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JAPANESE AND AMERICAN DIRECT INVESTMENT IN ASIA: A COMPARATIVE ANALYSIS

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I. *Introduction*

In order to empirically investigate the differences between "Japanese-type" direct foreign investment (DFI) and "U.S.-type" DFI[1] (Section II) I have engaged in cases studies of DFI in Asian developing countries over the last few years. I have focused on the four Asian Newly Industrialising Countries (NICs) (Korea, Hong Kong, Singapore, and Taiwan) and the four larger ASEAN (Association of Southeast Asian Nations) countries (Indonesia, the Philippines, Malaysia, and Thailand). While the studies have been hampered by the lack of data, notably the lack of consistent, internationally comparable direct investment data, some interesting results have emerged and this paper briefly summarises the more important findings of these studies.

In section III it is shown that American DFI exhibits a remarkably uniform pattern across countries and across time while the pattern of Japanese DFI differs significantly between countries and over time. This is hypothesised to result from the dominant influence of multinational corporations (MNCs) on American DFI (Hence it is characterised as "MNC-type" DFI.) and the Japanese concern with promoting DFI which is consistent with the evolution of comparative advantage patterns between the host countries and Japan.

In section IV the differences between American and Japanese investment presence are further explored using a three country (two investing countries, one host country) model of comparative investment advantage. Major emphasis is on the Taiwanese case here as data availability is greatest in this case. Here again we observe phenomena which reinforce the characterisations of Japanese and American DFI in section III.

Section V investigates the impact of DFI on the balance of trade and the level of GNP in several host countries as well as notes the difficulties inherent in evaluating the trade orientation of DFI statistically. Statistical analysis relies on survey information and some econometric analysis. Here it is seen that Japanese DFI's contribution to GNP was generally greater than that of American DFI and that its effects on trade are generally more pronounced. Furthermore, both American and Japanese DFI generally resulted in improvements or no change in the trade balance, contrary to the often heard criticism that DFI results in an increase in the trade deficit. (This is a particularly common criticism of Japanese DFI.) We conclude by observing that, while both American and Japanese DFI have contributed to host countries in these respects, in most cases Japanese DFI appears to have contributed to the development of the host economies more efficiently.

[1] These differences were first noted by Kojima (1973) and then detailed in Kojima (1978). The theoretical framework has since been further developed by Kojima (1982) and Kojima and Ozawa (1984).

II. *A Macroeconomic Model of Trade and Investment: the Kojima Hypothesis*

Here a macroeconomic model of trade and investment used to illustrate "Japanese-type" DFI is briefly introduced as it generates the hypothesis which this paper attempts to test. This is just a brief outline of the model and the reader is referred to other sources [Kojima (1978), Kojima (1982), and Kojima and Ozawa (1984)] for more complete treatment.

It is assumed that the direction of international trade is determined by "comparative costs" or, in other words, "comparative *trade* advantages." Given this the following proposition can be established. [See Kojima and Ozawa (1984), p. 6.]

> Proposition 1: Countries gain from trade and maximise their economic welfare when they export comparatively advantaged goods and import comparatively disadvantaged goods.

Let C stand for production cost, A and B for two countries, and x and y for two commodities. Assume comparative costs to be such that:

(1) $(C_{yA}/C_{xA})<(C_{yB}/C_{xB})$

or, for example,

(2) (\$1/\$2)/(¥300/¥200)<1

Here country A exports good y and imports good x while B does the opposite. Assuming that trade is balanced and that there are no transportation costs and tariffs, relative prices (or the terms of trade), p, would be

(3) $p=(P_{yA}/P_{xA})=(P_{yB}/P_{xB})$

where P is the absolute price of a good. For the numerical example,

(4) 1=(\$1.25/\$1.25)=(¥250/¥250)

implying that exchange rate is \$1=¥200.

Assuming constant costs for simplicity (violation of this assumption does not change major conclusions), country A specialises in the production of good y while country B specialises in the production of good x.

Returning to the numerical example we see that the production cost of good y in country A is \$1 while its export price is \$1.25. Thus, there is a 25% profit rate in this industry. In contrast the production cost of good x is \$2.00 while its import price is \$1.25. Thus, producers of x in country A incur negative profits and shut their plants down.[2] In country B a similar process occurs but in reverse; i.e. production of good y ceases.

This example illustrates the "correspondence principle between comparative costs and comparative profitabilities." By this it is meant that a country specialises in and exports the products of the comparatively advantaged industry because it is most profitable to do so and that difference in cost structures are the cause of differences in profitability between countries. In this sense to specialise along the lines of the pattern of comparative advantage is to do busi-

[2] In the traditional theory of international trade, however, gains from trade are evaluated in terms of increased welfare of a nation as a group of consumers based on analysis of a general equilibrium model. Consequently there is much research to be done before such analyses can be directly related to business activities.

ness in a manner consistent with the free working of the market (or price) mechanism.

Now let us introduce DFI into the model. It can be established that [Kojima and Ozawa (1984), p. 61]:

> Proposition 2: Countries gain even more from expanded trade when superior entrepreneurial endowments are transferred through corporations from home countries' comparatively disadvantaged industries in such a way as to improve the efficiency of the comparatively advantaged industries in host countries.

Due to DFI by country A's x industry in country B's x industry comparative costs change from those given in (1) and (2) to

(5) $(C_{yA}/C_{xA})<(C_{yB}/C_{x*})$

where C_{x*} stands for the production cost of good x after DFI and it is assumed that $C_{x*}<C_{xB}$. In our numerical example we get:

(6) (\$1/\$2)/(¥300/¥150)<1

If the terms of trade remain the same as given in equation (4), the rate of profit for country B's x industry increases to 66% [(¥250-¥150)/¥150] as compared to 25% [(¥250-¥200)/¥200] in the case of no DFI. This rate of profit is asserted to be uniform for all firms in country B's x industry due to the transfer of technology and other spread effects; thus such profits accrue to both domestic firms and foreign affiliates.

Futhermore, if the decline in costs results in a decline in P_{xB} (and the increase in the profit rate is thus somewhat smaller) the terms of trade moves in a direction favourable for A and A will gain from increased imports. This is the case of "offshore sourcing" through DFI. In addition, if y is an input needed in the production of x, A can also benefit from increased exports of y. In our numerical example we have:

(7) (\$1.25/\$1.00)=(¥250/¥200)=1.25

Thus the profit rate of B's x industry is only 33% [(¥200-¥150)/¥150].[3]

Thus, "a comparative *investment* advantage" for country A lies in country B's x industry, in which production costs are relatively low and can be further reduced through DFI. Furthermore, DFI by A in B's x industry is "trade oriented" DFI, which brings about "dynamic trade creation." This type of DFI is a complement to international trade, not a substitute for it. Finally, since such DFI yields greater profits than a case of no DFI, it is consistent with the free working of market mechanism.

In contrast, if DFI is directed into B's comparatively disadvantaged y industry, comparative costs become:

(8) $(C_{yA}/C_{xA})<(C_{y*}/C_{xB})$

[3] This latter case is the more usual one. Here competition eliminates "abnormal" profits in the longer run and they will thus converge to a "normal" rate. This is a crucial element of the correspondence principle between comparative costs and comparative profitabilities originally presented by Kojima (1973) and recently developed more precisely by Pyun (1984). The latter (p. 22) says, "The significance of Kojima's treaty on "trade-oriented" DFI model lies in his propositions that the market imperfections and monopoly profits are not crucial determinants for DFI and that DFI complements trade under the Heckscher-Ohlin theory."

where $C_{y*} < C_{yB}$ is assumed. In our numerical example we get:

(9) [(\$1/\$2)/(¥275/¥200)] < 1

Even if the terms of trade remain as in (4) no profit can be made in B's y industry as the cost of production (¥275) is still higher than the price (¥250). This is "anti-trade oriented" DFI which is usually induced by high tariffs and other protectionist measures taken by the host country. It is thus motivated by the desire of multinational corporations to capture protected markets. This type of DFI necessarily substitutes for trade.

In this paper we will show that Japanese DFI is the "trade oriented type" and, while American DFI in the Asian countries studied here cannot be characterised as "anti-trade oriented," we will show that, in general, it is not as trade oriented as Japanese DFI. As a result it will be seen that Japanese DFI has generally been efficient in promoting the growth and development of host economies.

III. *MNC-type versus Japanese-type DFI*

III.1. Materials and Methodology

Through country studies using host country data it was recognised that there is a substantial difference between American and Japanese DFI in the eight Asian countries studied. Here an attempt to systematically identify some of these differences is made using investing country data. Here we rely on data contained in the U.S. Department of Commerce's Survey, *U.S. Direct Investment Abroad, 1977* and figures on approved Japanese DFI published by the Japanese Ministry of Finance annually.

From these sources we can easily obtain the value of DFI abroad, $V_{i \cdot h}{}^{A}$ where A stands for the investing country, the U.S.A., h for the host country of concern, and i for the industry invested in. From this we can obtain the American *investment pattern* by analysing the following index for all i:

$$(10) \quad V_{i \cdot h}{}^{A} \Big/ \sum_{i=1}^{n} V_{i \cdot h}{}^{A}$$

where the denominator is the total amount of A's DFI in country h. The investment pattern can also be illustrated by a simple industry-wise ranking of DFI in the host country of concern. Similarly, we can also analyse the Japanese investment pattern for each host country h using:

$$(11) \quad V_{i \cdot h}{}^{J} \Big/ \sum_{i=1}^{n} V_{i \cdot h}{}^{J}$$

III.2. The Pattern of American DFI

Table 1 gives American DFI in the world, various regions, and certain countries by sector of investment. The table refers to the total assets accumulated by American firms at the end of calender 1977. As such this table varies somewhat from the tables on the "U.S. Direct Investment Position Abroad" published in the survey and annually in the *Survey of Current Business* although the investment pattern observed is quite similar in all sources.

TABLE 1. SECTORAL AMOUNT AND RANKING OF AMERICAN DFI IN DIFFERENT HOST AREAS (END OF 1977)

	World			Developed countries		Developing countries		Latin America		Asia*		Japan	
	$m.	Share %	rank	$m.	rank	$m.	rank	$m.	rank	$m.	rank	$m.	rank
1. Banking, Finance, Insurance & Real Estate	415,591	50.1	1	261,817	1	153,774	1	113,975	1	25,654	1	16,128	1
2. Petroleum	114,801	13.8	2	76,638	2	28,001	2	7,986	2	6,105	2	12,952	2
3. Trade	56,132	6.8	3	47,942	3	8,189	4	5,363	4	1,740	4	11,583	3
4. Chemicals & Allied Products	38,782	4.7	4	28,227	4	10,555	3	7,523	3	2,500	3	3,313	5
5. Other Industries**	33,791	4.1	5	21,210	7	7,970	5	3,616	7	1,128	6	408	12
6. Transportation Equipment	32,112	3.9	6	26,873	5	5,239	7	4,406	5	491	7	3,702	4
7. Machinery, Except Electrical	28,352	3.4	7	25,348	6	3,004	11	2,462	10	427	9	2,332	6
8. Primary Fabricated Metals	21,406	2.6	8	16,857	8	4,569	8	3,439	8	440	8	787	9
9. Mining	18,286	2.2	9	12,246	10	6,040	6	3,746	6	224	12	0	20
10. Electric & Electronic Equipment	17,118	2.0	10	13,042	9	4,076	9	2,355	11	1,295	5	745	10
11. Food & Kindred Products	14,176	1.7	11	10,809	11	3,367	10	2,752	9	423	10	799	8
12. Paper & Allied Products	7,876	0.9	12	6,372	12	1,504	13	1,367	12	83	17	148	15
13. Rubber Products	6,279	0.8	13	4,657	14	1,622	12	1,211	13	252	11	D	13
14. Instruments & Related Products	5,615	0.7	14	5,140	13	474	17	418	16	26	20	516	11
15. Textile Products & Apparel	3,439	0.4	15	2,411	15	1,029	14	765	14	D	15	93	17
16. Stone, Clay, Cement & Concrete	3,346	0.4	16	2,375	17	971	15	713	15	217	13	169	14
17. Other Manufacturing	2,930	0.4	17	2,411	16	519	16	376	17	112	16	136	16
18. Tobacco Manufactures	2,763	0.3	18	D	18	D	18	D	18	56	18	0	22
19. Glass Products	2,699	0.3	19	2,324	19	375	19	335	19	40	19	887	7
20. Lumber, Wood, Furniture & Fixtures	1,722	0.2	20	1,488	20	234	20	D	20	129	14	5	19
21. Miscellaneous Plastic Products	1,323	0.2	21	D	21	D	21	280	21	13	21	D	21
22. Printing & Publishing	1,081	0.1	22	962	22	119	22	86	22	D	22	22	18
Total	829,617	100.0		572,403		242,441		163,702		41,538		55,681	

* Excluding Japan, Australia, New Zealand and the South Pacific.

** Agriculture, Forestry and Fisheries, Construction and Other Services.

D Indicates items of same ranking as the world ranking.

Source: U.S. Department of Commerce, *U.S. Direct Investment Abroad, 1977* (published in April, 1981).

TABLE 2. SECTORAL RANKING OF AMERICAN DFI (END OF 1977)

	World	Asia***	Taiwan	Korea	Hong Kong	Singa-pore	Malay-sia	Thai-land	Phili-ppines	Indo-nesia
Banking and Insurance	1	1	1	3	1	1	1	1	1	2
Petroleum	2	2	7−	1	3	2	2	2	2D	1
Trade	3	4	5	4	2	5	5	3	5	5
Other Manufac-turing*	4	7	4D	9−	4D	4D	4D	4	3	4D
Chemicals	5	3	2	2	7	10−	7	5	8	3
Other Industries**	6	6	10−	6	5	8	6D	6D	6D	6D
Transportation Equipment	7	8	6	7D	10	7D	12−	11−	7D	9
Non-Electric Machinery	8	10	8	8D	8	6	8D	12−	12−	12−
Metals	9	9	11	11	9	9	11	8	9	7
Mining	10	12	12	12	11	12	10D	10	10	10D
Electric and Electronic Equipment	11	5+	3+	5+	6+	3+	3+	9	11D	11D
Food & Kindred Products	12	11	9	10	12D	11	9	7+	4+	8+
Total (US$ Million)	829,617	41,538	2,574	3,021	10,909	10,121	1,399	1,205	5,480	3,619

* Total of Labour Intensive Industries: Paper; Rubber; Musical Instruments; Textiles; Cement; Tobacco; Glass; Furniture; Plastics; Printing; Others.
** Agriculture, Forestry and Fisheries; Constructions; Other Services.
*** Excluding Japan, Australia, New Zealand and the South Pacific.
\+ Indicates items four ranks or more higher than the world ranking.
− Indicates items four ranks or more lower than the world ranking.
D Indicates items of same ranking as the world ranking.
Source: U.S. Department of Commerce, *U.S. Direct Investment Abroad, 1977* (published in April, 1981).

The most remarkable characteristic which emerges from this table is the fact that the sectoral pattern of American DFI is quite uniform throughout the world. In other words, the patterns of DFI in the world, developed countries, developing countries, Latin America, Asia, and Japan are all quite similar. The importance of this observation is underscored by the fact that the Pearson rank correlation coefficients of the sectoral ranking of worldwide DFI and DFI in each individual group or country are all positive and statistically quite significant.

This uniformity is again observed in Table 2 in which sectoral rankings of American DFI in the 8 Asian developing countries of major concern here are presented. Here it should be noted that 11 of the more narrowly defined categories in Table 1 are summed into the "Other Manufacturing" category in this table. Furthermore, some figures are unavailable due to the Department of Commerce's policy of not revealing investments made by individual firms. Categories marked by "D" indicate that the figure was suppressed to avoid disclosure of an individual firm's investment. In such cases, these sectors were assigned a ranking equal to that of the sector in the world ranking.

Using this assumption the major differences between patterns of investment in the world, the Asian region (excluding Japan), and the 8 countries of concern are indicated using a "+" or a "−". A "+" means that the sector in question is at least four ranks higher than in

the world pattern and a "−" means that it is at least four ranks lower. The relative lack of these marks in the table leads one to conclude that the pattern of US investment is relatively uniform in the Asian region as well.

The most notable exceptions to this observation are found in countries where the ranking of electric and electronic equipment is markedly more important than in the world ranking (Taiwan, Korea, Hong Kong, Singapore, and Malaysia). It is significant that most of these countries are resource-poor and have thus found it advantageous to emphasise labour-intensive industries. Investment in this sector depends heavily on the availability of cheap labour and reflects the tendency towards the "international division of the production process" discussed below.

The Pearson rank correlation coefficient was calculated for the world and each host country as well as for each pair of countries. In all 36 coefficients were calculated and all were positive. The coefficients were statistically significant at the 1% level in 17 cases and at the 5% level in 13 cases. Furthermore, the 6 cases which generated coefficients not significant at the 5% level or better (Taiwan and Thailand, Taiwan and the Philippines, Taiwan and Indonesia, Korea and the Philippines, Singapore and the Philippines, and Singapore and Indonesia) involve pairs of economies with drastically different resource endowments. In short, these results give strong support to the conclusion that the American pattern of DFI is uniform irrespective of host country in Asia.

Turning to Table 3 the evolution of the pattern of American DFI can also be analysed. This table utilises the annually published data on the (net) direct investment position abroad at the end of each year in question mentioned above and thus the rankings are slightly different than in the first 2 tables. In examining this table it is noticed that the ranks of "chemicals" and "non-electric machinery" have increased somewhat since 1966 and that of "mining" has fallen significantly. However, one cannot help being impressed by the relative uniformity of the pattern over time. In fact this pattern has remained quite uniform since soon after the last World War. Here it should also be noted that this uniformity over time is observed in all the regions and countries mentioned above to the extent that data is available.

To sum up, it can be said that the pattern of American DFI is remarkably uniform in

TABLE 3. OVERTIME CHANGES IN SECTORAL RANKINGS OF AMERICAN DFI IN THE WORLD

	1966	1977	1982
Petroleum	1	1	1
Banking & Insurance	3	2	2
Trade	4	3	3
Other manufacturing	2	4	4
Chemicals	8	5	5
Non-electric equipment	9	6	6
Other industries	5	8	7
Transportation equipment	7	7	8
Food & kindred products	11	10	9
Electric & electronic equipment	10	11	10
Mining	6	9	11
Metals	12	12	12

Source: Survey of Current Business, February 1981, August 1983. *US Direct Investemnt Abroad 1977.*

different countries, regions, and the world. Furthermore, this pattern is uniform with respect to time as well. What does this uniformity mean?

First of all, one could conclude that American DFI is undertaken without consideration of the comparative trade advantage positions of the U.S. or the host country involved. If this statement were not true we would expect the pattern of American DFI to differ between countries and over time because comparative trade advantage positions differ between countries and are changing over time. As will be detailed below there is considerable variation in the Japanese pattern between countries and across time.

Secondly, one might be able to conclude that the pattern of American DFI is determined mainly by the microeconomic interest of the MNCs involved. The most important category of American DFI is "finance" followed by "oil and oil refining," "trade," "chemicals (including pharmaceuticals)," "transportation equipment (mainly automobiles)," "non-electric machinery," "metals," "mining," "electric and electronic equipment," and "food (mainly companies such as Coca-Cola, MacDonald's, etc.)." It is notable that the important categories in this pattern are those dominated by large MNCs. It is further significant that the top categories in this ranking are those industries in which large MNCs find it most profitable to operate by exploiting their worldwide networks. These are oligopolistic industries which specialise in the production of differentiated products and in which the gains from transaction and market internalisation are pronounced. Finally, it should be noted that the structure of these industries has not changed much over the years and thus the investment patterns of the firms involved has changed little as well.

In short, the uniformity of the American investment pattern seems to reflect the fact that, in general, the same MNCs have dominated American DFI[4] in all regions of the world and that the interests of dominant firms have changed little over time. Thus, American DFI can be classified as the "MNC-type" of DFI.

III.3. The pattern of Japanese DFI

How about the pattern of Japanese DFI? Table 4 provides information for Japanese DFI similar to that given for American DFI. Columns A provide figures covering the cumulative total of approved investments through the end of fiscal 1972 (March, 1973) and columns B give the same information through the end of fiscal 1982 (March, 1983). These approval figures are different than the American ones in that they also include direct loans, expatriate offices, and real estate, although the last two items are of very limited importance. Despite the differences between the data sets it is still instructive to analyse the patterns of DFI which emerge.

In contrast to the American case described above, a marked difference in Japanese DFI patterns between countries is observed in Table 4. This dissimilarity is illustrated by the relative lack of significant Pearson rank correlation coefficients in Table 5. Table 5 gives coefficients for pairs of Asian countries using March, 1983, figures. (Those obtained using March, 1973, figures are omitted for simplicity.) Table 4 also shows that some significant

[4] There is certainly some small, non-MNC investment made by American firms. Therefore, it would be worthwhile to analyse the proportion of American DFI made by firms listed in *Fortune*'s top 500 in different countries. Chung H. Lee (1980) does differentiate major and non-major American corporations. He then compares American DFI with Japanese DFI and finds evidence supporting Kojima's hypothesis.

TABLE 4. SECTORAL RANKING OF JAPANESE DFI (COLUMNS A: END OF MARCH, 1973, COLUMNS B: END OF MARCH, 1983)

	World		Asia		Taiwan		Korea		Hongkong		Singapore		Malaysia		Thailand		Philippines		Indonesia	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Mining	1	1	1	1	10	14	12	16	12	14	17	17	1	2	8	15	1	1	1	1
Other Services	2	2	6	2	7	10	8	1	1	1	6	2	8	7	6	8	5	5	5	5
Commerce	3	3	10	6	13	9	15	14	3	2	11	7	13	10	3	3	10	15	12	13
Finance & Insurance	4	4	5	10	14	17	11	13	4	3	8	11	17	14	13	12	11	9	3	11
Textiles	5	10	2	4	2	5	1	3	2	4	9	13	9	3	1	1	4	7	2	3
Timber & Pulp	6	13	13	15	12	12	14	15	11	11	7	14	2	6	15	14	15	12	9	8
Subsidiaries & Real Estates	7	8	15	13	6	7	6	8	6	6	10	8	10	15	11	16	8	14	17	17
Steel & Non-Ferrous Metals	8	5	7	3	9	6	3	5	8	13	12	9	4	5	4	7	3	2	7	2
Electric Machinery	9	7	3	7	1	1	2	4	7	8	3	5	3	4	10	13	7	13	13	12
Transportation Equipment	10	9	12	11	16	8	9	10	17	17	1	6	14	12	9	5	14	3	16	9
Chemicals	11	6	9	5	4	4	5	2	14	15	5	1	7	1	5	6	13	4	11	7
Machinery, General	12	11	14	9	5	2	7	7	13	9	4	3	16	13	14	9	17	16	14	16
Other Manufacturing Industries	13	12	4	8	3	3	4	6	5	5	2	4	5	8	7	2	12	8	8	4
Food Manufacturing	14	14	11	14	8	11	10	11	10	12	13	10	6	11	2	4	9	10	10	14
Agriculture & Forestry	15	15	8	12	17	16	17	12	15	7	15	15	12	9	12	11	2	6	4	6
Fisheries	16	17	16	17	15	15	16	17	16	16	16	16	11	17	17	17	16	17	6	10
Construction	17	16	17	16	11	13	13	9	9	10	14	12	15	16	16	10	6	11	15	15
Total (US$ millions) A	6,773		1,390		108		207		99.6		90		75.5		129		88		473	
B	53,131		14,552		479		1,312		1,825		1,383		721		521		721		7,268	
Annual Growth Rate (%)	22.63		26.20		16.05		20.10		33.80		31.40		25.57		14.95		23.25		31.40	

Source: Ministry of Finance, *Zaisei Kinyu Tokei Geppo*, Sept., 1973 and Dec., 1983.

TABLE 5. RANK CORRELATION COEFFICIENTS OF JAPANESE DIRECT INVESTMENT BETWEEN IN ASIAN DEVELOPING COUNTRIES (AS END OF MARCH, 1983)

	Korea	Singapore	Hongkong	Thailand	Malaysia	Philippines	Indonesia
Taiwan	0.7206**	0.7230**	0.0515	0.4338*	0.3750	−0.0564	−0.0392
Korea		0.7181*	0.2647	0.4632*	0.4093*	0.2794	0.1544
Singapore			0.2108	0.4412*	0.1373	0.0098	−0.1912
Hong Kong				0.2328	−0.0294	−0.2157	−0.0809
Thailand					0.2745	0.2868	0.2132
Malaysia						0.5731**	0.7034**
Philippines							0.7647**

** Statistically significant at 1% level.
* Statistically significant at 5% level.
Source: Calculated from Table 4.

changes in investment patterns in each country occurred between March, 1973, and March 1983. In short, the Japanese DFI pattern *varies* depending on the host country involved and over time.

Particularly important in this respect is the Japanese practice of considering the impact of its DFI on the pattern of comparative trade advantage. In order to be consistent with the free operation of the market mechanism Japan makes a noticeable effort to develop an investment strategy which promotes the development of industries which have or are gaining comparative trade advantages in the host country concerned.

In this respect it is instructive to examine the pairs of countries in which patterns of Japanese DFI are relatively similar. First of all, patterns of DFI in the resource scarce economies of Korea, Singapore, and Taiwan are all similar as illustrated by the positive and significant correlation coefficients. This is to be expected as all these countries are resource scarce and Japanese DFI in these countries, especially that in export processing zones (EPZs), is often undertaken as a part of international division of the production process.

Secondly, it is noticed that patterns of DFI in the resource abundant countries of Indonesia, Malaysia, and the Philippines are relatively similar. Here again correlation coefficients are positive and significant. Yet, the correlation coefficients between these two groups of countries are generally not significant (The one exception is that of Korea and Malaysia.) and often negative; thus, one can conclude that the patterns of investment in these two groups of economies are dissimilar.

Thirdly, it might be expected that the DFI pattern in Hong Kong would resemble that in the resource scarce group but the pattern is actually quite different due to the importance of commerce, finance, and light manufacturing industries in the Hong Kong economy and in the Japanese DFI pattern. Finally, it is interesting to note that the pattern of DFI in Thailand is more similar to that in the resource scarce group than that in the resource rich group.

III.4. Conclusion

It has become clear that there is a distinctive difference between the patterns of American and Japanese DFI. American DFI can be classified as the MNC type of DFI and its pattern is remarkably uniform across host countries or regions and across time. This type of DFI

is motivated by the profit seeking interests of MNCs and is well explained by the "international business approach" to DFI. In contrast, the pattern of Japanese DFI varies between countries or regions and over time. Particularly important is the fact that the effect of DFI on the patterns of comparative trade advantage and their evolution over time is taken into account in the investment decision. In this respect it is necessary to develop a macro-economic theory of DFI to explain Japanese type DFI[5] as is briefly outlined in section II. In addition to describing the differing patterns of Japanese and American DFI, it is also important to explain how the behaviour and sources of firm competitiveness for Japanese and American firms differ. This is the topic of the next section.

IV. *American and Japanese Investment Presence Compared*

IV.1. Comparative Investment Advantage Analysis

In a well known work G.D.A. MacDougall (1951) attempted to test the validity of the comparative cost trade theory using a three country model in which American and British exports to the rest of the world were compared.[6] Defining X as exports to the rest of the world, US as a superscript indicating American activity, Br as a superscript indicating British activity, and i ($i=1,2,...n$) as a subscript indicating commodity category, an index of relative export shares was calculated.

$$(12) \quad \frac{X_i^{US}}{\sum_{i=1}^{n} X_i^{US}} \Bigg/ \frac{X_i^{Br}}{\sum_{i=1}^{n} X_i^{Br}}$$

This index was asserted to *reveal* industries in which the two countries had a comparative trade advantage or a competitive edge. Thus, this index was later named the index of "revealed comparative advantage." In order to test the comparative cost theory of international trade this index was then correlated with the following index of labour productivity.

$$(13) \quad L_i^{US}/L_i^{Br}$$

Here L is labour productivity with superscripts and subscripts as defined above. A high (and statistically significant) correlation was taken as evidence supporting the comparative cost theory of international trade.

In a similar way we can develop an index of "revealed comparative *investment* advantage"

[5] Here it should be emphasised that "Japanese type" and "MNC type" DFI are abstract concepts and that they are used as such. The above discussion should not be interpreted as meaning that all Japanese DFI is "Japanese type" DFI or that all American (and European) DFI is "MNC-type" DFI. Rather it is asserted that the majority of Japanese DFI is "Japanese type" and that the majority of American (and European) DFI is "MNC type." See Arndt (1974, p. 31) and Buckley (1983, p. 97) for some comments in this respect.

[6] See also Kojima (1970). Bilateral trade between the US and Britain was excluded because it was distorted by tariffs and other trade barriers and thus comparative costs were not a major determinant of observed trade flows making analysis of such trade flows meaningless in this context. However, it was meaningful to compare export performances in third markets as American and British firms faced a common environment in this case.

between American and Japanese investment in a given host country. This is obtained by using the definitions of investment patterns given in (10) and (11) above. We obtain

$$(14)\quad I_i(A/J)=\frac{V_{i\cdot h}{}^A}{\sum_{i=1}^{n} V_{i\cdot h}{}^A}\Bigg/\frac{V_{i\cdot h}{}^J}{\sum_{i=1}^{n} V_{i\cdot h}{}^J}$$

This is the I_i-index and reflects the relative presence of the two types of investment. If the index is greater than 1 this indicates a larger American presence and thus reveals a comparative investment advantage for American firms in the industry in question. If the index is less than 1 a larger Japanese presence is indicated revealing a comparative investment advantage for Japanese firms in the industry in question.

Recalling the fact that the pattern of American DFI is quite uniform throughout the world while the pattern of Japanese DFI varies from country to country, it then follows that the I_i-indices for a country will vary in accordance with the pattern of Japanese DFI.

Having defined the I_i-index the next task is to describe its determinants; in short an attempt to describe the determinants of comparative investment advantage is made. The most important direct determinant should be the profitability of the DFI in question. Let P_i denote the rate of profit in industry i; then:

$$(15)\quad P_i(A/J)=P_i{}^A/P_i{}^J$$

shows the relative profitability of American DFI in industry i as compared to that of Japanese DFI in that industry in a given host economy. We then write:

$$(16)\quad I_i=f(P_i);\ \text{where } (dI_i/dP_i)>0 \text{ is postulated.}$$

This hypothesis means that American and Japanese firms invest in industries in which their relative (to the other country's firms) profitability is high. This hypothesis will be tested in the Taiwanese case below by using simple regression analysis. Examination of the industry rank correlation coefficients between of I_i and P_i will also be used to evaluate this hypothesis; if the regression and rank correlation coefficients are positive and statistically significant this can be taken as evidence that the hypothesis is correct.

This type of investigation also sheds light on the Kojima theorem of the "correspondence between comparative costs and comparative profit rates," which was briefly outlined in Section II. Here it should be remembered that "trade oriented" DFI, which is consistent with the workings of the market mechanism and results in an increased divergence between comparative costs in the two countries concerned, makes greater profits than "anti-trade oriented" DFI. Indeed the latter type of DFI could result in negative profits.

Furthermore, it is hypothesised that P_i depends on factors which affect the competitiveness of the firm. Some of these factors are size, the ownership share, and the capital/labour ratio of the operation abroad. Define S as size, O as ownership share, and K as the capital/labour ratio and then relative size, relative ownership shares, and relative capital/labour ratios in industry i can be defined as follows:

$$(17)\quad S_i(A/J)=S_i{}^A/S_i{}^J$$

$$(18)\quad O_i(A/J)=O_i{}^A/O_i{}^J$$

$$(19)\quad K_i(A/J)=K_i{}^A/K_i{}^J$$

Then we assume:

(20) $P_i=g(S_i, O_i, K_i)$ where $(\partial P_i/\partial S_i)>0$, $(\partial P_i/\partial O_i)>0$, and $(\partial P_i/\partial K_i)>0$ are postulated.

In other words, relative profit rates are an increasing function of relative size, relative ownership shares, and relative capital/labour ratios because larger size, greater ownership shares, and higher capital intensity (implying the use of more sophisticated technology and management techniques) are factors assumed to strengthen competitiveness and thus facilitate greater profits.

We can then substitute S_i, O_i, and K_i for P_i in equation (16) to obtain:

(21) $I_i=h(S_i, O_i, K_i)$ where $(\partial I_i/\partial S_i)>0$, $(\partial I_i/\partial O_i)>0$, and $(\partial I_i/\partial K_i)>0$ are postulated.

Here we will also calculate the rank correlation coefficients between these variables to shed light on our hypothesis.

IV.2. A Case Study of DFI in Taiwan

Empirical research dealing with DFI is hampered by a lack of consistent data. The five indices we need to pursue the type of analysis outlined above can only be obtained from surveys conducted by investing or host country governments. Unfortunately, American and Japanese surveys are incomplete in many respects and thus host government surveys must be relied upon. The Investment Commission (Ministry of Economic Affairs) of the Republic

TABLE 6. AMERICAN AND JAPANESE DIRECT INVESTMENT IN TAIWAN (AS OF END 1982)

	I-index revealed comparative investment advantage	P^A Rate of profit %	P^J Rate of profit %	$P=P^A/P^J$ relative profitability	*S*-index relative size of firms	*O*-index relative ownership share	*K*-index relative capital intensity
1. Trade	A	0.04	—	A	A	A	A
2. Transportation	A	−0.74	—	A	A	A	A
3. Pulp, paper & products	9.000	3.46	1.27	2.724	8.992	1.021	1.800
4. Non-metallic minerals	4.875	1.84	2.31	0.797	86.180	0.356	23.288
5. Chemicals	3.292	6.60	3.68	1.793	3.385	2.413	1.649
6. Services	2.533	16.35	3.66	4.467	0.941	3.312	0.796
7. Food & beverage processing	1.909	6.62	7.42	0.892	1.556	1.452	2.029
8. Others	1.146	7.66	4.70	1.630	2.162	1.405	0.520
9. Electronic & electric appliances	0.813	13.01	2.84	4.581	0.822	1.971	0.806
10. Machinery equipment & instrument	0.748	−11.93	2.61	0.820	9.985	0.233	3.007
11. Textiles	0.587	0.35	3.36	0.104	31.203	0.740	1.538
12. Leather & fur products	0.500	−0.26	1.71	0.132	0.849	1.887	0.303
13. Garment & footwear	0.400	1.82	0.38	4.789	4.366	0.186	1.951
14. Plastic & rubber products	0.340	5.16	−1.56	4.308	4.745	1.069	1.886
15. Basic metals & metal products	0.306	7.55	1.03	7.330	1.514	1.045	1.058
16. Lumber & bamboo products	J	—	4.12	J	J	J	J
(Weighted average)	(1.000)	(3.42)	(2.30)	(1.487)	(2.671)	(1.006)	(1.581)

Source: Investment Commission, Taiwan, *A Survey Report on Foreign Direct Investment in Taiwan for 1982.*

of China (Taiwan) conducts such surveys annually and publishes the results in a publication called *A Survey Report on Foreign Direct Investment in Taiwan.* Table 6 was produced from the 1982 edition of this report.[7] We would like to detail this case as an example of the country studies undertaken.[8]

According to the survey report American DFI (Here DFI is defined as the foreign contribution of capital to American or Japanese firms in Taiwan.) amounted to NT$ 11,114 million (about US$ 279 million at 1982 exchange rates) and Japanese DFI NT$ 12,644 million (about US$ 317 million) at the end of 1982.[9]

(1) The difference in investment patterns is revealed in the I_t-indices. An "A" means that only American firms invested in the industry and "J" means that only Japanese firms invested in the industry. Two industries, "agriculture and forestry" and "mining" are omitted from the table as no American or Japanese investment was recorded in these sectors.

From the I_t-indices it can be seen that there is a greater American presence (and thus revealed comparative investment advantage for U.S.) in industries such as "trade," "transportation," "pulp, paper & products," "non-metallic minerals," "chemicals," "services," "food & beverages," and "others (musical instruments, publishing, printing, etc.)." In "electronic and electric appliances" and "machinery equipment (mainly automobiles)" both the US and Japan invest heavily and competition between firms from the two countries is extensive. It should be remembered that the above industries are typical areas of MNC operation.

In contrast, Japanese DFI exhibits a significantly greater presence in industries such as "lumber and bamboo products," "basic metals (mainly steel)," "plastic and rubber products," "garments and footwear," "leather and fur products," and "textiles." In other words, labour intensive, light industries such as "textiles," as well as "machinery equipment" and "electronic and electric appliances" mentioned above, tend to be the major object of Japanese DFI.

Thus, a clear difference between MNC-type and Japanese-type DFI emerges in Taiwan.

(2) Turning to the relationship between I_t and P_t we see that the Pearson rank-correlation coefficient between the I_t and P_t indices is 0.51 and significant at the 1% level, a fact which supports the hypothesis that I_t is an increasing function of P_t. (See Table 7, part (1).) This hypothesis is further supported by simple regression analysis (See Fig. 1). We obtain:

(22) $\log(e)(I_t) = 0.652987 + 0.563402 \log(e)(P_t)$ $\quad \mathrm{AdjR}^2 = 0.450188$

$\qquad\qquad\qquad\quad (2.634575)^* \quad (2.747805)^* \qquad\qquad\quad F = 7.550432^*$

(*-significant at 5% level) $\qquad\qquad\qquad\quad (DW = 0.85183)$

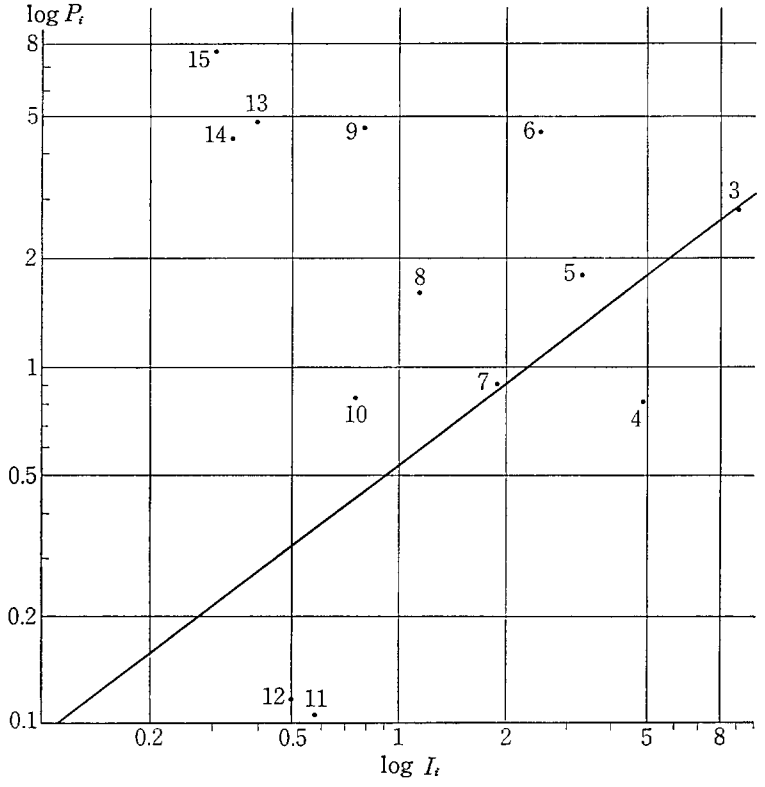
Here a sample of 9 industries from Table 6 was used. "Trade," "transportation," and "lumber & bamboo products" are omitted as indices could not be calculated for these categories. In addition, several outliers, "electronic & electric appliances," "garments & footwear," "plastic & rubber products," and "basic metals and metal products" are also excluded.

[7] This survey is based on questionnaires submitted by a total of 819 firms. (1072 were sent out.) 370 were submitted by Japanese firms, 121 by American firms, 251 by Overseas Chinese firms, and 77 from other firms.

[8] Country Studies are reprinted in detail in Kojima (1985).

[9] These figures are significantly different than the approved investment figures published by the Investment Commission in the 1983 edition of *Statistics on: Overseas Chinese and Foreign Investment, Technical Cooperation, Outward Investment, Outward Technical Cooperation, The Republic of China.* In that publication total approved foreign investment for 1952–1983 was put at US$ 1,152 million for the U.S. (the 1952–1982 total is calculated to be US$ 1,056 million) and US$ 871 million for Japan (US$ 674 million for 1952–1982).

FIG. 1 REVEALED COMPARATIVE INVESTMENT ADVANTAGE (I_i) AND COMPARATIVE PROFIT RATES (P_i): AMERICAN AND JAPANESE DFI IN TAIWAN (AS OF END 1982)



Note: Numbers of industries shown in Table 6.

In the first category Japanese presence is slightly greater but American profitability is much greater. In the other three cases American presence is limited, both absolutely and relatively, but relative profitability is greater. The ability of American MNCs to make greater (perhaps, monopoly) profits abroad may be the cause of the these last three exceptional observations. If these exceptions are excluded, we observe a positive and statistically significant relationship between I_i and P_i as shown in (22) above. However, the results must be interpreted with caution due to the small sample size.

Here it is useful to consider some specific industries. From Table 6 we see that the profit rate for Japanese textile firms is 3.36%, higher than the rate for American firms of 0.35%. It is postulated that this difference leads to a greater Japanese presence. An opposite example is that of chemicals; the profit rate for American firms is 6.60% while that for Japanese firms is 3.68%. Here American presence is greater a fact consistent with our hypothesis that $(dI_i/dP_i)>0$. The fact that this pattern is generally observed leads to the positive and significant correlation and regression coefficients.

However, there are some notable exceptions to the overall pattern. Of particular concern are the negative profit rates observed for American firms in "machinery equipment (mainly automobiles)," "transportation," and "leather and fur products," and for Japanese firms in "plastic and rubber products." The most significant of these is the large negative rate for American firms in the "machinery equipment" sector due mainly to the performance of American automobile firms in Taiwan. This might well be a case of anti-trade-oriented DFI where the American MNCs involved have set up factories with capacity too large for the domestic market but which do not produce competitive exports. If so this could be called "DFI dumping" in the sense that imports from the investing country (or a third country) would be more efficient than production in the host country.[10] In fact General Motors pulled out of Taiwan soon after the survey was published causing concern among Japanese firms considering similar investments in Taiwan. Furthermore, Toyota has since dropped plans for investment in Taiwan while Nissan is still negotiating about a potential new investment project.

(3) From Table 7, part (1) it can also be seen that the rank-correlation coefficients between I_i, P_i, S_i, O_i, and K_i are positive and significant at the 5% level or better in most cases. This reflects the fact that both Japanese and American firms attempt to strengthen competitiveness by increasing size, ownership shares, and the capital/labour ratio. It is interesting to

TABLE 7. RANK CORRELATION COEFFICIENTS OF U.S./JAPAN COMPARATIVE INVESTMENT ADVANTAGE INDICES

(1) US/Japan DFI in Taiwan (as of end 1982)

	P	*S*	*O*	*K*
I	0.5059*	0.7529**	0.7559**	0.6971**
P		0.4853*	0.7147**	0.5088*
S			0.4441*	0.9147**
O				0.4676*

(2) US/Japan DFI in Hong Kong (as of end 1981)

	S	*O*	*K*
I	0.9316**	0.8614**	0.9088**
S		0.7949**	0.9474**
O			0.7895**

(3) US/Japan DFI in Korea (as of October 1981)

	S	*O*
I	0.8713**	0.8430**
S		0.9119**

(4) US/Japan DFI in Indonesia (as of September 1983)

	S	*O*
I	0.9649**	0.9456**
S		0.9456**

(5) US/Japan DFI in Taiwan (Cumulative approvals for 1952–1983)
I:S=0.7564**

(6) US/Japan DFI in Singapore (as of end 1978)
I:S=0.9314**

(7) US/Japan DFI in the Philippines (Around 1980)
I:S=0.9643**

** Statistically significant at 1% level.
* Statistically significant at 5% level.

[10] Here it should be noted that 1982 was a recession year in which the automobile industry was especially hard hit worldwide.

note that some Japanese firms are relatively large and capital intensive although American firms maintain a relatively larger ownership share in "electronic and electric appliances." This reflects the fact that American MNCs invested in Taiwan earlier than their Japanese counterparts and thus the latter set up bigger, more capital intensive (thus utilising more sophisticated technology and management) factories in order to out-compete the former.

(4) Finally, the dominance of MNC-type DFI in the American pattern is illustrated by the fact that, using a weighted (by the foreign share of total assets) average of all industries, the profit rate of American firms is larger (3.42%) than Japanese firms (2.30%). This is perhaps due to the dominance of investment in oligopolistic or monopolistic industries. American firms are 2.7 times larger than Japanese firms, American firms are 1.6 times more capital intensive, and, although the ownership share appears the same in Table 6, wholly-owned subsidiaries account for 48% of the 121 American firms but only 23% of the 370 Japanese firms. On the other hand, minority ownership, less than 49%, joint ventures account for 21% of American firms and 42% of Japanese firms.

IV.3. Studies of DFI in other Asian Economies

Studies similar to that conducted for Taiwan have been made of DFI in several other Asian economies. Original data (similar to that in Table 6) for these studies is omitted here but the rank correlation coefficients calculated are presented in Table 7, parts (2)–(4) and (6)–(7). A few remarks regarding each case are made below.

Hong Kong

The Industry Department of Hong Kong kindly provided us with detailed survey data which, in conjunction with the publication "Overseas Investment in Hong Kong's Manufacturing Industry," provides the basis for the calculations made in Table 7, part (2). Data covers investment made through the end of 1981 and is limited to DFI in manufacturing. American DFI amounted to HK$ 3,062 million or 43.7% of the total (HK$ 7,013 million) while Japanese DFI amounted to HK$ 2,213 million or 31.6% of the total.

P_i, the relative profitability index, is not available in this case. However, the rank correlation coefficients between the other indices, I_i, S_i, O_i, and K_i are all positive and statistically significant at the 1% level.

(1) The I_i index shows that American firms have a relative investment advantage in industries such as "transportation equipment," "furniture and fixtures*," "toys," "jade and jewelry*," "chemical products," "metal products," "food and beverages," "electronic products," and "paper products," where an asterisk (*) indicates relatively unimportant industries.

In contrast, Japanese firms have an advantage in the following industries (in ascending order of the I_i index): "optics and photographics," "metal rolling, extraction, and fabrication," "printing and publishing," "leather products*," "plastic products," "watches, clocks and accessories," "non-electrical machinery," "miscellaneous manufactures," "electrical products," and "textiles and garments" and "yarns and fabrics," and American advantage is seen in the former group but there is no American presence in the latter group.

In short, the distinction between the MNC-type pattern of American DFI and the pattern of Japanese DFI is very clear in Hong Kong manufacturing.

(2) In the seven industries in which an American advantage is revealed, this advantage

is due to larger size and greater capital intensity. For example, American presence is larger in "electronic products" while Japanese presence is much larger in "electrical products". In "electronic products" and "paper products" Japanese and American firms compete. American firms are larger in the latter category but about the same size in the former. However, they are less capital intensive in both industries. These observations reflect the fact that, as in Taiwan, Japanese firms entered Hong Kong later than American ones but brought in more sophisticated technology and management.

(3) Due to Hong Kong's liberal policy toward DFI, overall ownership shares (calculated as a weighted average of all industries) are approximately equal for American firms (92.6%) and Japanese firms (87.6%). However, there are some pronounced differences in some industries, especially, "toys," "food and beverages," and "textiles and garments" where American shares are much larger than Japanese ones.

Korea

According to the Ministry of Finance approved American DFI amounted to US$ 427 million (24.3% of the total) and approved Japanese DFI amounted to US$ 966 million (55.0% of the total) for the 1962–1981 period. [See Koo (1983), p. 17.] An unpublished study, *A Survey of Foreign Direct Investment in Korea* undertaken by the Economic Planning Agency is the only source giving a list of foreign companies, their equity, and total assets. From this information DFI in 22 sectors (defined in an unavoidably arbitrary fashion) was calculated as of October 30, 1981. According to this source American equity DFI amounted to US$ 535 million and Japanese equity DFI to US$ 543 million. Thus, there is a large difference between approved and equity base figures.

(1) Here again the I_t-index indicates that American DFI has a stronger comparative investment advantage in those industries dominated by strong MNC interests. An American advantage is revealed in "petroleum refining," "computers and related products," "food and beverages," "pharmaceuticals," "industrial electronics," "technology services," "finance," "transportation," "chemicals," and "other industries," with the I_t-index descending in that order.

In contrast, Japanese DFI has a stronger advantage in "other services," "hotels and tourism," "electrical home appliances," "textiles," "pottery and porcelain," "construction," "garments," "miscellaneous manufactures," "agriculture and forestry*," "metals," and "general machinery," where an asterisk again indicates that DFI in that sector is minor.

(2) The rank-correlation coefficients between I_t, S_t, and O_t are positive and significant at the 1% level as shown in Table 7, part (3).

(3) Using a weighted (by the share of joint equity) average of all firms it is seen that the size of American firms (US$ 7.4 million) is larger than that of Japanese firms (US$ 2.4 million). Furthermore, the ownership share of American firms (60.1%) is also larger than that of Japanese firms (48.9%). Here it should be noted that, in addition to the differences between the MNC-type pattern of American DFI and the pattern of Japanese DFI, Korea's discriminate and restrictive policy toward DFI may also account for some of the observed differences in size and ownership.

Singapore

In the cases of Singapore and the Philippines only the I_t and S_t indices are available. However, analysis of only these two indices is asserted to be a meaningful proxy for the more

complete analysis conducted above. As an example consider Table 7, part (5) which deals with the Taiwanese case. Using approval figures for the 1952–1983 period only I_i and S_i can be calculated. Yet, analysis based on the rank correlation coefficient here would be quite consistent with, and thus could be used as a proxy for, the more full analysis given in Section IV.2 above. Thus, a positive correlation coefficient between I_i and S_i is also taken as evidence that DFI is made in a way consistent with the free working of the market mechanism.

In the case of Singapore, a highly positive and significant rank correlation coefficient is observed as shown in Table 7, part (6). The calculation is based on unpublished data of Singapore's Department of Statistics as given by Fong (1982). The data is a bit old as it covers DFI as of 1978. Furthermore, only the manufacturing sector is covered and oil refining, a very important activity of American firms, is excluded. Consequently American DFI (defined as gross fixed assets at the end of the year) (SP$ 450 million) appears smaller than Japanese DFI (SP$ 713 million). Japanese and American DFI patterns are again different: American presence is larger in MNC dominated activities such as "rubber products," "furniture," "radios," "metal grilling," and "other manufacturing," while Japanese presence is larger in more sophisticated industries such as "precision instruments," "paper and printing," "computers," and "transportation equipment (primarily shipbuilding and repairing)." Firms from the two countries compete in "textiles and garments."

It should also be noted that, on average, the size of Japanese firms (SP$ 8 million) is greater than that of American firms (SP$ 6 million). The difference is especially pronounced in those industries in which Japanese firms have a revealed comparative investment advantage. These differences have resulted from the fact that American DFI in Singapore has been heavily concentrated in "oil refining" and "finance," and to a lesser degree in older manufacturing activities while Japanese firms, as late comers, mainly invested in more sophisticated manufacturing sectors.

The Philippines

In this case data sources are not the same and thus data is not entirely consistent. American DFI figures are compiled from the American Chamber of Commerce in Manila, *American National Corporation in Sec-Business Day, Top 1,000 by Sector, Nationality and Percentage of Foreign Equity*, Manila, 1982. Only 168 larger firms are covered here. Japanese DFI figures are taken from JETRO, Manila, *A Survey of Japanese Firms in the Philippines, 1981.* 658 firms are covered accounting for almost all Japanese firms in the Philippines. In addition, Board of Investment figures show that American DFI accounted for 28.8% and Japanese DFI 20.1% of total DFI approved under P.D. 1789 and P.D. 218 during the 1968–1981 period.

The Philippines is a resource abundant country and the pattern of the I_i-index is significantly different than in the resource scarce countries analysed above. Yet, here again American firms have a comparative investment advantage in MNC dominated sectors such as "petroleum and coal," "sugar," "rubber," "food and beverages," "non-electrical machinery," "paper and its products," "transportation and communication," "leather and its products," "chemicals," and "electric and electronic apparatus." On the other hand, a comparative advantage for Japanese firms is revealed in "textiles" as well as other labour intensive manufactures, "mining" as well as other resource based industries, and "construction," "commerce," as well as other services.

Here again the correlation between the S_i and I_i indices is very highly positive and statis-

tically significant as shown in Table 7, part (7). The size of firms differs significantly: using a weighted average American firms are 10 times the size of Japanese ones. Wholly owned subsidiaries account for 45.8% of American firms but only 2.6% of Japanese firms. Industry wise differences are not known in this case. These differences in observed size and ownership structure are partially due to the exclusion of smaller American firms from the sample but the latter phenomenon is mainly due to the Philippine policy of restricting ownership shares of non-American foreign firms.

Indonesia

BKPM (the Indonesian Investment Adjustment Board) kindly provided us with detailed information which could be used to calculate I_i, S_i, and O_i indices. As shown in Table 7, part (4) the rank correlation coefficients of these three indices are highly positive and significant at the 1% level. However, data refers only to DFI in the manufacturing sector. Thus, large American investments in the petroleum and related industries are omitted and, as a result, the American DFI total as of September, 1983 appears far smaller than the Japanese total when it may in fact be substantially larger. [See Wie, (1984a).] Because the pattern of the I_i index is more or less similar to that in the Philippine case detailed explanation is skipped here.

V. *The Dynamic Effects of DFI on Host Economies in Asia*

V.1. Introduction

DFI is different from other capital inflows in that financial capital (foreign exchange) is not the only item involved. DFI is also associated with the transfer of resources such as physical capital, technology, and managerial skill. These unique characteristics allow DFI to be a catalyst to the creation of new industries in the host country, improvements in productivity, and export growth. As a result DFI's impact on structural change, trade and growth can be significant. This catalytic function is the most important contribution DFI can make to a host economy.

Although there are numerous effects of interest imparted by DFI on host economies our discussion here will be limited to effects on trade and total output (GNP) and related structural changes. Here it should be emphasised that DFI is asserted to affect output structure first. Then, as a result of these impacts on output structure, total output, trade volume, and trade structure are affected.[11] In the next section the effects of American and Japanese DFI on trade volumes with special reference to effects on the balance of trade are analysed utilising firm sales and purchase data as well as a simple regression approach. Then the third section reinterprets these results in an attempt to analyse impacts on trade orientation. It also tries to clarify what is meant by "trade orientation" in relation to the empirical evaluation of DFI's effects. Finally, effects of American and Japanese DFI on output are analysed utilising a multiple regression framework.

[11] An analysis of these structural changes is skipped here because of space constraints and will be undertaken in a separate paper.

V.2. Effects on the Balance of Trade

In this subsection the focus is the impact of DFI on the balance of trade as Japanese DFI has often been criticised as leading to a deterioration in a host country's trade balance or net foreign exchange earnings. Here it should be emphasised that this type of analysis is conceptually quite different than analysis of trade orientation, a topic taken up in more detail in the next subsection. Much of the empirical analysis in this subsection will be used in the evaluation of trade orientation as well but it is crucial that the two types of analysis be kept distinct to avoid confusion.

Two types of empirical analyses are particularly useful in this respect. First of all, one can analyse the trade data of foreign firms operating in a given country or region. Such data can be gathered from surveys conducted by investing or host governments. Here we will analyse data provided in Japanese and Taiwanese surveys as they are the only ones facilitating analysis of balance of trade impacts.[12] Japanese data will permit analysis of effects on both multilateral and bilateral (with Japan) trade balances while Taiwanese data will only permit analysis of effects on the multilateral trade balance. Secondly, a structural model specifying trade flows as a function of DFI can be constructed. Then [d (export flow)/d (DFI flow)] and [d (import flow)/(d (DFI flow)] can be estimated and compared. This is done for four countries, Korea, the Philippines, Taiwan, and Thailand. Here we will only analyse impacts on trade with Japan and the U.S.

Analysis of Japanese Survey Data

Before examining Japanese survey data it is important to realise that many host countries consider adverse balances of trade to be major problem and that the adverse balance of trade with Japan is often asserted to be a major element of this problem. Here it is instructive to look at host country export/import (X/M) ratios for trade between the countries concerned and Japan for 1975 and 1983. Two groups of economies can be identified, those in which the balance of trade with Japan improved in the 1975–1983 period and those in which it deteriorated. The (X/M) ratios for the countries for 1975 and 1983 respectively in the former group are as follows: Indonesia, 1.855 & 2.817; Brazil, 0.952 & 2.261; Korea, 0.582 & 0.667; Taiwan, 0.446 & 0.574; and Singapore, 0.263 & 0.330. The ratios for the latter group were: Australia, 2.392 & 1.520; Malaysia, 1.221 & 1.130; the Philippines, 1.092 & 0.749; the U.S., 1.042 & 0.575; Thailand 0.755 & 0.406; and Hong Kong, 0.178 & 0.127. (The Australian, Brazilian and American cases are added for reference.)

While it is impossible to draw any direct connection between these figures and the impact of DFI it is clear that trade deficits with Japan have been significant and increasing in some cases. This has led to severe criticism of Japanese DFI among other things. However, it does seem significant that these deficits have been shrinking in most more mature economies (Taiwan, Korea, and Singapore) while increasing in most less mature ones (Malaysia, the Philippines, and Thailand). Correspondingly Japan's DFI is more mature and thus more likely to have a pronounced positive effect on exports in the former group. The fact may be a cause of observed differences and may be an indication that less mature DFI leads to trade

[12] American and Singaporean surveys provide information about export and sales activity but not about input purchases and imports; A Korean survey provides necessary information for all foreign firms but data facilitating comparison of American and Japanese firms are unavailable from known sources.

deficits but that this trend reverses as DFI matures. [See Wert (1973).]

To get a clearer picture of this relationship it is helpful to look at Table 8 in which the trade, sales, and input purchase behaviour of Japanese firms in Asia is summarised. Three groups of industries are identified there. Group A consists of four resource based and thus location specific industries, "mining," "agriculture, forestry, and fisheries," "timber, pulp, and paper," and "food and beverages," as well as "commerce." As can be seen the portion of sales abroad is quite high in this group with sales to Japan being particularly high in the first two categories. Furthermore, exports are much greater than imports for all but "commerce." However, all DFI in this group leads to increases in host country trade surpluses with Japan and the world.

Group B consists of labour intensive manufacturing ("textiles" and "other sundry manufacturing") and three machinery industries ("electric," "precision," and "general" machinery) and is the group in which the phenomenon called the "international division of the production process" occurs most often. Local market sales ratios are 50%–65% and exports to third countries exceed exports to Japan. With the exception of "precision machinery" local market purchase ratios are 38%–50%. However, input purchases from Japan are often larger than purchases from third countries. Thus, DFI in this group results in a worsening of the trade balance with Japan but, with the exception of "precision machinery," an improvement of the trade balance with the world.

Group C consists of three intermediate good industries ("non-ferrous metals," "chemicals," and "steel") and "transportation equipment," all rather new industries in Asian host countries. (The impact of DFI in "other services" is rather unimportant and neglected here.) While the prospects for future growth in these industries is quite promising, they are still in the early stages of development and thus local market sales ratios are quite high (75%–90%) and imports of inputs (especially from Japan) quite high as well. Thus, DFI in these industries lead to increases in trade deficits with the world and with Japan.

Finally, we should note the role of the "commerce" industry which is dominated by the sogo shosha (general trading companies).

(1) These companies handle more than 72% of the sum of subsidiary exports to and imports from the world and 48% of those to and from Japan.

(2) This type of DFI thus promotes trade between host and third countries; such activity accounts for 51% of the trade activities of such firms.

(3) When Japanese affiliates sell their products directly to sogo shosha in the host country such sales are recorded as sales to the local market; if the resale of such goods abroad was accounted for it is likely that local market sales ratios would be much lower than those given in Table 8.

Analysis of Taiwanese Survey Data

Data compiled from the Taiwanese survey mentioned above is compiled in Table 9 and we can use this information to calculate X/M ratios by industry for American and Japanese firms in 1982. Due to the lack of total sales data export/sales and local sales ratios cannot be calculated but a limited number of ratios are available from previous studies.[13]

[13] Here it should be stressed that one cannot compare export/sales and imported input/total input ratios to directly ascertain effects on the balance of trade because value added is included in sales figures but not in input figures. Thus, the quotient of these two ratios is not equivalent to X/M. Yet these ratios are useful in depicting the degree of foreign dependence and are thus indirectly related to analysis of X/M ratios.

TABLE 8. SALES, PURCHASES, EXPORTS AND IMPORTS DUE DIRECTLY TO THE JAPANESE AFFILIATED COMPANIES IN ASIA (AS OF MARCH 1981)

		Composition of Sales (%)			Composition of Purchases (%)			Japan (million yen)			World (incl. Japan) (m. yen)		
		Local market	Japan	Third countries	Local market	Japan	Third countries	$\bar{X}_J$ Exports to Japan	$\bar{M}_J$ Imports from Japan	$\bar{X}_J/\bar{M}_J$	$\bar{X}_W$ Exports to World	$\bar{M}_W$ Imports from World	$\bar{X}_W/\bar{M}_W$
A)	1. Mining	1.2	95.9	2.9	53.2	46.8	0.0	4,914	342	14.368	5,065	342	14.810
	2. Agriculture, forestry, fishery	6.9	83.3	9.8	87.5	11.3	1.2	26,584	1,427	18.629	29,711	1,575	18.864
	3. Commerce	31.5	44.9	23.6	29.8	22.5	47.8	1,574,784	749,452	2.101	2,401,393	2,344,360	1.024
	4. Timber, pulp & paper	33.1	30.8	36.0	65.2	1.8	33.0	7,539	281	26.829	16,352	5,352	3.055
	5. Food & beverages	40.5	30.2	29.3	75.4	1.6	23.0	24,122	748	32.249	47,560	11,540	4.121
B)	6. Electric machinery	51.6	16.2	32.1	49.6	46.0	4.4	118,871	192,846	0.616	354,115	211,248	1.676
	7. Precision machinery	56.3	9.1	34.7	12.1	74.8	13.0	10,295	65,548	0.157	49,668	76,974	0.645
	8. Other sundry manufacturing	60.9	6.0	33.1	40.5	27.8	31.6	20,182	57,996	0.348	131,864	123,865	1.065
	9. Textiles	61.1	4.0	34.9	38.9	29.3	31.8	17,349	72,396	0.240	168,165	150,946	1.114
	10. General machinery	65.5	5.5	29.0	44.5	54.8	0.7	7,204	36,099	0.200	45,020	36,569	1.231
C)	11. Non-ferrous metals	74.5	2.6	22.8	20.6	42.1	37.3	1,729	15,952	0.108	16,659	30,104	0.553
	12. Chemicals	85.0	8.9	6.1	53.3	30.8	15.8	19,303	44,531	0.433	32,680	67,422	0.485
	13. Steel	85.4	10.1	4.5	26.6	53.3	20.1	13,678	50,757	0.269	19,747	69,911	0.282
	14. Transport equipment	89.7	1.9	8.3	38.2	61.1	0.6	4,645	93,456	0.050	24,579	94,433	0.260
	15. Other services	94.1	5.8	0.1	99.0	1.0	0.0	1,212	86	14.105	1,233	86	14.337
	Total	44.9	30.5	24.6	33.9	28.3	37.8	1,852,414	1,381,917	1.340	3,343,811	3,224,727	1.037

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

TABLE 9. EXPORTS AND IMPORTS OF TAIWAN DUE TO AMERICAN AND JAPANESE FIRMS (AS OF END 1982: MILLION N.T. DOLLAR)

	American Firms					Japanese Firms				
	$\bar{X}$ Direct exports to world	$\bar{x}$[a] Ratio of $\bar{X}$ to total sales %	$\bar{M}$ Imports of inputs from world	$\bar{m}$ Ratio of $\bar{M}$ to total inputs %	$\bar{X}/\bar{M}$ Ratio	$\bar{X}$ Direct exports to world	$\bar{x}$[b] Ratio of $\bar{X}$ to total sales %	$\bar{M}$ Imports of inputs from world	$\bar{m}$ Ratio of $\bar{M}$ to total inputs %	$\bar{X}/\bar{M}$ Ratio
1. Trade	578		200	25.6	2.90	—		—	—	—
2. Transportation	431		175	89.4	2.47	—		—	—	—
3. Pulp, paper & products	199	19.2	194	33.4	1.03	20	21.8	16	19.9	1.24
4. Non-metallic minerals	1,412	0.0	303	16.6	4.59	818	62.4	113	43.3	7.23
5. Chemicals	5,660	22.0	3,742	34.1	1.51	5,222	39.3	3,403	50.5	1.53
6. Services	346		54	79.5	6.36	147		112	19.9	1.31
7. Food & beverage	3	1.5	2,258	55.6	0.001	713	45.2	32	3.0	22.07
8. Others	4,627	(91.6)[c]	1,699	52.0	2.72	3,795	(72.4)[c]	1,441	56.7	2.63
9. Electronic & electric appliances	26,243	92.8	18,780	74.5	1.40	49,372	51.1	25,357	54.9	1.95
10. Machinery equipment & instrument	15,570	25.3	5,248	44.6	2.97	6,636	69.6	4,420	46.4	1.50
11. Textiles	10,069	96.7	5,037	71.7	2.00	7,488	81.1	2,902	41.6	2.58
12. Leather & fur products	255	100.0	—	—	∞	331	99.0	118	62.8	2.79
13. Garment & footwear	1,737	100.0	578	60.1	3.01	1,032	97.4	89	21.3	11.57
14. Plastic & rubber products	514	56.2	487	57.3	1.05	4,022	90.4	690	27.5	5.83
15. Basic metals & metal products	617	44.6	586	51.8	1.05	2,634	44.5	2,459	64.4	1.07
16. Lumber & bamboo products	—	—	—	—	—	355	100.0	98	44.7	3.64
Total (Weighted Average)	68,261	(62.8)[d]	39,346	(57.2)	(1.73)	82,585	(57.5)[d]	41,250	(50.8)	(2.00)

Source: Investment Commission, Taiwan, *A Survey Report on Foreign Direct Investment in Taiwan for 1982.*
a: Investment Commission Survey Date for 1978 as cited in Wu, et al. (1980), p. 124.
b: Investment Commission Survey Data for 1979 as cited in Liu, et al. (1983), p. 111.
c: Other manufacturing.
d: Weighted average of all manufacturing.

(1) Imported inputs (raw materials, parts, and components) accounts for an (weighted) average 57.2% of input purchases by American firms but only 50.8% for Japanese firms. The Japanese ratio was slightly lower (46.4%) than the American one (49.8%) in 1981 and both ratios were almost equal in 1979 and 1980 (about 47.5% and 50.0% respectively). [1979–1981 ratios are from Liu, et al. (1983), pp. 153–154.] This is surprising in view of the fact that Japanese firms are often criticised for purchasing "too many" foreign (especially Japanese) inputs.

(2) Using a weighted average of export/sales ratios we see that the American ratio ranged between 59.7% and 68.0% in the 1974–1978 period with the 1978 ratio being 62.8%. [See Wu, et al., p. 124.] The Japanese ratio was 57.5% in 1979 and 56.9% in 1980. [See Liu, et al., p. 111.] While not directly comparable we see that Japanese ratios have probably tended to be slightly lower than American ones and surmise that this pattern has not change

much since.

(3) The 1982 X/M ratio was 1.73 for American firms and 2.00 for Japanese firms. The American ratios were 1.68, 1.37, and 1.66 while Japanese ratios were 1.97, 1.85, and 2.02 for 1979, 1980, and 1981 respectively.[14] Thus, both types of DFI would seem to result in improvements in the trade balance with the Japanese contribution slightly larger here.

(4) "Food and beverages" is an interesting example where American firms import a large portion of inputs (55.6%) and export virtually nothing while the pattern is reversed for the Japanese firms in that industry. This reflects the fact that American DFI in this sector is dominated by MNC-type DFI such as Coca-Cola whereas Japanese DFI in this sector is the offshore sourcing type of DFI.

(5) Another interesting example is the "electronic and electric appliances" sector where American and Japanese firms compete fiercely with each other. Here American firms import 74.5% of their inputs while the Japanese import only 54.9% of theirs and export/sales ratios are very high for American firms (92.8%) but moderate for Japanese firms (51.1%). Here we can see the "international division of the production process" at work in the American firms. Yet, X/M ratios are lower in American firms (1.40 versus 1.95) in this industry.

(6) Another example where the "international division of the production process" is observed is "textiles." Here American firms procure 71.7% of their inputs abroad and 96.7% of their sales are exports. Corresponding figures for Japanese firms are 41.6% and 81.1% respectively. X/M ratios are 2.00 for American firms and 2.58 for Japanese firms.

Econometric Analysis

In that the theoretical framework constructed above allows one to view trade flows as a function of DFI, it should be possible to econometrically estimate a coefficient which reveals the impact of a DFI flow on trade flows. The primary advantage of this approach is that all indirect impacts of DFI on trade, as well as the direct impacts which are measured in survey data, will be accounted for in the estimation. In other words, survey data usually measures only the direct exports and imports of foreign firms[15] but this measurement alone is incomplete as DFI indirectly affects trade through its transfer of technology to local firms, its stimulation of increased (or possibly decreased) competition, and complex input-output relationships.

Here it is possible to specify two types of trade functions, multilateral or bilateral. In this section we limit ourselves to bilateral trade functions where trade with country A is viewed as a function of DFI from the country. The assumption underlying this specification is that trade with country A depends only on DFI from that country. This assumption provides an interesting starting point for analysis although it should be stressed that there are several problems with this approach which lead to qualifications on the estimated coefficients as will be seen below. Thus, the estimations described below should be viewed as initial trials.

Formally, the functions to be estimated are as follows:

$$\log(e)(X_J) = \text{constant} + (x_J)\log(e)(I_{J-1}) \tag{23}$$

$$\log(e)(M_J) = \text{constant} + (m_J)\log(e)(I_{J-1}) \tag{24}$$

[14] 1979–1981 ratios were calculated using export figures from the 1982 Investment Commission survey and import figures from Liu, *et al.*, pp. 153–154.

[15] The Taiwanese survey identifies some "indirect" exports although these are defined as "direct" exports in this context.

(25) log (e) (X_A)=constant+(x_A) log (e) (I_{A-1})

(26) log (e) (M_A)=constant+(m_A) log (e) (I_{A-1})

where X_J =host country exports to Japan
M_J=host country imports from Japan
X_A =host country exports to the US
M_A=host country imports from the US
I_J =Japanese DFI
I_A =American DFI
-1 =a time subscript indicating year t-1; no subscript indicates year t (this is omitted in the Thai case.)
x_J, m_J, x_A, m_A=coefficients to be estimated; as this is a double log function these are elasticities of the relevant trade flow with respect to the relevant DFI flow (superscripts are used to indicate the country involved in the test; T=Taiwan, P=Philippines, K=Korea, and Th=Thailand)

The results of ordinary least square estimations are shown in Table 10 for four countries, Taiwan, the Philippines, Korea, and Thailand.[16] Here it should be noted that a single term, one year lag of the independent variable was utilised in the first three countries because estimations are based on DFI approval data. Due to the lag between the time of approval and actual investment such a lag was hypothesised to exist. In the Thai case this is not done, however, because actual (net) inflow data was used in the estimation.

In evaluating the impact of DFI on the balance of trade it is useful to compare x_J and m_J and x_A and m_A. If the export elasticity is larger then it can be concluded that the DFI flow in question leads to an improvement in the balance of trade while the opposite can be concluded if the import elasticity is larger.

(1) In Taiwan we see that $x_J > m_J$ and $x_A > m_A$; thus, both Japanese and American DFI lead to an improvement in the trade balance.

(2) In the Philippines we observed the opposite phenomenon; here $x_J < m_J$ and $x_A < m_A$. Thus, both types of DFI lead to deterioration of the trade balance.

(3) In Korea and Thailand we see that $x_J > m_J$ in both countries. We also observe $x_A > m_A$ in both countries but x_A and m_A are not significantly different from 0 (at the 5% level). Thus, Japanese DFI leads to an improvement of the trade balances in these countries and American DFI appears to have no impact on them[17] at the 5% significance level.

Thus, we can see that Japanese DFI has worked to improve trade balances in three countries and to deteriorate it in one. On the other hand, American DFI has stimulated improvement in one country and deterioration in one with effects in two others not statistically significant. This lack of impact on trade may reflect the fact that American influence is more limited in Thailand and Korea than in the other two countries or it may be a result of smaller degree of trade orientation than observed in the case of Japanese DFI.

However, before turning to analysis of trade orientation two qualifications should be

[16] The econometric approach toward evaluating the impact of DFI on trade and output (see the next subsection) should be further developed. I am grateful to Eric Ramstetter, visiting Ph.D. candidate from the University of Colorado, Boulder, who collected statistical data and performed the estimations.

[17] It is interesting to note the Thai case here; Thailand's balance of trade deficit with Japan is significant and has been growing during this period. Yet, the above estimates suggest that Japanese DFI has not been a cause of this phenomenon; rather it has worked to improve the trade balance.

TABLE 10. DFI—TRADE FUNCTIONS

	$\bar{R}^2$	F	DW
Taiwan: 1967–1982 with one year lag			
(1) log e X_J=3.61478+0.90561 log e I_{J-1} (4.91245)** (4.04748)**	0.50629	16.3821**	1.1328
(2) log e M_J=4.68747+0.85991 log e I_{J-1} (7.96980)** (4.80829)**	0.59590	23.1197**	1.1602
(3) log e X_A=2.88683+1.21451 log e I_{A-1} (2.12603) (3.44057)**	0.41945	11.8374**	0.4951*
(4) log e M_A=3.10234+1.04362 log e I_{A-1} (2.52793)* (3.27112)**	0.39272	10.7002**	0.4284*
Philippines: 1969–1981 with one year lag			
(5) log e X_J=6.12523+0.22678 log e I_{J-1} (47.5594)** (4.32451)**	0.59598	18.7013**	1.4101
(6) log e M_J=6.18550+0.29155 log e I_{J-1} (49.2024)** (5.69565)**	0.72376	32.4403**	1.3599
(7) log e X_A=4.75456+0.62726 log e I_{A-1} (6.20296)** (2.57044)*	0.31846	6.60714*	1.1040
(8) log e M_A=4.32450+0.74031 log e I_{A-1} (5.04792)** (2.71377)*	0.34657	7.36453*	0.9898*
Korea: 1966–1981 with one year lag			
(9) log e X_J=3.91729+0.76521 log e I_{J-1} (6.28810)** (4.49348)**	0.5613	20.191	0.5052*
(10) log e M_J=5.72982+0.51632 log e I_{J-1} (12.2723)** (4.05207)**	0.5069	16.419	0.3514*
(11) log e X_A=5.22836+0.61110 log e I_{A-1} (4.47172)** (1.50705)	0.0781	2.271	0.4147*
(12) log e M_A=5.62881+0.53808 log e I_{A-1} (6.53993)** (1.80265)	0.1304	3.249	0.4284*
Thailand: 1966–1982 with no lag			
(13) log e X_J=3.07245+0.95608 lag e I_J (4.33709)** (4.23475)**	0:51466	17.9331**	1.1723
(14) log e M_J=4.19326+0.83908 log e I_J (7.63741)** (4.79529)**	0.57889	22.9948**	1.0929*
(15) log e X_A=3.29310+0.65463 log e I_A (2.69716)* (1.78778)	0.12069	3.19614	0.3209*
(16) log e M_A=4.22405+0.55038 log e I_A (4.28698)** (1.86251)	0.13368	3.46894	0.3539*

** statistically significant at 1% level.
* statistically significant at 5% level. (for DW: DW≦dl or DW≧4−dl at 5%.)

noted. First of all, it is clear that these are not normal trade functions in that price and income variables usually present are not included. If possible extensions to include such variables (among other possibilities) should be considered. Secondly, exclusion of American (and other) DFI from the Japanese trade functions and exclusion of Japanese (and other) DFI from the American trade functions may have led to an omitted variable problem and resulted in biased coefficients. This problem seems particularly relevant in the Philippine and Taiwanese cases where Japanese firm exports to the US are significant and may explain why the American coefficients are larger than the Japanese ones.[18]

[18] In addition, several equations exhibit first order autocorrelation and the loss of efficiency may be responsible for the insignificant coefficients on American DFI in Thailand and Korea. This problem is closely related to the specification of the lag structure used and further work in this area is necessary as well.

V.3. Effects on Trade Orientation

In the previous section we were concerned with the effects of DFI on the balance of trade. One indicator used to analyse this effect was the (multilateral or bilateral) X/M ratios of foreign firms in a given host country and another was whether the export elasticity of DFI was greater than or less than the import elasticity. In this section the focus is on trade orientation or trade creation due to DFI. We shall first reinterpret the results of the previous section in this light and then attempt to clarify the concept involved with a theoretical explanation of what is meant by trade orientation.

Empirical Results Reinterpreted

As in the previous section we have two tools, foreign firm survey data and econometrically estimated elasticities, with which to evaluate the trade orientation of DFI. With regard to the former, the focus shifts from various X/M ratios to export/sales and imported input/total input ratios. Here it must be emphasised that both ratios should be used if the goal is to evaluate overall trade orientation. Larger ratios indicate a greater degree of export and import orientation of the DFI involved respectively. However, as these ratios always vary between 0 and 1, it is impossible to distinguish between anti-export (or anti-import) oriented DFI and export (or import) oriented DFI using this tool. Furthermore, adding these ratios is not meaningful and this fact means that these ratios cannot be added to construct a meaningful index of overall trade orientation. However, these ratios are useful in comparing the export and import orientation of two types of DFI and thus shed light on the relative trade orientation of the types of DFI involved.

Using the Japanese data given in Table 8 this kind of comparison is impossible. Using the Taiwanese data given in Table 9 we can analyse American and Japanese import orientation in 1982 but analysis of export orientation is impossible. However, there are several other studies giving information which can be used to compare the sales and input purchase practices of American and Japanese firms in Taiwan and the most recent information was noted in section V.2 above. It will be recalled that export/sales ratios were consistently higher (though by a small margin in most cases) for American firms. Unfortunately, we must compare ratios from different years. Imported input/total input ratios were almost equal in 1979 and 1980 while the Japanese ratio was slightly higher in 1981 and somewhat lower in 1982. Thus, American DFI appears slightly more export oriented here (although the difference observed is quite small in most cases) and no consistent difference in import orientation emerges.

Looking at the econometric analyses we can compare the sizes of x_J+m_J and x_A+m_A to get another indication of trade orientation. Furthermore, these elasticities can be negative; if this is the case then DFI can be identified as anti-trade oriented. In fact all elasticities were positive or not different from 0 at the 5% level.

In the Philippines and Taiwan both $x_A>x_J$ and $m_A>m_J$ are observed. Thus, American DFI appears more trade oriented and this may be a result of America's strong ties with these economies. However, as pointed out above, the failure to account for trade with the US by Japanese firms may have led to an overestimate of x_A and m_A in these cases.

In Korea and Thailand the reverse was true; $x_J>x_A$ and $m_J>m_A$ were observed. In addition the estimates of x_A and m_A were statistically insignificant at the 5% level. This indicates that Japanese DFI was more trade oriented in these countries.

The Concept of Trade Oriented DFI Revisited

Here it seems desirable to review the concept of trade oriented DFI and possible ways of measuring it empirically as the concept does not appear to be well understood yet. First of all, it must be stressed that this is dynamic concept dealing with the gains from trade over time which result from a given investment. Trade oriented investment is that investment which results in the outward movement of a country's production possibility frontier and a subsequent increase in the production of good in which the country has a comparative advantage in relation to the investing country.[19] The international price ratio is given and it is assumed that there are no permanent tariffs or other protective measures although transitional ones may be necessary in the case of infant industries.

Two types of trade-oriented DFI can be considered here; investment in a sector in which a comparative advantage already exists or investment in a "promising infant industry" in which the country is likely to develop a comparative advantage in the future. It is this latter case which is of particular interest in the context of developed country DFI in a developing country. In contrast, "anti-trade oriented DFI" or "DFI dumping" are phrases referring to investment in "faulty" infant industries in this context; these are industries which require permanent trade protection for survival.

To measure the degree to which DFI is trade oriented it is useful to distinguish between import-substitution and export-expansion stage of economic development. The promising infant industry grows successfully from the first to the second stage. In the following ΔX and ΔM stand for incremental change in exports and imports of the host country respectively.

(1) In the import substitution stage, production, Y_q, of industry q increases as a result of DFI. M_q, imports of the good involved, are assumed to remain at 0 but M_r, imports of inputs required in the industry increase. X_q, exports of the good are non-existent at this stage. In other words, $\Delta Y_q>0$, $\Delta M_q=0$, $\Delta M_r>0$, and $\Delta X_q=0$.

Consequently, the change in the value of total imports is positive

(27) $\Delta M=\Delta M_r>0$

and the change in the value of total trade is also positive.

(28) $\Delta X+\Delta M=\Delta M_r>0$

Therefore, this is trade oriented DFI despite the fact that the effect on the trade balance is definitely negative.

(29) $\Delta X-\Delta M=-\Delta M_r<0$

Thus, in the import substitution stage, the effects of trade oriented DFI on overall trade volumes are positive (This is trade creation.) and the effects on the balance of trade are clearly negative. Furthermore, the sales of the firm involved are directed entirely to the domestic market.[20] Therefore, it may be more relevant to analyse the contribution of DFI to output of the industry involved or of the entire economy in this context.

[19] This type of DFI is illustrated diagramatically and explained in Kojima and Ozawa (1984); see figure 2 and relevant explanations.

[20] Japanese firms in Indonesia, Thailand, and other countries are often condemned for being involved mainly in import substituting manufacturing industries. Consequently, DFI is never "export creating" for the host countries at this stage of development. On the other hand, Japanese exports of inputs to such countries may grow rapidly leading to further criticism.

(2) As the industry in question matures output increases, $\Delta Y_q > 0$, exports begin $\Delta X_q > 0$, imports of the good are non-existent, $\Delta M_q = 0$ and imports of inputs continue to increase, $\Delta M_r > 0$. Thus trade volume increases.

(30) $\Delta X + \Delta M = \Delta X_q + \Delta M_r > 0$

However, the change in the trade balance is ambiguous as the sizes of export and import increases are not clear.

(31) $\Delta X - \Delta M = \Delta X_q - \Delta M_r$

Consequently, even in the export expansion stage, it is not clear whether DFI leads to an improvement in the trade balance. Yet, our analysis above suggests that Japanese DFI did lead to improvements in the blance of trade as it matured.

(3) Special attention must be paid to the effects of DFI on the production of intermediate goods. DFI in an intermediate good industry can lead to increases in production of the intermediate good, Y_r, and reduction of similar imports, M_r. Yet, this DFI may be trade oriented[21] if the host country has a comparative advantage in the production of this intermediate good in that the availability of cheaper and/or better inputs can lead strengthen comparative advantage in a final good sector where expanded production is stimulated. In this way exports could possibly expand more than otherwise.

Assume that

(32) $\Delta X_q = \Delta M_r + \Delta Y_r + \Delta W_q$

where W_q is wages (and other primary factor payments) earned in final good industry q. Now suppose wages are constant, final good exports increase, input imports decline or remain constant and that input production increases. Then

(33) $\Delta X + \Delta M = \Delta X_q + \Delta M_r$

is ambiguous unless input imports remain constant. In this case this type of DFI is clearly trade oriented. Finally, the effect of this type of DFI on the balance of trade is clearly favourable.

(34) $\Delta X - \Delta M = \Delta X_q - \Delta M_r > 0$.

Here it should be pointed out that greater economic growth results the smaller the increase in imported inputs, M_r, and the greater the increase in exported output. Consequently, expansion of exports through increased domestic production of inputs, Y_r, and increases in value added, W_q, is more desirable than expansion of exports relying on large increases in imports of inputs, M_r. Here we see that greater trade orientation, $\Delta X + \Delta M > 0$, may not always lead to greater increases in total output. Consequently, here again, measuring effects on total output ΔY, is more relevant.

In fact DFI in areas where the "international division of the production process" is observed often leads to heavy dependency on imported inputs and very high export/sales ratios. This is often observed in export processing zones (EPZs). Consequently, it takes

[21] In Hong Kong a Japanese firm established a large spinning mill (whereas no American firm did). As the output was sold on the domestic market Japanese DFI was condemned as being more domestic market oriented in this respect. However, such DFI may well have been trade-oriented for the reason described here. See Lim and Mok (1983).

as much as a 3% increase in exports to generate a 1% increase in GNP. It seems necessary to reexamine the promotion of this type of DFI and export led growth strategies in this respect. The focus should be shifted to promoting DFI which results in greater increases in value added and local inputs. An important element of this process is the promotion of intermediate good production, either through DFI or domestic investment policies. However, to repeat, only promising infant industries of this type should be promoted and care must be taken to insure that such investment projects are economically competitive and careful cost-benefit analyses of individual projects are crucial in this respect.

To sum up we emphasise the following points. First of all, if DFI stimulates increases in exports, $\Delta X>0$, directly or indirectly, it is trade oriented or trade creating. Secondly, even if DFI results in increases of input imports, $\Delta M>0$, it is still trade oriented, despite the fact that such imports may lead to a deterioration of the trade balance. Thirdly, the sum of DFI-trade elasticities, x_J+m_J or x_A+m_A, indicates the degree of trade orientation.[22] Lastly, however, it should be reemphasised that greater trade orientation does not necessarily result in a greater contribution of DFI to the development of the host country. Thus, we now turn to econometric analysis of DFI's contribution to GNP.

V.4. DFI's Contribution to GNP

DFI contributes to increases in the GNP of host countries in several ways. First of all, a gross or net contribution to domestic capital formation may result and thus affect growth. In addition, there are many qualitative effects; examples are the stimulation of new industries, stimulation of structural changes in output, stimulation of productivity increases, technology transfer, and export expansion. These factors all represent potential contributions of DFI which would be non-existent in a hypothetical case where DFI did not occur. Unfortunately, we cannot evaluate the hypothetical case of no DFI and this makes evaluation of DFI's contribution somewhat difficult. However, we can compare the contributions of American and Japanese DFI in a certain country.

Here again one can focus on the impact of DFI on changes in output structure to view GNP as a function of DFI. In other words, changes in output levels result from changes in output structure induced by DFI in a manner similar to the way in which changes in trade structure and levels result. Thus, the following function is specified and estimated by ordinary least squares for Taiwan, the Philippines, Korea, and Thailand. Here again the one year lag is omitted in the Thai case.

$$\text{(35)}\quad \log(e)(\text{GNP}) = \text{constant} + (y_A)\log(e)(I_{A-1}) + (y_J)\log(e)(I_{J-1})$$

Here again this exercise is intended, as an initial trial and the results are subject to the same qualifications as the trade functions estimated earlier. Furthermore, comparisons of coefficients estimated for different host countries are thought to be meaningless as there are marked differences in economic structures of the countries involved which are likely to be reflected in the estimates.

It is anticipated that the per unit contribution of Japanese DFI (as represented by its

[22] The export/total sales ratio and the imported input/total input ratio can viewed as limited proxies for these elasticities. However, information contained in these ratios is quite different and they cannot be added to get an indicator of overall trade orientation.

TABLE 11. DFI—GNP FUNCTIONS

	$\bar{R}^2$	F	DW
Taiwan: 1967–1982 with one year lag			
(1) log e GNP=6.50532+0.27669 log e I_{A-1}+0.61993 log e I_{J-1}	0.5898	11.784**	0.9897
(8.07582)** (0.93350) (2.69170)*			
Philippines: 1969–1981 with one year lag			
(2) log e GNP=9.06935+0.04417 log e I_{A-1}+0.25545 log e I_{J-1}	0.5448	8.180**	0.8624
(11.3140)** (0.15251) (2.82480)*			
Korea: 1966–1981 with one year lag			
(3) log e GNP=7.00655+0.44253 log e I_{A-1}+0.42818 log e I_{J-1}	0.4972	8.416**	0.5369*
(9.41700)** (1.98557) (3.44554)**			
Thailand: 1966–1982 with no lag			
(4) log e GNP=6.84968−0.05013 log e I_A+0.89638 log e I_J	0.5349	10.202**	1.0978
(9.70748)** (−0.21057) (3.81506)**			

** Statistically significant at 1% level.
* Statistically significant at 5% level. (for DW: DW≦dl or DW≧4−dl at 5%.)

estimated DFI-output elasticity, y_J) will be larger than that of American DFI (y_A) because the pattern of Japanese DFI has been more concentrated in areas in which the host countries have a comparative advantage and its evolution has been consistent with the pattern of structural change in the host economies.

(1) Results for the Taiwanese case are given in Table 11, part (1). For the 1967–1982 period y_J is 0.62 and statistically significant at the 5% level while y_A is only 0.28 and not statistically significant at the 5% level.[23] This indicates a greater per unit contribution of Japanese DFI.

(2) For 1969–1981 period in the Philippines estimated coefficients are shown in part (2) of Table 11; y_A is only 0.04 and not statistically significant and y_J is 0.26 and significant at the 5% level. Here again per unit contributions are greater in the case of Japanese DFI.

(3) Korean results for the 1966–1981 period are given in Table 11, part (3). We see that y_A is 0.44 and not quite statistically significant at the 5% level while y_J is 0.43 and statistically significant at the 1% level. If one is willing to reject the hypothesis that y_A is 0 despite the somewhat lower level of statistical significance, then we can conclude that per unit contributions were virtually equivalent in Korea. This reflects the fact that Japanese and American DFI was directed into different sectors in a complementary manner.

(4) Thai regression results for the 1966–1982 period are shown in Table 11, part (4) and reveal that y_J is 0.90 and significant at the 1% level while y_A is −0.05 but not at all statistically significant. Thus, here again, the per unit contribution of Japanese DFI was far greater.

On the whole, it can thus be said that Japanese DFI was more efficient in promoting the growth of host country output than American DFI was. The reason for this is asserted to be the dynamic trade-oriented nature of Japanese DFI which promotes the development of industries in which the host country has a comparative advantage. Indeed the negative

[23] Hsiao and Hsiao (1984) also estimated similar functions (with no lag) adding Overseas Chinese DFI and Other DFI as independent variables. They found that the Japanese coefficient was larger when ordinary least squares estimation was used in a 1953–1982 sample and the American coefficient was larger when autocorrelation was corrected for in a 1967–1982 sample. However, they noted that these differences were not statistically significant as adjusted R^2 increased when Japanese, American, and Other DFI were aggregated into one term.

coefficient in Thailand could be an indication of anti-trade orientation on the part of American DFI in that country. However, it is clear that, with the possible exception of Korea, the contribution of American DFI to host country GNP has not been statistically significant. This is a likely result of MNC-type DFI which can lead to disregard of comparative advantage and the macroeconomic impacts of DFI.

VI. *Conclusion*

In this paper two facts of importance are highlighted. First of all, it is shown that the patterns of Japanese and American DFI are quite different and that these differences can be largely explained by differences in the behaviour of American and Japanese firms. The microeconomic interests of MNCs dominate America's DFI and as a result macroeconomic impacts, such as the impact of DFI on patterns of comparative advantage, are largely ignored. On the other hand, the pattern of Japanese DFI has been characterised as the "trade oriented type" in which macroeconomic impacts, such as the impact on patterns of comparative advantage, have been considered either explicitly or implicitly. As a result Japanese DFI differs considerably between countries and over time.

Secondly, we have seen that Japanese DFI has contributed to the development of host countries with more efficiency than American DFI has in most cases. Here our analysis was limited to impacts on trade and GNP and thus more comprehensive analysis is desirable in this respect.

Furthermore, we have limited ourselves to investigation of impacts of developed country (Japan and U.S.) DFI in developing countries in Asia. There is reason to believe that a change in the sample, for example investigation of DFI among developed countries, would lead to consideration of different issues and mandate the development of new theoretical tools. It is thus our next task to tackle such issues.

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