclature (1993, pp. 59-61). The last category includes a shift from low-end to high-end products, quality and price, and the increasing sophistication of production process technology. However, the purpose of this article is to examine the relative importance of both firm-specific and locational factors in affecting each category of investment strategy pursued by the firms in the sample, and *not* to test the theories of FDI.

## The model

For our present analysis, the working model is:

$P$  (type of investment strategies) =  $f$  (employment, investment intensity, age, percentage of ownership, exchange rates (yen per dollar), changes in exchange rates, labour costs in Japan and their changes, relative labour cost in the host country, and their changes).

The dependent variable is the probability that a certain type of FDI strategy was pursued by the Japanese TNCs in the sample. Essentially, the dependent variable reflects a binary choice faced by the TNCs in the sample with the code "1" if a certain strategy was chosen by a firm and "0" otherwise. Each strategy is treated as a separate decision heuristically faced by these TNCs.

---

<sup>3</sup> As it appears, export- and domestic-market orientation strategies are almost mutually exclusive. Out of 77 observations from our responding firms, 3 establishments (less than 5 per cent) had both export- and domestic-market orientation, and 10 observations had no identified strategies, yielding a total of 64 observations. As such, we will treat in our analysis the two strategies as a single choice of strategies faced by the firms—either to allow for export-market penetration or to allow for domestic-market penetration. In this case, the independent variable becomes the probability that a firm undertook an investment for export-market penetration, as opposed to domestic-market penetration.

**Table 1. Expected signs of independent variables**

Independent variable	Dependent variable (strategies)		
	Export oriented	Low cost suppliers	Upgrading products and technology
<b>Firm-specific factors</b>			
Employment	+	+	-
Investment	+	+	+/-
Capital intensity	+/-	+/-	+
Age	-	+/-	-
Percentage ownership	+	+	+
<b>Locational factors</b>			
Foreign exchange rate (yen/dollar)	-	-	+/-
Changes in foreign exchange rate	-	-	+/-
Labour costs in Japan	+	+	+/-
Change in labour costs in Japan	+	+	+/-
Relative wages in host country	-	-	+
Change in relative wages in host country	-	-	+

Source: Author's estimates.

Note: +/- indicates that the sign is indeterminate.

Table 1 summarizes the expected sign of the independent variables for each type of FDI strategy. The first independent variable, *employment*, reflects the size as well as the labour intensity of the investment. It is expected that this variable is positively correlated with both export penetration and low-cost supplier strategies, and negatively correlated with the upgrading of products and technology. *Employment* and *total investment* were alternated as proxies for size in the analysis. The original database contains only the value of paid-in capital (basically equivalent to the stockholders' equity in a corporation) transferred by parent firms to each affiliate. To convert this paid-in capital to total investment figures, other capital secured from financial

---

markets (i.e., debt), was taken into account as well as the debt policy used by each firm. From the Nikkei Corporate Financial database, the debt-equity structure of the firms in the sample was obtained for the period 1989-1994 and was used to estimate the total investment of each establishment.<sup>4</sup> Data on paid-in capital available in various national currencies were converted into constant 1990 dollars. Then, using the average debt-equity structure of each firm, the total investment of each establishment was estimated. A drawback of the procedure was that it often required a strong assumption about the appropriateness of the prevailing foreign exchange rate (especially in the case of China).

*Capital intensity*, measured as the average dollar investment per employee, relates to the technological content of the investment. It was expected that this variable would correlate positively with (particularly) the upgrading of products and technology. *Age* was measured as the longevity of a particular investment as of 1994. That variable captures a firm-specific discretionary decision in terms of the timing of the investment. Many analysts have indicated that while Japanese FDI in East Asia prior to 1970 was mainly intended for host countries' domestic markets to take advantages of the prevailing import substitution regimes in the region, investments in the 1980s were aimed at substituting exports from Japan and, during the 1990s, FDI has catered to domestic consumption in Japan (Yoshitomi, 1994). Under the pressures of new competition and changes in international conditions, Japanese TNCs are also forced to expand their technology sourcing; it would therefore be expected that *age* correlates negatively with exports and strategies to upgrade products and technology.

*Percentage of ownership* indicates the control of an investment. In general, this measure also indicates the extent of FDI liberalization in a particular country. For export markets, there is no reason for TNCs to share the control of their investments with local firms; therefore, we would expect this variable to correlate positively with an export penetration strategy. Similarly, the upgrading of products and technology might involve the deployment of proprietary technology of the firm and, therefore, it is expected that ownership control would also correlate positively with such a strategy.

---

<sup>4</sup> There are two underlying assumptions in this procedure: first, that the debt-equity structure of the investment establishments in various countries is the same as the debt-equity structure of the parent firm; secondly, that such a debt structure does not change over time. Our analysis shows that the capital structure of each firm was stable during 1989-1994, with a standard deviation of only about 5 per cent. This procedure and its underlying assumptions was corroborated by two Japanese affiliates and with a senior official at the Industrial Bank of Japan.

---

The last six independent variables—foreign exchange rates, labour costs in Japan, relative labour costs in host countries, and changes in each of these variables—aim at capturing locational factors. All of these variables were calculated as three-year averages *prior* to the year of a particular establishment. Labour-cost data were the average annual wage per employee in the electrical machinery industry (ISIC 383). Relative domestic labour costs were adjusted to labour productivity differentials using Japanese labour productivity as a base. Similarly, changes in labour costs were also calculated after adjustments to changes in labour productivity.<sup>5</sup> In the case of the relative labour costs in host countries, it would be expected that this variable would correlate negatively with both export penetration and low-cost strategies. Since this variable also reflected the relative skill levels of a country, we would expect that it would correlate positively with the product and technology upgrading of the investment.

## **The results**

To test the above model, we employed a logistic regression analysis, using the maximum likelihood method of estimation, as reported in tables 2 through 4.

### ***Export versus domestic-market orientation***

From table 2 it appears that the significant independent variables that differentiate an export-market penetration strategy from a domestic-market orientation strategy are ownership control (positive, as expected); changes in Japanese labour costs (positive, as expected); and changes in exchange rates (negative, contrary to expectations). The significance of ownership control also indicates the limitations of host countries' policies in imposing ownership restrictions on export-oriented FDI. It is of interest to note that replacing the employment variable with total investment (table 1, second column) does not alter the overall results; in either case, the three variables are significant in affecting the market orientation of the investment.

---

<sup>5</sup> The relative wage of a host country was measured as the annual wage/output per worker of the host country's ISIC 383 divided by the wage/labour productivity of the same industry in Japan. Similarly, changes in labour costs were calculated as the changes of wage per worker productivity. All measures were calculated as three-year simple moving averages.



**Table 2. Logistic regression results**  
(Dependent variable: export-market penetration strategy)

Independent variables	Coefficient <sup>a</sup>	Coefficient <sup>a</sup>
<b>Constant</b>	<b>6.61</b> (4.94)	<b>-6.68</b> (4.92)
<b>Employment</b>	<b>-4.55 E-05</b> (0.50 E-03)	
<b>Investment</b>		<b>-8.36 E-07</b> (3.58 E-06)
<b>Capital intensity</b>	<b>1.16 E-06</b> (4.21 E-06)	<b>1.78 E-06</b> (4.76 E-06)
<b>Age</b>	<b>0.138</b> (0.139)	<b>0.139</b> (0.138)
<b>Percentage ownership</b>	<b>0.031**</b> (0.013)	<b>0.031**</b> (0.013)
<b>Foreign exchange (yen/dollar)</b>	<b>44.35</b> (655.59)	<b>55.65</b> (633.77)
<b>Changes in foreign exchange</b>	<b>-0.107*</b> (0.063)	<b>-0.108*</b> (0.063)
<b>Labour costs in Japan</b>	<b>2.05 E-04</b> (6.37 E-02)	<b>2.03 E-04</b> (6.32 E-02)
<b>Change in labour costs in Japan</b>	<b>0.313**</b> (0.152)	<b>0.31**</b> (0.152)
<b>Relative wages in host country</b>	<b>-0.244</b> (1.328)	<b>-0.219</b> (1.318)
<b>Change in relative wages in host country</b>	<b>5.55 E-02</b> (5.49 E-02)	<b>5.62 E-02</b> (5.49 E-02)
<b>Log likelihood</b>	<b>-32.307</b>	<b>-32.282</b>
<b>Number of cases</b>	<b>39</b>	<b>39</b>
<b>Total number of observations</b>	<b>64</b>	<b>64</b>

Source: Author's estimates based on survey results.

<sup>a</sup> Numbers in parentheses show standard errors.

\* Significant at  $p < .10$ .

\*\* Significant at  $p < .05$ .

The results of the questionnaire survey show that the most frequently cited reasons for pursuing an export penetration strategy are major changes in exchange rates (mentioned by 75 per cent of the responding firms); access to major export markets through the Generalized System of Preferences (GSP) (mentioned by 50 per cent of these firms); pressures from existing competitors (mentioned by 50 per cent of these firms); changes in host country relative labour costs (mentioned by 38 per cent of these firms); and

**Table 3. Logistic regression results**  
*(Dependent variable: upgrading of products and technology)*

<b>Independent variables</b>	<b>Coefficient<sup>a</sup></b>	<b>Coefficient<sup>a</sup></b>
<b>Constant</b>	<b>45.03**</b> (18.048)	<b>-28.56**</b> (13.34)
<b>Employment</b>	<b>3.39 E-03***</b> (1.24 E-03)	
<b>Investment</b>		<b>-1.44 E-05**</b> (7.04 E-06)
<b>Capital intensity</b>	<b>-2.46 E-05**</b> (1.17 E-05)	<b>-4.31 E-05**</b> (1.96 E-05)
<b>Age</b>	<b>0.943**</b> (0.445)	<b>0.744**</b> (0.38)
<b>Percentage ownership</b>	<b>4.47 E-03</b> (2.31 E-02)	<b>6.29 E-03</b> (1.82 E-02)
<b>Foreign exchange (yen/dollar)</b>	<b>1316.4</b> (1445.7)	<b>556.62</b> (1184.9)
<b>Changes in foreign exchange</b>	<b>-0.082</b> (0.120)	<b>0.012</b> (0.085)
<b>Labour costs in Japan</b>	<b>7.22 E-04**</b> (3.60 E-04)	<b>6.24 E-04**</b> (3.08 E-04)
<b>Change in labour costs in Japan</b>	<b>0.306</b> (0.215)	<b>0.125</b> (0.164)
<b>Relative wages in host country</b>	<b>8.997*</b> (4.84)	<b>4.084</b> (2.985)
<b>Change in wages in host country</b>	<b>-0.103</b> (0.147)	<b>-0.052</b> (0.114)
<b>Log likelihood</b>	<b>-16.958</b>	<b>-22.513</b>
<b>Number of cases</b>	<b>11</b>	<b>11</b>
<b>Total number of observations</b>	<b>77</b>	<b>77</b>

Source: Author's estimates based on survey results.

<sup>a</sup> Numbers in parentheses show standard errors.

\* Significant at  $p < .10$ .

\*\* Significant at  $p < .05$ .

\*\*\* Significant at  $p < .01$ .

improvements of local supplier firms (mentioned by 38 per cent of these firms). The survey also revealed that domestic-market oriented FDI, as opposed to export-market penetrating investment, was motivated primarily by growing domestic markets (cited by 75 per cent of the respondents) and the maturity of the industry (cited by 38 per cent of the respondents). The importance of these factors is self-evident. Yet, the econometric analysis allows only a partial corroboration due to the limitations of the database.

**Table 4. Logistic regression results**  
(Dependent variable: low-cost supplier strategy)

Independent variables	Coefficient <sup>a</sup>	Coefficient <sup>a</sup>
Constant	-5.138 (4.904)	-4.008 (4.597)
Employment	9.14 E-04** (4.58 E-04)	
Investment		2.52 E-06 (3.01 E-06)
Capital intensity	-3.87 E-07 (3.29 E-06)	-2.96 E-06 (3.79 E-06)
Age	-2.07 E-03 (0.148)	0.025 (0.133)
Percentage ownership	0.031** (0.013)	0.027** (0.012)
Foreign exchange (yen/dollar)	96.21 (597.01)	-166.15 (566.11)
Changes in foreign exchange	0.062 (0.051)	0.071 (0.049)
Labour costs in Japan	5.43 E-05 (1.06 E-04)	1.17 E-04 (1.50 E-04)
Change in labour costs in Japan	-0.312** (0.154)	-0.289** (0.142)
Relative wages in host country	-0.408 (1.147)	-0.566 (1.158)
Change in relative wages in host country	0.408 (1.147)	0.012 (0.047)
Log likelihood	-42.343	-44.131
Number of cases	32	32
Total number of observations	77	77

Source: Author's estimates based on survey results.

<sup>a</sup> Numbers in parentheses show standard errors.

\* Significant at  $p < .10$ .

\*\* Significant at  $p < .05$ .

\*\*\* Significant at  $p < .01$ .

---

## ***Product and technology upgrading***

Table 3 shows the results for the strategy of technology upgrading. There are three firm-specific variables that are significant in affecting the choice of such a strategy: size (in employment or total investment, positive); capital intensity (negative, contrary to expectation); and age (positive, contrary to expectation). Two locational factors are also significant, namely, labour costs in Japan (positive, as expected) and relative labour costs in the host country (positive, also as expected). The results indicate that product and technology upgrading are manifest in large investments and utilize less capital-intensive technology. While labour costs in Japan have pushed Japanese TNCs to invest abroad with more advanced product and process technologies, such technological upgrading takes place particularly in host countries where skilled labour is available, as indicated by their higher level of wages. Interestingly, this shifting strategy was evident in the older investments, rather than in the more recent ones.

The survey results strengthen the above statistical findings. The three most cited driving forces for this particular strategy are improvements of local technological capabilities (cited by 50 per cent of respondents); the nature/maturity of the industry (cited by 38 per cent of respondents); and changes in specific technology (cited by 38 per cent of respondents). Presumably, the firms in the sample are well aware of the need to upgrade their investments in East Asia from low-end products to increasingly high-end products. If Japanese TNCs had followed such a strategy, however, the results suggest that they did so selectively, focusing on mature technologies with capital intensity. Understandably, that strategy would be more likely to take place in host countries where local technological capabilities and human capital are more developed, as indicated by a higher average wage of local labour.

## ***Low-cost supplier strategy***

There are three variables that are significant in discriminating between low-cost strategies from non-low-cost strategies (table 4), namely, employment (positive, as expected); percentage ownership (positive); and changes in labour costs in Japan (negative, contrary to expectation). These results confirm that Japanese FDI in East Asia took place in order to take advantage of the relatively abundant and cheap labour in the region. The positive correlation between ownership control and low-cost strategy seems to underline the notion that production efficiency can be achieved not only through the

---

scale of the investment and lower labour costs—hence the significance of the employment variable—but also through the use of specific organizing principles (e.g., lean production, subcontracting networks) which can be deployed best if TNCs have a strong ownership control over the investment.<sup>6</sup>

The survey results show that the most quoted factors for the low-cost strategy are pressures from new entrants/Asian NIEs (quoted by 50 per cent of the respondents); the nature of the buyer-supplier relationship (quoted by 50 per cent of the respondents); improvements of local suppliers (quoted by 38 per cent of the respondents); and changes in host country relative labour costs (quoted by 38 per cent of the respondents). Reinforcing the previous discussion, it can be argued that, as a low-cost strategy is contingent upon the nature of buyer-supplier relationships and the improvement of local suppliers, such a strategy appears to be more effectively carried out when the management has a greater control of the operation. This signifies further the importance of ownership control for the implementation of specific organizing principles within the affiliate.

The analysis provides some, albeit limited, support to the critical importance of the interplay among locational factors (i.e., exchange rates, relative labour costs) and firm-specific factors (i.e., plant size, ownership, investment intensity, timing/age) in affecting the choice of investment strategies by Japanese TNCs in East Asia. Strong support was not found for the argument that Japanese TNCs have broadened their technology sourcing and deepened their technological investment in East Asia. The technological upgrading strategy accounted for only about 14 per cent of the total number of FDI establishments in East Asia and for about 14 per cent of the total amount invested. In terms of employment, however, the technological shifting strategy represents about 24 per cent of the total employment, indicating that this strategy takes place in a low capital-intensity environment. The above analysis is static in nature, and does not capture the qualitative changes that have

---

<sup>6</sup> The case study of the Indonesian electronics affiliates partly supports this notion. The Indonesian electronics industry is characterized by its dual structure, one for exports and the other for catering to the domestic market. Export-oriented firms are largely controlled by foreign-based TNCs (about 90-100 per cent foreign ownership) and are highly efficient, employing advanced production techniques and equipment, producing quality products and stringent in terms of the use of local suppliers and subcontractors. The domestic-oriented firms, on the other hand, operate under protection from import competition, are much less efficient, use rather obsolete technology, are more lenient in their local sourcing and produce lower quality products. Of course, such efficiency differentials should be attributed not only to the governance structures of the investments, but also, especially, to their different regulatory and incentives regimes.

---

during 1986-1989, but it has levelled off since then, reflecting the appreciation of the yen after the Plaza Accord. If Japanese TNCs have indeed deepened their technological investment in the electronics industry in the region, it would be expected that there would be a shift from mainly consumer electronics towards the other three industries. Apparently, this deepening took place by building a production platform of consumer electronics, supported by a vast production network of parts and components, but with only a limited network of semiconductors production.

The disaggregation of FDI data into subregional groupings reveals an interesting pattern. As no Japanese electronics TNCs invested in Viet Nam during the period of observation (1958-1993),<sup>8</sup> we included only three subregions in our analysis: the Asian NIEs, ASEAN-4 and China. Japanese FDI in the ASEAN-4 has grown very rapidly, and in 1986 it surpassed FDI in the NIEs in employment terms.<sup>9</sup> By 1993, Japanese FDI in the ASEAN-4 was two times higher than that in the NIEs in terms of employment, but it was about equal in terms of value, showing that FDI in the NIEs is more capital intensive than in the ASEAN-4.

Japanese FDI in China has grown significantly especially since 1988. Although in 1993 the cumulative investment in China was only 15 per cent of the total FDI investment in the ASEAN-4 in terms of employment, it represented 23 per cent of total FDI in terms of value in the ASEAN-4. Again, this suggests that among the three subregions the capital intensity of the Japanese FDI has been consistently the lowest in the ASEAN-4. The following section explores this issue more fully.

### *Patterns of capital intensity*

Figure 1 shows the cumulative as well as the three-year moving average capital intensity of Japanese FDI.<sup>10</sup> Interestingly, capital intensity shows

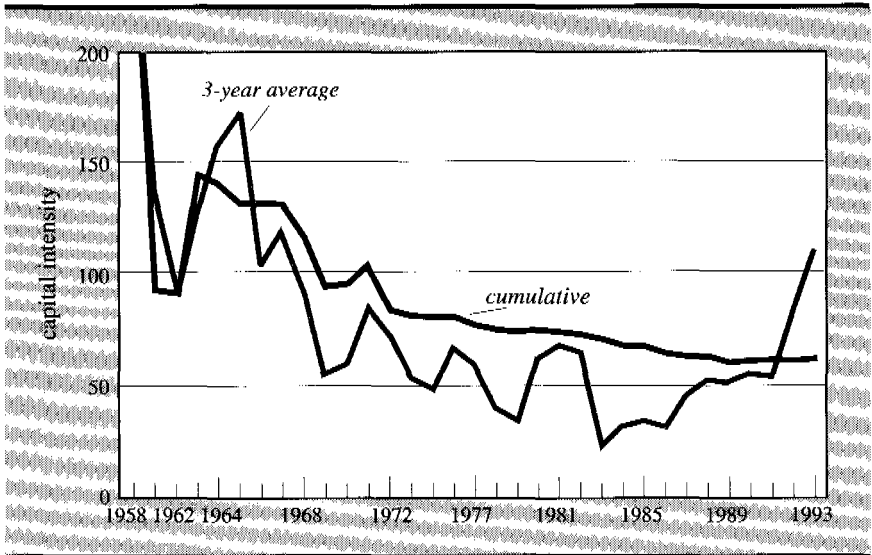
---

<sup>8</sup> The first known Japanese electronics investment in Viet Nam was Sony's \$7 million joint venture in Ho Chi Minh City, involving about 300 employees to assemble colour televisions and audio systems. The joint venture got its investment licence in October 1994, and it is expected to start production in 1995.

<sup>9</sup> It should be noted, however, that Japanese FDI in ASEAN-4 was concentrated mainly in Malaysia and Thailand. In 1993, both Indonesia and the Philippines combined represented only about 15 per cent of the employment of Japanese FDI in ASEAN-4.

<sup>10</sup> The cumulative capital intensity, calculated as cumulative capital invested (from 1958 to a particular year) divided by cumulative employment, indicates the average capital intensity of all FDI up to that year. The three-year moving average is calculated as the average capital invested in the last three years divided by the average employment in the same period. The three-year moving average figure, therefore, reflects more accurately the current trend (smoothed) in a particular year than the cumulative figure.

**Figure 1. Capital intensity of Japanese electronics TNCs in East Asia<sup>a</sup>**  
(Constant 1990 dollars)



Sources: EIAJ (1993); Nihon Kezai (1993), and UNDP database.

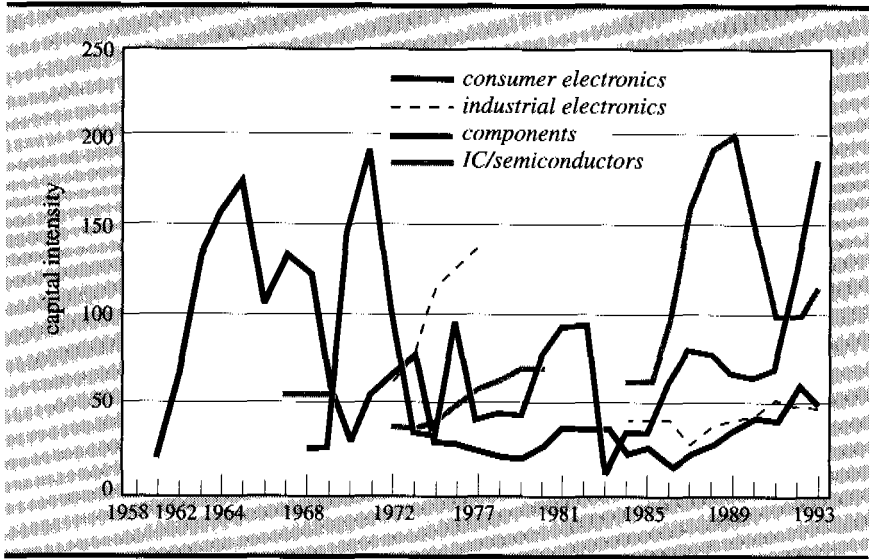
<sup>a</sup> Capital intensity per employee calculated at constant 1990 dollars.

a continuous decline as indicated by the cumulative figures. The three-year moving average FDI figures show, however, that this trend has been reversed in the past three years. The FDI average capital intensity almost doubled from about \$55,000 per employee in 1990/1991 to about \$109,000 per employee in 1993.<sup>11</sup>

Declining capital intensity was manifest particularly in consumer and industrial electronics, although both industries have indicated a reversed trend in the last few years (figure 2), albeit at a slower rate compared to the other industries. This reflects the orientation of the Japanese electronics TNCs in these two industries to relocate mainly their labour-intensive opera-

<sup>11</sup> By the end of 1993, the average capital intensity of *all* Japanese FDI was about \$62,800 (at constant 1990 dollars) per employee. From the Nikkei financial database, in the last five years, on average, the firms in the sample spent 44 per cent of their total FDI on physical capital goods. Using this estimate, it can be inferred that out of \$62,800 invested per employee in 1993, about 44 per cent or \$27,800 per employee, were physical capital expenditures. Björn Wellenius (1993) reported that in case of the United States electronics firms, the equivalent capital expenditure was about \$30,000 per employee.

**Figure 2. Sectoral capital intensity of Japanese electronics TNCs in East Asia<sup>a</sup>**  
*(Constant 1990 dollars)*



Sources: EIAJ (1993); Nihon Kezai (1993), and UNDP database.

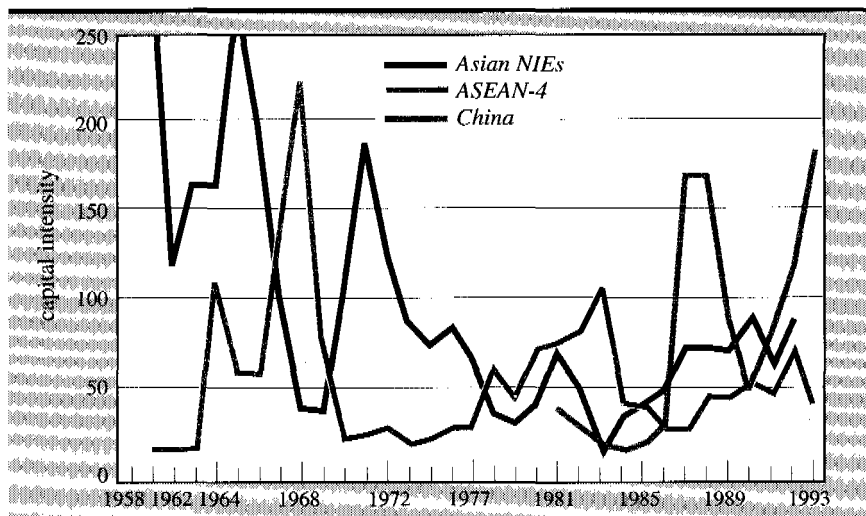
<sup>a</sup> Capital intensity per employee calculated at constant 1990 dollars.

tions in East Asia. Figure 2 also shows that the increasing capital intensity in the last three years has been driven primarily by the parts and components industry and, to a lesser degree, semiconductors. The capital invested per employee for parts and components production increased substantially, from about \$62,000 in 1986, jumping to \$123,000 in 1992, and to \$184,000 in 1993 (in constant 1990 prices). Such an increase in capital intensity coincides with two changes: the export reorientation of Japanese FDI, from European and North American markets to, increasingly, Japanese markets, and the increasing sophistication of products produced by Japanese affiliates in East Asia in the 1990s (Yoshitomi, 1994).

The three-year average capital intensity of the semiconductors industry also increased until 1990, and has dropped again since then. It has been documented that the capital intensity of the production of semiconductors tends to increase from time to time, reflecting the rapid proliferation of new product and process technologies employing micro-electronics-based automation. It has been estimated, for example, that the minimum investment requirements



**Figure 3. Capital intensity by area of Japanese electronics TNCs in East Asia<sup>a</sup>**  
(Constant 1990 dollars)



Sources: EIAJ (1993); Nihon Kezai (1993), and UNDP database.

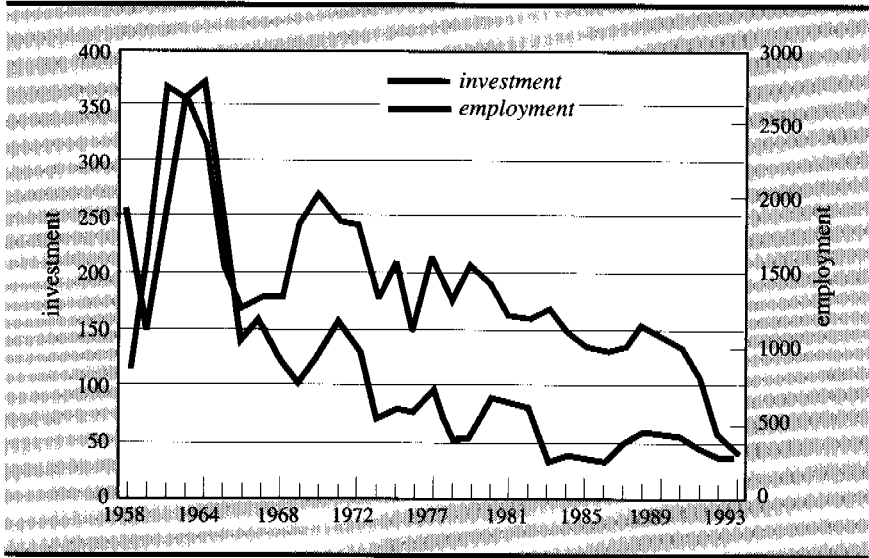
<sup>a</sup> Capital intensity per employee calculated at constant 1990 dollars.

for the production of the most advanced semiconductors<sup>12</sup> has increased dramatically from \$5 million in 1976 to \$60 million in 1982 and to \$100 million in 1986 (Chen, 1990). The increase of capital intensity of Japanese FDI, therefore, partly reflects this overall trend. The drop in capital intensity of new FDI in the semiconductors industry in the last three years may indicate a renewed emphasis on the labour-intensive, assembly operations of semiconductors' production (i.e., "packaging") and on semiconductors products that are less advanced technologically. These observations can plausibly be interpreted as reflecting the reluctance of Japanese electronics TNCs to relocate some of their technologically advanced semiconductors production to East Asia, at least until 1993.

Figure 3 indicates that, prior to 1983, Japanese FDI in both Asian NIEs and ASEAN-4 experienced a decline in capital intensity, but that has been

<sup>12</sup> There is, however, a reversed trend for the production of mature, standard and less sophisticated semiconductors, such as discrete devices. Their capital requirements tend to decrease from time to time.

**Figure 4. Average plant size (3-year moving average)<sup>a</sup>**  
*(Constant 1990 dollars)*



Sources: EIAJ (1993); Nihon Kezai (1993), and UNDP database.

<sup>a</sup> Three-year moving average. Investment per plant calculated at constant 1990 dollars.

reversed since then. Japanese FDI in China started only in 1981, but with a remarkably higher capital intensity than FDI in ASEAN-4 and similar to the capital intensity of FDI in the Asian NIEs. The cumulative capital intensity of FDI in China showed a continuous increase; since 1987, the capital intensity of FDI in China has surpassed the cumulative capital intensity of ASEAN-4 and is rapidly approaching the level of the cumulative capital intensity in the Asian NIEs. In fact, as figure 6 shows, the capital intensity of the latest Japanese FDI in China surpassed the capital intensity of the Japanese FDI in NIEs. If indeed Japanese TNCs are to deepen their technological FDI in East Asia, such investment is more likely to take place in China.

### ***Average plant size***

Like capital intensity, the average plant size of Japanese electronics TNCs is also declining in terms of both employment and dollar investment per plant (figure 4). In 1972, the average plant size of Japanese affiliates, was \$133 million (constant 1990 prices), or 1,811 workers per plant. The com-

---

parative figures were \$79 million, or 1,190 workers in 1982; and \$37 million, or 434 workers in 1992 (constant 1990 prices).

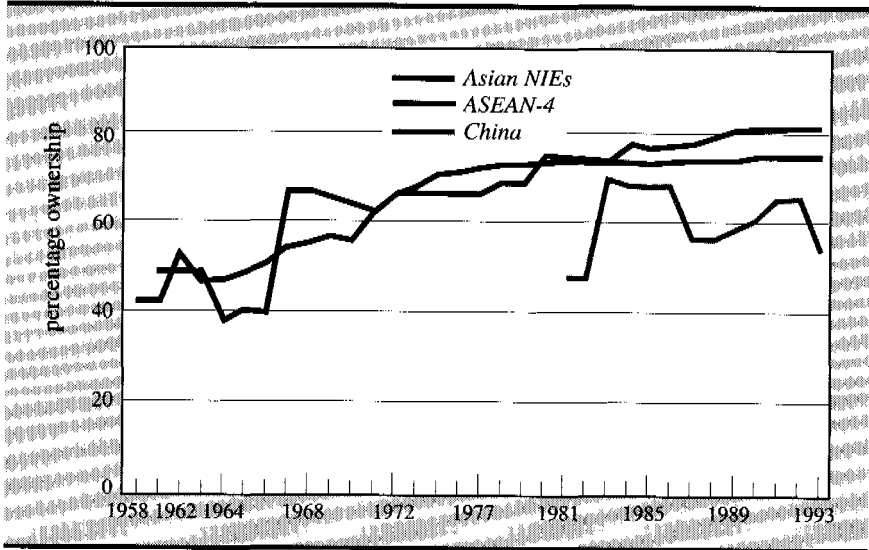
Case studies of affiliates in host countries indicate that output per plant has been increasing from time to time. Yet, such an increase in productivity has been achieved through a decline in both capital intensity (figure 1) and average plant size (figure 4). There are two possible elements at work here. The first is that the process technology for producing electronics products has been largely standardized and, with the increasing demand, the price of certain capital goods has been declining. This is particularly true for capital goods which embody standard microelectronics extensively. Secondly, Japanese electronics TNCs have been able to perfect their "organizing principles" which enable them to combine fewer inputs and yield greater outputs. A popular example would be the deployment of "just-in-time" technology and tight subcontracting schemes which have allowed Japanese TNCs to reduce capital requirements (both capital goods and working capital) significantly. This insight lends support to the viewpoint that Japanese electronics TNCs have been perfecting their ingenuity in the process of manufacturing technology.

## **Ownership structure**

Figure 5 shows that Japanese ownership of FDI in East Asia has been increasing. Ownership increased steadily from 42 per cent in 1958 to 66 per cent in 1970, and steadied at about 76 per cent in the mid-1980s and early 1990s.

If we use foreign ownership as a proxy for the degree of FDI liberalization in a country, then the data suggest that Governments in the region have been more open and receptive towards FDI. Among the three subregions, the ASEAN-4 countries have become the most liberal in allowing foreign ownership, followed by the Asian NIEs and China. Japanese ownership in the ASEAN-4 increased steadily, surpassed that in the Asian NIEs in 1980, and reached 82 per cent in 1993. The figures for the Asian NIEs have been unchanged since 1980 at about 75 per cent, and for China, they have fluctuated rather erratically, reaching about 55 per cent in 1993. Apparently, despite the attractiveness of China as a location for FDI by being both a growing market and an export platform, Japanese TNCs faced a daunting task in dealing with the complexity and the lack of transparency of China's FDI regime. Together with the imposed ownership restrictions, Japanese TNCs are induced to forge equity collaboration with Chinese domestic firms.

**Figure 5. Ownership by area of Japanese electronics TNCs in East Asia**  
(Percentage)



Sources: EIAJ (1993); Nihon Kezai (1993), and UNDP database.

Japanese TNCs maintain almost a complete control (with 98-99 per cent ownership) of FDI in the semiconductors industry. Clearly, this reflects their interest in protecting their product and process technologies, many of which are proprietary. Since almost all of the output of the Japanese semiconductors affiliates is intended for the export market, there is no incentive for them to share ownership with local firms. It also shows that there is a limit for host Governments in terms of restrictions that they can impose, including on ownership, on FDI in this technology-intensive sector.<sup>13</sup>

Japanese ownership in industrial electronics has been steady at 82-84 per cent during the last two decades. With the exception of 1993, the electron-

<sup>13</sup> The case of Fairchild, which pulled out of Indonesia in 1986, is indicative. Fairchild proposed to modernize its semiconductor plant in Jakarta using automation and advanced production technology, but this proposal was rejected by the Government of Indonesia on the grounds that such a change would reduce employment. This incident, in combination with the slump of world demand, forced Fairchild to pull out altogether from Indonesia (Thee and Pangestu, 1994, 21).

ics parts and components industry also showed a relatively stable ownership structure at about 80 per cent. The consumer electronics industry has been the lowest in terms of ownership control by Japanese TNCs, reaching about 70 per cent in the 1990s. As noted earlier, the lower ownership control coincided with the domestic-market orientation of Japanese FDI in consumer electronics, particularly for large markets such as China and Indonesia. As such, this industry is more prone to ownership restrictions by the host countries.

### **Export versus domestic-market orientation**

The following analysis is derived from the sub-sample described earlier. The data show that there has been an increasing trend of export-oriented investments, as opposed to domestic-market orientation, although the proportion has levelled off since 1990. Until 1970, export-oriented investments by Japanese TNCs were only in consumer and industrial electronics; their employment contribution was 85 per cent and 15 per cent, respectively. Since then, exports of consumer electronics have been supplemented gradually by components and semiconductors. In 1993, the employment composition of export-oriented Japanese FDI was 52 per cent for consumer electronics, 26 per cent for parts and components, 12 per cent for industrial electronics and 10 per cent for semiconductors. For exporting firms, the capital intensity of parts and components production has been the highest and the capital intensity of consumer electronics has been the lowest, reflecting the overall tendencies previously discussed.

Since 1970, the ASEAN-4 has been replacing the Asian NIEs as export platforms for Japanese FDI in the electronics industry. By 1987, about 60 per cent of the export-oriented employment was in ASEAN-4, and that figure reached 67 per cent in 1993. The proportion of capital investment in ASEAN-4 exhibits a similar pattern, but at a lower level, concurring with the lower capital intensity of FDI in ASEAN-4. Japanese FDI in China started rather late and picked up rapidly, but at a slower rate compared to the growth of FDI in ASEAN-4 during the 1970s. This suggests that these two sub-regions faced not only different opportunity sets at different periods, but also had different FDI regimes as well.

The previous analysis showed that ownership structure is one of the important variables that significantly differentiated between export and domestic-market orientation of Japanese TNCs in the region. The ownership

---

control by Japanese TNCs of their export-oriented FDI has been consistently and significantly above that of their domestically oriented FDI throughout the past twenty-five years. The export-oriented FDI shows an increasing trend, first at a very rapid rate during the 1967-1973 period and then at a much slower rate during the remaining years, approaching 90 per cent in 1993. Interestingly, Japanese ownership of domestically oriented FDI almost did not change, staying at about 50 per cent throughout the period of observation. This indicates that while export-oriented FDI regimes have been largely liberalized, this is not the case for domestically oriented FDI. Japanese TNCs are confronted with regulatory frameworks which impose certain restrictions, including ownership limits on domestically oriented FDI.

The above discussion addressed the quantitative and qualitative changes of Japanese FDI that took place during the period 1958-1993. Some general observations can be made from the preceding analyses. Japanese electronics TNCs appear to have been building a regional production network tailored for catering to domestic markets prior to 1970, and increasingly for export markets, including for Japanese markets, since the mid-1980s.<sup>14</sup> Their product lines consist largely of consumer electronics supported by an increasing role of parts and components production. Such a deepening of regional production networks has been followed by an increasing sophistication of product and process technologies, as indicated by the increasing capital intensity of the production of parts and components, including semiconductors. Their investments in consumer electronics, however, continue to utilize labour-intensive production technologies and benefit from the abundant supply of cheap labour in the region.

Nevertheless, the analysis indicates that Japanese TNCs experienced pressures from new competition from Asian NIEs producers. Even their more recent FDI was aimed at maintaining their position as low-cost suppliers *vis-à-vis* their counterparts in the NIEs. As a consequence of the increasing liberalization in the region, Japanese electronics TNCs have been able to increase their ownership control of their FDI in the region. Ownership control seems to play a critical role in the low-cost supplier strategy. It could be surmised that the production efficiency of the Japanese electronics TNCs is achieved through the use of efficient production technologies and organizing

---

<sup>14</sup> This trend seems to contrast with the strategy of United States and European TNCs which appear to use East Asia as an assembly platform particularly for export markets. A more detailed analysis is, however, needed to compare Japanese, United States and European FDI in the electronics industry in the region.

---

principles involving their relationships with suppliers, contractors and buyers. Many of these technologies and organizing principles are proprietary. Given the diversity of the region in terms of skill levels, education and working habits, ownership control becomes a necessary condition for the effective deployment of such proprietary technologies and organizing principles.

### **Future strategic foci of Japanese electronics transnational corporations**

The two previous sections addressed only the pattern of Japanese FDI in the past and not their future behaviour and the nature of the changes that are currently taking place. To address these issues, the firms in the sample were asked about their current and future strategies, their plans relating to linkages with suppliers, subcontractors and local authorities and the ways in which they plan to organize their regional operations. The firms in the sample were asked to indicate the relative importance of each description that best reflected their current and foreseeable future strategy in East Asia. The results are summarized in table 6.

#### *Current and future strategic orientation*

The survey indicates (table 6, panel 1) that the present strategies of the sample of Japanese electronics TNCs is heavily focused on cost-efficiency and product rationalization (with an average score of 4.37). These TNCs only put a moderate importance on "strong emphasis on quick time delivery" and "major focus on low-end products and markets" (the scores are 3.37 and 3.25, respectively). At present, these firms put a relatively weak emphasis on competition through technology and time.

There are, however, marked changes in the firms' strategic future orientation. Their emphasis on every aspect of the above strategic orientations increases, while their emphasis on low-end products and markets decreases. As indicated by the t-statistics in table 6, panel 1, there are two particularly significant strategic changes intended for the future: increasing "emphasis on high-end products and markets" and "strong emphasis on quick delivery time and excellent customer services". In the meantime, TNCs are expected to maintain in the future their heavy emphasis on cost-efficiency and product rationalization.

**Table 6. Current and future strategic foci of Japanese electronics TNCs in East Asia<sup>a</sup>**

<i>Strategic orientation</i>	<i>Mean scores</i>		
	<i>Current</i>	<i>Future</i>	<i>t-statistic</i>
Focus on cost efficiency and product rationalization	4.37	4.37	0.000
Major focus on high-end products and markets	2.12	3.37	2.165**
Major focus on low-end products and markets	3.25	2.62	-0.928
Establishing the firm as the technology leader	2.50	3.12	0.902
Strong emphasis on quick delivery and excellent customer services	3.37	4.25	1.790*
Strong emphasis on quick new product introduction	2.50	3.25	1.271
Strong focus on becoming the industry standard setter	2.37	2.62	0.304
<i>Domestic and regional linkages</i>			
Emphasis on building strong linkages with:			
Local/regional suppliers of materials and components	3.25	4.37	2.302**
Producers of capital equipment (jigs, mouldings, fixtures)	2.62	3.62	1.776*
Contract manufacturers (OEM, ODM)	2.37	3.62	1.843*
Distributors, value-adding re-sellers, and end-users	3.00	3.75	1.342
Independent engineering firms	1.87	3.00	1.842*
Private research-and-development laboratories	1.62	2.87	2.280**
Government research-and-development laboratories and universities	2.00	3.12	2.346***
<i>Organization of regional operation</i>			
Country specialization by product line	3.00	3.50	1.080
Country specialization by type of value-adding activities (design, component production, assembly, support services)	3.00	3.87	2.497***
Decentralization/autonomy for regional subsidiaries	2.50	3.00	0.882
Establishing regional headquarters to provide services to the region	2.62	3.62	1.776*

Source: Based on company questionnaires.

<sup>a</sup> The score range from 1 (lowest) to 5 (highest).

Note: t-statistics are to test the difference between the two mean scores of current and future orientation.

\* Significant at  $p < .1$ .    \*\*  $p < .05$ .    \*\*\*  $p < .01$ .



---

## ***Domestic and regional linkages***

Interestingly, the survey results indicate that Japanese electronics TNCs have, at the moment, only put a relatively low emphasis on building strong linkages with their input and technology suppliers, subcontractors and distributors. The scores range from as low as 1.62 (for linkages with private laboratories) to a maximum of 3.25 (linkages with local/regional suppliers of materials and components). This confirms the previous findings according to which Japanese electronics TNCs have only developed a Japan-centred regional production base with Japanese parent firms still controlling the core technologies, while their affiliates throughout East Asia are involved in labour-intensive operations for final assembly, supported by a production network of parts and components.

The TNCs in the sample surveyed indicated, none the less, that they intend to change significantly their future efforts to build domestic and regional linkages. The average score is increasing across the board and it is significant statistically almost in every category of linkages (table 6, panel 2). Ranking the relative importance of each type of linkage based on its score and comparing the ranks for the current and future orientations of TNCs, it is found that the rank order remains the same. In the future, the TNCs surveyed plan to give still more importance to their linkages with their suppliers, contract manufacturers and distributors, compared with their linkages with their technology suppliers (i.e., engineering firms, research-and-development laboratories, universities). This may indicate that Japanese electronics TNCs will strengthen their regional sourcing and broaden their technology supply base in the region in the future, but such a development will only take place very gradually.

A caution is in order, nevertheless, in interpreting the above results. Given the profit pressures that electronics TNCs have experienced since the early 1990s, it could be the case that the above results may simply reflect their short-term preoccupation with such a profit squeeze and, hence, underestimate the importance of competition through technology leadership and their links with local laboratories and research-and-development firms.

## ***Organization of regional operations***

Panel 3 of table 6 reports the organizational aspects of the regional operations of Japanese electronics TNCs. Currently, they seem to be balancing many aspects of their regional operations, putting a similar, "moderate" em-

---

phasis on "country specialization" by product or by value-adding activity, "autonomy for regional affiliates" and attempts to "establish regional headquarters to provide services to their various plants in the region".

In the future, it is clear that the firms in the sample intend to improve their emphasis on each aspect of their regional organization, as indicated by across-the-board improvements of their scores. In particular, there are two areas that TNCs intend to change compared with their existing organization: increasing "country specialization by value-adding activity" (i.e., design, component production, assembly, services), and an increasing tendency to "establish regional headquarters", as indicated by the t-statistics in panel 3, table 6. Apparently, Japanese electronics TNCs will reinforce and rationalize further their regional operations. Depending on its specific conditions, each country will be assigned a specific role in terms of design, component production, assembly or services. In the meantime, there is a tendency to establish regional headquarters, particularly in Singapore, to provide services for various plants in the region.

The above results strengthen the previous analysis of Japanese FDI in the electronics industry in East Asia. Japanese TNCs have maintained—and will probably continue to do so—strict control over their core technologies, by restricting the relocation of certain manufacturing activities and by maintaining—if they do relocate—full ownership control of FDI (e.g., the semiconductors case). In the meantime, Japanese TNCs have planned to strengthen their regional operations by establishing a more vertical division of labour across a number of host countries beyond assembly operations. The TNCs surveyed gave only a limited indication that they will be developing more aggressively close linkages with local engineering firms, laboratories or universities. Altogether, the survey results suggest that the deepening of technological sourcing in the region will only be manifest selectively and gradually. As the expansion and deepening of technological sourcing in the region is contingent upon the availability of suitable technological infrastructure and of skilled engineers and technicians, the increasing involvement of the Government of Japan and the private sector in various training and education programmes targeted for East Asian participants can be interpreted as a key long-term commitment for their planned expansion in the region. Interestingly, their current regional reorganization could also mean a preparation for further technology diffusion. It reinforces further the previous assertion that the cross-border technology diffusion by Japanese TNCs is largely embedded in their organizing principles, involving their relationships with suppliers, subcontractors and buyers.

---

## Conclusions and policy implications

The East Asian experience indicates that their regional development has been driven by the twin engines of FDI and technology diffusion. Governments, whether or not interventionist, have attempted in one way or another to influence this process using various policy instruments at their disposal. From the *host country* perspective, Governments in East Asia are interested in the potential of the electronics industry for attracting FDI, generating employment and exports and building up domestic technological skills and capabilities. In 1989, the electronic industry's production constituted about 44 per cent of the gross domestic product of Singapore, about 15 per cent of Malaysia and Hong Kong, about 10-11 per cent of Taiwan Province of China and the Republic of Korea, and less than 5 per cent of Thailand, the Philippines and Indonesia, albeit growing very rapidly for the last three countries. More and more Governments in East Asia are considering the electronics industry as critical for their industrial development and attempt to promote it directly and indirectly as an integral part of their industrial policy, at least implicitly. Beyond simple industrial targeting, the Governments of the Asian NIEs (except Hong Kong), followed lately by Malaysia, have used "functional targeting" of activities such as research and development, investment, technical training and education to complement their industry-specific promotional efforts. As the development of the electronics industry involves heavy research and is contingent upon the availability of skilled engineers and scientists, it has benefited from Government subsidies in higher education and from overall incentives for research and development.

Two additional interrelated issues bear significant implications for host country policies. The first relates to the characteristics of the electronics industry: high income-elasticity of demand, which in turn stimulates the rapid proliferation of new product innovations, and high developmental expenditures. For industrializing countries, there is an inherent limitation to their technical capacity to push technology frontiers and, consequently, access to foreign technology becomes critical. In particular, these countries will benefit most when they adopt policies which facilitate technology diffusion through FDI, licensing and informal trading of know-how through training and education. This is exactly the reason for the emerging convergence of FDI policies in ASEAN, for example, in terms of their investment incentives, restrictive rules and performance requirements.

---

---

The second issue pertains to the export orientation of FDI, which provides a discipline mechanism through competition in international markets. Interestingly, Japanese TNCs in East Asia have always targeted FDI to cater to both domestic and export markets. Japanese TNCs and the Government of Japan seem to be sympathetic to the idea of introducing a certain degree of protection and nurturing during the early stage of the electronics' industrial development of a country. Japanese TNCs are willing to negotiate and work within the existing regulatory frameworks of their host countries, regardless of how underdeveloped, ambiguous and opaque they may be. In the meantime, the Government of Japan is actively exporting its own policy ideas—as an alternative to the western “ideology” of free markets—to the neighbouring Asian countries.<sup>15</sup>

From the Japanese perspective, the importance of the electronics industry in the overall Japanese trade and investment is evident. In 1992, the exports of all Japanese industrial affiliates in East Asia to the world were concentrated mainly in electrical machinery, representing 50 per cent of the total exports of all Japanese affiliates. In the same year, electrical and electronic machinery accounted for 53 per cent of total exports to Japan and 45 per cent of total imports from Japan by all Japanese affiliates in East Asia. In value terms, Japanese affiliates in East Asia purchased 203 billion yen of electrical and electronic components and 179 billion yen of finished electrical and electronic goods from their Japanese parent firms, while selling 76 billion yen of components and 223 billion yen of finished electrical and electronic goods to their parent firms in Japan (Yoshitomi, 1994). These statistics clearly reflect the intra-firm, intra-industry trade phenomenon of Japanese FDI in the electronics industry, which has grown very rapidly since the mid-1980s.<sup>16</sup> In 1986, the total intra-firm, intra-industry trade of Japanese TNCs in electrical machinery amounted to 175 billion yen with a 38 billion yen (or 22 per cent) trade surplus in favour of the parent firms. In 1992, the same trade figure was 681 billion yen, still with 84 billion yen of surplus, or 12 per cent, in favour of the Japanese parent firms. This shows that, in relative terms, the intra-firm, intra-industry trade in the electronics industry has a tendency to narrow the trade deficit in favour of the Japanese parent firms.

Furthermore, the survey has indicated that Japanese electronics firms have created a Japan-centred regional production base, with Japanese elec-

---

<sup>15</sup> *The Economist*, 14-20 January 1995.

<sup>16</sup> In 1986, Japanese affiliates in East Asia purchased 142 billion yen worth of components and 36 billion yen of finished electrical machinery from their parent firms, while selling 141 billion yen of components and 205 billion yen of finished goods to their parent firms.

tronics TNCs still controlling the core technologies. While in the past their East Asian affiliates were largely involved in the production of consumer electronics using labour-intensive technologies, these affiliates are also now producing more and more sophisticated parts and components, as indicated by their increasing capital intensity. As discussed earlier, the most significant feature of Japanese FDI in the electronics industry is the combination of decreasing capital intensity with efficient organizing principles. This diffusion of production technologies embedded in the organizing principles, together with disembodied know-how and informal mechanisms including training and education, can be singled out as the dominant contribution of Japanese TNCs to the host countries' industrial development. How far such a benefit can be materialized depends largely on the current stage of technological development of the host country, the availability of human capital and its mobility (intra-firm as well as across firms), and policy regimes that are trade and FDI friendly.

In the meantime, new developments have taken place in Japan as well as in other parts of East Asia. The bursting of Japan's "bubble economy", Japan's economic slow-down and increasing capital costs, and the recent yen appreciation have forced Japanese TNCs to increase their technological FDI in the region. The number of new investment applications by Japanese electronics TNCs in China and in ASEAN-4 increased substantially during 1993-1994. The number of Asian students in Japan's universities have also multiplied during the last few years. In addition to the private initiatives of Japanese TNCs, the Japan International Cooperation Agency and the Association for Overseas Technical Scholarships have also been very active in sponsoring training for the private sector by way of sending employees of local firms to Japan for a period of 3 to 12 months. About 5,000 people participated in these programmes during 1990-1991, and the number almost doubles every year. Japan has also been increasingly active in providing assistance for the development of technology infrastructure in ASEAN-4 and China (e.g., standardization, testing, science parks). Clearly, there is a strong signal that the nature of Japanese FDI in the region is about to change. Japanese electronics TNCs are indeed preparing and consolidating their technological base in the region through new investment and inter-firm networks.

The policy implications of an upgraded Japanese supply base in East Asia deserve careful analysis which should include more detailed information on the corporate strategies of the other actors, i.e., United States, European and—increasingly—overseas Chinese. The growing United States trade deficit with the region and the growing Japanese surplus are, in part, related

---

to the FDI patterns of their TNCs. Will the United States-Japan trade frictions escalate and become regional frictions? There are also concerns about investment networks as a new form of industrial organization that creates new barriers to entry. But few data exist that permit a rigorous analysis essential for policy discussions. The role of technology transfer is crucial to the growth prospects of the region which has, thus far, relied more on productivity gains from increased inputs and export-led structural changes.<sup>17</sup> The recently approved APEC investment code will require transparency, legal due process, abandoning or restrictive performance requirements etc.. How can such a code be effectively implemented? How would China, a member of APEC, but not of the World Trade Organization, enforce such a code? What would be the relationship between the APEC code and the OECD Multilateral Investment Agreement? Questions are numerous, but answers are few. Much more information and research are required—especially because politics create policy—with or without research! ■

---

<sup>17</sup> See Ostry (1995) for a detailed analysis.

---

## References

- Chen, Edward K. Y., (1990). "The electronics industry", in H. Soesastro and M. Pangestu, eds., *Technological Challenge in the Asia-Pacific Economy* (Sydney: Allen & Unwin), pp. 51-73.
- Dunning, John H. (1980). "Toward an eclectic theory of international production: some empirical tests." *Journal of International Business Studies*, 11, pp. 9-31.
- \_\_\_\_\_ (1993). *Multinational Enterprises and the Global Economy* (New York: Addison-Wesley).
- Eaton, Curtis B., Richard G. Lipsey and Edward Safarian (1994). "The theory of multinational plant location in a regional trading area", in Loraine Eden, ed., *Multinationals in North America* (Alberta: University of Calgary Press), pp. 53-78.
- The Economist* (1995). "Japan: the new nationalists", 14 January, pp. 19-21.
- Electronic Industry Association of Japan (EIAJ) (1993). *1993 Handbook on Overseas Operations* (in Japanese) (Tokyo: EIAJ).
- Hsu, Robert C. (1994). *MIT Encyclopedia of Japanese Economy* (Cambridge, Massachusetts: MIT Press).
- Kogut, Bruce (1988). "Joint ventures: theoretical and empirical perspectives." *Strategic Management Journal*, 9, 4, pp. 319-322.

- 
- McFetridge, Donald G. (1989). *Trade Liberalization and Multinationals* (Ottawa: Economic Council of Canada).
- New Vietnam (1995). "Sony Vietnam", 1, 19, pp. 20-21.
- Nihon Keizai Shimbun (1991). *Nihon Kezai Handbook 1991* (in Japanese) (Tokyo: Nihon Keizai Shimbun, Inc.).
- Ostry, Sylvia (1995). *The New World Trading System: Who's on First?* (New York: Twentieth Century Fund Press.)
- Thee, Kian Wie and Marie Pangestu (1994). "Technological capabilities in Indonesia's manufactured exports" (Jakarta: Indonesian Institute of Science and Centre for Strategic and International Studies), mimeo.
- Wellenius, Björn (1993). "Electronics and the developing economies: introduction and overview", in B. Wellenius, A. Miller and C.J. Dahlman, eds., *Developing the Electronics Industry* (Washington, D.C.: The World Bank), pp. 1-14.
- Yoshitomi, Masaru (1994). "Building a new United States-Pacific Asia economic relationship for the post-Uruguay Round era". Paper presented at the 5th United States-Korea Academic Symposium, University of California at Berkeley, mimeo.