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# Sequential Foreign Investments, Regional Technology Platforms and the Evolution of Japanese Multinationals in East Asia

Jaeyong Song

July 2001

How can host governments in East Asia encourage existing foreign investors to stay and upgrade their operations over time? This paper investigates the firm-level mechanisms that underlie the sequential foreign direct investment (FDI) decisions of multinational corporations (MNCs).

The author develops a firm capability-based model of such sequential FDI decisions in the setting of the historical experiences of Japanese electronics firms operating in East Asia. He also analyzes the significance of the recent emergence of regional technology platforms that some firms have established in host countries.

The empirical findings indicate that sequential FDIs are firm specific, evolutionary processes in which prior investment decisions in capabilities may be more important than external factors (such as exchange rates and local wage hikes). Policy implications would suggest that host government incentives for MNCs to develop local capabilities, as well as to improve the level of productivity of local workers, can influence MNCs' decisions in favor of upgrading activities rather than "switching out" of that country.

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# PREFACE

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Masaru Yoshitomi
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## ABSTRACT

In this paper, we investigate the firm-level mechanisms that underlie the sequential foreign direct investment (FDI) decisions of multinational corporations (MNCs). To understand inter-firm heterogeneity in the sequential FDI behaviors of MNCs, we develop a firm capability-based model of sequential FDI decisions. In the setting of Japanese electronics MNCs in East Asia, we empirically examine how prior investments in firm capabilities affect sequential investments into existing production bases in response to major environmental changes. In our empirical investigation, which is based on descriptive statistical analysis, panel data regression analysis, and field studies, we find supporting evidence for our main argument that sequential FDIs are firm-specific, evolutionary processes in which prior investments in firm capabilities influence future sequential FDI behaviors.

Based on our empirical findings, we suggest that host-country governments in East Asia should note that sequential FDI decisions are conditioned by firm-specific locational choices and subsequent investments in local capability development. An important policy implication of this study is that a country's economic development is affected by MNCs' strategic choice of "upgrading" or "switching-out" in the country. Host government incentive policies to encourage MNCs to develop local capabilities as well as to improve the level of productivity of local workers can influence MNCs' decisions in favor of upgrading activities.

During the past several decades, East Asian countries have emerged as major host locations for foreign direct investments (FDIs) in the electronics industry. The recent financial crisis in the region encouraged host governments to become more aggressive in attracting FDIs. Initially, MNCs setting up manufacturing bases in East Asia pursued simple assembly operations of low value-added products, with the aim of taking advantage of low-wage labor forces. Over time, some began to upgrade their activities and technologies in selected host locations, whereas others migrated to new low-wage locations when local wages in the existing host locations went up.

In response to the subsequent location decisions of MNCs, in the form of upgrading or switching-out, host governments in the region began to pay greater attention to the issue of how to retain foreign investors in the midst of environmental changes such as the recent financial crisis. More and more host governments have come to realize that the strategic choices of MNCs of "upgrading" or "switching-out" in a country are intrinsically tied to the stability of the country's economic development.

How can host governments in East Asia induce existing foreign investors to stay and upgrade their operations over time? We suggest that to answer this question, policy-makers should first understand the decision criteria the MNC uses for its choice of global production locations. Decisions regarding the locational choice of various activities within a global network have been viewed as key to the firm's global strategy. However, most existing studies of the locational choices of MNCs have focused on factors external to firms (e.g., exchange rates, wages, and agglomeration

economies). Few have analyzed how *firm capabilities* have affected the location decisions of MNCs. The main goal of this paper is to investigate the firm-level mechanisms underlying sequential FDI location decisions — upgrading vs. switching-out — of MNCs in order to help host governments in East Asia better understand the strategic location decision-making rules of MNCs.

The empirical analysis of this paper consists of three parts. In the second section of the paper, using descriptive statistics, we describe the changing pattern of the East Asian production networks of Japanese electronics firms since 1985 in response to the dual environmental shocks – the sharp appreciation of the yen and major changes in the local production environments in Taipei,China, Korea, and Singapore. We examine the locational migration of traditional assembly operations from these three major production bases to the newly emerging ASEAN countries and PRC from the late 1980s until the mid 1990s. Further, drawing on archival data, we analyze the overall pattern of the upgrading of activities in the existing plants in Taipei,China, Korea, and Singapore. In the third section of the paper, we summarize the statistical findings of a series of panel data regressions that we performed during our companion research work (Song and Kogut, 2000). Then, in the fourth section, we explore the recent evolution of the organizing mode of Japanese production networks in East Asia, based on findings from field interviews and surveys. Our main focus is on the emergence of regional technology platforms that led to a new organizing mode of Japanese MNCs that we call the "three-tier coordination system." We first describe the major roles of the regional technology platforms that Japanese electronics firms have set up in East Asia, and then empirically investigate the location selection criteria for regional technology platforms.

Finally, in the last section of the paper we summarize our empirical findings and draw government policy implications from our empirical analysis.

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## 1. Theoretical Background

In this section, we begin by describing major theories of sequential FDI location decisions, and then propose a firm-capability-based view of sequential FDIs. In addition, we review conventional theories on Japanese FDIs.

### *1.1 Sequential FDI Location Theories*

There are three complementary theories through which we can understand sequential FDI location decisions: we label them comparative advantage, agglomeration economies, and experiential learning. While these theories are not mutually exclusive, they suggest distinct predictions regarding the factors influencing sequential FDI location decisions. The static theory of comparative advantage mainly concerns differences among locations in terms of factor endowments and the exchange rates of host countries. This view suggests that foreign direct investment is more likely to be attracted to locations that possess favorable locational endowments, meaning classical sources of comparative advantages such as low wages. Once a location loses its comparative advantage, it is unlikely to attract subsequent FDI. An exporter may even withdraw from the country in response to extreme appreciations of the local currency or local wage hikes, as predicted by Dixit (1989). For a MNC, exiting tends to take the form of "switching" from one country to another.

While the view of comparative advantage suggests the possibility of migration or switching from an existing location in response to changes in macroeconomic factors, both the agglomeration economies view and the experiential learning view focus on path dependencies in sequential foreign investment decisions. The agglomeration economies view suggests that FDI is attracted to locations that promise agglomeration benefits (Wheeler & Mody, 1992). Once agglomeration economies are gained in a location, the location is likely to attract subsequent FDIs. The agglomeration economies view sees the externalities found in specialized workers, suppliers, and infrastructural investments as important factors in the economic development of the location through agglomerations of firms (Hirschman, 1958; Krugman, 1991; Arthur, 1994). Markusen (1990) suggested that the early decision of a firm to invest in a region promotes the creation of agglomeration economies and thus reinforces the location's attractiveness for other investors. Grossman and Helpman (1991) emphasized the role that initial accumulations of knowledge or experience play in a particular country in terms of creating path dependencies in the long-run patterns of resource allocations to production and research activities in the country. They suggested that both the history of

knowledge accumulation and comparative advantage in a country would influence MNCs' decisions of where different activities should be undertaken.

Both the theories of comparative advantage and agglomeration economies provide reasonable explanations of the importance of country-level factors, such as local wages and the availability of skilled workers, in determining the overall trend of MNCs' locational choices across countries in a region. However, these macro theories ignore substantial inter-firm differences in sequential FDI decisions. Grossman and Helpman (1991: 177) argued, consequently, that static notions of comparative advantage can offer "only a limited insight into the causes of the international specialization." Moreover, the comparative advantage view has difficulty explaining why a substantial number of firms continue to invest in host countries that no longer offer the benefit of low wages, whereas other firms move to other low wage locations. The agglomeration economies view also has difficulty explaining why some MNCs in an agglomerated location switch to other less agglomerated locations, while others stay and upgrade in the host location despite the same environmental change.

In contrast to these models of country-level differences in terms of factor endowments or agglomeration benefits, the experiential learning view focuses on the heterogeneity of inter-firm differences due to their histories of overseas operations. The management literature has often cited these differences between firms. In one of the first statistical studies, Davidson (1980) found that prior experience in a host country tended to increase the probability of choosing the same location for sequential FDIs. Subsequent studies such as Caves and Mehra (1986) and Kogut and Singh (1988) have found similar effects. In a similar vein, Hennart and Park (1993) showed that the experiential knowledge gained by Japanese firms in manufacturing a product in the United States could be transferred to another product, and thus facilitated subsequent FDIs into the U.S. In their empirical investigation of Japanese investments into the U.S., Kogut and Chang (1996) and Chang (1995) found substantial variations across firms in sequential FDI behavior, reflecting differences in their histories of previous investments in the U.S.

In the following empirical analysis, drawing mainly on the experiential learning approach, we place special emphasis on the role of firm capabilities in sequential FDI decisions. In this firm capability-based view of sequential FDIs, we focus on the platform investments of MNCs in firm-specific, location-bound capabilities, as differentiated from host-country capabilities based on agglomeration economies or availability of highly productive, skilled workers. We emphasize that what determines the future expansion or upgrading of activities in a host country is active investments in firm-specific capabilities rather than just experience from a long history of operations or favorable host- country conditions.

### *1.2 Conventional Theories of Japanese MNCs*

One of the major goals of this paper is to enhance our knowledge of the recent evolution of Japanese production and R&D networks in East Asia. A brief description of conventional models of Japanese FDIs in East Asia will serve as an important starting point for further inquiries into the changing patterns of Japanese production networks in East Asia since 1985. Japanese investments in East Asia have been explained in terms

of the "flying geese model," referring to Kojima's macroeconomic model of FDIs (Kojima, 1978), and Bartlett and Ghoshal's global organization model (Bartlett and Ghoshal, 1989). These models attempted to provide explanations of the relatively homogeneous pattern of Japanese investment in East Asia.

The so-called "flying geese model" focused on the timing and locational migration of Japanese investments. According to this model, Japanese firms first build major positions in Japan, and export their products overseas. As their product moves to maturity in its life cycle, they move their production bases to East Asia, while they pursue the upgrading of products and technologies at home. As the comparative advantage and industrial structures of host countries change over time, the production bases of mature, labor-intensive products move to other foreign locations that offer lower wages.

In explaining the timing and location of Japanese investments, Kojima (1978) adopted a slightly different and more sophisticated theoretical lens. He argued that Japanese investments in East Asia typically take place in product sectors in which Japanese firms are on the verge of losing their comparative advantage. Like the flying geese model, Kojima's model described the products or activities that were transferred to East Asia as mature, standardized products and labor-intensive assembly processes.

These location patterns imply a corresponding set of organizing principles for Japanese MNCs. Focusing on the relationship between headquarters in Japan and overseas plants, Bartlett and Ghoshal (1989) called the organizing model of Japanese production networks the "global organization model" or "centralized hub model." According to Bartlett and Ghoshal, the headquarters in Japan maintains tight central control of decisions, resources, and information. Most of the overseas subsidiaries are unable to create new products or strategies or even to modify the existing ones, due partly to a lack of capabilities and partly to the reluctance of the headquarters to delegate responsibility and authority to subsidiaries. More advanced activities, such as product planning and development or the production of key components, are strictly confined to plants in Japan. Bartlett and Ghoshal argued that Japanese firms pursue advantages in efficiency at the expense of local responsiveness and the transfer of advanced technologies and activities to host countries.

These conventional models of Japanese FDI have many common threads. First, they view Japanese plants in East Asia as screwdriver plants set up to take advantage of low-paid, unskilled workers for simple assembly processes, or to overcome trade barriers. Those products that were transferred to East Asia were mature, standardized ones with low levels of technological sophistication. According to these models, Japanese firms were not so active in sourcing components locally, and instead imported most key components from Japan. Local R&D activities in East Asian plants were almost unimaginable in these models. They implicitly assumed that Japanese firms in East Asia made little investment into the development of local managerial, engineering, and sourcing capabilities. Japanese firms were described as migrating to new locations once the existing location no longer offered the advantage of low wages. Moreover, Japanese firms were implicitly assumed to be following a homogeneous evolutionary path. These models ignored heterogeneity or variation in investment patterns among Japanese firms. In the empirical analysis below, we will show that, unlike the descriptions of conventional views of Japanese FDIs, differences in firm-level

capabilities at both the corporate and host country levels led to a heterogeneity of sequential FDI patterns among Japanese electronics firms in East Asia.

## 2. The Dual Shocks and the Evolution of Japanese Production Networks

As an empirical setting for our analysis of sequential FDI decisions, we chose Japanese electronics FDIs in East Asia. In this section, drawing on archival data compiled by the Japanese government, research institutes, and industry associations, we will examine the changing pattern of Japanese electronics FDIs in East Asia in response to the "dual environmental shocks" — the appreciation of the yen and major changes in local production environment in Taipei,China, Korea, and Singapore.

### *2.1 The Dual Environmental Shocks and Changing Patterns of Japanese FDIs in East Asia*

Since 1985, these "dual environmental shocks" have led to a reshuffling of the production networks of Japanese electronics firms in East Asia. As shown in Chart 1, the sharp appreciations of the yen since 1985 triggered a massive flow of Japanese foreign direct investments. The exchange rate of the yen against the US dollar dropped from 239 in 1985 to 169 in 1986, and then further to 128 by 1988. As a result of the yen's appreciation since 1985, the overseas sales volume of Japanese firms nose-dived from 13,400 billion yen in 1985 to 10,000 billion yen in 1986 (MITI, 1991). The Matsushita group alone suffered a loss of $500 million in sales in 1986. Due to the rise of the yen, total foreign investments in the electronics industry increased 6.5 times in the late 1980s compared to the early 1980s (Japan External Trade Organization [JETRO], 1990). East Asia was the leading recipient of Japanese foreign investments in electronics, accommodating 67.9% of new plants over 1986-1994 (Electronic Industries Association of Japan [EIAJ], 1995).

The impact of the yen's appreciation on Japanese electronics firms was magnified by the second wave of shocks from Taipei,China, Korea, and Singapore, which hosted 73% of Japanese electronics plants in East Asia as of 1985 (Toyo Keizai, 1986). In the late 1980s, the production environments in these three economies worsened dramatically due to a coincidence of multiple and unfavorable events. For Korea and Taipei,China, wage hikes and labor unrest in the late 1980s took a toll on Japanese investments in search of low wages. For Singapore, on top of wage hikes, a shortage of labor and land posed serious threats to manufacturing operations. Since 1989, export-seeking investments in these countries have suffered from the elimination of tariff privileges from the United States.

These dual environmental shocks forced Japanese electronics firms to reexamine their East Asian production networks. The rise of the yen compelled them to transfer more advanced activities to East Asia. At the same time, the production environments in Taipei,China, Korea, and Singapore no longer supported the low-wage-based, assembly-oriented production of mature products. The major increase in foreign investments led to qualitative changes in the patterns of organizing regional production networks. Enormous pressure to cut costs due to the rise of the yen and fierce global competition forced Japanese firms to reduce the time lag between the initial production

of technically advanced products in Japan and their subsequent transfer to East Asia. For example, both wide-screen TVs, which were first produced in Japan in 1991, and mini-disc (MD) players, first launched in 1992, have been produced in East Asia since 1995 for reverse export to Japan. By contrast, the first overseas production of VCRs took place 8 years after their introduction in Japan in 1975. A recent JETRO survey found that 74.7% of Japanese plants in East Asia were producing products that were being produced simultaneously by their parent plants in Japan. Only 19.2% specialized in low-end products that Japanese parents no longer produced in Japan (JETRO, 1994). This accelerating transfer of technologically advanced products cannot be adequately explained by the traditional models that assume a transfer of standardized products at the mature stage of the product cycle. Moreover, the active transfer of products in which Japan has a solid comparative advantage indicates a major departure from the traditional portrayal of Japanese FDIs taking place in product lines where Japan has lost its comparative advantage.

Moreover, the advance of automated assembly in conjunction with the decrease in the wage portion of total production costs meant that simple final assembly by low-paid, unskilled workers no longer offered any significant advantage. MITI's benchmark survey shows that the ratio of Japanese electronics transplants in Asia that specialized in simple assembly dropped sharply from 27% in 1983 to 12.5% in 1992 (MITI, 1986; 1994). A growing number of Japanese firms have emphasized integrated production of key components and local sourcing to reduce component costs (Long-Term Credit Bank Research Institute (LTCBR), 1994).

Some pioneering firms have gone a step further by transferring non-manufacturing activities, such as R&D and regional coordination. As mentioned earlier, conventional models of Japanese FDI described both activities as being strictly centralized in Japan.

In 1989, Japanese electronics firms in East Asia spent 1.9% of their total facility investments on R&D activities, a sharp increase from the 1.2% spent in 1986. At that stage, R&D work in the local subsidiaries typically involved the modification of product design or improved production technologies to support local production activities (MITI, 1991; LTCBR, 1995). Some advanced production bases in Singapore and Taipei,China served as regional technology platforms to support regional production networks in ASEAN-4 countries and the People's Republic of China (PRC), which share common languages and cultures, as we will elaborate later.

### *2.2 Sequential FDIs and the Changing Roles of Singapore, Taipei,China, and Korea*

In the late 1980s and the early 1990s, changes in the local production environments in Taipei,China, Korea, and Singapore — the second environmental shock — triggered a major change in terms of the flow of Japanese electronics investments in East Asia. As shown in Chart 2, the initial shockwave of the rise of the yen encouraged Japanese electronic firms to funnel more investments into these three economies, where they had already gained considerable experience. However, by 1988, their share had dropped sharply to 27%, while that of the ASEAN-4 countries skyrocketed to 56% from 30% the previous year. In terms of the number of new subsidiaries, the share of Taipei,China, Korea, and Singapore decreased even further.

In the 1990s, PRC has emerged as the most important destination of Japanese investments in the electronics industry. Between 1991 and 1994, 49.1% of new Japanese electronics plants in East Asia were set up in PRC, compared to only 8.4% between 1988 and 1990 (EIAJ, various years). The locational migration pattern illustrated by Chart 2 appears to be consistent with conventional models of Japanese FDIs. Japanese firms appear to have changed their plant locations based on dynamic changes in the comparative advantages of host countries. However, what these models fail to explain is that firms did not respond in identical ways. About 20% of Japanese electronics subsidiaries in Taipei,China, Korea, and Singapore were shut down during 1988-1994. However, instead of exiting from these countries, many other firms upgraded their activities and products of existing plants in Taipei,China, Korea, and Singapore.

In response to dual shocks, these Japanese electronics firms focused on restructuring the operations in these three economies. In 1989, in spite of the explosive increase of greenfield investments into ASEAN countries — Malaysia, Thailand, Indonesia, and the Philippines — Japanese electronics firms spent more money for investments in plants and equipment in the Newly Industrialized Economies (NIEs) — Taipei,China, Korea, Singapore, and Hong Kong, China — than in ASEAN (Ministry of International Trade and Industry (MITI), 1991). The 1992 MITI benchmark survey further reveals that 41.2% of Japanese electronics subsidiaries in the NIEs sourced more than 80% of their components and materials locally, while 12.2% recorded a local sourcing ratio lower than 40%. The comparable figures in ASEAN were 12.6% and 39%. These statistics suggest that substantially higher numbers of Japanese subsidiaries in Taipei,China, Korea, and Singapore established local supplier networks than their counterparts in ASEAN countries or PRC.

Table 1 shows that the ratio of "screwdriver plants" among investments was substantially lower in the Asian NIEs than in the ASEAN-4 countries. Moreover, the local sourcing ratio was significantly higher in the Asian NIEs (66.8%) than in the ASEAN-4 countries (47.6%) in 1992.

Moreover, in spite of the explosive increase of greenfield investments into ASEAN-4 countries, Japanese electronics firms spent more money for investments in plants and equipment in the NIEs (90 billion yen) than in the ASEAN-4 countries (74 billion yen) in 1989. In the NIEs, 20.5% of the total facility investments were geared to rationalizing or restructuring existing operations, and 3.5% for R&D facilities. The comparable figures in ASEAN-4 countries were 2.5% and 0.2%.

We should also note here that local capability development in Taipei,China, Korea, and Singapore varies substantially among Japanese firms. Some firms in these countries made substantial investments in local capability development early on, by adopting an integrated production system or establishing local sourcing networks, while other firms in the same country failed to make much investment into firm-specific, location-bound capabilities. These patterns of activity and product upgrading in the Asian NIEs, and the advances in the intra-regional division of labor among Japan, the Asian NIEs, and the ASEAN-4 and PRC, suggest major departures from conventional models of Japanese FDIs in East Asia.

In summary, the dual environmental shocks offered both opportunities and challenges to existing Japanese subsidiaries in East Asia. The urgent need to transfer

advanced activities and products overseas enhanced the value of existing subsidiaries in Taipei,China, Korea, and Singapore. On the other hand, unfavorable changes in the local environments undermined incentives to further invest in those countries. The key strategic decision facing Japanese electronics firms was how to deal with existing investments in Taipei,China, Korea, and Singapore in relation to the emerging ASEAN countries and PRC. One group of Japanese electronics firms chose to upgrade their subsidiaries in Taipei,China, Korea, and Singapore toward advanced manufacturing and technology development, while using new plants in the ASEAN countries and PRC as labor-intensive production bases (JETRO, 1994). Another group of firms abandoned its production bases in Taipei,China, Korea, and Singapore and relocated to the ASEAN countries or PRC. In other words, the dual environmental shocks made the variations in the sequential investment decisions of Japanese electronics firms much more conspicuous in Taipei,China, Korea, and Singapore in the late 1980s and early 1990s. Thus, they provide an ideal setting to examine the role of heterogeneous capabilities in sequential investment decisions. Relating these variations in strategies to the heterogeneity in capabilities is the objective of the statistical analysis described below.

## 3. Determinants of Sequential FDI Location Decisions

In the statistical analysis of a previous paper (Song and Kogut, 2000), we examined the influence of prior investments in firm capabilities — both firm-specific and location-bound capabilities as well as corporate-level capabilities — on sequential FDI location decisions made in response to major environmental changes. In the regression analysis, we focused on the following empirical questions:

1) To what extent can sequential decisions to upgrade or downgrade FDI be explained by prior investments in firm capabilities?

2) Within firm capabilities, what is the relative importance of local capabilities as opposed to corporate-level capabilities on sequential FDI decisions?

3) How important are economic factors such as host-country productivity and wage levels in sequential FDI decisions?

For our statistical analysis, we modified the idea of "quality ladders" of Grossman and Helpman (1991) to develop a measure of "technology ladders" for specific products. This ladder permitted us to operationalize the idea of upgrading and downgrading investments in a country. We then analyzed the sequential investment decisions of Japanese electronics firms in Taipei,China, Korea, and Singapore over the period 1988-1994 through panel data regressions. The sample for the regression analysis consisted of all manufacturing subsidiaries of member companies of the Electronics Industries Association of Japan (EIAJ) in Taipei,China, Korea, and Singapore over that period. According to our database, 128 of these firms had plants in Taipei,China, Korea, and Singapore at some point between 1988 and 1994. Since 49 firms had subsidiaries in at least 2 of the countries of interest, we used subsidiaries in each country as our unit of analysis, in order to capture variations among firms in the same location as well as variations of locations within the same firm in sequential FDI decisions.

We measured the dependent variables of the sequential FDI decisions of Japanese electronics firms in Taipei,China, Korea, and Singapore by the direction of change in activities in each location over 1988-1994 (two-period ordered logit regression) or in a given year between 1988 and 1994 (random-effects, fixed-effects, and discrete time panel data regressions). The sequential changes in the activities of existing subsidiaries in a host country were classified as upgrading, status quo, or downgrading as evaluated by adjustments of product portfolios, number of plants, and local R&D activities. For example, if firm A added more technologically advanced product(s) to Singapore in a given period, it was judged as "upgrading." The addition of new plants or R&D labs was also counted as an "upgrading" of activities. On the contrary, if firm B retrenched from a host country by eliminating a more technologically advanced product, a plant, or a R&D lab from Singapore, the case was classified as a "downgrading" of activities. An exit from a location was also judged as "downgrading." If there was no change in the period, it was regarded as "status quo."

By estimating the effects of local capabilities, global capabilities, and host-country productivity and wage levels on sequential FDI decisions, we factored out macroeconomic factors from subsidiary and firm-level influences on decisions to upgrade or downgrade activities in existing operations. To provide more fine-grained insights into the effects of firm-specific, location-bound capabilities (e.g., Sony's local capabilities in Taipei,China), we further classified local capabilities by the variables of overall experience, internally-developed local capabilities, and local capabilities developed in the supply networks, and examined these variables separately in our statistical analysis.

As shown in Table 2, which summarizes the statistical findings of a series of panel data regressions, the empirical results confirm the importance of capabilities accumulated at the host country, parent company, and local subsidiary levels in sequential foreign direct investment decisions. In particular, the results show that in response to major economic changes, firms that have invested actively in local engineering and sourcing capabilities tend to remain and to pursue upgrading more aggressively than firms that do not invest in these capabilities. For example, the effects of the "local sourcing ratio" as a proxy variable for local sourcing capabilities are especially significant and consistent. The higher the local sourcing ratio, the more likely a firm will upgrade local operations and the less likely it will downgrade or exit. The ordered logit regression indicates a positive effect of "integrated production" as a measure for local engineering or manufacturing capabilities on upgrading decisions, although this variable was dropped in other regressions due to data constraints. Unlike the other local capability variables, the effects of overall local experience, measured in terms of duration of local operations, were neither significant nor consistent across models.

To summarize the results regarding global capabilities, we found that Japanese electronics firms with more overseas subsidiaries tend to pursue upgrading. However, contrary to our predictions, a high overseas production ratio coupled with more overseas subsidiaries at the corporate level encourages firms to pursue downgrading as well. This asymmetry in the findings indicates substantial inter-firm differences in regional organizing strategies. The random-effects models also showed that the technological capabilities of the parent company are important variables in decisions to upgrade

technologies in overseas subsidiaries. The effect of technological capabilities on downgrading or exit is not strong, however. Taken together, the differences in these results imply that upgrading decisions draw upon the R&D capability of the parent firm.

The panel data analysis also shows the importance of comparative advantage in a multinational corporation's choice of sequential FDI locations. We found significant and positive effects of local wages on the propensity to downgrade or exit, suggesting that the higher the local wages, the more likely a firm is to downgrade or exit. In symmetry with the downgrading results, increases in local wages have negative effects on a firm's decision to upgrade. We also found a significant effect of local productivity on sequential FDI decisions. The higher the local productivity (as measured by manufacturing value-added), the more likely a MNC is to upgrade local operations and the less likely it is to downgrade or exit.

Overall, these statistical findings show that firm capabilities, and especially locally accumulated capabilities of MNCs, matter in the location choices of MNCs, after controlling for changes in macroeconomic factors such as local wages and productivity. The significant effects of country difference demonstrate the importance of country-specific comparative advantages or agglomeration economies. However, our findings suggest that the local capacities of an MNC, developed internally as well as on supply networks, counter-balance unfavorable changes in country-specific factors. These findings support the view that decisions on sequential FDIs are made in response to the acquisition of capabilities that will serve as platforms for the future upgrading of activities.

The role of local capabilities in sequential FDI decisions suggest that important competencies of MNCs reside at the local level, and that such locally-accumulated competencies shape the geographic evolution of MNCs. Moreover, in contrast to the common assumptions of prior research in the experiential learning view, our findings based on multiple measures of local capabilities suggest that MNCs do not learn passively from a long history of operations. As long as a firm has limited its operations to simple assembly, a long history of local operations (measured in terms of the duration of local operations) does not necessarily guarantee that the location offers capabilities for more advanced activities. In contrast, purposeful investments in local managerial, engineering, and sourcing capabilities encourage firms to pursue upgrading.

In a similar vein, our statistical findings explain why the majority of Japanese electronics firms continued to operate and some even upgraded operations in Taipei,China, Korea, and Singapore, in spite of the unfavorable environmental changes. In these cases, some firms developed valuable local capabilities. As long as such capabilities require a local presence for their renewal, MNCs have an incentive to maintain the operation for future expansion. In this sense, local capabilities encourage a strategy of betting on the future potential of existing investments.

The positive effects of global capabilities on both upgrading and downgrading decisions suggest that Japanese electronics firms that have strong global capabilities are more active and capable of initiating changes — both upgrading and downgrading — in their existing overseas operations than those with a weak global presence. This finding suggests that some Japanese electronics firms with strong global capabilities pursued "operating flexibility," by shifting production sites in response to environmental changes (Kogut and Kulatilaka, 1994), while others upgraded their operations in the

same countries. Recently, Tang and Tikoo (1999) showed that a MNC with an extensive overseas production network can benefit from the operating flexibility opportunities that its network provides.

Our findings on both the negative effects of productivity and the positive effects of local wages on downgrading suggest that a host country that relies mainly on low wages to attract FDIs makes itself vulnerable to the investment location decisions of MNCs. When an unfavorable environmental shock occurs, a MNC switches out from the host country unless highly productive workers and suppliers have been developed within the MNC or are available externally. Yet, our findings also indicate that the advantage of low cost, based on low-wages, is still important in the overseas manufacturing of many Japanese electronics firms.

## 4. The Emergence of Regional Technology Platforms

To enrich our statistical findings, we conducted extensive field interviews and surveys at both corporate headquarters and 25 East Asian subsidiaries of 10 Japanese electronics multinational corporations, in 1996 and 1997. At the corporate headquarters, we interviewed executives and general managers in charge of formulating global or East Asian strategies. At the overseas subsidiaries, we met both expatriate and locally hired managers and engineers working in the areas of strategic planning, operations management, and R&D.

The field study findings identified important differences among Japanese electronics firms regarding their sourcing strategies and regional organizational structures. A few of the firms that we visited had pursued the upgrading of technologies in some existing subsidiaries in Singapore, Taipei,China, and Korea in which they had built substantial local managerial, engineering, and sourcing capabilities. Traditionally, parent companies in Japan were the sole transferors of technology, information, and personnel in the East Asian production network (Kojima, 1978; Bartlett and Ghoshal, 1989). However, since the late 1980s, Japanese firms such as Matsushita and Murata have begun to help these subsidiaries to modify or develop their own product designs and production processes, and then transfer them to sister plants in East Asia.

On the other hand, a few firms elected to shift out of production from sites disfavored by shifts in comparative advantage. For example, in response to local wage increases in Taipei,China since the late 1980s, KOA, a maker of resistors, closed one of its two plants there and downgraded operations in the remaining one. The data from our interviews and surveys in both Japan and Taipei,China indicated that KOA neither actively trained local engineers nor developed long-term suppliers in that economy in spite of a long history of local operations. Again, consistent with our statistical findings, we see that global sourcing strategy and organizational capabilities at the local level are intrinsically linked.

To better understand how Japanese firms upgraded their activities in locations where they had built up considerable local capabilities, we further analyzed how Japanese MNCs differentiated, duplicated, and integrated the roles of their overseas subsidiaries in the search for efficiency, learning, and flexibility. We gave special emphasis to the regional technology platform as a new breed of overseas subsidiary with upgraded strategic roles.

We define regional technology platforms as core overseas plants which (1) modify or develop technologies — product designs and/or production processes — for sister plants in the region and (2) provide subsequent support for the manufacturing operations of these plants. Unlike conventional Japanese manufacturing subsidiaries, with their low level of local capabilities, these regional technology platforms accumulated a high level of local engineering and sourcing capabilities. They not only upgraded technologies for their own manufacturing operations, but also developed routines to generate and transfer knowledge to sister plants in their overseas production network. In terms of knowledge flows, they received high volumes of knowledge inflows from the parent company in Japan, and then after modifying or further developing these technologies, generated high levels of knowledge outflows to sister plants in the region.

### *4.1 The Roles of Regional Technology Platforms*

Drawing on this definition of regional technology platforms as developers and transferors of technologies in the overseas production network, out of the 22 plants in our field surveys, we classified Matsushita Technology (MASTEC), Matsushita Electronics (MESA), and Sony Precision Engineering Center (SPEC) in Singapore, Matushita Television (MTV) in Malaysia, and Mabuchi Taiwan [sic] as regional technology platforms. The main criterion for the distinction between regional technology platforms and non-regional technology platforms was whether a subsidiary transferred locally-developed or modified technologies to sister plants in the region, and then provided ongoing technical assistance to these plants. Traditionally, Japan provided the product designs to overseas manufacturing bases. However, beginning in the late 1980s, regional technology platforms began to modify or develop their own product designs and then provide them to sister plants. MESA began to manufacture its first internally-designed audio model in 1988. In 1996, about 70% of the product models that were produced in sister plants in East Asia had been designed or modified by MESA. In addition to the modification and development of product designs, the regional technology platforms also modified and developed production processes, which they then transferred to sister plants. After providing these product designs and plant layouts to sister plants in East Asia, they provided ongoing engineering and quality assurance support for them.

From our field study, we learned that Japanese electronics MNCs had developed regional technology platforms to pursue continuous technological upgrading and rapid global expansion by exploiting the enhanced capabilities and resources in their overseas production network in the face of resource constraints at home. Reversals in the locus of knowledge between corporate headquarters and some overseas subsidiaries further encouraged leading Japanese MNCs to deepen the differentiation of strategic roles of overseas subsidiaries by making use of unevenly distributed and specialized resources in the overseas production network. Moreover, increases in the duplication of production lines, centered on regional technology platforms, enabled them to pursue operating flexibility in their regional networks.

The emergence of regional technology platforms brought about a major change in the structural design of Japanese MNCs. According to conventional models of Japanese FDIs, Japanese electronics firms traditionally used highly-centralized control

mechanisms based on dyadic relations between parent companies in Japan and East Asian subsidiaries, or what we call a "two-tier coordination system." The parent companies in Japan maintained tight control over resources, information, and technology. In this dyadic coordination system, little differentiation was made in the roles and activities of different overseas plants. East Asian subsidiaries merely implemented orders from corporate headquarters, using technology developed in Japan. Lateral linkages among East Asian subsidiaries in terms of technology, information, and personnel seldom existed, although they did transfer components, materials, and finished goods under the control of the parent companies. However, the emergence of regional technology platforms led to the development of "three-tier coordination mechanisms," with the regional technology platforms occupying an intermediate position between Japan and the low-wage assembly bases. In this three-tier coordination system, which was a new mode of organization for Japanese MNCs, the roles and activities of East Asian subsidiaries were differentiated. Japan was no longer the sole transferor of technology, information, and personnel, as regional technology platforms generated intra-regional flows. Moreover, the development of regional technology platforms, which advanced the differentiation and duplication of subsidiary tasks and resources, enabled Japanese electronics MNCs to make use of the unevenly distributed subsidiary-level capabilities and the operating flexibility within their East Asian production networks.

### *4.2 Selection Criteria for Regional Technology Platforms*

So far, we examined the nature of regional technology platforms and how they have changed the East Asian production networks of Japanese electronics firms. The last empirical question that we will address, based on our field study, is where Japanese electronics MNCs established their regional technology platforms among candidate host locations. From our field interviews at both corporate headquarters and overseas subsidiaries, we identified the following factors as the major selection criteria for regional technology platforms: (1) the availability of engineering capabilities, (2) the development of local supporting industries, (3) government incentives for technology upgrading, (4) linguistic and cultural proximity, and (5) the existence of wholly-owned subsidiaries.

To analyze the validity of each selection criteria, we conducted a series of simple statistical analyses using our field surveys in 22 subsidiaries. First, we ran a one-way ANOVA analysis to examine whether there were statistically significant differences between regional technology platforms and non-regional technology platforms. Second, we conducted both multiple comparison and pairwise ANOVA to check whether there were significant differences in our surveys across Singapore, Taipei,China, Malaysia, and Thailand as host countries. Finally, we attempted to cross-check the findings from the ANOVA analysis by conducting qualitative comparative analysis (QCA) on the selection criteria for regional technology platforms.

*4.2.1. The Availability of Engineering Capabilities*

Because a major role of the regional technology platforms was to modify production technologies and product designs and then transfer them to sister plants, they needed to secure a sufficient number of able engineers and adequate in-house manufacturing know-how. The subsidiaries that emerged as regional technology platforms have actively engaged in R&D activities and the development of engineering expertise. In the one-way ANOVA, we found significant differences between regional technology platforms and other manufacturing subsidiaries in terms of R&D activities and the capabilities of local engineers. Specifically, respondents from regional technology platforms gave significantly higher scores to the capabilities of local engineers to modify product designs. They also placed a significantly higher emphasis on local R&D activities aimed at using local components. On a question regarding the relative importance of production goals, the regional technology platforms gave significantly higher scores to innovativeness. In terms of the level of technologies embedded in products as of 1995, we also found a significant difference between the two groups.

In addition to these subsidiary-level differences, we also found significant differences in R&D activities and engineering capabilities across host countries. These differences also affected the locational choices of Japanese MNCs. In the one-way ANOVA analysis based on multiple comparison tests, we found significant differences in terms of the skill levels of workers, innovativeness, and the level of technologies relative to sister plants in the region. In the pairwise (country-by-country) ANOVA, we found that subsidiaries in Singapore gave significantly higher scores to the skill levels of workers than those in Taipei,China, Malaysia, and Thailand. Moreover, in terms of the level of technologies embedded in products, respondents in Singapore gave significantly more positive answers than respondents in Taipei,China, Malaysia, and Thailand. These statistical findings provide an answer to the question of why Singapore is often the preferred location for regional technology platforms. Although Taipei,China lagged behind Singapore in the above areas, it put a significantly greater emphasis on innovativeness as a production goal than did Malaysia or Thailand. In terms of the level of technologies relative to other plants in East Asia, Taipei,China also yielded significantly higher scores than Thailand.

These findings of high levels of worker skills, technologies, and innovativeness in Singapore and Taipei,China reflect both the external and internal availability of skilled workers and engineers. High rates of secondary and college-level enrollment have produced a large number of engineers and technicians in these countries. A long history of manufacturing operations in the two economies enabled Japanese MNCs to secure experienced workers and engineers who had acquired firm-specific knowledge through on-the-job training.

*4.2.2. The Development of Local Supporting Industries*

In addition to the local engineering capabilities, the availability of local supply networks may play an important role in the emergence of certain plants as advanced manufacturing sites. The growing importance of components and materials in determining the cost and quality of finished goods (Ferdows, 1997) has added

incentives for MNCs to transfer advanced products to locations where they have developed effective supplier networks. As mentioned above, our ANOVA analysis showed that regional technology platforms carried out local R&D activities aimed at accommodating locally sourced components much more aggressively than did non-regional technology platforms.

Such R&D activities require close interaction with suppliers. Thus, geographical proximity to qualified suppliers is an important qualification for regional technology platforms, which perform R&D activities to accommodate locally sourced components. In our survey, Japanese electronics firms in Singapore and Taipei,China reported a higher local sourcing ratio of components and materials than did their counterparts in Malaysia and Thailand. In the ANOVA analysis, local suppliers in Taipei,China showed a significantly higher level of technological capabilities than their counterparts in Malaysia and Thailand. Taipei,China even had significantly higher scores than Singapore on this item. This high local sourcing ratio in Taipei,China and, to a lesser extent, in Singapore, was the outcome of well-developed local supplier networks, both internal and external to the Japanese electronics MNCs. Given that the majority of local suppliers are subsidiaries of Japanese firms, the initial agglomeration of Japanese electronics firms in these countries in the 1970s and early 1980s contributed to the development of the local supporting industries. For example, Mabuchi Motors still has quality problems with locally-procured components in PRC and Malaysia, whereas in Taipei,China, local suppliers that have acquired Japanese technologies over a long history of operations provide much more reliable components and materials.

*4.2.3. Government Incentives for Technology Upgrading*

Government incentive schemes to attract regional core operations and advanced manufacturing activities also helped existing plants in certain locations to emerge as regional technology platforms. The representative case is Singapore, where a series of government schemes gave added incentives to Japanese electronics firms to develop their existing subsidiaries there into regional technology platforms.

Since 1979, Singapore has offered incentives to existing plants related to investments in employee training. It has also established joint industrial training centers with MNCs, and invested heavily in the development of skilled workforces. In the mid-1980s, it introduced Operational Headquarters (OHQ) incentive schemes. To quality as an OHQ, an MNC needed to base its regional R&D, distribution, service network and financial systems in Singapore alone among East Asian countries. As of September 1992, forty-seven MNCs had obtained OHQ status (JETRO, 1994). In 1989, it also took the initiative in the establishment of the "Growth Triangle" that links Singapore, Johor (Malaysia), and Batam (Indonesia). The establishment of OHQ and the Growth Triangle encouraged MNCs to make strategic moves to maintain and upgrade activities in Singapore, while transferring labor-intensive manufacturing to low-wage neighboring countries.

Recently, the National Science and Technology Board (NSTB) of Singapore introduced several incentive schemes to encourage MNCs to further invest in R&D activities. First, it established the Research Incentive Scheme for Companies to support MNC activities aimed at developing long-term R&D capabilities in Singapore. Second,

it adopted the Research & Development Assistance Scheme, which is designed to support specific R&D projects. Finally, it has facilitated the training of local research scientists and engineers under the Manpower Development Assistance Schemes. Table 3 compares the incentive policies of selected East Asian governments.

*4.2.4. Linguistic, Ethnic, and Cultural Proximity*

A fundamental role of regional technology platforms is to create and transfer technologies and then provide continual engineering and training support to sister plants in the region. The sharing of language, culture, and ethnic backgrounds between engineers in regional technology platforms and those in recipient plants can make the process of technology transfer and assistance smoother and more effective. In our interviews, executives in regional technology platforms mentioned that due to the similarities in culture, language, and ethnic backgrounds, ethnic Chinese engineers from Singapore, Taipei,China, and Malaysia often turned out to be better teachers for local engineers and workers in PRC and other East Asian countries than did their Japanese counterparts. The same went for ethnic Indian and Malay engineers in Singapore. According to our survey, it was mainly the subsidiaries in Singapore and Malaysia that provided technical support to new operations in other ASEAN countries and PRC. The main beneficiary of technical support from Taipei,China was PRC. In summary, common ethnic, linguistic, and cultural backgrounds, as well as manuals in local languages such as English and Chinese, gave an advantage to overseas plants located in Singapore, Taipei,China, and Malaysia as regional technology platforms in supporting new plants in Southeast Asia and PRC.

*4.2.5. Wholly-owned Subsidiaries*

Since they acted as bases for the development and production of advanced products, regional technology platforms were often the initial recipients of proprietary know-how and advanced technologies originally developed in Japan. The possibility of this proprietary know-how being leaked to local partners, or of potential conflicts of interests with local partners made Japanese electronics MNCs prefer wholly-owned subsidiaries to joint ventures as candidates for regional technology platform status.

*4.2.6. Findings from the Qualitative Comparative Analysis (QCA)*

In addition to a series of ANOVA analysis, we attempted, using a technique called qualitative comparative analysis (QCA), to examine the aforementioned selection criteria for regional technology platforms. QCA is an analytic technique for the comparative analysis of qualitative data using reduction techniques from Boolean algebra. On the basis of Boolean methods of logical comparison, it conceives each case holistically as a combination of causal and outcome conditions. It compares these combinations with one another in a "truth table," and then logically minimizes them through a bottom-up process of paired comparisons. These paired comparisons are done in accordance with a simple rule that combines rows that differ on only one causal condition but produce the same outcome. This process of paired comparisons goes on

until no further reduction is possible, and prime implicants are derived. The last stage of logical minimization is made in a prime implicant chart that shows the correspondence between the prime implicants and the original causal combinations drawn from the truth table. After eliminating redundant prime implicants, the QCA produces a reduced logical equation for the outcome of interest. Following these procedures, we constructed a truth table, identified prime implicants, and drew a prime implicant chart to produce a reduced logical equation for the conditions for the emergence of regional technology platforms.

Given the importance of engineering capabilities in the development of locally suitable technologies and in providing technical assistance to sister plants, we hypothesized that prior experience of local R&D operations, measured in terms of the dummy for the local R&D lab as of 1990, would be likely to increase the chance for an existing plant to be chosen as a regional technology platform. We also hypothesized that Japanese electronics firms would likely prefer wholly-owned subsidiaries to joint ventures as regional technology platforms. Finally, we hypothesized that considering the aforementioned factors of availability of skilled workers and good infrastructure, the development of local supporting industries, ethnic and linguistic similarities, and government incentive schemes, Japanese firms would be more likely to prefer Singapore as the location for their regional technology platforms in East Asia.

In the QCA of 22 cases in our survey, we found that wholly-owned subsidiaries in Singapore, or subsidiaries in Taipei,China and Malaysia that were performing R&D activities as of 1990, emerged as the regional technology platforms. The findings from the QCA as well as from ANOVA statistically confirmed our hypotheses regarding the selection criteria for regional technology platforms.

## 5. Conclusion and Policy Implications

In this paper, we investigated the underlying firm-level mechanisms behind sequential FDI decisions by MNCs. Looking at Japanese electronics MNCs in East Asia, we empirically examined how prior investments in firm capabilities affected sequential investments into existing production bases in response to major environmental changes. In our empirical investigation, based on descriptive statistical analysis, panel data regression analysis, and field studies, we found supporting evidence for our main argument that sequential FDIs are firm-specific, evolutionary processes in which prior investments in firm capabilities influence future behaviors. The significant effects of country differences measured in terms of host-country productivity and wages in the regression analysis showed the importance of country-specific comparative advantages or agglomeration economies. However, contrary to the comparative advantage view that ignores firm-level dynamics and inter-firm variations in FDI location decisions, this paper has clearly shown that there are significant inter-firm variations in sequential FDI behaviors. Moreover, we showed that firm capabilities *do* matter in the location decisions of MNCs, even after controlling for country differences. These findings clearly suggest that sequential FDI decisions are affected not only by host-country conditions but also by firm capabilities.

Our field research further revealed that the upgrading of activities in certain East Asian subsidiaries has led to the emergence of a new mode of organization for Japanese

overseas networks, based on regional technology platforms. Moreover, the evidence from our field research showed that the important location selection criteria for regional technology platforms are: the local availability of engineering and sourcing capabilities; as well as government incentives for technological upgrading. Our findings from both empirical analysis and field research are consistent with recent surveys conducted by JETRO reporting on the upgrading of the activities of Japanese subsidiaries in East Asia (JETRO, 1999, 2000).

What are the potential government policy implications of this study? In our two-period ordered logit analysis, we found that in response to the dual environmental shocks, Japanese electronics firms upgraded their operations much more actively in Singapore than in Taipei,China and Korea. In our field study, we confirmed that Japanese electronics firms preferred Singapore as a site for regional technology platforms in East Asia. These findings have policy implications for national governments that hope to induce and then retain foreign investors, irrespective of environmental changes. Aggressive incentive schemes to encourage MNCs to upgrade their operations, in conjunction with efforts to improve complementary infrastructures for advanced activities, seem to have generated a positive feedback loop in Singapore.

In recent years, and particularly after the crisis in 1997, other East Asian countries ranging from Malaysia to Korea have followed Singapore's lead, by introducing various incentive packages to induce sequential FDIs for advanced activities. However, it remains to be seen whether these countries will be able to catch up with Singapore. However, our findings suggest that without policies to encourage MNCs to develop local capabilities, the investment boom into the ASEAN-4 or PRC may turn sour, since these economies suffer from shortages of qualified human resources and suppliers, as well as poor infrastructures. Japanese firms may migrate to lower-wage production sites such as Vietnam or India if the production environments in the ASEAN-4 countries or PRC worsen. In a similar vein, unless they encourage the continued development of local capabilities, even the existing bases in Taipei,China, Korea, and Singapore may turn out to be temporary bases, as Japanese firms upgrade their capabilities in ASEAN-4 and PRC.

In the past, East Asian countries focused mostly on how to attract foreign investors. Aggressive policies often paid off, and many countries in the region have successfully attracted a substantial number of foreign investors. However, as their production environments often changed in a direction which penalizes traditional low-wage-based, simple assembly operations, the question of how to retain existing foreign investors and encourage them to upgrade their activities and technologies has become as important as how to attract initial investments. This issue of attracting sequential FDIs from existing foreign investors has become all the more critical since the recent financial crisis that swept through the region, as host governments have tried to retain existing foreign investors irrespective of environmental changes.

We argue that host-country governments in East Asia should note that sequential FDI decisions are conditioned by firm-specific locational choices and subsequent investments in local capability development. An important policy implication from this study is that a country's economic development is affected by the strategic choices of MNCs to "upgrade" or "switch-out" in the country. Incentive policies to encourage MNCs to develop local capabilities as well as to improve the level of productivity of local workers' skills can influence MNCs' decisions in favor of the upgrading of activities.

# Charts and Tables

## Chart 1: Overseas Production Ratio and Exchange Rates

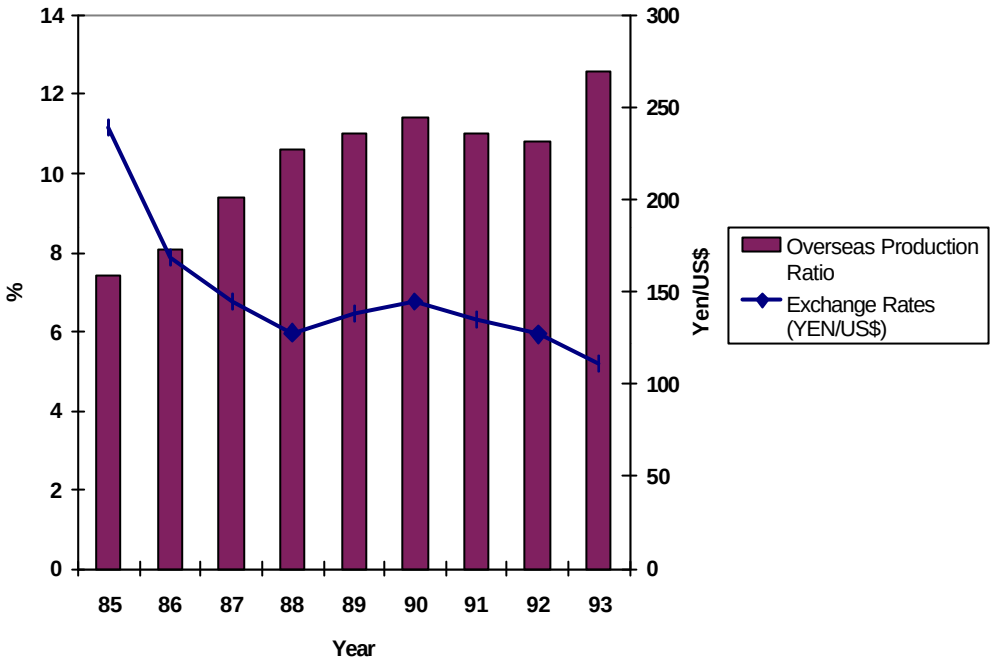
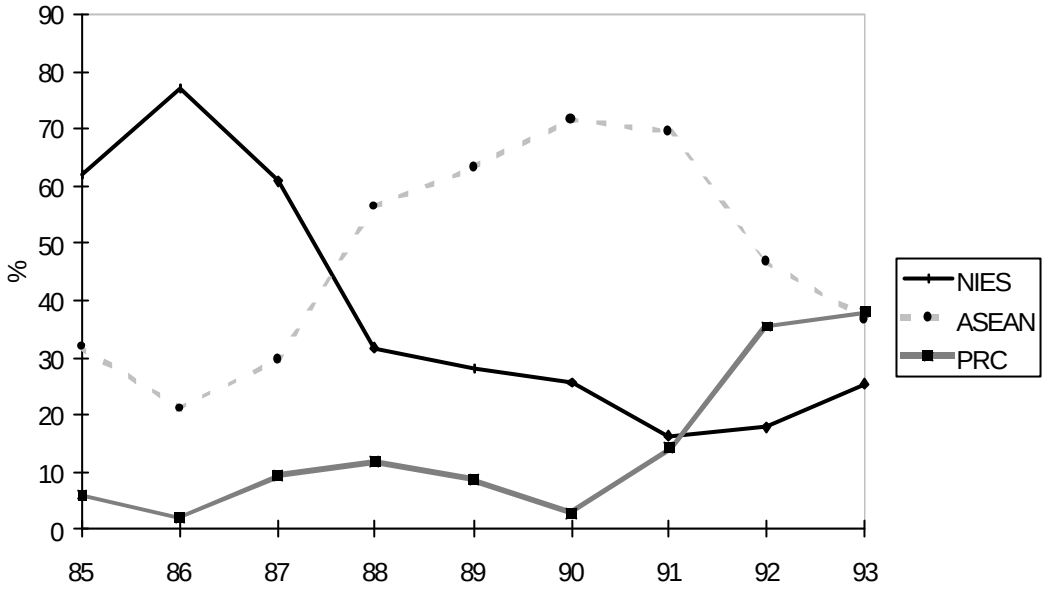


**Chart 2: Locational Migrations of Japanese Investments in East Asia**

**(% share of amounts of new investment flows from Japan)**




Source: Ministry of Finance

Note: New investment flows exclude reinvestments from locally retained incomes and local finance.

**Table 1: Activities of Japanese Electronics Multinational Corporations in Asian NIEs and ASEAN-4 (as of 1989)**

| | Asian NIEs | ASEAN-4 |
|---|---|---|
| Investments in Plants and Equipment | 90 billion yen | 74 billion yen |
| Share of Screwdriver Plants | 14.9% | 18.1% |
| Local Sourcing Ratio | 45.5% | 34.3% |
| Share of R&D Investments in Total Investments in Plants and Equipment | 3.5% | 0.2% |

Source: MITI. 1991. Kaigai doshi tokei soran (Benchmark Survey of Japanese Foreign Investments).

**Table 2: Summary of Findings from All Regressions (Full Models)**

| Dependent VARIABLES | Upgrading vs. Status Quo vs. Downgrading | Upgrading | | Down-grading | | Exit |
|---|---|---|---|---|---|---|
| Regression Models | Ordered Logit | Fixed Logit | Random Logit | Fixed Logit | Random Logit | Discrete Time Logit |
| Number of Observations | 168 | 414 | 1230 | 332 | 1230 | 1230 |
| Local Duration (LDUR) | 0.0353 (0.0258) | -.1033 (.1376) | .0243 (.0217) | .2543† (.1531) | .0006 (.0193) | -.0606* (.0304) |
| Local Manager Ratio (LOCMGR) | 0.3197 (0.6853) | .0241 (.1588) | .0039 (.0069) | .0076 (.0214) | -.0142† (.0086) | -.0213 (.0170) |
| Local Sourcing Ratio (LOSOURCE) | 2.2766** (0.8499) | 4.5710† (2.7422) | 1.3186* (.6715) | -6.6667* (3.2415) | -1.8992** (.6518) | -2.9061** (1.0961) |
| Integrated Production (PRODTYPE) | 0.6528† (0.3870) | N.A. | N.A. | N.A. | N.A. | N.A. |
| Capital Intensity (CAPEMP) | 1.3598 (8.5270) | 20.4928 (16.7730) | 3.2332 (5.4032) | -14.5584 (22.5072) | -3.8538 (6.6703) | -14.8686 (15.1522) |
| Equity Ratio (EQUITY) | 0.5789 (0.7145) | .6979 (2.7857) | .0314 (.5672) | -7.2733† (3.7985) | -.2755 (.5139) | -1.2695 (.7940) |
| Local Sales Ratio (LOSALES) | -0.6780 (0.5144) | -3.9249* (1.8900) | -1.0479* (.4416) | 1.3972 (1.3340) | -.4638 (.4108) | -.4447 (.6359) |
| Overseas Production Ratio (OPR) | -0.0136 (0.0099) | -.0357 (.0223) | .0071 (.0071) | -.0148 (.0314) | .0107† (.0062) | .0172† (.0094) |
| Number of Overseas Subs (COSUB) | 0.0332 (0.0259) | -.0225 (.0289) | .0130 (.0083) | -.0752 (.0788) | .0265** (.0093) | -.0700 (.0624) |
| R&D Intensity (RNDINT) | -0.6488 (0.3668) | .3562 (.2459) | .1151* (.0505) | -.4227 (.3527) | -.1076† (.0645) | -.0384 (.1158) |
| Local Mfg Value-added (MVA) | N.A. | .0001 (.0001) | .0001** (.00004) | -.0002 (.0002) | -.00014** (.00004) | -.00014 (.000077) |
| Local Wages (WAGE) | N.A. | -.0003† (.0001) | -.00026** (.00007) | .0003 (.0002) | .00017* (.00007) | .0003** (.0001) |
| KOREA | -0.8568† (0.5093) | N.A. | N.A. | N.A. | N.A. | N.A. |
| TAIPEI,CHINA | -1.4492** (0.4203) | N.A. | N.A. | N.A. | N.A. | N.A. |

Note: † significant at p = 0.1; * significant at p = 0.05; ** significant at p = 0.01

**Table 3: Comparison of Government Policies Regarding Inward Foreign Direct Investments**

| | Singapore | Malaysia | Taipei,China | Korea |
|---|---|---|---|---|
| Incentive Schemes | - Continual upgrading of network of physical infrastructure to service foreign investors<br>- Government agencies to provide one stop service for foreign investors<br>*- Pioneer status for strategically important sectors; expansion incentives; Operational Headquarters; Post-Pioneer Incentive* | - Tax holidays for FDIs that obtained pioneer status<br>*- Incentives for export, reinvestments, R&D, training, environmental protection, and Operational Headquarters (OHQ)*<br>- Establishments of 10 Free Trade Zones and Licensed Manufacturing Warehouse status to promote exports<br>- Incentives for FDIs in agriculture and tourism | *- Five-year tax holiday for FDIs that meet criteria of R&D investments, environmental protection, enhancement of productivity, personnel training, and establishment of international brands*<br>- Special incentives for FDIs in export processing zones and in Shintsu Science Park | - Tax privileges: *FDIs in high technology areas*; FDIs in export processing zones → Exemption of income tax for 5 years; exemption of tariffs for the import of capital goods |
| Major Charac-teristics | - Pioneer in liberal and open inward FDI policy<br>*- Effective use of incentive packages to promote upgrading of activities and technologies as well as to induce new investments* | - Active inducement policies toward foreign investments: adoption of Singaporean model<br>- Goal of New Economic Policy to encourage foreign equity at around 30% | - Selective encouragement of inward FDIs<br>- Recent emphasis on automotive, services, machinery, and information-related sectors | - Economic development policy based on indigenous firms → Restrictive policy on inward FDIs: adoption of Japanese model<br><br>- Recent efforts to induce FDIs in high-technology areas |

Note: incentive schemes mainly for upgrading are italicized

Source: OECD. 1993. Foreign direct investment relations between the OECD and the dynamic Asian economies: The Bangkok Workshop; Japan External Trade Organization (JETRO). Sekai to Nihon no Kaigai Chokusetsu Toshi (Foreign direct investments of the world and Japan), various years.

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