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DYNAMICS OF JAPANESE DIRECT INVESTMENT IN EAST ASIA*

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Abstract

In the past 25 years, Japan's direct foreign investment (DFI) expanded dramatically. The purpose of this paper is to examine whether this expansion has been consistent with assertions that Japan's DFI has been of the pro-trade-oriented (PROT) type. On the one hand, there was a large shift of Japan's DFI toward the advanced economies in the 1980s that was generally not of the PROT type but rather of the anti-trade oriented (ANT) type. On the other, Japan's investments in East Asian economies also expanded and was generally of the PROT type. This expansion of the Japanese investment frontier, bath in country-and industry-wise dimensions, contributed much to the host economies. However, the patterns of DFI in East Asia have also shown a tendency to converge. This paper uses a dynamic model of PROT-type DFI to explain and interpret these phenomena.

I. *Introduction*

Japan's direct foreign investment (DFI) has expanded dramatically in the last 25 years. It is now a good time to review that expansion. Kojima's theorizing on the relationship between the type of DFI, in particular the trade orientation of DFI, and the causes and effects of that DFI (e.g., Kojima 1973, 1975) originated in the early 1970s in an attempt to explain some of the apparently unique characteristics of Japan's outward DFI. This theoretical framework has been severely criticized by some on a number of grounds.[1] However, I continue to believe that this framework has been shown to be a useful and general theoretical tool for describing outward DFI from catching-up (not pioneer) economies and is applicable not only to Japan but also to many other developing economies, particularly in East Asia.[2] However, this framework needs to be made more precise and more explicitly dynamic. In this context, a model based on the concept of the "expansion of the DFI frontier" is explored as an

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[1] Many reviews and comments have been written in this regard, for example Arndt (1974), Buckley (1983, 1985), Clegg (1987), Geroski (1979), Kohlhagen (1978), Lee (1990), Naya and Ramstetter (1992), and Thee (1984a).

[2] Instead of referring to "Japanese-type" DFI as I have in the past, Lee (1990) prefers the phrase DFI for "transition economies" and Thee (1992) uses the phrase DFI for "advancing economies".

extension of the "flying-geese pattern" of industrial development first identified by Akamatsu (1962a, 1962b). The extension of this framework and demonstration of its usefulness in describing Japan's outward DFI is thus the major purpose of this paper.

To this end, section II first describes the data and analytical methods used, as well as the overall trends in Japan's outward DFI, including a special focus on the shift of Japan's DFI towards advanced countries. Section III then describes the expansion of Japan's investment frontier in nine East Asian economies (the Asia–9: China, Hong Kong, Indonesia, Malaysia, Korea (South), the Philippines, Singapore, Taiwan, Thailand). This section shows how Japan's DFI is diversified and upgraded in the industry dimension as well as diversified in the geographical dimension as well. The interesting thing here is that the patterns observed are regular and tend to converge. In section IV, a dynamic model of pro-trade oriented (PROT-type) DFI is constructed and contrasted with anti-trade oriented (ANT-type) DFI. The relationship between this model and Akamatsu's "flying-geese pattern" of industrial development are explored and the causes and implications of the convergence of Japan's investment frontier are investigated.

II. *Overall Trends and the Shift of Japanese DFI Toward Advanced Countries*

This section first surveys data and methodological issues before turning analyses of trends in Japan's DFI.

IIa. Data and Analytical Methods

Japan's Ministry of Finance's data on reported/approved DFI are the primary data source used throughout this paper. These have several defects, but provide the only long time series on activities of Japanese multinationals by country and industry.[3]

Industries are classified into three major groups. The first is group R (resource development) industries consisting of agriculture, forestry, and fisheries, mining, and construction. The second is group S (services) consisting of commerce, finance and insurance, real estate, and other industries. The third is group M (manufacturing) which is further divided into three sub-groups. The first is sub-group L (labor-intensive, light manufacturing) consisting of food manufacturing, textiles (including apparel), and miscellaneous manufacturing (a rather ambiguous category including jewellery, toys, and sporting goods among other items). The second is sub-group I (intermediate-good manufacturing), including timber and pulp, chemicals, and primary (and fabricated) metals. DFI in these industries shares several characteristics with DFI in group R in that an important motive for such investments is the desire to

[3] The Ministry of Finance data cover. the amounts of DFI reported to (from December 1980) or approved by (through November 1980) the Ministry. The data are reported on a fiscal years basis with fiscal years ending March 31 of the following calendar year. The primary weakness of these data is that they refer only to reported-approved investments and do not account for abandoned projects or withdrawn investments. Largely as a result of abandoned projects and withdrawals, balance of payments figures on total actual DFI stocks at yearend 1992 (stocks calculated as cumulative flows from 1965 forward) amounted to only 66 percent of the corresponding stock of reported-approved DFI. Note also that there are large variations in the ratio of actual-to-reported-approved DFI across time and across countries. Finally, both of these data sets have the disadvantage of excluding reinvesting earnings. This generally result in some underestimation of DFI.

secure offshore sourcing of resource-based products. The third sub-group is K (machinery manufacturing) consisting of general (non-electric) machinery, electric (and electronic) machinery, and transport machinery.

Geographically, the focus is on DFI in two regions, North America as a respresentative of advanced economies and the Asia–9 as a representative of developing economies[4]. Data are presented for 5 years, 1972, 1982, 1986, 1989, and 1992. The Appendix to this paper presents details on the stock of Japan's DFI in each host region and country by industry group and sub-group. The statistical approach is exceedingly simple, to examine the changes over time using logarithmic graphs of the data presented in Appendix. The result is a clear and simple depiction of how the patterns of Japan's DFI have tended to converge in the Asia–9 economies.

IIb. Overall Trends

Figure 1 depicts the trends of Japan's total outward DFI for 1969–1992, both in terms of annual flows (W_f) and the stock (W_s) where the stock is measured as cumulative flows through the end of the fiscal year in question. Since the figure utilizes a logarithmic scale, the slope of each curve represents the rate of growth in W_f and W_s, respectively. Although W_f fluctuates somewhat over time, the W_s curve reveals a rapid and rather steady growth of DFI stocks over this period. However, from the W_f curve, four distinct stages easily be identified. Stage I is the period through 1972, beginning with Japan's initial outward DFI in the post-World War II period in 1951. Since DFI stocks were essentially non-existent before this period, stock's growth rate was very rapid in this period, an annual average of 36.2 percent from 1969 to 1972. Stage II is the period from 1972 to 1982, when the average annual growth rate of the DFI stock was 22.7 percent. Stage III is the 1982–1989 period during which the growth rate of stocks averaged 25.1 percent. In the latter part of this period, this growth rate accelerated, reaching 33.9 percent in 1986–1989. Stage IV is the period from 1989 forward during which annual flows fell from their peak of US$68 billion in 1989 to US$34 billion in 1990 and further in 1991–1992. The growth rate of stocks thus fell to an annual average of 15.0 percent in 1989–1992.

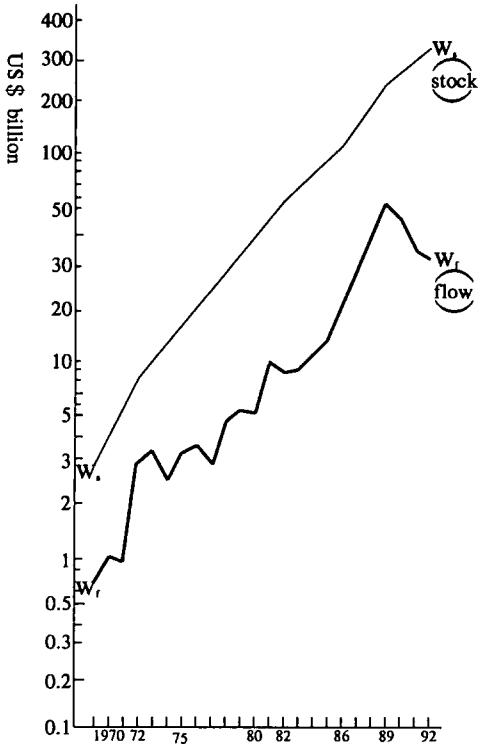
IIc. The Shift Toward Advanced Country Markets

In addition to changing levels and growth rates, Japan's DFI also went through important structural changes in industry and geographical dimensions. First, as shown in Table 1, Japan's DFI grew more rapidly in North America (and other advanced economies) than in the Asia–9 (and other developing economies). This geographical shift was especially pronounced in 1982–1989. During this period the share of North America in total DFI stocks increased from

[4] Europe is another important region of Japan's DFI in advanced economies. However, in view of the fact that Japan's DFI in this region experienced similar trends and changes over time as DFI in North America, this paper focuses on the latter to simiplify the presentation.

Among developing economies, Asia is the largest region accounting for 15.5 percent of the stock of reported-approved DFI in 1992, while all other developing areas combined (Latin America, the Middle East, and Africa) accounted for a similar share, 14.9 percent. Within Asia, the Asia-9 dominated accounting for 98.4 percent of the DFI stock in Asia in 1992.

FIG. 1 JAPANESE OUTFLOW DIRECT INVESTMENT (TOTAL) IN THE WORLD
W_f : annual flow, W_s : stock



28.7 percent to 42.9 percent, while the corresponding share of the Asia–9 decreased from 27.0 percent to 15.7 percent.

These changes in geographical shares are closely related to changes in industry shares (Table 1). First, DFI in the R group was important in the 1972, accounting for 36.2 percent of DFI stocks worldwide. The industries in this group are among those in which Japan has a distinct comparative disadvantage. As result, Japan had a macroeconomic incentive to promote the development of these industries overseas and then import the resulting products (typical offshore-sourcing DFI). However, DFI in the R group grew more slowly than other DFI and by 1989 the share of this group was only 7.6 percent worldwide. The Asia–9 accounted for a large portion of this investment with the share of the Asia–9's R group in total DFI worldwide increasing from 5.3 percent in 1972 to 10.8 percent in 1982, due primarily to large investments in Indonesia's Asahan dam and aluminum smelting project and natural gas projects. However, even in this region, investments in this group grew relatively slowly thereafter, and the share of the group of the region in the world total was only 3.2 percent in 1989. Therefore, investment in the R group has declined in relative importance in both advanced and developing economies and has not been a major factor in the geographical shift toward advanced economies.

TABLE 1. SHARES OF TOTAL DFI STOCKS BY REGION AND INDUSTRY (percent)

	1972	1982	1986	1989	1992
T: Total (all industries)					
World	100.0	100.0	100.0	100.0	100.0
North America	22.9	28.7	35.3	42.9	43.9
Asia–9	18.7	27.0	20.2	15.7	15.2
S: Services					
World	37.9	45.7	59.5	66.4	66.6
North America	15.2	18.3	24.0	28.3	29.6
Asia–9	3.0	5.5	6.0	7.6	6.5
M: Manufacturing					
World	25.9	31.9	26.6	26.0	26.9
North America	4.5	8.0	9.3	13.2	13.0
Asia–9	10.4	10.8	7.7	6.0	6.2
R: Resource Development					
World	36.2	22.4	13.9	7.6	6.5
North America	3.2	2.4	2.0	1.4	1.2
Asia–9	5.3	10.8	6.5	3.2	2.5

Sources: Ministry of Finance (various years).

In contrast, the S group was a major factor in this shift (Table 1). The share of the S group in DFI stocks worldwide increased rapidly from 37.9 percent in 1972 to 66.4 percent in 1989. The share of DFI in North America's S group in world DFI stocks grew at a similar rate, from 15.2 percent to 28.3 percent in this period. As a result, S group investments accounted for two-thirds of DFI stock in North America in 1989 (c.f., Appendix Table 2). S group DFI in the Asia–9 also grew exceedingly rapidly but remained at relatively low levels, their share of worldwide DFI stocks rising from 3.0 percent in 1972 to 7.6 percent in 1989. This shift toward services is part of a worldwide trend (UNCTAD 1993) and raises three issues.

The first issue relates to the fact that the traditional theory of DFI (or the theory of the multinational corportation; e.g., Dunning 1977, 1993) has heretofore concentrated on explaining international production as opposed to international servicing. The fact that services DFI has become the largest type of DFI suggest that the traditional theory needs revisions to focus more clearly on international servicing.

The second issue relates to the importance of services DFI in the fluctuations of DFI over time. As indicated above, there was a large increase in DFI flows from 1986 to 1989 and then a large decline thereafter. More specifically, in 1989 DFI flows were US$45 billion higher than in 1986, with 70.4 percent of this increase accounted for by increased DFI flows in services. On the other hand, in 1992, DFI flows were US$33 billion below 1989 levels, 49.9 percent of this decrease accounted for by services (Ministry of Finance, various years). Moreover, services DFI flows to North America accounted for very large shares of the changes in worldwide services DFI in these periods, 49.8 percent of the increase in 1986–1989 and 71.3 percent of the decline in 1989–1992. Thus, the pronounced fluctuations observed in Japan's DFI flows that were observed in the late 1980s and early 1990s are primarily due to fluctuations in services DFI, particularly services DFI in North America.

The magnitude of these fluctuations raises a third issue: were these pronounced fluctuations in services DFI in North America appropriate and productive? Within DFI flows in the

S group in North America, the combination of finance and insurance and real estate accounted for 48.9 percent of the upsurge in 1986–1989 and 71.3 percent of the decline in 1989–1992 (Ministry of Finance, various years). These volatile flows reflected the changed attitudes of Japanese firms toward asset management and speculation on foreign assets during periods when liquidity in Japan experienced similarly wild fluctuations due to exchange rate changes and flutuations in the prices of Japanese assets. Furthermore, a fairly large portion (perhaps one third) of these fluctuations were due to investments and disinvestments without much regard to economic fundamentals and many Japanese institutional investors incurred big losses as a result.

The share of the M group in worldwide DFI stocks was much more stable than the shares of the first two groups, increasing from 25.9 percent in 1972 to 31.9 percent in 1982 before falling back to 26.0 percent in 1989 (Table 1). M group DFI grew particularly rapidly in North America and the share of M group DFI stocks in worldwide DFI stocks grew from 4.5 percent in 1972 to 8.0 percent in 1982 and 13.2 percent in 1989. Thus, manufacturing was also an important factor in the shift toward advanced country markets. In contrast, the share of DFI stocks in the Asia–9's M group in worldwide DFI stocks was steady between 1972 to 1982 at 10.4 percent and 10.8 percent, respectively, before declining to 6.0 percent in 1989. Thus, the Asia–9 was a more important destination of manufacturing DFI through the early 1980s but this was reversed by the late 1980s. Note that this reversal occured despite the fact that manufacturing DFI stocks in the Asia–9 grew quite rapidly in 1982–1989, 15.1 percent annually; it was just that other DFI stocks grew that much faster.

As will be detailed in the following section, Japan's manufacturing DFI in the Asia–9 (or, more generally, in developing economies), where the wage cost is much cheaper than in Japan, is of the PROT-type, which is beneficial to both investing and host economies. On the other hand, Japan's manufacturing DFI in North America (or, more generally, in advanced economies), where the wage cost has until very recently been more expensive than in Japan, has been of the ANT-type. This means that, again until very recently, Japan has had a comparative advantage in producing relatively labor-intensive manufacturing goods for the North American market. Under such conditions, Japanese firms investing in North America are not able to produce competitively, and such DFI has thus been unprofitable for Japanese investors and welfare decreasing for U.S. consumers. Thus, this kind of ANT-type DFI is not recommendable.

In reality, almost all Japanese DFI in U.S. manufacturing has been motivated, at least in part, by the desire to overcome protectionist trade barriers such as the anti- dumping dispute mechanism and voluntary export restraints (VERs). The first such restriction to induce Japanese DFI in the United States was the 1962 agreement to restrict Japan's textiles exports. The second such trade conflict involved steel, resulting in the institution of a VER and the trigger price mechnanism in 1966. Third, Japan's DFI in the U.S. electric and electronic machinery industry was first undertaken in the early 1970s, following an anti-dumping dispute in 1968. Fourth, perhaps the most important example of DFI in reaction to trade restrictions was the rapid increase in Japan's DFI in the U.S. automobile industry following the institution of the automobile VER in 1981. Another important motive for investment in U.S. manufacturing in recent years has been the appreciation of the Japanese yen, a factor which has been particularly important in the period after 1985. By producing in North America, Japanese manufacturing firms have been able to avoid the loss of market share that they otherwise

would have suffered due to exchange rate-related rises of production costs in Japan.

To sum up this section, Japan's outward DFI grew rapidly in 1970–1972 with growth slowing in 1972–1982 and then accelerating again in 1982–1989, due mainly to the boom in outward DFI in 1986–1989. There was a conspicuous shift of Japan's outward DFI toward advanced economies in 1982–1989, the major cause of which was the rapid increases in services DFI that cannot be easily explained by the traditional theory of DFI and in ANT-type manufacturing DFI. The decline in Japan's outward DFI flows in the 1990–1992 period suggests that the future growth rate of Japan's DFI stocks may be in the 7–10 percent range (it averaged 7.35 percent in 1986–1992 excluding the abnormal change), far below the rapid growth rates of more than 20 percent in 1972–1982 and 1982–1989.

III. *The Direct Foreign Investment Frontier in the Asia–9*

As noted above, Japan's DFI was concentrated more in developing economies through the first two stages (1969–1972 and 1972–1982) but shifted toward the advanced economies in the third and fourth stages (1982–1989 and 1989–1992). Despite this regional shift, Japan's DFI in the Asia–9 continued to grow rapidly and remained an important element of Japan's outward DFI. This section focuses on a more detailed analysis of the evolution of this DFI. To facilitate this analysis, the concept of the DFI frontier, resembling warm front in a weather map, is employed.

Also as noted above, Japan's DFI in the Asia–9 has been of the PROT-type as Japanese firms invested in activities that were characterized by comparative disadvantage in Japan but comparative advantage in the host economies. Many of these industries were infant industries in the host economies and Japanese DFI thus played an imporatant role in the industrial development of several host economies. Moreover, as host economies became increasingly sophisticated and patterns of comparative advantage between Japan and the host economy shifted, Japanese firms began to invest in more sophisticated activities in the host economies. This pattern of diversification and upgrading the industrial pattern of DFI in a single host economy is referred to as the deepening of the DFI frontier. At the same time this industry-wise diversification and upgrading was occuring, Japan's DFI in the Asia–9 was also diversified in terms of the geographical location of such investments. In other words, activities that were originally concentrated in a few host economies tended to spread, with a time-lag, to other host economies in the region. This process is referred to as the widening of the DFI frontier. As will be shown below the deepening and widening of the DFI frontier in the Asia –9 follows some regular patterns which are of interest.

However, to understand these patterns, it is first helpful to put such patterns in the context of post-World War II economic development in Japan. Briefly summarized, the 1950s was a recovery period in which labor-intensive industries such as textiles and other light manufacturing played a relatively important role. In the 1960s, heavy and chemical industries were promoted by the government and this resulted in the rapid growth of steel, petrochemicals, shipbuilding, and other related industries. In the 1970s, the machinery industries, particularly electric and electronic machinery and automobiles began to play prominant roles. Finally from the 1980s, knowledge-intensive industries such as integrated circuits, computers, and robots were stimulated and all industries were encouraged to restructure to use more advanced

technology and to automate more. Japan's comparative advantage shifted in a pattern that largely followed this upgrading of the industrial structure. One of the outstanding results of the shifts in comparative advantage was that firms involved in activities that became comparatively disadvantaged through the process of structural change often sought to set up production facilities abroad and then export back to Japan or third markets, or to sell in local markets.

Since the pattern of comparative advantage also depends on the host country involved, it is also helpful to distinguish three groups of host economies in the Asia–9. The first is group consists of the resource-abundant host economies such as Indonesia, the Philippines, and China. These economies share the characteristic of having developed later than the other Asia –9 economies, with per capita incomes remaining relatively low through out the 1970s. The second group consists of labor-abundant economies such as Taiwan, Korea, Malaysia, and Thailand. These economies also share the characteristics of being medium-sized and of having moved rapidly to achieve relatively high per capital income levels by the early 1990s. The third group of host economies consists of two service-sector dominated cities, Hong Kong and Singapore. These economies are the smallest in terms of population and hence have not developed indigenous industries that are subject to large increasing returns such as steel or automobile. Moreover, both of these economies have histories as entrepots and have developed into commerical, financial, transportation, and communication hubs for their respective sub-regions and, by the late 1980s, had attained very high per capita incomes equivalent to those in advanced economies.

The location of DFI in the R group is determined in large part by where the resources are located. This factor is especially important for multinational firms from Japan which has only very limited natural endowments. The timing and scale of Japan's resource development DFI then depends on the demand for intermediate goods (including food) in Japan which in turn depends on the upgrading of Japan's industrial structure. DFI in the S group is similar in that the production of services must often be located in close proximity to location at which such services are consumed. Therefore, DFI in services and resource development are largely determined by location-specific factors.

In contrast, the location of manufacturing DFI is mainly determined by more general factors (e.g., labor abundance, the wage rate) that determine the nature of comparative advantage patterns.[5] Among the manufacturing sub-groups, DFI in the L sub-group is particularly sensitive to labor costs and tends to be concentration in locations with low wages. On the other hand, the K sub-group is more sophisticated and capital intensive, and investment in this sub-group tends to become more important as wages rise. In this manner, the upgrading of DFI can help raise income levels (the ultimate goal of economic development) and enhance capabilities to improve social infrastructure such as education, transportation, communication, and government systems, as well as business infrastructure related to finance and distribution.

Among manufacturing DFI, investment in the I sub-group is distinguished by the fact that, like DFI in the R and S groups, it is more influenced by location specific factors. Of course the wage level is still important as most of these goods are traded, but the endowments

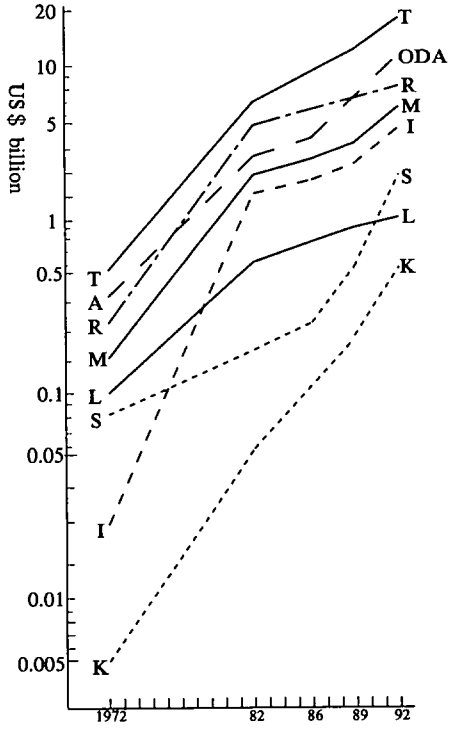
[5] Kumar (1994) identifies that, even for U.S. firms, that the wage cost is the most important determinant of production location.

of raw materials and/or international supply centers (e.g., oil refineries in Singapore) which are used intensively in these industries are often more important. Since investments in the I sub-group often entail large fixed costs with increasing returns to scale, attainment of large-scale production is often crucial to realizing the benefits of these increasing returns. Hence small countries with limited demands for specific intermediate goods are often not suitable locations for DFI in the I sub-group. As a result, Japan's DFI frontier in the I sub-group is not as systematic as the DFI frontiers in the L and K sub-group.

IIIa. The Deepening of the Direct Foreign Investment Frontier

This section takes a detailed look at the deepening of Japan's DFI frontier in selected Asia -9 economies. Consider first the case of Indonesia, an example of a resource-abundant host economy (Figure 2, Appendix Table 4). This large, resource-abundant economy has been the largest recipient of Japanese DFI and official development assistance (ODA). In 1972, DFI in the R group accounted for 55.1 percent of Japan's total DFI stocks in Indonesia, this share increasing to 69.4 percent in 1982 before falling back to 63.8 percent in 1989. The share of the S group was very low at 17.0 percent in 1972 and fell in 1972–1982 and 1982–1989 to 6.3 percent in the latter year, before increasing rapidly to 12.8 percent in 1992. In manufacturing, the share DFI in the I sub-group was very low in 1972 (5.2 percent) but had increased rapidly

FIG. 2 JAPANESE INVESTMENT IN INDONESIA



by 1982 (to 18.1 percent) due to investments in petroleum products and the Asahan dam and aluminum smelting project. This share of this sub-group remained the highest of the manufacturing sub-group in 1989 (18.3 percent). Taken together these investments in the I sub-group and the R group have been an important element of Japan's efforts to obtain resource-intensive intermediate goods through DFI abroad.

Industrialization in Indonesia has lagged behind that in several other Asia–9 economies. Japan's investment in Indonesian manufacturing was accordingly concentrated in the L sub-group at first, this sub-group having a share of 21.6 percent in 1972 (Figure 2, Appendix Table 4). However, DFI in this sub-group grew relatively slowly and this share fell to 7.6 percent in 1982 and 8.6 percent in 1989. On the other hand, Japan's DFI in the K sub-group was very small in 1972, only 1.1 percent, and still quite small in 1989, 3.0 percent, and 1992, 4.7 percent. As a result of the above trends, the convergence ratio for manufacturing DFI, defined as the ratio of DFI stocks in the largest and smallest of the manufacturing sub-groups, decreased from 20.0 in 1972 (DFI in the L sub-group/DFI in the K sub-group) to 6.1 in 1989 (DFI in the I sub-group/DFI in the K sub-group). These ratios are larger than corresponding ratios in other Asia–9 economies but the corresponding ratio of DFI stock in the L and K sub-groups was much smaller by 1989, 2.9. These trends further reflect the fact that manufacturing industrialization is still in its early phases in Indonesia as exports of resource-related products still dominate. Hence Indonesia is still in need of DFI and ODA to enhance the social infrastructure.

The patterns of Japan's DFI in the Philippines, another resource-abundant host economy, resembles that in Indonesia but the level of DFI was much lower, about one-eigth in stock terms in 1989. The main motive for DFI in the Philippines is to obtain resource-intensive products. Accordingly DFI in the R group, much of it in copper mining, accounted for as much as 78.2 percent of Japan's DFI stock in the Philippines in 1972, this share falling to 49.5 percent in 1982 and 36.2 percent in 1989 (Appendix Table 5). DFI in the I sub-group was also important with this share increasing from 7.4 percent in 1972 to 20.5 percent in 1982 before falling back somewhat to 15.3 percent in 1989. The shares of DFI in the L and K subgroup grew relatively rapidly in 1972–1989, from 6.4 percent to 12.4 percent and from 2.5 percent to 20.5 percent, respectively. In contrast, investment in the S group accounted for a relatively small share in the Philippines, only 15.6 percent in 1989. As a result of the above trends, the covergence ratios for manufacturing DFI delclined from 3.0 in 1972 (DFI stocks in the I sub-group/DFI stocks in the K sub-group) to 1.7 in 1989 (DFI stocks in the K sub-group/DFI stocks in the L sub-group). Thus, industrialization and the role of Japan's DFI in Philippine industrialization was a step ahead of those in Indonesia. However, Japan's DFI in the Philippines has still been rather unsuccessful and immature compared to DFI in other Asia –9 economies, and the Philippines was one of the few asia–9 economies which has received more ODA than DFI. Perhaps these problems reflect the relatively large reliance on U.S. DFI in the Philippines.

Japan's DFI in China began in 1982, in response to China's initiation of efforts to open this socialist economy to extrenal trade and investment, and then increased very rapidly. However, because this DFI is still in its early stages, the evolution of DFI patterns is not as clear as in other economies. The share of DFI stocks in the R group is very small, 2.6 percent in 1989 (Appendix Table 6). However, cumulative ODA in China is much larger than DFI stocks, US$4.1 billion versus US$ 2.5 billion 1989, and much of this has been used to finance

resource and infrastructure development, activities in high demand in China at present. Related to this is the somewhat surprisingly high share of the S group in total DFI stocks, 74.9 percent in 1989. Investments in activities such as hotels, supermarkets, and banks are included in this category, but it also includes large banking and finance DFI used to finance loans for natural resource (particularly oil). Due to the large role of natural resource-related activities, I have classified China as a resource-abundant economy here, though it is likely that it may become a labor-abundant economy from the viewpoint of Japanese investors in the near future.

Among manufacturing sub-groups, the I sub-group started out with the highest share in 1982, 10.0 percent, probably due to relatively large steel-related investments, but this share fell to 3.3 percent in 1989, despite the large investment needs in this industry. Conversely, the share of the L sub-group grew rapidly from 2.9 percent to 6.9 percent, as did the share of the K sub-group from 1.4 percent in 1982 to 12.3 percent in 1989. These changes resemble those observed in the Philippines but the pace of change was somewhat faster in China. As result of these changes, the convergence ratio in China's manufacturing went from 7.0 in 1982 (DFI stocks in the I sub-group/DFI stocks in the K sub-group) to 3.7 in 1989 (DFI stocks in the K sub-group/DFI stocks in the I sub-group).

China has made strong requests that Japanese firms greatly increase DFI and techonology transfer in the future. To this end, it is desirable that a complementary division of investment between the major investors in China (Hong Kong, Taiwan, Singapore, Europe, Japan, and the United States) be obtained. It seems most logical for Japanese firms, in coordination with the large disbursements of Japanese ODA in China, focus on resource and infrastructure development, while firms from Hong Kong, Taiwan, and Singapore should focus on labor-intensive manufacturing since they are now much more competitive in these activities than Japanese firms.

The labor-abundant group of Asia–9 host economies identified above is rather heterogeneous and can be further subdivided into the more advanced economies of Korea and Taiwan and the less advanced economies of Malaysia and Thailand. Figures 3 and 4 illustrate the examples of Korea and Thailand as representatives of this group.

With the exception of Malaysia, these economies are not well endowed with natural resources, and again with the exception of oil and gas investments in Malaysia, Japan's DFI in R group has been rather limited in these economies. Even in Malaysia, the share of the R group in total DFI stocks was only 27.4 percent in 1972 and fell to 12.3 percent in 1989 (Appendix Table 10). The share of the S group in Japan's DFI stocks in these economies also started out at very low levels but increased rapidly in the 1980s; this share increased from 6.0 percent in 1972 to 49.9 percent in 1989 in Korea, from 5.0 percent to 21.4 percent in Taiwan, from 17.0 percent ot 26.4 percent in Thailand, and from 5.3 percent to 15.1 percent in Malaysia (Appendix Table 7–10).

Among manufacturing industries, these economies displayed the greatest divergence in terms of the role of the I sub-group. Among the more advanced labor-adundant economies, Korea is relatively large and has emphasized the development of industries in the I sub-group with emphasis peaking in the late 1970s. As a result, the share of the I sub-group in total DFI stocks increased from 15.9 percent in 1972 to 26.9 percent in 1982 but then declined to 13.3 percent in 1989 (Appendix Table 7). A similar pattern is observed in Taiwan but shares are lower (12.6 percent, 19.7 percent, and 15.5 percent, respectively; Appendix Table 8). In

FIG. 3 Japanese Investment in Korea

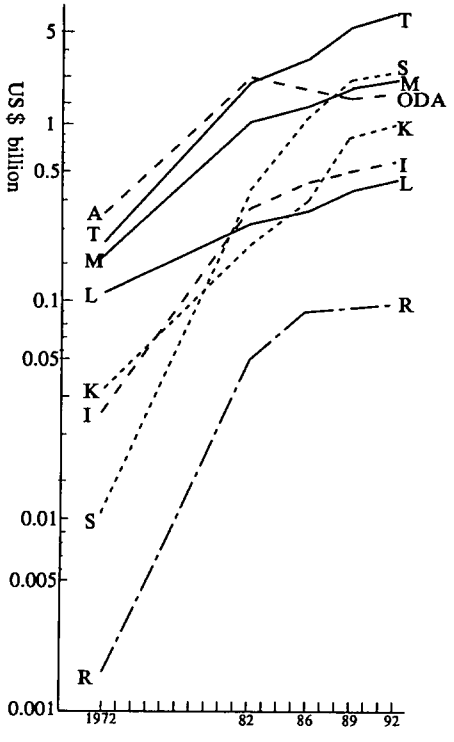
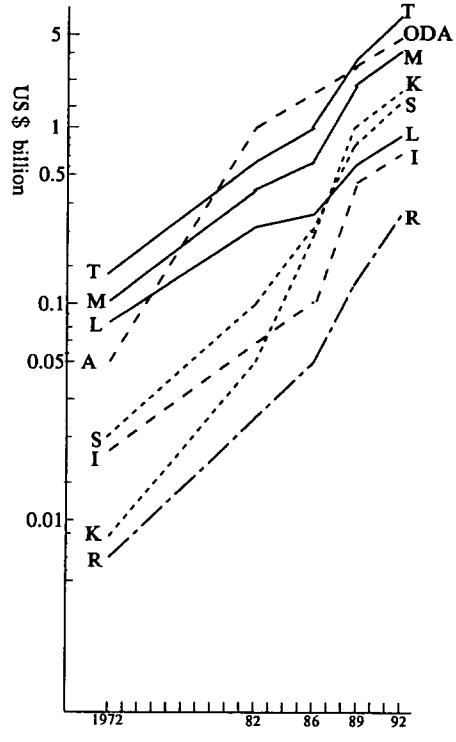


FIG. 4 Japanese Investment in Thailand



Thailand, these shares were relatively low and stable (13.9 percent, 12.4 percent, and 15.7 percent, respectively; Appendix Table 9). In Malaysia, as might be expected given the relative abundance of resources, shares were relatively large but declined in recent years as industrialization has proceeded (34.8 percent, 36.9 percent, and 22.5 percent, respectively; Appendix Table 10).

However, for firms investing in these economies, the most important goals of DFI were to mobilize and enhance the quality of labor in the host economies. Due to the heterogeneity of these economies, there were lags between these processes in each economy, but patterns of industrialization and Japanese DFI began with emphasis on the L sub-group and shifted to greater emphasis on the K sub-group with some regularity. In Korea, for example (Figure 3, Appendix Table 7), the L sub-group had the highest share of DFI stocks in 1972, 57.4 percent, but this share fell to only 11.7 percent in 1989. In contrast, the share of the K sub-group increased from 18.1 percent in 1982 to 22.7 percent in 1989. Thus, Japan's DFI in Korea has diversified and upgraded from labor-intensive, light manufactures to machinery, intermediate goods manufacturing, and services. This general pattern is also observed in Taiwan, except that the K sub-group played a larger role (shares increased from 40.0 percent in 1972 to 52.9 percent in 1986) and the decline in the I sub-group's share (from 40.4 percent to 22.0 percent) was more pronounced (Appendix Table 8). As a result of these shifts, the convergence ratios

for manufacturing DFI declined from 3.6 in 1972 (DFI stocks in L sub-group/DFI stocks in the I sub-group) to 1.9 in 1989 (DFI stocks in the K sub-group/DFI stocks in the L sub-group) in Korea and from 3.2 in 1972 (DFI stocks in the L sub-group/DFI stocks in the I sub-group) to 2.7 in 1989 (DFI stocks in the K sub-group/DFI stocks in the I sub-group) in Taiwan.

Japan's DFI patterns in Thailand (Figure 4, Appendix Table 9) are somewhat similar to those observed in Korea. For example, DFI in the R group has accounted for the lowest shares of DFI stocks of the three major groups, DFI in the S group has grown relatively rapidly, and DFI in the L sub-group preceded DFI in the K sub-group. However, the Thai case differs in that DFI in the L sub-group was the main source of DFI growth in the 1972–1982 period, while DFI in the K sub-group was the major element of DFI's increase in the 1982–1989 period. More specifically, the share of L sub-group in total DFI stocks fell from 57.6 percent in 1972 to 50.3 percent in 1982 and 19.8 percent in 1989, while the share of the K sub-group increased from 6.4 percent to 12.2 percent and 33.9 percent in each respective year. In other words, the transition from L sub-group domination to K sub-group domination took place one period later in Thailand than in Korea. Japan's DFI in Malaysia followed a similar pattern, though L sub-group DFI was never as important, with the share of the L sub-group falling from 17.2 percent in 1972 to 13.4 percent in 1989, while the share of the K sub-group increased from 15.3 percent to 36.7 percent in the same period. As a result of these changes, the convergence ratio for manufacturing DFI in Thailand fell from 9.0 in 1972 (DFI stocks in the L sub-group/DFI stocks in the K sub-group) to 2.2 in 1989 (DFI stocks in the K sub-group/DFI stocks in the I sub-group). In Malaysia, this ratio actually increased slightly but was at a very low level in both of these years, 2.3 in 1972 (DFI stocks in the I sub-group/DFI stocks in the K sub-group) and 2.7 in 1989 (DFI stocks in the K sub-group/DFI stocks in the L sub-group).

As noted above, the service-sector dominated group of city states (Hong Kong and Singapore) are distinguished from other economies in the region by the importance of service-sector activities. Correspondingly, the S group dominates Japan's DFI in these economies with shares in 1989 of 50.3 percent in Singapore and 90.5 percent in Hong Kong (Appendix Tables 11–12). In manufacturing there has also been a tendency to concentrate in small-scale manufacturing due to the small size of these two economies and the lack of natural resources. In Singapore, the share of the L sub-group in total DFI stocks fell from 20.1 percent in 1972 to 14.3 percent in 1987 and the share the K sub-group also fell from 48.5 percent to 17.6 percent. The L sub-group's share was large in Hong Kong in 1972, 31.8 percent, but fell to only 4.1 percent in 1989, while the share of the K sub-group was very low in both years, 2.0-2.7 percent. The resulting convergence ratios for manufacturing DFI fell from 3.3 in 1972 (DFI stocks in the K sub-group/DFI stocks in the I sub-group) to 1.2 in 1987 (DFI stocks in the K sub-group/DFI stocks in the L sub-group) for Singapore and from 15.9 in 1972 (DFI stocks in the L sub-group/DFI stocks in the K sub-group) to 5.1 in 1989 (DFI stocks in the L sub-group/DFI stocks in the I sub-group) for Hong Kong.

IIIb. The Ratio of Machinery Investments to Labor-intensive Investments

In the preceding section, the convergence ratio for manufacturing DFI, that is the ratio of DFI stocks in the largest manufacturing sub-group to DFI stocks in the smallest manufac-

TABLE 2: RATIO OF DFI STOCKS IN MACHINERY MANUFACTURING(K) TO DFI STOCKS IN LABOR-INTENSIVE MANUFACTURING (L) IN THE ASIA–9 AND NORTH AMERICA (DFI stocks in VS$ millions, ratios)

	1972			1982			1989		
	K	L	K/L	K	L	K/L	K	L	K/L
Asia–9, aggregate	157	407	0.39	1346	1772	0.76	5950	4261	1.40
Asia–9 mean	23	49	0.76	352	261	1.11	2236	1229	1.62
Asia–9, std. dev.	21	40	0.83	654	251	0.92	4994	2403	0.71
Singapore	44	18	2.44	469	211	2.22	1003	819	1.22
Taiwan	43	44	0.98	234	110	2.13	943	448	2.10
Philippines	2	6	0.33	85	57	1.49	271	163	1.66
Korea	41	119	0.34	238	248	0.96	874	448	1.95
Malaysia	12	13	0.92	85	166	0.51	919	337	2.73
China	0	0	--	1	2	0.50	303	171	1.77
Thailand	8	74	0.11	63	262	0.24	1109	647	1.71
Indonesia	5	102	0.05	134	554	0.24	312	896	0.35
Hong Kong	2	32	0.06	37	162	0.23	215	327	0.66
North America, avg.	49	30	1.63	2172	834	2.60	16415	8031	2.04

Note: the Asia–9 mean and standard deviation excludes China for 1972.
Sources: Ministry of Finance (various years).

turing sub-group, was used as an indicator of how DFI patterns have tended to converge in the Asia–9 economies. This convergence was indicated by the tendency for these ratios to decline in most economies. However, these ratios did not always decline and the volatility of DFI in the I sub-group, as well as the heavy dependence of such DFI of location-specific factors, means that it may be more meaningful to focus on the ratio of DFI stocks in the other two sub-groups as an indicator of covergence. Hence, in Table 2 the ratio of DFI stocks in the K sub-group to DFI stocks in the L sub-group have been calculated for all the Asia–9 economies. Since the K sub-group is generally more sophisticated than the L sub-group, this ratio also provides a good indicator of the deepening of Japan's DFI frontier in these economies, as it indicates the pace at which the structure of DFI has been upgraded from dominance by labor-intensive, light manufacturing to dominance by machinery.

The first four economies listed in Table 2, Singapore, Taiwan, the Philippines, and Korea, as well as Hong Kong which has very low ratio due to specialization in textiles, were the economies in which the ratio of K sub-group DFI stocks to L sub-group DFI stocks rose first. With the exception of Hong Kong, ratios in these economies were higher than the Asia–9 average and were very close to 1 or higher as early as 1982. The other four economies, Malaysia, China, Thailand, and Indonesia, did not see this ratio rise much until the 1982–1989 period; ratios in these economies were low in 1982, 0.24–0.51, reflecting the fact that manufacturing DFI in the second stage (1972–1982) was dominated by the L sub-group in these economies. However, with the exception of Indonesia, all of these economies received large investments in the K sub-group in 1982–1989 and by 1989, these ratios had increased to quite high levels.

In addition to these trends, there was a general trend for the ratio to converge toward 1 in most economies, indicating a more even balance between DFI in the two sub-groups. For example, for the Asia–9 as a whole the ratio went from 0.39 in 1972 to 1.40 in 1989. The exceptions to this trend toward convergence are seen in Taiwan and Malaysia where ratios

were already close to 1 in 1972 and increased in the 1972–1989 period.[6] Interestingly, the convergence toward 1 is also observed in North America in the 1982–1989 period, as it was in Singapore and Taiwan in this period. Thus, while there is a clear upward trend in this ratio over time in the Asia–9 and I expect that the ratio will continue to be larger than 1 for the region as a whole, I don't expect it to increase indefinitely but rather to converge toward some fixed value. In conclusion, the convergence of the ratio of machinery DFI to DFI in labor-intensive, light industries is indicative of Japan's DFI has been undertaken in a stepwise fashion with the structure changing in a manner that corresponds with the development stage of the host economy. As a result, Japan's DFI has helped foster balanced industrial structures in host economies.

IIIc. The Geographical Spread of the Direct Foreign Investment Frontier

Above I have depicted the diversification and upgrading of the industrial structure of Japan's DFI in the Asia–9 economies, or in other words, the deepending of Japan's DFI frontier in each host economy. Looking at the same data from a different angle, it is also possible to illustrate the geographical spread or the widening of Japan's DFI frontier. Often times, Japan's DFI in a given industry has begun concentrated in one or a few host economies and then gradually spread to other economies in the region. The widening of the DFI frontier is particularly regular with respect to DFI in the L and K sub-group but less regular with respect to DFI in the I sub- group or the S and R groups, largely due to the importance of location-specific factors in such investments that has been discussed above.

Figure 5 depicts the geographical spread of Japan's DFI in the Asia–9's K sub-group. As can be readily seen, in 1972 the difference between the largest recipient (Singapore) and smallest recipient (Hong Kong) was extremely large. However, in subsequent periods, DFI in recipients that were small in 1972 tended to grow relatively quickly. Consider, for example, a geographical convergence ratio calculated as the ratio of DFI stocks in the largest host economy to the DFI stocks in the smallest (8th) economy, where China is left out of the calculation due to very low levels of DFI in 1972 and 1982. This ratio declined markedly from 22.0 in 1972 to 12.7 in 1982 and then to 5.1 in 1989 (Table 3), indicating a strong trend toward geographical convergence in this industry. A similar trend is also observed for DFI in the L sub-group where the corresponding covergence ratio fell from 19.8 to 9.7 and 5.5 in each year, respectively (Table 4).

Similar trends are also observed when large and small recipients are separated into different groups. When considering DFI in the K sub-group (Figure 5, Table 3), the large recipient group consists of Korea, Taiwan, Singapore, Thailand, and Malaysia with the Philippines, Indonesia, and Hong Kong comprising the small recipient group. Again calculating the convergence ratio as the ratio of DFI stocks in the largest host economy to the DFI stock in the smallest economy in each group, this ratio can be seen to have fallen consistently in the large recipient group (8.8 in 1972, 7.4 in 1982, and 1.3 in 1989). In the small recipient group, the ratio first increased from 2.5 in 1972 to 3.6 in 1982 but then fell very rapidly to 1.5

[6] The tendency of convergence is better identified by Table 2 in such way that the standard deviation of the K/L for Asia–9 declined relative to the mean (1.09 in 1972, 0.83 in 1982 and 0.44 in 1989) and the standard deviation also declined in absolute value in 1982–1989.

FIG. 5 JAPANESE INVESTMENT IN K (MACHINERY)

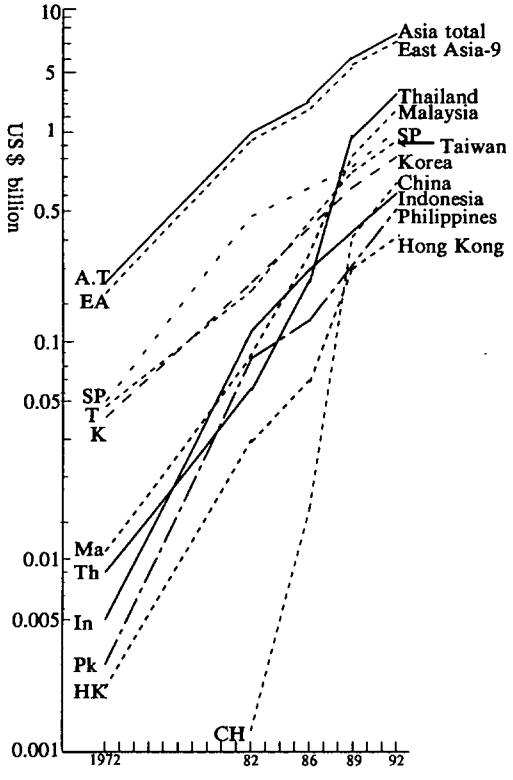


TABLE 3. THE CONVERGENCE OF THE MACHINERY MANUFACTURING INVESTMENT FRONTIER IN THE ASIA–9
(DFI stocks in US$ millions, ratios)

	1972		1982		1989	
A. All Asia–9 less China, High = 1st country, Low = 8th country						
High	44	(Singapore)	469	(Singapore)	1109	(Thailand)
Low	2	(Hong Kong)	37	(Hong Kong)	215	(Hong Kong)
Ratio	22.0		12.7		5.1	
B. Larger Recipient Group (Korea, Taiwan, Singapore, Thailand, Malaysia)						
High	44	(Singapore)	469	(Singapore)	1109	(Thailand)
Low	5	(Thailand)	63	(Thailand)	874	(Korea)
Ratio	8.8		7.4		1.3	
C. Smaller Recipient Group (Philippines, Indonesia, Hong Kong)						
High	5	(Indonesia)	134	(Indonesia)	312	(Indonesia)
Low	2	(Hong Kong)	37	(Hong Kong)	215	(Hong Kong)
Ratio	2.5		3.6		1.5	

Sources: Ministry of Finance (various years).

TABLE 4. THE CONVERGENCE OF THE LABOR-INTENSIVE MANUFACTURING INVESTMENT FRONTIER IN THE ASIA–9 Less China
(DFI stocks in US$ millions, ratios)

	1972		1982		1989	
A. All Asia–9 less China, High = 1st country, Low = 8th country						
High	119	(Korea)	554	(Indonesia)	896	(Indonesia)
Low	6	(Philippines)	57	(Philippines)	163	(Philippines)
Ratio	19.8		9.7		5.5	
B. Larger Recipient Group (Korea, Taiwan, Singapore, Thailand, Indonesia)						
High	119	(Korea)	554	(Indonesia)	896	(Indonesia)
Low	18	(Singapore)	110	(Taiwan)	448	(Taiwan)
Ratio	6.6		5.0		2.0	
C. Smaller Recipient Group (Malaysia, Philippines, Hong Kong)						
High	32	(Hong Kong)	166	(Malaysia)	337	(Malaysia)
Low	6	(Philippines)	57	(Philippines)	163	(Philippines)
Ratio	5.3		2.9		2.1	

Sources: Ministry of Finance (various years).

in 1989. When considering DFI in the L sub-group, the recipient groups differ in that Indonesia is member of the large recipient group, while Malaysia is a member of the small recipient group. In this case, the ratios fell continuously in both the large and small recipient groups (Table 4).

Thus, in the K and L sub-groups there is a strong trend toward less geographical diversity of DFI stocks over time. This country-wise convergence suggests that Japan's DFI in the Asia –9 has matured and may be likely to stagnate in the future, given the present conditions in Japan's investing industries. For example, Japan's DFI in the L sub-group began in a few economies, then spread to other economies in the region, and has since stagnated for reasons to be examined in more detail below. A similar convergence has also been observed in the K sub-group, though this DFI has yet to stagnate as has DFI in the L sub-group. Thus, the geographical convergence of DFI in these sub-groups is related to the deepening of the DFI frontier discussed in the previous section. The maturation of Japan's DFI and the corresponding potential for future stagnation is an important emerging issue which will be explored theoretically in the following section.

IV. *Economic Development with Direct Foreign Investment*

The empirical analysis in the previous sections suggests that it is important to further explore three issues in a more general theoretical framework: (1) how to generalize a dynamic model of PROT-type DFI; (2) how to relate this model to the flying-geese pattern of industrial development; and (3) how to explain the convergence of Japan's DFI frontier.

IVa. A Dynamic Model of PROT-DFI

Kojima's (1973, 1975) analysis of PROT-type DFI is based on two propositions:

Proposition 1: Countries gain from trade and maximize their economic welfare when they export comparatively-advantaged goods and import comparatively-disadvantaged goods.
Proposition 2: Countries gain even more from expanded trade when superior entrepreneurial endowments are transferred through multinational corporations from the home countries' comparatively-disadvantaged industries in such a way as to improve the efficiency of comparatively-advantaged industries in the host countries and to contract comparatively-disadvantaged industries in the home countries.

Proposition 1 is nothing other than the principle of comparative advantage which describes how to maximize the gains from trade. Proposition 2 then describes how PROT-type DFI reinforces the gains from trade by increasing productivity through DFI and may be called the principle of complementing comparative advantage patterns.

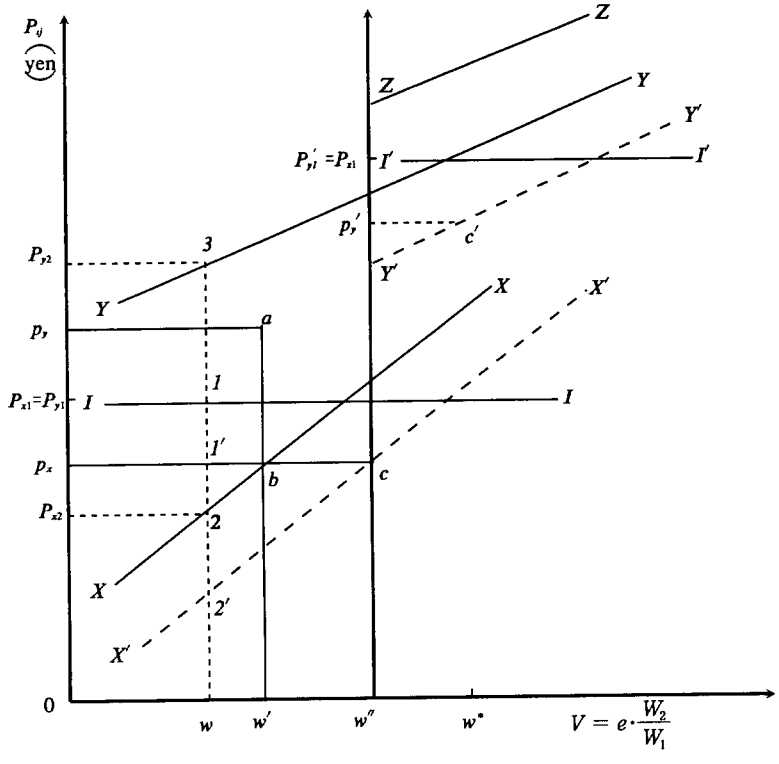
The effects of PROT-type DFI can also be explained with Figure 6. Assume two countries, 1 and 2, two industries, X and Y, and 2 factors of production, capital and labor. To make interpretation easier assume that country 1 is Japan and that Japan exports good Y and imports good X from country 2 which is assumed to be Thailand. Japan is also assumed to invest in Thailand's X industry. If X and Y units are defined appropriately, country 1 produced both goods with unit cost of 100 yen at the given wage rate measured in yen, W_1. In a figure which measures the relative wage rate on the horizontal axis and the price of good i (P_{ij}, where $i=x, y; j=1, 2$) on the vertical axis, both measured in yen, this is illustrated by the line *I-I* where the price of good X (P_{x1}) equals that of good Y (P_{y1}), or $P_{x1}=P_{y1}$. Lines *X-X* and *Y-Y* depict country 2's cost curve for goods X and Y, respectively, which are converted from country 2's currency (baht) at the prevailing yen/baht exchange rate (e). The relative wage rate on the horizontal axis is thus the relative wage rate measured in yen, $V=e\ (W_2/W_1)$, where W_2 is Thailand's wage rate measures in baht.[7] Country 2's cost curves, *X-X* and *Y-Y* are increasing because increases in the relative wage lead to increased goods prices and the *Y-Y* curve is higher than the *X-X* curve reflecting the relatively high costs of producing good Y in country 2, as this industry is assumed to be relatively capital intensive.

Assuming a given e and W_1 and a wage level of W_2 in country 2, country 1's cost of producing both goods X and Y is illustrated by point *1* at cost $P_{x1}=P_{y1}$. Under these same assumptions, country 2's autarky cost of producing good X is illustrated at point *2*, or cost P_{x2}, while the autarky cost of producing good Y is illustrated at point *3*, or cost P_{y2}. Thus, $P_{x2}<P_{x1}$ and $P_{y2}>P_{y1}$, or more importantly, $P_{x2}/P_{y2}<P_{x1}/P_{y1}$. In other words, country 2 has a comparative advantage in the production of good X. Thus, following proposition 1, if country 2 exports good X and imports good Y, both countries can obtain the gains from trade.

In order to determine the terms of trade and thus the trade equilibrium, one must first consider the reciprocal demands of both countries, though these are not shown in Figure 6. However, even without them and assuming balanced trade, it is possible to conclude that the equilibrium price of good X, p_x, will be between P_{x1} and P_{x2}, while the equilibrium price of good Y, p_y, will be between P_{y1} and P_{y2}. Assuming some arbitrary prices fitting this assumption, p_x and p_y, country 2's equilibrium in the X market is determined at point b which yields a wage

[7] More exactly, this should be $V=e\ (W_2/R_2)/(W_1/R_1)$ where R_1 and R_2 are the prices of capital in countries 1 and 2, respectively. However, due to the free movement of capital, $R_2=R_1$ is assumed and V becomes as defined in the text. Note also that when e and W_1 don't change, $V=W_2$ is obtained.

FIG. 6



rate of w' which is higher than the original wage rate w. This increase of wages is one expression of the gains from trade. Conversely, country 1's equilibrium at point b also reflects the welfare-increasing gains from trade because a larger volume of good X is available at lower cost. Equilibrium in the Y market is then illustrated by point a. However, this illustration is ambiguous because the marginal condition is not shown. If, on the other hand, the wage rate, W_1, heretofore assumed to be fixed for simplicity, rises gradually and the supply cost of good Y increases accordingly, the cost curve would coincide with the international price and a point like point a. Thus, the gains from trade in good Y can be explained in a manner similar to the explanation used in the case of good X.

The next step in the analysis is to introduce PROT-type DFI, where country 1 invests in country 2's X industry. It is assumed that this investment enhances labor productivity in the recipient industry and this leads the cost curve for country 2's X industry to shift to X'-X'. Alternatively, one could assume that there was initially no X industry in country 2 and that DFI leads to creation of a new industry; this is an example of a successful infant industry. After the cost curve shifts to X'-X', the cost in country 2 is illustrated by point $2'$, widening the differential relative to country 1's autarky price given at point 1. This creates more trade and even if the international price remains at p_x, the post-DFI equilibrium becomes point c, with country 2's wage further raised to w''. Thus, PROT-type DFI reinforces the traditional

gains from trade with productivity increases.

The gain for the investing country 1 is larger if the X industry is an intermediate goods industry, the products of which are in high demand in country 1. For example, in the Japanese case, the increased availability of low cost intermediate goods through offshore production has made it possible for Japanese firms to reduce the costs of producing exports from Japan. Conversely, in the case of Japan's exports of intermediate and capital goods, importing countries are able to reduce production costs and increase their exports. This process gives rise to a virtuous cirlce of cost reduction and to explain it a new model of intermediate goods trade is required.

It is natural for Japanese firms to choose investment locations that give rise to cost curves such as the X'-X' curve in Figure 6. This is because these are locations with lower labor costs. In this model, there are two important elements, the cost of labor and the quality of labor and related factors. With respect to location, labor abundant host economies are more attractive the lower the wage is. However, at the same time, the quality of labor and related factors such as social infrastructure are also important factors in determining the efficiency and attractiveness of labor and thus host economies.

Moreoever, as illustrated above, it is also natural that the wage rates in host economies rise as a result of expanded trade and DFI. In the early stages of development when wages are low at a rate like w, the profit rate of Japan's DFI is $1'2'/1'w$ which is fairly high. However, when production expands to point c and the wage increases to w'' accordingly, the profit rate becomes zero. In this case, there are no motives for new Japanese DFI in this industry or motives for withdrawal of previous investments. In other words, Japan's DFI in country 2's X industry has matured. What should Japanese firms do then? There are two possibilities: Japanese firms can diversify and upgrade DFI in country 2 by initiating DFI in the more sophisticated Y industry or Japanese firms that have previously invested in country 2's X industry can cease investing in (or withdraw from) country 2 and invest in another country. The first alternative leads to the deepening of the DFI frontier, while the latter leads to the widening of the DFI frontier.

It should also be noted that a fall in e or the appreciation of the yen works to shift the original X-X cost curve downwards toward the X'-X' curve. Thus, the effect of the yen's appreciation is similar to the effect of inward DFI in this respect. Moreover, using the terminology of Figure 6, if yen's appreciation reduces costs from point *2* to point *2'*, this appreciation strengthens motives for offshore sourcing (or outsourcing) of parts, components, and other intermediate goods.

Heretofore, I have focused on analysis of PROT-type DFI but it is also helpful to analyze the effects of ANT-type DFI for sake of comparison.[8] As explained above, ANT-type DFI occurs, for example, when Japanese firms invest in a higher wage economy like the United States. Here we assume that Japan has a comparative advantage in the Y industry as compared with a third, more capital intensive industry, and Japan is labor abundant relative to United States. In Y industry, Japanese firms can thus expand exports to the United States but this export expansion is assumed to have been restricted by U.S. trade policies. Japanese firms then

[8] Note also that profit rates are different for PROT-type and ANT-type DFI. For example, Japanese manufacturing affiliates in Asia had relatively high profit rates, 8 percent in 1980, 14 percent in 1984, and 13 percent in 1988, while Japanese manufacturing affiliates in the United States had relatively low profit rates, 6 percent in 1980, 0 percent in 1984, and −3 percent in 1990 (Daiichi Kangin 1993, p. 8).

undertake DFI in the U.S. Y industry in order to circumvent these trade restrictions and insure access to the U.S. market. However, the Japanese firms in the U.S. Y industry must produce at a cost above the world price because of the higher wages they must pay in the United States. As a result, they sell at relatively high prices resulting in a loss of consumer welfare in the United States.

To fully depict the diversification and upgrading of Japan's DFI in Figure 6, a third industry Z, which is more capital and knowledge intensive than industries Y and X must be introduced into the discussion. In Figure 6, consider point c where country 2's (Thai) X industry has matured. Then assume that the new Z industry appears in the world market. Meanwhile, Japan's wage, W_1, is assumed to have risen and Japan's cost curve shifted from I-I to I'-I'.[9] Such changes should be shown as continuous but are shown in discrete form here for simplicity's sake. At the new wage, the cost of the two goods in Japan is $P_{y1}'=P_{z1}$, where P_{z1} is the price of good Z. The cost curve of good Y in country 2, Y-Y, is assumed to be the same as before while the country 2's cost curve for good Z is assumed to be Z-Z. In this situation, country 1 has a comparative advantage in the production of good Z but has lost comparative advantage in the production of good Y. If Japan undertakes DFI in country 2's Y industry, the Y-Y curve shifts down to Y'-Y' and country 2 can now produce good Y at a cost below the world price, p_y'. Equilibrium occurs at a point like c' and country 2's wage rate increases further to w^*. Thus, this is another case of PROT-type DFI that is analogous to the above explanation of DFI in country 2's X industry. This possibility emerges when Japan loses, though in many cases not entirely, competitiveness in the Y industry, creating the possibility for production undertaken abroad to be sold in local markets, exported back to Japan (offshore sourcing), or exported to other markets (offshore exports). In this example, the fact that the price of Y rises from p_y in the first stage to p_y' in the second is thought to be an unavoidable result of increases in Japanese wage, remembering that all of these wages and prices are measured in yen.

IVb. The Flying-Geese Pattern of Industrial Development

Akamatu (1962, 1962b; see also Kojima 1978, pp. 61-67) described a flying-geese pattern of economic development that is essentially a theory of the catching-up product cycle. This theory contrasts with Vernon's (1966) theory of the innovation-initiated product cycle in that the product cycle begins with efforts to imitate new and better products or services already being produced abroad, not with the innovation of new and better products or services. The flying-geese pattern involves three major processes, the first being the productivity improving process. In this process, an economy is first introduced to a new and better good or service, say good X, being produced in a foreign country, usually through imports. After demand reaches a certain threshold, domestic production becomes economically viable and after production continues for a while, exports become feasible as efficiency improves. Efficiency gains resulting from exploitation of economies of scale, learning by doing, technological improvements, and capital deepening (i.e., rising capital-labor ratios) are the driving force behind the productivity improving process.

[9] While I - I line showed $P_{x1}=P_{y1}=100$ yen, now I' - I' line represents $P_{y1}'=P_{z1}=200$ yen due to the rise in country 1's wage (W_1).

Second, there is a process of upgrading the industrial structure. This normally implies that the shares of relatively capital- and knowledge-intensive activities gradually increase in an economy. A typical example would be where the X industry's share gradually declines from high levels, the Y industry's share increases rapidly but then peaks and decreases, and the Z industry's shares increase gradually with the increase accelerating after a period. Here it is important to stress that capital is defined to include human capital (e.g., scientists, engineers, managers, and other skilled labor) and social infrastructure. In this process rising incomes and changing demand patterns are crucial driving forces and, along with ample endowments of human capital and social infrastructure, are necessary for upgrading to be successful.

Since both productivity improving and upgrading processes require capital deepening, capital accumulation which is facilitated through saving, is a major element of economic development. Moreover, with a given capital-labor endowment ratio and a given rate of capital accumulation, an economy must choose how much weight to put on the productivity improving process, and thus raise wages and incomes, and how much weight to put on the upgrading process which does not raise wage levels but does help meet diversified demands. This is the "natural order of industrial sequencing" [Smith (1808, p. 293)].

The pattern of comparative advantage of an economy with respect to the rest of the world is another constraint on industrial sequencing. More specifically, it is said that industries with capital-labor ratios that are relatively close to the capital-labor endowment of an economy will be comparatively advantaged or most competitive in the international market. [Jones (pp. 22 −32)]. Thus, comparatively advantaged industries change gradually over time, for example from X industry to Y industry and further to Z industry, in response to changes in capital-labor endowments. Correspondingly, a development strategy that emphasizes industries that are comparatively advantaged is pro-trade oriented development, and trade-oriented FDI is consistent with such strategies.

The third process is analogous to the spread of the Japanese investment frontier as described above. An example of this is where exports from the X industry grow, peak, and then wane, followed sequentially by similar process in the Y industry and then the Z industry. When exports from the Y industry peak, two types of outward direct investment are often observed. The first type of investments are to secure intermediate goods used in the comparatively advantaged Y industry. A second type is outward investment in the X industry to maintain market shares through local sales and/or reexporting in an industry that is becoming increasingly comparatively disadvantaged in the home economy. The result is a phenomenon akin to the spread of the Japanese investment frontier.

The term flying-geese pattern of industrial development is famous but has often been used ambiguously and imprecisely.[10] For example, observers often do not clarify the stage or stages of the product cycle that they have in mind. Rather, they often attempt to argue that the system of economic development observed in the Japanese case when that country caught up with other developed economies was subsequently observed in Asia's Newly Industrializing Economies (NIEs: Hong Kong, Korea, Singapore, and Taiwan) and is now being observed in the 4 larger economies in the Association of Southeast Asian Nations (ASEAN-4: Indonesia,

[10] Since Dr. Saburo Okita introduced the term "flying-geese" at the 4th Pacific Economic Cooperation Conference (PECC) in Seoul in 1985 (e.g., PECC 1985; Okita 1986), it has been widely used in Japan and Asian countries.

Malaysia, Philippines, and Thailand). Such an argument assumes that these late-comer economies have developed or will develop in a manner consistent with the natural order of industrial sequencing, with variation among economies resulting from differing factor endowments and economic size.[11] If this is the case, it has been natural that the NIEs and more recently some of the ASEAN economies have begun to undertake patterns of outward FDI of the PROT-type, much as Japanese firms did in the late 1960s and early 1970s. The Japanese economy has now matured, attaining a relatively balanced industrial structure, and other East Asian economies are now following Japan's footsteps one by one in diversifying their industrial structures to attain more balanced industrial structures. This convergence of economic development levels is a crucial factor in the convergence of Japan's investment frontier, as further elaborated below.

IVc. Convergence of Japan's Investment Frontier

It is important to discover the reasons that the Japanese investment frontier has tended to converge and the implications of that convergence for future investment in the Asian region. A number of points regarding future prospects for the region are most relevant here.

First, if the Asia–9 economies succeed in catching up with Japan by utilizing the natural order of industrial sequencing within 20 or 30 years, then foreign direct investment from Japan and other economies will eventually be unnecessary. However, this also reflects the fact that DFI contributed successfully to the economic development of host economies in the Asia–9, with foreign multinational firms often playing the role of a tutor or catalyst.

Second, until now, the Asia–9 have often used to encourage DFI using the export processing zone (EPZ) model as a basis. In this approach, DFI is encouraged in a tariff-free zone (either an EPZ or a bonded factory), host country factors of production earn some of the value added produced (mainly the wage bill), and final products are exported abroad. The EPZ model is constrained in that it facilitates less than optimal spillover effects on the host economy. The Asia–9 have specialized in more or less similar products such as textiles and electric equipment. However, they have been unable to create a complementary division of labor among each other and are losing export markets. The United States was a large, liberal absorber of exports from these economies through the 1970s but recently protectionist trade barriers have increased. Therefore the Asia–9, with the exception of smaller economies such as Singapore and Hong Kong, must turn to more fundamental development strategies that emphasize enhancing capital accumulation and the development of human resources, social infrastructure, and related supporting industries.

Third, for the Japanese economy, it is of utmost importance to create a new leading or strategic industry. Without the development of such an industry, further outflows of DFI in older industries will result in the hollowing out of the Japanese economy, increased unemployment. On the other hand, as has happened recently, outflows of DFI are stimulated by economic events such as currency appreciation. In short, there is an optimal level of outward DFI for a country corresponding to the stage of development among other factors.

Fourth, for Japanese firms, DFI abroad in industries like the X industry and the Y industry become unprofitable after the local wage rises to a certain level. Individual industry

[11] Ozawa (1990, 1993) presents a precise model of the regional concatenation process.

studies (Tran 1992, Wakasugi 1994) indicate, for example, each of the two or three large firms in an industry set up core factories with optimum scale for the industry (e.g., in nylon or polyester production, 30–100 tons per day) in one country abroad. The investment then matures and further investment is not forthcoming. This reflects convergence of DFI patterns, as investments shift from the X industry to the Y industry, first in one country and then in another.

In addition to facing rising wages in recipient economies, investment from other economies, namely the United States and other advanced economies, as well as from other developing Asian economies, has increased rapidly. This increased competition has made Japanese investments less profitable. In this respect a mutually complementary division of investment, as well as cooperation on other matters, is needed among investors.[12]

V. *Conclusion*

At present in 1994, the Japanese economy stands at a crossroads as the post-bubble recession lingers and is one factor clouding the prospects for Japan's future DFI abroad. In this context, it is important that future DFI in Asia should seek new directions in contributing further to the steady economic development of host economies. Although the Japanese investment frontier has matured and tended to converge in both country and industry dimensions, there remains plenty of room for Japanese DFI to expand in the Asia–9 economies. This is particularly apparent if it is recognized that DFI stocks in the Asia–9 were only about one-third of the levels in North America in 1989 or 1992. Among the potential destinations for future DFI, China is large and emerging market and Indonesia is another large market with strong growth potential. Moreover, there are a number of potentially important Asian host economies other than those in the Asia–9, for example, Vietnam, Myanmar, India, Pakistan, Sri Lanka, and Bangladesh. More specifically, there is a lot of potential for service sector DFI in the Asia–9, where service sector investments account for much smaller shares of DFI stocks than in North America or Europe. Investments in resource development and social infrastructure are also urgently needed, but ODA must often be combined with DFI before DFI becomes profitable in these types of ventures. Another specific opportunity of some interest is in China's automobile industry. Increases in income levels have stimulated growth in automobile demand in China and the ASEAN–4 countries to a point where it is now possible to construct plants at the minimum optimum scale in each of these countries.

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[12] Here agreed specialization as described in Kojima (1970, 1992) is taken into consideration.

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APPENDIX

Japanese Direct Foreign Investment Stocks by Country and Industry

This appendix presents data on Japan's DFI stocks by country and industry group and sub-group for the World (Appendix Table 1), North America (Appendix Table 2), the Asia-9 (Appendix Table 3), and each of the Asia-9 economies individually (Appendix Tables 4-12). In the tables for the Asia-9 (Appendix Tables 3-12) the cumulative amounts of Japan's official development assistance (ODA) are also given for reference.

The industry classification used is the same outlined in the text; the definitions used are repeated below.

Group R (resource development): agriculture, forestry, and fisheries, mining, and construction.

Group S (services): commerce, finance and insurance, real estate, and other industries.

Group M (manufacturing): consists of three sub-groups defined below.

sub-group L (labor-intensive, light manufacturing): food manufacturing, textiles (including apparel), and miscellaneous manufacturing.

sub-group I (intermediate-good manufacturing): timber and pulp, chemicals, and primary (and fabricated) metals.

sub-group K (machinery manufacturing): general (non-electric) machinery, electric (and electronic) machinery, and transport machinery.

APPENDIX TABLE 1. DFI STOCKS IN THE WORLD

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	6,773 (100.0)	53,131 (100.0)	105,970 (100.0)	253,897 (100.0)	386,530 (100.0)
R: resource development	2,454 (36.2)	11,908 (22.4)	14,760 (13.9)	19,183 (7.6)	24,838 (6.5)
S: services	2,567 (37.9)	24,271 (45.7)	63,004 (59.5)	168,587 (66.4)	257,711 (66.6)
M: manufacturing	1,752 (25.9)	16,952 (31.9)	28,206 (26.6)	66,127 (26.0)	103,981 (26.9)
L: light manufacturing	632 (9.4)	3,859 (7.2)	5,640 (5.3)	15,399 (6.0)	24,814 (6.4)
I: intermediate goods	678 (10.0)	7,684 (14.5)	11,033 (10.4)	20.565 (8.1)	30,309 (7.9)
K: machinery	442 (6.5)	5,409 (10.2)	11,533 (10.9)	30,163 (11.9)	48,858 (12.6)

Sources: Ministry of Finance (various years).

APPENDIX TABLE 2. DFI STOCKS IN NORTH AMERICA

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	1,548 (100.0)	15,225 (100.0)	37,406 (100.0)	108,993 (100.0)	169,580 (100.0)
R: resource development	218 (14.1)	1,260 (8.3)	2,107 (5.6)	3,492 (3.2)	4,739 (2.8)
S: services	1,027 (66.3)	9,714 (63.8)	25,394 (67.9)	71,971 (66.0)	114,474 (67.5)
M: manufacturing	303 (19.6)	4,251 (27.9)	9,905 (26.5)	33,530 (30.8)	50,367 (29.7)
L: light manufacturing	39 (1.9)	834 (5.4)	1,557 (4.2)	8,031 (7.4)	13,169 (7.8)
I: intermediate goods	224 (14.5)	1,245 (8.2)	2,875 (7.7)	9,084 (8.3)	13,458 (7.9)
K: machinery	49 (3.2)	2,172 (14.3)	5,473 (14.6)	16,415 (15.1)	23,742 (14.0)

Sources: Ministry of Finance (various years).

APPENDIX TABLE 3. DFI STOCKS IN THE ASIA–9

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	1,269 (100.0)	14,343 (100.0)	21,439 (100.0)	39,925 (100.0)	58,923 (100.0)
R: resource development	362 (28.5)	5,712 (39.8)	6,909 (32.3)	8,116 (13.2)	9,481 (16.1)
S: services	206 (16.3)	2,905 (20.3)	6,355 (29.7)	19,393 (48.6)	25,388 (43.1)
M: manufacturing	701 (55.2)	5,726 (39.9)	8,175 (38.1)	15,270 (38.2)	24,055 (40.8)
L: light manufacturing	407 (32.0)	1,772 (12.4)	2,376 (11.1)	4,261 (10.6)	6,507 (11.0)
I: intermediate goods	138 (10.8)	2,608 (18.2)	3,262 (15.2)	5,058 (12.7)	8,002 (13.6)
K: machinery	157 (12.4)	1,346 (9.3)	2,537 (11.8)	5,950 (14.9)	9,546 (16.2)
A: ODA total	925	7,238	12,065	19,915	30,044

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).

APPENDIX TABLE 4. DFI STOCKS IN INDONESIA

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	473 (100.0)	7,268 (100.0)	8,673 (100.0)	10,435 (100.0)	14,409 (100.0)
R: resource development	260 (55.1)	5,042 (69.4)	6,002 (69.2)	6,659 (63.8)	7,384 (51.3)
S: services	81 (17.0)	225 (3.1)	309 (3.6)	655 (6.3)	1,848 (12.8)
M: manufacturing	132 (27.9)	2,001 (27.5)	2,362 (27.2)	3,121 (29.9)	5,177 (35.9)
L: light manufacturing	102 (21.6)	554 (7.6)	711 (8.2)	896 (8.6)	1,117 (8.1)
I: intermediate goods	25 (5.2)	1,313 (18.1)	1,436 (16.6)	1,913 (18.3)	3,330 (23.1)
K: machinery	5 (1.1)	134 (1.8)	215 (2.5)	312 (3.0)	680 (4.7)
A: ODA total	341	2,651	3,376	6,213	9,569

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).

APPENDIX TABLE 5. DFI STOCKS IN THE PHILIPPINES

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	88 (100.0)	721 (100.0)	913 (100.0)	1,322 (100.0)	1,943 (100.0)
R: resource development	69 (78.2)	357 (49.5)	446 (8.9)	478 (36.2)	533 (27.4)
S: services	5 (5.5)	74 (10.3)	98 (10.7)	206 (15.6)	315 (16.2)
M: manufacturing	14 (16.3)	290 (40.2)	369 (40.4)	637 (48.2)	1,096 (56.4)
L: light manufacturing	6 (6.4)	57 (7.9)	71 (7.8)	163 (12.4)	205 (10.6)
I: intermediate goods	7 (7.4)	148 (20.5)	162 (17.7)	203 (15.3)	335 (17.2)
K: machinery	2 (2.5)	85 (11.8)	136 (14.9)	271 (20.5)	556 (28.6)
A: ODA total	152	1,140	2,125	3,443	5,629

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).

APPENDIX TABLE 6. DFI STOCKS IN CHINA

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	0 (-)	70 (100.0)	513 (100.0)	2,474 (100.0)	4,472 (100.0)
R: resource development	0 (-)	5 (7.1)	15 (2.9)	66 (2.6)	131 (2.9)
S: services	0 (-)	55 (78.6)	421 (82.1)	1,853 (74.9)	2,665 (59.6)
M: manufacturing	0 (-)	10 (14.3)	77 (15.0)	556 (22.5)	1,675 (37.5)
L: light manufacturing	0 (-)	2 (2.9)	32 (6.2)	171 (6.9)	681 (15.2)
I: intermediate goods	0 (-)	7 (10.0)	28 (5.5)	82 (3.3)	183 (4.2)
K: machinery	0 (-)	1 (1.4)	17 (3.3)	303 (12.3)	811 (18.1)
A: ODA total	0 (-)	403	2,028	4,087	6,446

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).

APPENDIX TABLE 7. DFI STOCKS IN KOREA

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	207 (100.0)	1,312 (100.0)	2,118 (100.0)	3,854 (100.0)	4,623 (100.0)
R: resource development	2 (0.9)	52 (4.0)	89 (4.2)	92 (2.4)	94 (2.1)
S: services	13 (6.0)	421 (32.1)	941 (44.4)	1,922 (49.9)	2,295 (49.6)
M: manufacturing	193 (93.1)	839 (63.9)	1.088 (51.4)	1,840 (47.7)	2,235 (48.3)
L: light manufacturing	119 (57.4)	248 (18.9)	306 (14.5)	454 (11.7)	533 (11.5)
I: intermediate goods	33 (15.9)	353 (26.9)	377 (17.8)	511 (13.3)	644 (13.9)
K: machinery	41 (19.8)	238 (18.1)	405 (19.1)	874 (22.7)	1,058 (22.9)
A: ODA total	324	1,340	1,267	1,327	1,539

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).

APPENDIX TABLE 8. DFI STOCKS IN TAIWAN

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	108 (100.0)	479 (100.0)	1,051 (100.0)	2,285 (100.0)	3,427 (100.0)
R: resource development	2 (2.0)	8 (1.7)	13 (1.2)	21 (0.9)	39 (1.1)
S: services	5 (5.0)	32 (6.7)	83 (7.9)	489 (21.4)	1,027 (30.0)
M: manufacturing	100 (93.0)	439 (91.6)	955 (90.9)	1,775 (77.7)	2,361 (68.9)
L: light manufacturing	44 (40.4)	110 (23.0)	231 (22.0)	448 (20.9)	589 (17.2)
I: intermediate goods	14 (12.6)	95 (19.7)	168 (16.0)	384 (15.5)	585 (17.1)
K: machinery	43 (40.0)	234 (48.9)	556 (52.9)	943 (41.3)	1,187 (34.6)
A: ODA total	13	5	5	5	5

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).

APPENDIX TABLE 9. DFI STOCKS IN THAILAND

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	129 (100.0)	521 (100.0)	884 (100.0)	3,268 (100.0)	5,887 (100.0)
R: resource development	7 (5.1)	33 (6.3)	60 (6.8)	162 (4.2)	318 (5.4)
S: services	22 (17.0)	98 (18.8)	204 (23.1)	861 (26.4)	1,717 (29.2)
M: manufacturing	101 (77.9)	390 (74.9)	620 (70.1)	2,245 (69.4)	3,851 (65.4)
L: light manufacturing	74 (57.6)	262 (50.3)	335 (37.9)	647 (19.8)	1,138 (19.3)
I: intermediate goods	18 (13.9)	65 (12.4)	102 (11.5)	489 (15.7)	806 (13.7)
K: machinery	8 (6.4)	63 (12.2)	183 (20.7)	1,109 (33.9)	1,908 (32.4)
A: ODA total	58	1,077	2,082	3,234	4,487

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).

APPENDIX TABLE 10. DFI STOCKS IN Malaysia

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	76 (100.0)	764 (100.0)	1,283 (100.0)	2,507 (100.0)	4,815 (100.0)
R: resource development	21 (27.4)	152 (19.9)	203 (15.8)	309 (12.3)	461 (9.6)
S: services	4 (5.3)	79 (10.3)	224 (17.5)	377 (15.1)	873 (18.1)
M: manufacturing	51 (67.3)	533 (69.8)	856 (66.7)	1,821 (72.6)	3,841 (72.3)
L: light manufacturing	13 (17.2)	166 (21.7)	225 (17.5)	337 (13.4)	723 (15.0)
I: intermediate goods	26 (34.8)	282 (36.9)	395 (30.8)	564 (22.5)	985 (20.5)
K: machinery	12 (15.3)	85 (11.2)	236 (18.4)	919 (36.7)	1,773 (36.8)
A: ODA total	28	534	1,035	1,416	2,158

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).

APPENDIX TABLE 11. DFI STOCKS IN SINGAPORE

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	90 (100.0)	1,383 (100.0)	2,571 (100.0)	5,715 (100.0)	7,837 (100.0)
R: resource development	1 (0.6)	20 (1.4)	35 (1.4)	175 (3.0)	267 (3.4)
S: services	14 (16.0)	354 (25.6)	987 (38.4)	2,872 (50.3)	4,319 (55.1)
M: manufacturing	75 (83.4)	1,009 (73.0)	1,549 (60.2)	2,668 (46.7)	3,251 (41.5)
L: light manufacturing	18 (20.1)	211 (15.3)	263 (10.2)	819 (14.3)	1,013 (12.9)
I: intermediate goods	13 (14.8)	329 (23.8)	569 (22.1)	846 (14.8)	1,042 (13.3)
K: machinery	44 (48.5)	469 (33.9)	717 (27.9)	1,003 (17.6)	1,197 (15.3)
A: ODA total	19	85	140	173	195

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).

APPENDIX TABLE 12. DFI STOCKS IN HONG KONG

(US$ millions, percentage shares in parentheses)

Industry	1972	1982	1986	1989	1992
T: DFI total	100 (100.0)	1,825 (100.0)	3,433 (100.0)	8,066 (100.0)	11,510 (100.0)
R: resource development	2 (1.6)	43 (2.3)	46 (1.3)	155 (1.9)	254 (2.2)
S: services	62 (62.3)	1,567 (85.9)	3,088 (90.0)	7,302 (90.5)	10,329 (89.7)
M: manufacturing	36 (36.1)	215 (11.8)	299 (8.7)	608 (7.6)	928 (8.1)
L: light manufacturing	32 (31.8)	162 (8.9)	202 (5.9)	327 (4.1)	458 (4.0)
I: intermediate goods	2 (2.3)	16 (0.9)	25 (0.7)	66 (0.8)	92 (0.8)
K: machinery	2 (2.0)	37 (2.0)	72 (2.1)	215 (2.7)	377 (3.3)
A: ODA total	0	3	7	16	16

Sources: Ministry of Finance (various years); Ministry of Foreign Affairs (1993).