

THE ALLOCATION OF JAPANESE DIRECT FOREIGN INVESTMENT AND ITS EVOLUTION IN ASIA

KIYOSHI KOJIMA

I. *Introduction*

In a previous paper [Kojima (1985)] we have compared the characteristics of and impacts imparted by Japanese and American direct foreign investment (DFI) in Asia. There it was shown that the patterns of Japanese and American DFI differed sharply, that Japanese DFI tended to stimulate more trade with Japan than American DFI did with the US, and that Japanese DFI tended to contribute more efficiently to the GNP of host countries.

In this paper we take a closer look at the allocation of Japanese DFI between host countries and regions, the evolution of Japanese DFI in Asia, and the relationship between Japanese DFI and changes in industrial and trade structures in the host country. In analysing the evolution of Japanese DFI in Asia we focus, not only on its spectacular growth, but also on the step-by-step upgrading of investment structure in accordance with the evolution of comparative trade advantage positions of Japan and each host country. In this way we can see how Japanese DFI has been allocated and evolved in a manner consistent with the free working of the market mechanism and thus been able to contribute efficiently to the economic development of host countries. This discussion then provides the basis for discussion of the effects of Japanese DFI on changes in output and trade structure in host countries.

To this end three types of analysis are undertaken in this paper. In section II, the allocation of Japan's DFI is subjected to close scrutiny; a three country model of comparative investment advantage is used to show that the allocation of Japan's DFI is highly correlated with relative profitability and factors determining relative profitability. In section III, the evolution of Japan's DFI over time is described in an attempt to analyse the "spread of the Japanese investment frontier." A three country model is also used to describe this evolution. Section IV then examines the relationship between Japanese DFI and changes in the structures of industry and trade in the host country. Finally, concluding remarks are made in section V.

II. *The Allocation of Japanese DFI*

This section describes how Japanese DFI has been allocated between host countries and industries. Two topics are taken up. First, the industrial allocation of Japanese DFI in eight Asian countries, the East Asian NICs (Newly Industrialising Countries: Hong Kong, Korea, and Taiwan) and the five original ASEAN countries (Association of Southeast Asian Nations: Indonesia, Malaysia, the Philippines, Singapore, and Thailand) is described.

Second, comparative investment advantage indices are constructed and used to compare the allocation of Japanese DFI in different regions. Here an attempt to describe the determinants of Japanese DFI's allocation is also made.

II.A. The Allocation of Japanese DFI in Asian Countries

According to the Ministry of Finance's approved DFI data, Japanese DFI totalled US\$ 53.1 billion by the end of March, 1983, with US\$ 14.55 billion (27.4% of the total) invested in Asia. Total DFI grew at an annual rate of 23.5% between March, 1973, and March, 1983, while DFI in Asia grew at a rate of 26.3% in the same period. Thus, the share of DFI in Asia increased during this period. [see Kojima (1985), Table 4].

Japanese DFI is divided into 3 groups. *Group S* consists of activity classified as "commerce and services." Industries such as "commerce," "finance," "real estate," "construction," and "other services" are included in this group. This group accounted for 46.7% of Japanese DFI worldwide as of March, 1983, and the industries involved play a critical role in developing the "business infrastructure" which promotes Japanese trade and DFI.

Group R consists of activity classified as "resource related industries." "Mining," "agriculture," and "fisheries" are the industries included and this group accounts for 21.4% of total DFI. The industries in this group are those in which Japan has comparative disadvantage and thus Japan has a macro-economic incentive to promote the development of these industries abroad by investing in them and then importing the resulting products. This type of DFI is thus "trade-oriented" and sometimes referred to as "offshore sourcing" DFI.

Group M consists of manufacturing industries and should be further divided into three sub-groups. Sub-group M_1 consists of "labour intensive consumer goods industries" such as "textiles," "food manufacturing," and "other miscellaneous goods" and accounts for 7.3% of all Japanese DFI. Sub-group M_2 consists of "machinery and other manufacturing industries" such as "electric equipment," "transportation equipment," and "general machinery." This sub-group accounts for 10.2% of Japanese DFI. In analysing investment in sub-groups M_1 and M_2 we observe the "international division of the production process" based on the cost of labour. In other words, as labour shortage became acute and wages rose in Japan, a strong macro-economic incentive to transplant these industries abroad where labour costs were lower emerged. The finished products were then exported back to Japan (offshore sourcing) or to third countries (offshore exporting). Thus, on the one hand, this type of DFI contributed to the exports of the host countries involved. Furthermore, on the other hand, such DFI also stimulated the export of capital equipment, intermediate goods, and parts from Japan. As such this type of DFI is also trade oriented DFI.

Sub-groups M_3 consists of "intermediate goods" industries including "timber and pulp," "steel and non-ferrous metals," and "chemicals." This group accounts for 14.4% of Japanese DFI and DFI in these industries shares several characteristics with DFI in group *R* in that an important motive for such investments is the desire to secure "offshore sourcing" of resource based products.

Patterns of Japanese DFI in Indonesia, Malaysia, and the Philippines are similar in that mining DFI is very important. In these countries, Japanese DFI in other resource related industries such as agriculture and fisheries are also important. These three nations are well endowed with natural resources and complementarity with the Japanese economy has been

increased through the progress of DFI in resource related industries. In addition, Japan has also invested significant amounts in industries falling in the M_3 group. Examples are "steel & non-ferrous metals" and "chemicals." As noted above this DFI is similar to DFI in group R industries in that the goal is to secure stable supplies of resource intensive products. While Japan used to invest in and import the resources themselves and then manufacture intermediate goods in Japan, there is an increased tendency to manufacture the intermediate goods in the host country (mainly due to the rise of energy costs in Japan) and Japanese DFI in such activity is increasing.

Secondly, we turn to the resource scarce economies. Three of these economies, Korea Singapore, and Taiwan, have already completed the first stage of industrialisation in textiles and other labour-intensive sectors and have moved into the second stage of industrialisation in machinery production and intermediate good production. Japanese DFI has accordingly been rapidly upgraded in these countries; indeed it is likely that Japanese DFI played a leading role in upgrading the industrial structure of these economies. It is further significant that Japanese firms have used these countries extensively as offshore production bases.

The pattern of Japanese DFI in Hong Kong is quite special in that DFI in the service sector, textiles, and other miscellaneous manufactures dominates. This is a reflection of the role of Hong Kong as an important entrepot of business transactions.

The pattern of DFI in Thailand is also somewhat special in that, while one might consider Thailand a resource abundant country, DFI in the M_1 category dominates. However, on reflection this is not unusual as Thailand also has an abundance of cheap labour and is still in the first stage of industrialisation.

It should also be noted that the importance of Japanese DFI in commerce and finance varies widely irrespective of the type of economy involved because, except Hong Kong and Thailand, Japanese DFI in these fields is regulated to differing degrees in different countries.

To sum up we can see that the patterns of Japanese DFI differ quite conspicuously between the resource abundant economies, the resource scarce ones, and the commercial/financial center (Hong Kong). This phenomenon is due to the fact that Japanese firms consider the impacts of their investments on the patterns of comparative advantage. This view will be further reinforced in section III where we will see that, in addition to varying between host countries the Japanese DFI pattern also varies markedly over time. However, before proceeding to such dynamic analysis, it is instructive to examine the determinants of Japanese DFI's allocation between regions and countries.

II.B. Japanese Direct Investment in Two Regions or Countries Compared

In this section a three country model is set up to analyse one investing country's (Japan's) DFI allocation between two host countries or regions. Let $V_{i,h}^J$ ($i=1, 2, \dots, n$) stand for DFI in host country (or region) h and industry i while $V_{i,k}^J$ ($i=1, 2, \dots, n$) stand for DFI in country (or region) k and industry i .

$$(1) \quad I_i(h/k) = \frac{V_{i,h}^J}{\sum_{i=1}^n V_{i,h}^J} \bigg/ \frac{V_{i,k}^J}{\sum_{i=1}^n V_{i,k}^J}$$

which is called the "Japanese comparative investment advantage index in two host countries

TABLE 1. JAPANESE DIRECT INVESTMENT IN ASIA and NORTH AMERICA (AS OF MARCH 1981)

	<i>J</i> -index Revealed comparative investment advantage	Rate of profit (a) Asia (%)	Rate of profit (b) N.A. (%)	<i>P</i> -index Relative profit- ability (a)/(b)	<i>S</i> -index Relative size of firms	<i>O</i> -index Relative ownership shares	<i>K</i> -index Relative capital intensity
1. Non-ferrous metal (A)	33.000	9.38	15.36	0.611	0.036	1.373	0.262
2. Precision machinery (A)	18.000	15.84	-0.97	17.330	2.048	0.848	0.721
3. Textiles	16.104	3.28	0.09	36.444	1.055	0.858	1.049
4. General machinery	5.349	0.55	16.30	0.034	0.797	0.680	0.379
5. Other manufacturing	4.861	7.92	5.67	1.407	0.758	0.703	0.236
6. Transport equipment	4.694	4.76	-4.90	1.971	0.277	0.560	0.356
7. Chemicals	4.074	5.43	6.00	0.905	0.353	0.708	0.296
8. Steel	4.008	2.79	0.86	3.244	0.706	0.603	0.453
9. Other services	2.441	1.19	-0.28	5.250	3.799	0.778	3.101
10. Electric machinery	2.003	10.01	4.15	2.412	0.216	0.796	0.151
11. Food & beverages	1.472	10.18	2.93	3.474	0.467	0.648	0.183
12. Forestry & fishery	0.613	3.19	-6.74	1.473	0.342	0.676	0.104
13. Commerce	0.186	1.05	4.16	0.252	0.412	0.832	0.510
14. Timber, pulp & paper	0.115	3.20	3.22	0.994	0.047	0.784	1.178
15. Mining (N)	0.056	0.62	2.22	0.279	0.465	0.448	0.087
(Weighted Average)	(1.000)	(4.21)	(4.31)	(0.977)	(0.383)	(0.714)	(0.147)

Note: In (A), there is no or negligible investment in North America, whereas in (N) no or negligible presence in Asia. Their rankings are as-sumed to be the same throughout 5 indices.

Source: MITI, *A Comprehensive Survey on Japanese Direct Investment Abroad*, 1983.

(regions).” In an analogous fashion indices of relative profit rates, $P_i(h/k)$, relative size of firms, $S_i(h/k)$, relative ownership shares, $O_i(h/k)$, and relative capital intensity, $K_i(h/k)$ can also be defined. Calculation of such indices for various regions is possible using a recent MITI study, *A Comprehensive Survey of Japanese Direct Investment Abroad*.¹ While this source does not give country by country breakdowns, this data will be used to compare Japanese DFI in North America and Asia and in Latin America and Oceania below. It is also possible to calculate $I_i(h/k)$ and $S_i(h/k)$ indices using the Ministry of Finance’s data. This information will be used to compare Japanese DFI in country pairs as well.

Japanese DFI in Asia and North America

Data dealing with Japanese DFI in Asia and North America are given in Table 1. Here region h is defined as Asia and region k is defined as North America. Thus, indices greater than 1 reflect greater presence (and thus a comparative investment advantage), larger profit rates, larger size, larger ownership shares, and greater capital intensity respectively for firms in Asia as compared to those in North America.

TABLE 2. RANK CORRELATION COEFFICIENTS BETWEEN COMPARATIVE INVESTMENT ADVANTAGE INDICES OF JAPANESE DFI IN TWO ECONOMIES

(a) Based on MITI's Survey.				
(1) Japanese DFI in Asia/North America (as of end 1981)				
	<i>P</i>	<i>S</i>	<i>O</i>	<i>K</i>
<i>I</i>	0.5607*	0.7857**	0.4321*	0.5250*
<i>P</i>		0.6536**	0.4821*	0.4786*
<i>S</i>			0.5286**	0.6893**
<i>O</i>				0.7821**
(2) Japanese DFI in Latin America/Oceania (as of end 1981)				
	<i>P</i>	<i>S</i>	<i>O</i>	<i>K</i>
<i>I</i>	0.7607**	0.7643**	0.5893**	0.5250*
<i>P</i>		0.5214*	0.6643**	0.3036
<i>S</i>			0.5179**	0.6821**
<i>O</i>				0.6536**
(b) <i>I</i> : <i>S</i> relations based on Finance Ministry's Approved DFI Data.				
(3) Asia/North America		(March 1982)		0.8022**
(4) Indonesia/USA		(March 1981)		0.5918**
(5) Korea/USA		(")		0.5912**
(6) Indonesia/Korea		(")		0.6941**
(7) Brazil/Australia		(")		0.7526**
(8) Hong Kong/Singapore		(")		0.9033**
(9) Malaysia/Thailand		(March 1973)		0.8039**
(10) Malaysia/Thailand		(March 1983)		0.8529**
(11) Korea/Taiwan		(March 1973)		0.7990**
(12) Korea/Taiwan		(March 1983)		0.8309**

** Statistically significant at 1% level.

* Statistically significant at 5% level.

¹ This is a survey based on a sample of 1,298 usable answers to questionnaires sent to 3,247 firms which undertook *equity* investment abroad. (1,401 replies were received.) Therefore, the coverage is not as comprehensive as the Ministry of Finance's approval data. Furthermore, the system of industry classification is somewhat different as well. It is particularly significant that the category of "finance" is omitted.

(1) It is assumed that the pattern of Japanese DFI in the two regions varies according to Japan's comparative advantage position vis-à-vis each region. This assumption is strongly supported by analysis of the $I_i(h/k)$ index in Table 1. A comparative investment advantage is only revealed for North America's commerce industry and three resource based industries (12. "forestry and fishery," 14. "timber, pulp and paper," and 15. "mining"). This is consistent with the hypothesis that America is a trading center as well as a supplier of natural resources and some resource-intensive goods.

(2) As shown in Table 2, part (a, 1), the rank-correlation coefficients between the five indices are positive and statistically significant at the 5% level or better in all cases. This fact is taken as an indication that Japanese DFI is efficiently allocated between the two regions in that the differences in the patterns of DFI in the two regions correspond to differences in profitability and its determinants.

(3) The most crucial relationship is that between the $I_i(h/k)$ and $P_i(h/k)$. Here $I_i(h/k)$ is viewed as a function of $P_i(h/k)$; in other words, relative investment presence is a function of relative profitabilities. This specification is suggested by the correspondence principle between comparative investment advantages and comparative profitabilities. [see Kojima (1978) for detailed development of this principle.] Using a sample of 14 industries (4. "general machinery" is omitted) from Table 1, simple regression of $I_i(h/k)$ on $P_i(h/k)$ yields the following result.

$$(2) \log(e) (I_i) = 0.133474 + 0.833928 \log(e) (P_i) \quad \text{Adj } R^2 = 0.319842$$

$$(0.282194) (2.667061)^* \quad F = 7.113217^*$$

(*-significant at the 5% level) (DW = 0.672911)

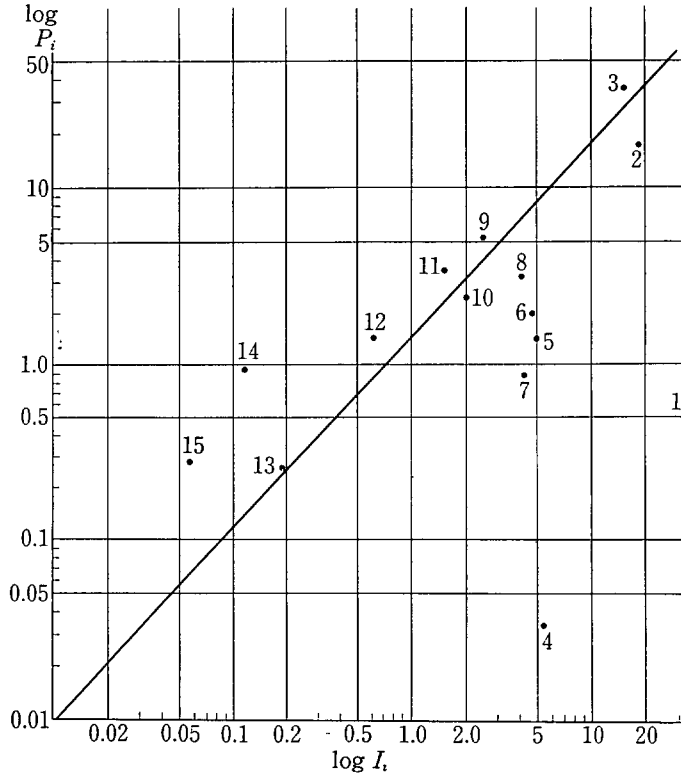
We observe a positive and statistically significant relationship between I_i and P_i as hypothesised; this is illustrated in Fig. 1.

(4) More disaggregated analysis of the relationship between the $I_i(h/k)$ and $P_i(h/k)$ indices reveals that there is a strong tendency for presence to be greater where profitability is higher. This is observed in almost all industries in both regions and is illustrated by the relatively large presence and profit rates of "textiles" in Asia and "commerce" in the North America. In this respect we can again see the tendency for Japanese DFI to be trade-oriented.

However, we also observe several cases in which the profit rate of Japanese firms in North America is negative; "precision machinery," "transport equipment," "other services," and "forestry and fishery" are such cases, the most significant of these being "transport equipment." To this we add cases in which the profit rates of Japanese firms are extremely low, either absolutely or in comparison to Japanese firms in Asia: "textiles," "steel," and "electric machinery" are such cases. In most of these sectors there has historically been a high concentration of Japanese exports and it should be recalled that DFI in these sectors in North America (especially the U.S.) has been largely a result of political pressure or a desire to avoid the erection of trade barriers. I would like to call this type of DFI "DFI dumping" as this DFI results in the substitution of higher cost production in the host country for lower cost imports and is thus anti-trade oriented. Such DFI is thus inconsistent with the free working of the market mechanism.

However, the overall influence of such cases appears to be limited at this point as the weighted average of Japanese firm profit rates in Asia (4.21%) is roughly equal to that in North America (4.31%). Given this fact and the results of the analysis presented above it

FIG. 1. JAPANESE DIRECT INVESTMENT IN ASIA/NORTH AMERICA (AS OF MARCH 1981):
RELATIVE PRESENCE (I_i): RELATIVE PROFIT RATES (P_i)



can be concluded that Japanese DFI in North America and Asia is allocated in a manner largely consistent with the free working of the market mechanism.

(5) Although varying from industry to industry the size of Japanese firms is, on average, smaller in Asia than in North America as firms in Asia are only 38% the size of firms in North America. Ownership shares are also smaller and capital intensity lower in firms in Asia. On average, ownership shares in Asia are 71% of those in North America and capital intensity of firms in Asia is only 15% that of firms in North America. This may represent another characteristic of Japanese DFI in Asia which seems to be particularly representative of the preferred behavioural patterns of Japanese firms abroad.

Japanese DFI in Latin America and Oceania

A similar analysis is also undertaken comparing Japanese DFI in Latin America (the major host country being Brazil) to that in Oceania (the major host country being Australia). A detailed table similar to Table 1 is omitted here but the relevant rank correlation coefficients are given in Table 2, part (a, 2). Here again all coefficients are positive and all but one coefficient is significant at the 5% level or better.

Here it is instructive to focus on two cases, "textiles" and "mining." As to the former

case we note that such investment in Latin America was 13 times greater than such investment in Oceania and that the rate of profit of firms in Latin America was 16.7% while that of firms in Australia was only 7.5%. Here we see a case where Japanese DFI has been allocated in a trade oriented fashion in accordance with the free working of the market mechanism.

However, the story is quite different in "mining." Such DFI amounted ¥92.0 billion in Oceania and ¥6.1 billion in Latin America. On the other hand, before tax profit rates were 4.6% in Oceania and 12.8% in Latin America. After tax rates show a larger difference; such rates were 2.1% and 11.9% respectively.

What do these results mean? Indeed it seems that the Japanese presence in Oceania's mining sector is far greater than warranted. Given the above figures it is natural for Japanese mining DFI to shift from Oceania to Latin America as the latter seems to be a more efficient operating base. Thus, Japanese firms can become more competitive (facilitating greater exports among other things) by investing in Latin America as compared to Oceania.

In view of the fact that mining DFI in Australia and Brazil dominates here it is useful to note that government restrictions in the former country are numerous and may be more severe than Brazilian restrictions. Some examples are restrictions on foreign ownership shares and export pricing policies, a set of export control guidelines, a set of production permission procedures, and a resource rent tax proposal. This bureaucratic red tape is exasperated by troublesome labour relations and frequent wage hikes. I suspected that these problems and the overall politicisation of resource trade with Japan might be a significant cause of the relatively low profit rate of Japan's resource oriented DFI observed in Oceania.

Japanese DFI in Pairs of Host Countries

We have been able to calculate $I_i(h/k)$ and $S_i(h/k)$ (the relative firm size) indices for a number of countries and regions from the Ministry of Finance's approved DFI data. Correlation coefficients between these indices for pairs of host countries were calculated and the results are reported in Table 2, part (b, 3-12). As described in Kojima (1985) this type of analysis can be viewed as a proxy for the more complete analysis involving 5 indices because S_i is expected to be highly correlated with P_i and the other indices. It is indeed remarkable that all coefficients are positive and significant at 1% level. To the extent that $S_i(h/k)$ can be used as a proxy for the omitted indices we can then conclude that here again Japanese DFI appears to be allocated efficiently between countries in that relative presence is greater the more favourable relative business conditions are.

III. *Some Major Characteristics of Japanese DFI's Evolution in Asia*

Here it seems appropriate to add an explanation of how the Japanese DFI pattern is upgraded over time. The major point is that, not only does the pattern of Japanese DFI vary in accordance with comparative trade advantage patterns across countries, but it also changes over time in response to the evolution of host country comparative trade advantage. Such evolution of Japan's DFI pattern leads to the "spread of the Japanese investment frontier." In this way Japanese DFI spreads from light industries utilising simple technologies to more sophisticated industries.

III.A. Changes in the Pattern of Japanese DFI and Changes in the Level of Host Country Industrialisation

The above points are well illustrated in the Fig. 2-5. Here we look at the evolution of Japanese DFI in Brazil and the eight Asian countries discussed in section II. Brazil is a very important destination of Japanese DFI and a NIC which is a major supplier of natural resources (especially iron ore) to Japan.

In these figures we plot an index of the level of industrialisation on the horizontal axis and a DFI ratio showing the relative importance of a certain type of DFI on the vertical axis. As our index of the industrialisation level an indicator which is highly correlated with the (industrial output/total output) ratio for an economy is desirable. In general, per capita GNP corresponds to this ratio quite closely and thus per capita GNP (y) is plotted on the horizontal axis of all figures.

In Fig. 2 we plot the i -ratio, the ratio of Japanese DFI in manufacturing (M) to total Japanese DFI (T) in a given country, on the vertical axis.

(i) In the four resource abundant countries, Brazil, Indonesia, Malaysia, and the Philippines, the i -ratio generally increases with y . Furthermore, the lower country's industrialisation stage (and y) is the lower the i -ratio tends to be. This means that, even in resource

FIG. 2 THE RATIO OF JAPANESE DIRECT INVESTMENT IN THE MANUFACTURING SECTOR (M) TO TOTAL JAPANESE DIRECT INVESTMENT (T) IN EACH HOST COUNTRY, 1972 AND 1982

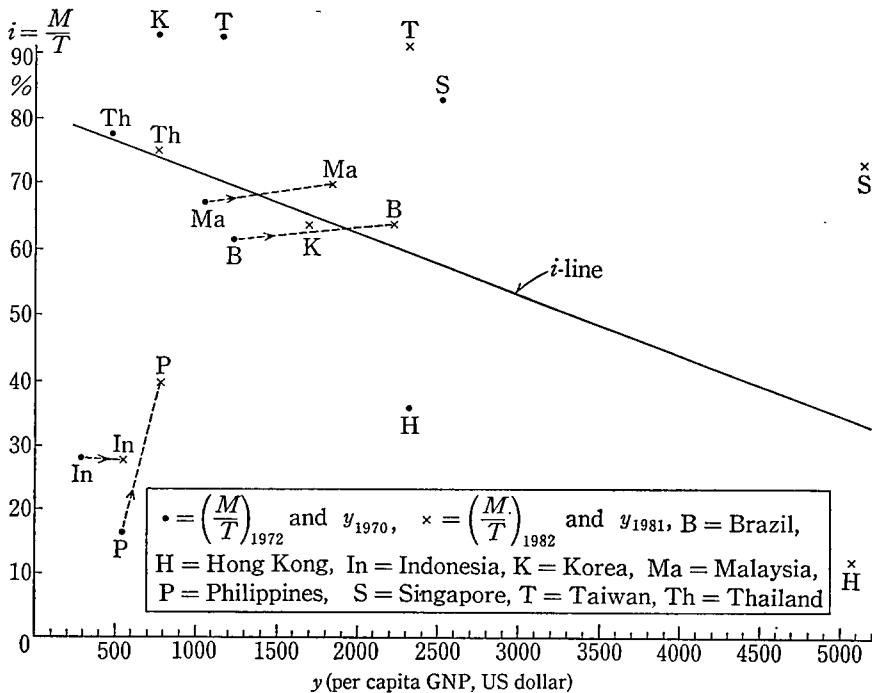


FIG. 3 THE SPREAD OF THE JAPANESE INVESTMENT IN LIGHT INDUSTRIES

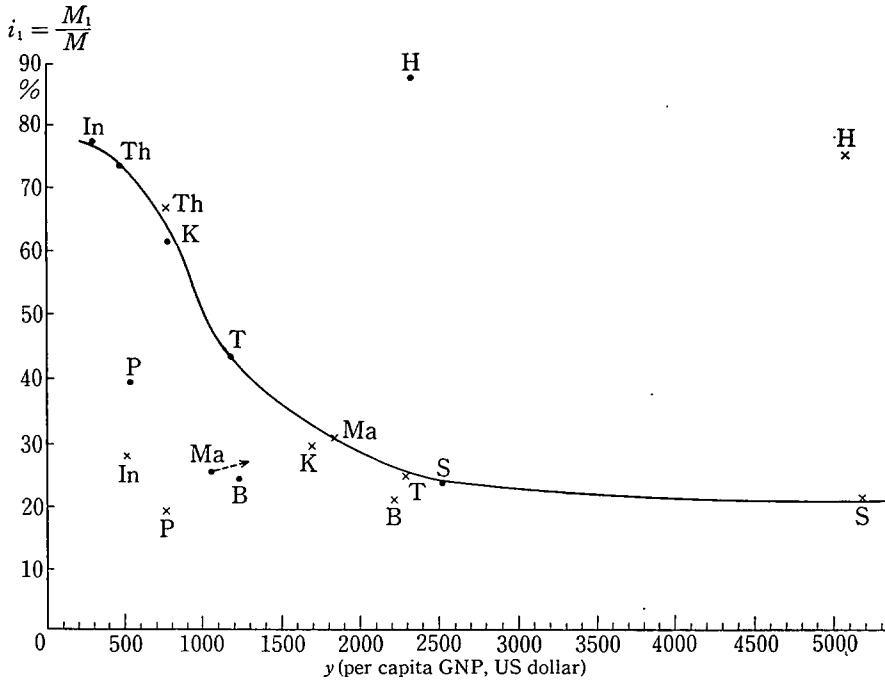


FIG. 4 THE SPREAD OF THE JAPANESE INVESTMENT IN MACHINERY INDUSTRIES

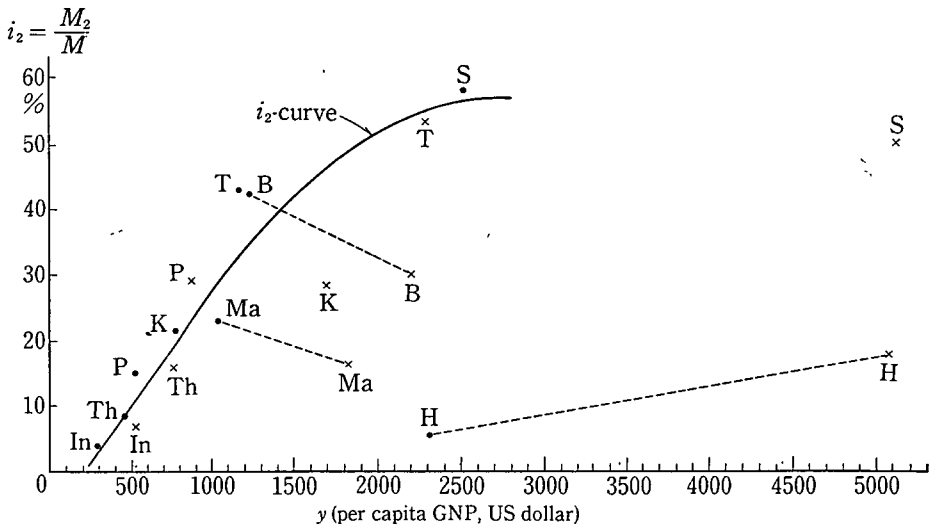
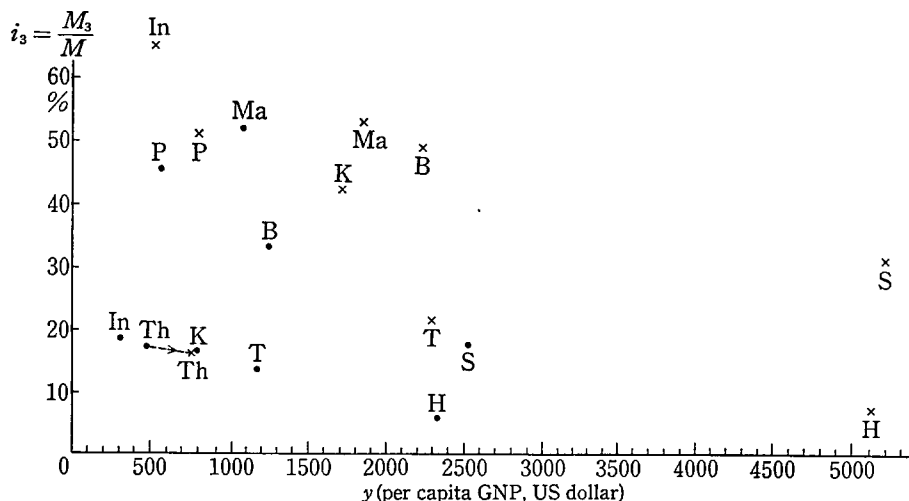


FIG. 5 THE SPREAD OF THE JAPANESE INVESTMENT IN INTERMEDIATE GOODS PRODUCTION



abundant economies, industrialisation has progressed and accordingly the relative importance of Japanese DFI in manufacturing has increased despite the fact that resource development DFI still dominates in some countries (e.g. Indonesia and the Philippines).

(ii) In the other five resource scarce economies, Hong Kong, Korea, Singapore, Taiwan, and Thailand, the i -line is negatively sloped; the i -ratio is a decreasing function of y . The decline is almost coincident with the line in Thailand. The Hong Kong points are far below the line although the line connecting the two points is roughly parallel to the line. The Korean point for 1972 is far above the line although the 1982 point is on the line reflecting a sharp decline in the i -ratio due to the increase in service sector (especially hotel) DFI. Taiwan and Singapore are typical offshore manufacturing production centers (as was Korea in 1972) and thus points are well above the line reflecting the importance of manufacturing DFI in these countries. Yet, here again the i -ratio has declined somewhat with increases in y . Finally, it should be noted that, of the former resource abundant group, points for Brazil and Malaysia have converged toward the line over time. Given the growing importance of the manufacturing sectors in these economies, it might be expected that the i -ratio will begin to decline with further increases in y .

Here again it can be seen that the pattern of Japanese DFI has evolved in a manner consistent with the evolution of the industrialisation and comparative advantage in various host countries.

In figures 3, 4, and 5, y is plotted against some sub-ratios of manufacturing investment in order to illustrate the spread of the Japanese investment frontier. It should be noted that this phenomenon is not observed with regard to resource oriented investments because of their location specific nature. On the other hand, manufacturing is "footloose" allowing a gradual spread of Japanese manufacturing activity abroad in accordance with economic conditions in the host countries involved. To facilitate this investigation the following sub-ratios were calculated.

i_1 -ratio = [Japanese DFI in labour-intensive light industries (M_1)]/total Japanese DFI in

manufacturing (M)]

i_2 -ratio = [Japanese DFI in machinery industries (M_2)/total Japanese DFI in manufacturing (M)].

i_3 -ratio = [Japanese DFI in intermediate manufacturing production (M_3)/total Japanese DFI in manufacturing (M)]

Despite a number of exceptions, in Fig. 3 the i_1 -curve is seen to be generally downward sloping while the i_2 -curve in Fig. 4 is generally upward sloping.

(i) Looking first at the Taiwanese case we notice that the i_1 -ratio declines with y and that the ratio was already quite low in 1972. On the other hand, the i_2 -ratio has increased with y indicating that Japanese DFI shifted from light industries to machinery industries in this period. A very similar pattern is seen in Korea although the i_1 -ratios are somewhat larger and the i_2 -ratios somewhat smaller. In Singapore the i_1 -ratios are even lower but decline only slightly with y while the i_2 -ratios are much larger and decline slightly indicating the fact that machinery was a dominant industry throughout this period in Singapore. Finally, the ratios in Hong Kong show the same movement as in Korea and Taiwan but the i_1 -ratios are much higher and the i_2 -ratios much lower than in the former cases. This divergence reflects the importance of light industries throughout this period in Hong Kong.

(ii) Here again the Thai case closely parallels those of Korea and Taiwan but the levels of the i_1 -ratios are higher and the i_2 -ratios are lower indicating its lower level of industrialisation.

(iii) Behaviour of the ratios in the four resource abundant economies is different than that in the resource scarce economies in one respect or another. In the Philippines and Indonesia the i_1 -ratios also decline with y and the i_2 -ratios also increase with it. However, the decline in the i_1 -ratio is very conspicuous in these cases as are the low levels of the i_2 -ratios in the Indonesian case and the i_1 -ratios in the Philippine case. In Brazil the i_1 -ratios are relatively low and decline slightly while the movement of the i_2 -ratio is different in that it also declines. In Malaysia the pattern observed in most economies is completely reversed; the i_1 -ratio increases and the i_2 -ratio declines.

Turning to Fig. 5 we notice that no clear relationship between the i_3 -ratio and y across countries and y levels emerges. However, it is significant that the i_3 -ratio has risen with y in all countries except Thailand. No clear trend across countries and y levels emerges for the following reasons.

(i) The production of intermediate goods such as iron and non-ferrous metals, basic chemicals, and timber and pulp has a location specific nature and such production has increased in resource abundant countries such as Brazil, Indonesia, Malaysia, and the Philippines. Thus, i_3 -ratios increased with y in these countries and reached quite high levels by 1982 in all of them.

(ii) The rapid rise in the Korean ratio (and its high level in 1982) is explained by its specialisation in the production of intermediate goods based on the import of raw materials. This activity has been facilitated by a high level of industrialisation and increased derived demands for intermediate goods.

(iii) Neither Thailand's natural resource base nor its level of industrialisation seem sufficient to attract Japanese investors in this area yet.

(iv) Finally, Hong Kong, Singapore, and Taiwan are small economies and it is difficult to establish an optimum scale factory in these environments.

TABLE 3. OVERTIME CHANGES IN COMPARATIVE INVESTMENT ADVANTAGE:
THE CASE OF JAPANESE DIRECT INVESTMENT IN KOREA,
1982 COMPARED TO 1972

	$(V_i)_0$ Share of each industry in total investment 1972 (%)	$(V_i)_1$ Share of each industry in total investment 1982 (%)	$(V_i)_1 - (V_i)_0$ Difference of the share in 1982 compared to that in 1972 (p.p.)	$I_i(1/0)$ $(V_i)_1/(V_i)_0$ Overtime changes in investment pattern	$S_i(1/0)$ $(S_i)_1/(S_i)_0$ Overtime changes in size of firms
1 Other services	2.1	28.0	25.9	13.333	19.020
2 Agriculture & forestry†	0.1	1.3	1.2	13.000	33.087
3 Construction†	0.3	2.4	2.1	8.000	17.057
4 Chemicals	3.3	20.5	17.2	6.212	10.243
5 Commerce†	0.1	0.4	0.3	4.000	2.971
6 Finance & insurance†	0.5	0.7	0.2	1.400	5.209
7 General machinery	3.0	3.6	0.6	1.200	2.627
8 Transport equipment	2.0	2.2	0.2	1.100	2.206
9 Timber & pulp†	0.2	0.2	0.0	1.000	0.586
10 Fishery†	0.1	0.1	0.0	1.000	1.679
11 Food & beverages†	1.5	1.4	-0.1	0.933	1.840
12 Expatriate office & real estate	3.3	2.9	-0.4	0.879	0.821
13 Electrical machinery	14.7	12.3	-2.4	0.837	1.779
14 Steel & non-ferrous metal	12.3	6.2	-6.1	0.504	1.410
15 Mining†	0.4	0.2	-0.2	0.500	1.461
16 Other sundry manufactures	10.3	4.9	-5.4	0.476	1.530
17 Textiles	45.8	12.7	-33.1	0.277	0.739
Total (or weighted average)	100.0	100.0	95.4	(1.000)	(2.332)

Note: † unimportant.

Source: Finance Ministry's approval statistics.

Thus, while there is a trend for i_3 -ratios to increase with y within countries, there is a weak tendency for i_3 -ratios to decline with y across countries making it impossible to discern a relationship between y and i_3 -ratios in Fig. 5.

However, as a whole, the figures illustrate the spread of Japanese DFI from labour intensive industries utilising simple technologies to industries utilising more sophisticated technologies (from the M_1 group to the M_2 and M_3 groups). Furthermore, the spread of Japanese DFI corresponds with the increase of the income levels of the host countries indicating that the pattern is closely related to level of development and the evolution of the pattern of comparative trade advantage in the host countries. Such evolution is consistent with the free working of the market mechanism. Japanese DFI has thus contributed to the rapid economic development of Asian countries.

III.B. Overtime Changes in the Pattern of Japanese DFI

Here we can calculate another kind of comparative investment advantage index to show how Japanese DFI changes over time. Let ${}_0V_{i,h}$ and ${}_1V_{i,h}$ stand for Japanese investment in industry i ($i=1, 2, \dots, n$) in host country h at time 0 and time 1 respectively. Then

$$(3) \quad I_{i,h}(1/0) = \frac{{}_1V_{i,h}^J}{\sum_{h=1}^n {}_1V_{i,h}^J} \bigg/ \frac{{}_0V_{i,h}^J}{\sum_{h=1}^n {}_0V_{i,h}^J}$$

can be calculated. This can be called the index of "overtime changes in comparative investment advantage." The calculation of this index and its analysis reveals how DFI patterns are upgraded over time and whether the observed changes are consistent with the working of the market mechanism. In Table 3 the example of Japanese DFI in Korea at the end of fiscal 1972 and 1982 is detailed.

(1) First of all, we notice that "textiles" declined dramatically in importance, correspondingly the $I_i(1/0)$ was only 0.277. A similar decrease is also observed in "other sundry manufactures" where the index was 0.476. These are both rather labour intensive sectors and these indices reflect the concentration of Japanese DFI in labour intensive manufacturing in the late 1960s and early 1970s.

(2) It is also interesting to note declines in the importance of "steel and non-ferrous metals" and "electrical machinery," the indices being 0.504 and 0.837 respectively in these cases. This reflects the fact that DFI in these areas picked up considerably around 1972 but had declined in importance by 1982.

(3) The importance of DFI in "transport equipment," "general machinery," and "chemicals" increased in varying degree due to the increase of DFI in these sectors. This increase is particularly dramatic in "chemicals" as the index of 6.212 indicates. The increase in DFI in "other services" is also important and phenomenal but is due largely to increasing hotel investments made by Koreans residing in Japan.

The above observations correspond closely to our previous description of how Japan's investment frontier has spread.

Next, we have calculated the rank correlation coefficient between $I_i(1/0)$ and $S_i(1/0)$ and this result is reported in Table 4. The coefficient is highly positive and significant at the 1% level meaning that, as the average firm size of an industry increases relative to other industries, relative presence tends to increase as well. On average the size of Japanese investments in Korea increased 2.3 times over the ten year period under study. Since the $S_i(1/0)$ index can be thought of as a proxy for profitability, ownership share, and capital intensity indices, we can conclude it is evident that the pattern of Japanese DFI has evolved in a manner consistent with the operation of the market mechanism in Korea. Thus, Japanese DFI has

TABLE 4. RANK CORRELATION COEFFICIENTS OF OVERTIME CHANGES BETWEEN MARCH 1973 AND MARCH 1983: $I_i(1/0) : S_i(1/0)$

(1) Korea	0.8627**
(2) Taiwan	0.7377**
(3) Hong Kong	0.7770**
(4) The Philippines	0.8873**
(5) Singapore	0.6985**
(6) Malaysia	0.8554**
(7) Thailand	0.5882**
(8) Indonesia	0.8922**

** Statistically significant at 1% level.

Source: Ministry of Finance's approved DFI.

harmonised with and possibly even played a leading role in the restructuring of Korean industries.

(5) The Korean case is representative of the experience of other Asian countries. This is illustrated by the high correlation of $I_i(1/0)$ and $S_i(1/0)$ indices in Taiwan, Hong Kong, the Philippines, Singapore, Malaysia, Thailand, and Indonesia shown in Table 4.

IV. *The Impact of Japanese DFI on Structural Change in Host Countries*

As noted in previous work [Kojima (1978, 1985)], changes in industrial structure induced by DFI are the crucial link between DFI and other impacts imparted by DFI. This process is closely related to the evolution of Japanese DFI described in section III above and in this section we focus on how this mechanism works. There are three steps in this process to consider. (a) First of all, the relationship between the quantity of DFI and the structure (or pattern) of DFI must be considered; here the level of Japanese DFI is postulated to be an increasing function of the rate at which the structure of DFI is upgraded. This first proposition is examined using a cross section of many countries in the region.²

(b) Next one must consider the relationship between the structure of DFI on the one hand and the structure and level of domestic output on the other. Here it is hypothesised that the faster DFI structure changes the faster domestic output structure changes and that greater increases in output also result from faster changes in domestic output (and DFI) structure(s).

(c) Finally, one must consider the relationship between domestic output (and thus DFI) structure(s) and trade structure and levels. Here again more rapid changes in DFI structure (and thus output structure) are thought to lead to more rapid changes in trade structure and more rapid increase in trade levels.

While detailed analysis of (b) is skipped here, analyses of (a) and (c) are taken up in cross-sections. Furthermore, relationships (c) and (b) were reformulated in quantity terms and analysed using regression analysis in previous work [Kojima (1985)].

Our first step is to construct a DFI structural change coefficient for Japanese DFI. Define $(V_i)_0$ as the share of industry i ($i=1, 2, \dots, n$) in total Japanese DFI in a given country or region in year 0 and $(V_i)_1$ as the same share in year 1. Then the sum of the absolute values of the differences between $(V_i)_1$ and $(V_i)_0$ can be defined as structural change coefficient, I_s . (See the third column of Table 3 for an example.)

$$(4) \quad I_s = \sum_{i=1}^n \left| \left(\frac{V_{i,h^j}}{\sum_{i=1}^n V_{i,h^j}} \right)_1 - \left(\frac{V_{i,h^j}}{\sum_{i=1}^n V_{i,h^j}} \right)_0 \right|.$$

I_s and the annual (compound) growth rate of Japanese DFI,³ I_g , are calculated for several

² On the other hand, we have shown that the pattern of American DFI is rather uniform over time [Kojima (1985)]; the important implication of this observation is that there is no relationship between the level and structure of American DFI. This latter proposition is not examined in detail in this subsection but, given that relationships (b) and (c) outlined below apply to any type of investment, it is then differences in the relationship between DFI levels and DFI structure that leads to differences in the impacts of American and Japanese DFI.

³ Both calculations are done utilising the approved DFI data from the Ministry of Finance.

FIG. 6. $I_s : I_0$

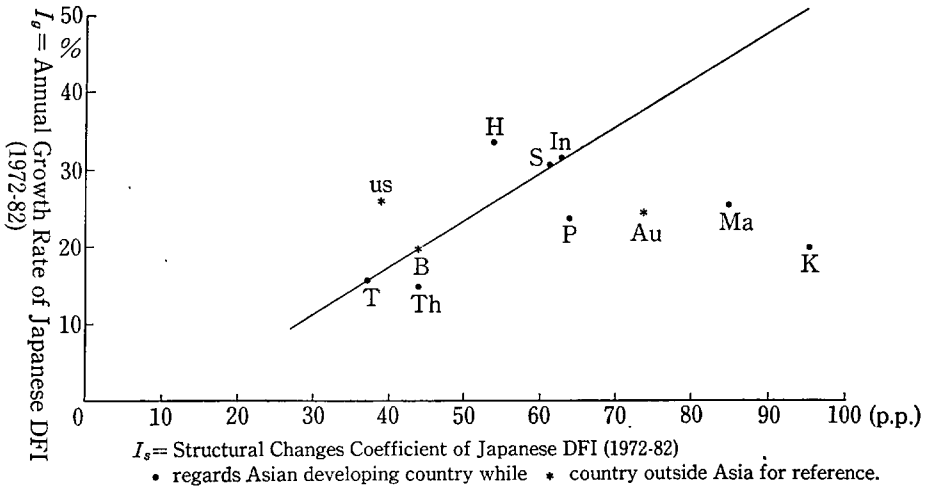


FIG. 7. $I_s : X_s$

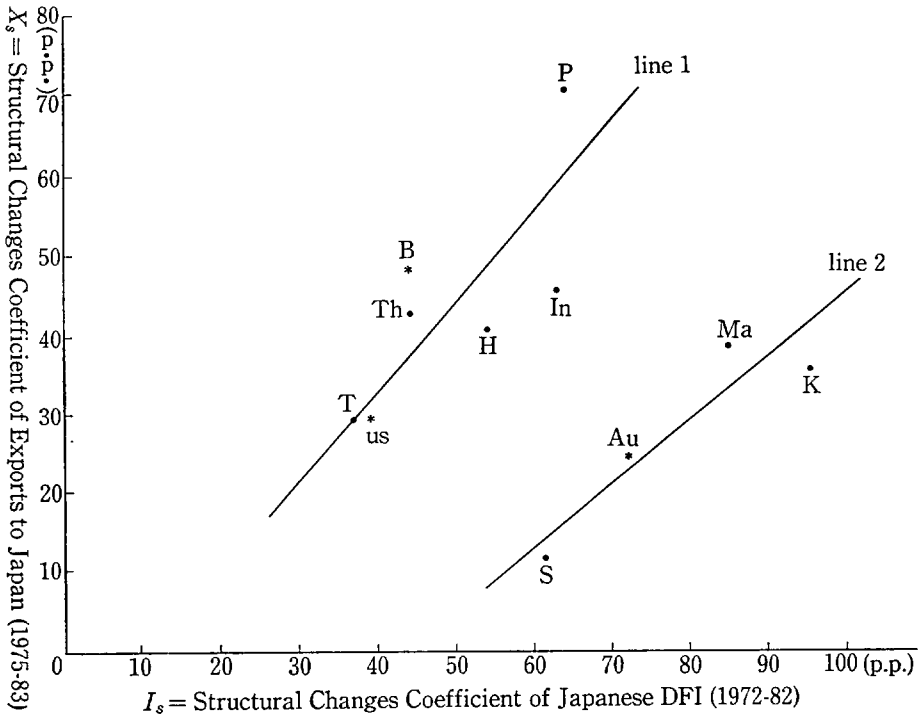
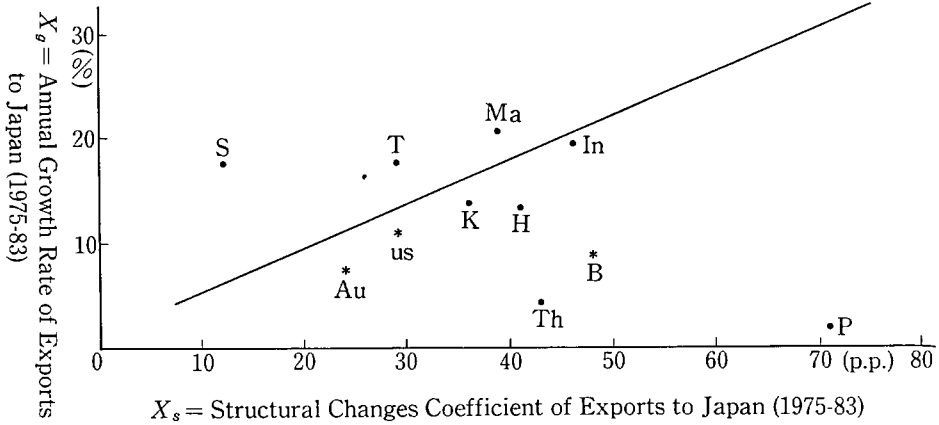


FIG. 8. $X_s : X_g$



economies for the 1972–1982 period and plotted in Fig. 6. In addition we define a Japanese import (host country export) structural change coefficient, X_s , in a manner exactly analogous to I_s . Then X_s and the annual (compound) growth rate of Japanese imports from each host economy, X_g , are calculated for the same economies for the period 1975–1983 using data from Japan’s *White Paper on International Trade*. The differences in the time periods used in the calculations reflect the existence of a time lag between an investment and its impact on exports to Japan. I_s and X_s are then plotted in Fig. 7 and X_s and X_g are then plotted in Figure 8.

Fig. 6 illustrates relationship (a) described above. Indeed rapid growth of Japanese DFI seems to be associated with rapid changes in the structure of such DFI. There are three noticeable outliers in this relationship. Korea is an economy undergoing rapid structural change in which heavy industry and hotel DFI is increasing. However, Japanese DFI did not increase that much in the period under study, although it had reached rather high levels by 1972. Structural change in Japanese DFI in Malaysia and Australia is also unusually high for the rate of growth due to the rapid shift from natural resource development to industrial DFI.

In Fig. 7 two reference lines have been drawn as there are two groups of economies which need to be distinguished here. It should be noted that line 2 represents the relationship in economies undergoing more rapid change in DFI; these are the three outliers in Fig. 6 and Singapore. However, it is important that a positive relationship between I_s and X_s is observed in both groups.⁴

Finally, Fig. 8 shows that X_s and X_g are also positively related in this cross section. However, here again there are some notable exceptions to the general trend. Singapore’s X_g is high despite a small X_s , largely due to the increases in the price of petroleum products experienced during this period. On the other hand, X_g was low despite relatively high X_s ’s in the Philippines, Brazil, and Thailand. A major reason for this is the fact that Japanese

⁴ It should also be noted that, defining M_s as the structural change coefficient of Japan’s exports to each host country (imports of the host country), a similar relationship is also observed between M_s and I_s although such analysis is not reported here.

imports from these countries still consists largely of primary products and that Japan's slowed economic growth in this period had particularly adverse effects on such exports.

In these figures we have thus illustrated relationships (a) and (c) described above. In short, Japanese DFI increases more rapidly when the structure of DFI changes more rapidly and thus contributes to a more rapid change in trade structure. These more rapid changes in trade structure then lead to more rapid increases in the host country's trade with Japan. However, it is significant that the links between Japanese DFI levels and structure on the one hand and trade structure on the other seem to be weaker in more mature economies such as Korea.

V. Conclusion

In this paper we have shown three things. First, we have shown that the pattern of Japanese DFI differs between host countries or regions. Here the differences in the patterns of Japanese DFI in several Asian host countries were first described. Then a three country model of comparative investment advantage was used to show that, in general, Japanese DFI is efficiently allocated between regions. The correspondence principle between comparative investment advantages and comparative profitabilities was also illustrated. Second, we examined how the pattern of Japanese DFI is upgraded over time by analysing the relationship between host country industrialisation and the pattern of Japanese DFI as well as a comparative investment advantage index. Finally, in view of the fact that the pattern (or structure) of Japanese DFI was found to change markedly over time we discussed the relationship between Japanese DFI and structural changes in the host country. These observations support our earlier conclusion [Kojima (1985)] that Japanese DFI contributes efficiently to the development of host countries.

EMERITUS PROFESSOR OF HITOTSUBASHI UNIVERSITY AND PROFESSOR OF INTERNATIONAL CHRISTIAN UNIVERSITY

REFERENCES

- Kojima, K. (1978), *Direct Foreign Investment: A Japanese Model of Multinational Operations*, Croom Helm, London.
- Kojima, K. (1982), "Macroeconomic versus International Business Approach to Direct Foreign Investment," *Hitotsubashi Journal of Economics* 23 (no. 1, June).
- Kojima, K. and Ozawa, T. (1984), "Micro- and Macro-economic Models of Direct Foreign Investment: Toward a Synthesis," *Hitotsubashi Journal of Economics* 25 (no. 1, June).
- Kojima, K. (1985), "Japanese and American Direct Investment in Asia: A Comparative Analysis," *Hitotsubashi Journal of Economics* 26 (no. 1, June).