Hitotsubashi Journal of Economics 29 (1988) 165-179. © The Hitotsubashi Academy

AMERICAN AND JAPANESE DIRECT FOREIGN INVESTMENT IN TAIWAN: A COMPARATIVE STUDY*

TEIN-CHEN CHOU

I. *Introduction*

Since the mid 1960s, Japanese firms have rapidly increased their overseas investment (Ozawa, 1979). The distinct features of Japanese firms, which differ significantly from firms in other countries, have attracted the attention of many researchers.[1] Professor Kiyoshi Kojima (1973, 1978, and 1985) has posited that the market orientation of Japanese direct foreign investment (DFI) is significantly different from that of other countries, especially American DFI. Kojima argues that Japanese DFI is "trade-oriented," while American DFI is "anti-trade-oriented." The implicit assumptions with regard to the differences in market orientation include the differences in the choice of industry, the state of the "product-cycle," the scale of operations, and firm-specific advantage. Furthermore, a corollary of Kojima's hypothesis is that the firm carrying out DFI will choose between different patterns of ownership, ranging from 100% ownership to a joint venture or to a minority interest.

Several studies have in fact shown, by means of applying a structure-conduct-performance paradigm,[2] that the differences in foreign ownership could lead to differences in the determinants of profitability. Accordingly, this study constructs a profitability equation and uses regression analysis to examine whether the determinants of the profitability of Japanese and American firms, respectively, are all the same.

In section II, Kojima's hypothesis is discussed in greater detail and a number of null hypotheses concerned with market orientation and other operational characteristics are proposed. These hypotheses are then tested using the 1983 survey data on DFI in Taiwan. The empirical evidence for Taiwan, in contrast to the case of Korea (Lee, 1980), does not seem to support Kojima's hypothesis since both American and Japanese DFI in Taiwan

* This paper was presented at the 14th Annual Conference of the European Association for Research in Industrial Economics, at the Colegio Mayor Empresa Publica in Madrid, August 30–September 1, 1987. I would like to thank Gili Yen and B.S. Stewart for helpful improvement in English. Remaining errors are, of course, mine.

[1] For instance, see Kojima (1973, 1978, 1985), Kojima and Ozawa (1984), Lee (1980, 1983, 1984), Ozawa (1979), Romer (1976) and Pangestu (1987).

[2] With regard to the application of the industrial organization approach to the problem of DFI, see Cave (1971, 1982). For a discussion on profitability and ownership, see Chen (1983), Newfarmer and Marsh (1981) and Donsimoni and Leoz-Arquelles (1981).

are observed to be export-oriented. However, other results show that differences still remain with regard to the scale of operations, factor intensities and the balance of ownership between American and Japanese DFI in Taiwan.

In section III, a profitability model is set up and then tested by using the data for American and Japanese firms both jointly and separately. Therefater a Chow-test is applied, the results indicating that differences in the determinants of profitability for American and Japanese firms do in fact exist. The empirical results also provide additional information in support of the view that there are significant differences in the behavior of these two kinds of DFI in Taiwan. Concluding remarks are provided in Section IV.

II. *Testing Kojima's Hypothesis*

(a) The dimensions of Kojima's hypothesis

Before presenting a theoretical discussion and carrying out an empirical evaluation of Kojima's hypothesis, it is first of all important to know something about the situation of DFI in Taiwan. Table 1 presents DFI in Taiwan on the approval basis for the 1953–85 period. As shown in the bottom row of the table, American and Japanese DFI together constituted 71% of the total DFI and the remaining 29% was shared by other countries.[3]

However, during the 1953–60 sub-period, U.S. and Japanese DFI accounted for 99.8 % of the total DFI for that period. Although their share is declining, it is clear that the United States and Japan remain the predominant investors in Taiwan. It seems reasonable, therefore, to regard Taiwan as a good "laboratory" as far as a comparison of American and Japanese DFI is concetned.

TABLE 1. DIRECT FOREIGN INVESTMENT IN TAIWAN, 1953–85
(on approval baiss)

unit: thousand US$

Year	(1) U.S.A.	(2) Japan	(3) = (1) + (2) Sub-total	(4) Others	(5) Total
1953-60	23,481	1,681	25,162 (100%)	50 (0%)	25,212
1961-65	55,000	8,171	63,171 (94%)	3,653 (6%)	66,824
1966-70	163,658	79,158	242,816 (80%)	61,412 (20%)	304,228
1971-75	227,844	126,862	354,706 (59%)	243,996 (41%)	598,702
1976-80	306,242	241,784	548,026 (72%)	210,592 (28%)	758,618
1981-85	940,048	672,771	1,612,819 (72%)	618,817 (28%)	2,231,636
1953-85	1,716,273	1,130,427	2,846,700 (71%)	1,138,520 (29%)	3,985,220 (100%)

Sources: Investment Commission, MOEA (1985), *Statistics on Overseas Chinese & Foreign Investment, Technical Cooperation, Outward Investment, Outward Technical Cooperation, R.O.C.*, p. 9.

[3] However, here, overseas Chinese investment is not included in the data. It amounted to US$1,175 million on the approval basis during that period.

The comparison of American and Japanese DFI should be especially instructive in the light of a recent hypothesis advanced by Kiyoshi Kojima (1973, 1978 and 1985). Kojima argues that Japanese DFI complements Japan's comparative advantage position and is thus "trade-oriented"; in contrast, American DFI displaces the U.S.'s comparative advantage position and is thus "anti-trade-oriented."[4] Clearly, Kojima's hypothesis deals only with the impact of DFI on trade—the effect on the comparative advantage of the countries involved. However, one would also expect DFI to change the growth rate of the host country's economy and thus have a long-run dynamic effect on its pattern of trade. Without specifying the long-run dynamic effect, one cannot, therefore, designate any given DFI as either trade-oriented or anti-trade-oriented. To avoid the possible confusion that might arise due to the ambiguous usage of terminology, *export-oriented* and *domestic-market-oriented* are used in this paper in place of "trade-oriented" and "anti-trade-oriented," respectively. The former has the apparent advantage of referring to a more immediate effect of DFI which bears no relation to its long-run dynamic effect.

According to Kojima, most Japanese firms that have undertaken DFI have directed their attention towards using the abundant natural resources and unskilled labor of the host country. As a result, Japan's DFI in the manufacturing industries has been mostly confined to such traditional industries as textiles and clothing and to such unskilled labor-intensive processing industries as motor vehicle assembly and electrical apparatus. These industries have been able to be operated by relatively small-scale firms. On the contrary, American DFI has been directed towards the domestic market of the host country. In addition, American firms have usually undertaken DFI in more highly-sophisticated industries, such as the machinery industry, and in capital-intensive industries such as chemicals, mainly through the medium of large oligopolistic firms.

Moreover, the state of the "product cycle" created by American firms tends to be relatively new, whereas the corresponding one for the Japanese firms tends to be relatively mature. As a result, it can be postulated that Japanese firms are more likely to possess advantages in non-marketable, firm-specific marketing, while the American firms' advantages are rooted in technology and management. Since it is easier to transfer production technology than it is to transfer marketing capability, Japanese investors are more likely to allow the local partners to share in the control of their foreign operations, thus causing them to prefer to enter into a joint venture or opt for a minority shareholding instead of seeking 100% ownership.[5] However, for the Americans the reverse is true. They prefer 100% ownership to joint ventures and minority holdings.

To sum up, the differences in market orientation (export- orientation vs. domestic-market-orientation), the choice of industry (sophisticated industries vs. conventional ones), the factor-intensity of technology (unskilled labor-intensive vs. capital-intensity), the size of the firm (small vs. large scale), and the control of ownership (minority vs. majority hold-

[4] It is quoted from Lee (1980, note 1, p. 26) that "Kojima uses Purvis's definition (1972) of trade-oriented and anti-trade-oriented investment. Accordingly, foreign investment is trade-oriented if it generates an excess demand for imports and an excess supply of exportable at constant terms of trade, and it is anti-trade-oriented if the converse holds."

[5] The same argument that Japanese firms are deemed to be more responsive to the formation of joint-ventures with the host country is found in Ozawa (1979).

TABLE 2. SOME DIMENSIONS OF KOJIMA'S HYPOTHESIS

	Japanese DFI	American DFI
Market orientation	Export-oriented	Domestic-market-oriented
Choice of industry	Conventional	Sophisticated
Firm size	Small	Large
Technology (factor intensity)	Labor-intensive	Capital-intensive
Ownership	Joint-venture & minority control	100% ownership or majority holdings

Source: the author.

ings) between American and Japanese DFI in Taiwan may be inferred from Kojima's hypothesis which is summarized in Table 2.

(b) Empirical tests of Kojima's hypothesis

To see if the choice of industry between American and Japanese DFI in Taiwan is significantly different or not, U.S. and Japanese DFI is broken down by industry in Table 3. Because the willingness to invest is the main concern, the data on the approval basis rather than on the arrival basis is used here. Table 3 shows 13 manufacturing industries in which U.S. and Japanese DFI was undertaken. Among them, the five leading industries in which U.S. was allocated are electronics & electric appliances; chemicals; basic metals and metal products; machinery, equipment & precision instruments; and food & beverage processing, in descending order of the amount invested. As for Japanese DFI, the only difference in these top five industries is that plastic & rubber products replaces food & beverage processing to take fifth place.

In order to further judge the significance of the order of preference of the different industries on the list, the rank correlation of the amount invested within the manufacturing industries for the two kinds of DFI is calculated. The value of Spearman's correlation coefficinet is found to be 0.791, and thus the null hypothesis that American investment is consistently related to Japanese investment with regard to the choice of industry is rejected at the 1% significance level.[6] Moreover, a similar result (the correaltion coefficient is 0.731) is found by using equity data for U.S. and Japanese firms for the year 1984.

Table 3 also shows that the number of investment projects is, in general, larger in U.S. DFI than in Japanese DFI. The exceptions are lumber & bamboo products, machinery, equipment & instruments, and miscellaneous manufactured products. However, to compare scales of operation (or market orientation, factor intensity or ownership control) of the DFI of these two countires, the data needs to be more detailed and on an arrival basis.

Every year, the Investment Commission of the Ministry of Economic Affairs collects annual survey data on DFI. The data are prepared and published in the "Survey Report on Foreign Direct Investment," and in the report can only be read in its fixed format. How-

[6] A similar structural pattern of industry exists not only between America and Japanese investment, but also between foreign investment and local investment. By means of the same calculation, Spearman's correlation coefficient is found to be 0.637 for the comparison between American and local firms, and also for that between Japanese and local firms.

TABLE 3. AMERICAN AND JAPANESE DIRECT INVESTMENT IN TAIWAN BY INDUSTRY, 1953–85 (on approval basis)

unit: thousand US$

Industry	U.S.A.			Japan		
	Cases	Amount	Average amount	Cases	Amount	Average amount
Food & Beverage Processing	25	48,196	1,928	27	13,098	485
Textile	1	2,224	2,224	29	34,346	1,184
Garment & Footwear	15	4,229	282	38	8,122	213
Lumber & Bamboo Products	6	778	130	18	4,709	262
Pulp Paper & Products	3	12,314	4,105	10	1,831	183
Leather & Fur Products	10	2,447	245	9	1,087	121
Plastic & Rubber Products	22	26,914	1,223	70	59,974	857
Chemicals	82	440,577	5,373	94	88,055	937
Non-metallic Minerals	12	8,705	725	41	15,957	389
Basic Metals & Metal Products	45	89,518	1,982	163	112,450	690
Machinery Equipment & Instruments	42	59,440	1,415	90	300,961	3,344
Electronic & Electric Appliances	140	808,316	5,774	220	331,512	1,507
Miscellaneous Manufactured Products	27	14,130	523	58	36,595	631
Sub-total	430	1,517,788	3,530	867	1,008,697	1,163
Services	69	192,929	2,796	27	119,998	4,444
Others ①	9	13,919	1,547	6	1,732	289
Total	505	1,716,333	3,399	900	1,130,427	1,256

1. Including agriculture, mining, construction.

Sources: Investment Commission, MOEA (1985), *Statistics on Overseas Chinese & Foreign Investment, Technical Cooperation, Outward Investment, Outward Technical Cooperation, R.O.C.*, p. 10.

ever, this data cannot completely meet the needs of the hypothesis test. Fortunately, by being able to obtain the original tape for this survey's data, we have been able to make this comparison feasible.

We have decided to use 1983 DFI firm data. Brief definitions and the sources of the variables are given in the Appendix. The market orientation (EX, EXJ and EXA), firm size and scale of operations (CAP, SALE, TASS, NASS and WORK), ownership control (OWN), and factor-intensity (KL, RD and IMI) are compared between American & Japanese DFI in Taiwan. The null hypothesis here is that there is no difference in each of those variables between the DFI of the two countries in Taiwan. Accordingly, Kojima's confecture forms our alternative hypothesis. The mean and standard deviation of the above variables can be calculated for each country's DFI. Then, the t-statistic for the tests of the above null hypothesis are shown in Table 4. It is to the results and discussions that we now turn.

First of all, the degree of export-orientation may be explained by the export intensity variable (EX). American firms export 61% of their sales, while Japanese firms export

TABLE 4. A COMPARISON OF SOME FEATURES BETWEEN AMERICAN AND JAPANESE FIRMS IN TAIWAN, 1983

	U.S.A.	Japan	U.S.A.	Japan	U.S.A.	Japan
Market-orientation	EX		EXJ		EXA	
Mean	61.0	60.0	4.6	29.5	50.5	19.3
S.D.	43.1	43.8	17.0	37.5	40.9	31.9
t-stat.	0.19		8.45***		6.08***	
Firm size & scale	CAP		SALE		TASS	
Mean	83.8	47.7	373	234	297	174
S.D.	123.0	70.3	503	362	253	271
t-stat.	2.66***		2.45***		4.03***	
Scale & ownership	NASS		WORK		OWN	
Mean	155	76	454	261	74.3	60.2
S.D.	219	126	1,130	556	33.2	28.4
t-stat.	3.27***		1.56*		4.03***	
Factor-intensity	KL		RD		IMI	
Mean	73.1	47.0	0.78	0.20	52.2	49.8
S.D.	173.3	75.3	2.49	0.81	33.3	33.5
t-stat.	1.38*		2.18**		0.61	

Significance levels of t-statistics are ***=1%, **=5%, *=10%.

Source: the original taped data of "the 1983 Survey on Foreign Direct Investment in Taiwan" conducted by the Investment Commission, MOEA.

60%. Both American and Japanese firms are thus highly export-oriented. The t-statistic shows that the null hypothesis cannot be rejected. This seems to be inconsistent with Kojima's hypothesis concerning market orientation. One possible explanation of this phenomenon is the attitude of the Taiwan government. There are many restrictions imposed on direct investment by foreign investors. However, most of the restrictions are not based on statute law but arise as a result of the procedures for obtaining approval from the Investment Commission of the Ministry of Economic Affairs. Export-oriented foriegn investment is particularly welcome in order to fully utilize the abundant supply of labor in Taiwan and to earn foreign exchange.[7] Of course, another reason for selecting this type of foreign investment is to protect domestic firms from foreign competition.[8] As a consequence, both American and Japanese DFI firms in Taiwan are export-oriented. Cohen's suggestion (1977, p. 135) that the principal reason behind the Korean government's en-

[7] The requirement of the export ratio is usually a necessary condition for obtaining approval for a foreign investment project. Concerning direct investment policy in Taiwan, see Wu et al. (1980) and Yu (1985). However, it should be noted that the direction of policy was forced to change due to Taiwan's huge trade surplus with the U.S. since 1986.

[8] One may therefore say that the policy of approving foreign investment by the Taiwan government is highly selective. This can also explain why there is no significant difference in the choice of industry between Japanese and American DFI in Taiwan.

couraging DFI may have been political rather than economic seems to gain empirical support in the case of Taiwan.

However, if we further compare the destination of exports, we find that one half of the American firms' exports (50.5%) are sold back to the U.S., and only 4.6% are sold to Japan (see Table 4). In the case of the Japanese firms, only 29.5% of their total exports are sold to Japan, and 19.3% are sold to the U.S. It is unlikely, judging from the results, that Japanese exporters in Taiwan adopt a "circular export strategy" to circumvent restrictive import measures by the U.S. It seems reasonable, therefore, to confirm the above argument that Japanese firms in Taiwan possess firm-specific (and non-location-specific) advantages in marketing (international marketing).[9] The high export intensity and resale ratio to the home country reveal that American DFI in Taiwan is motivated by the international division of labor considerations of large U.S. multinationals which usually have firm-specific, non-marketable advantages in production technology and management.

Second, firm size and the scale of operations can be compared by the following variables: capital, sales, total assets, net assets and employees. Table 4 shows that American firms in Taiwan have significantly larger scales of operation than Japanese firms in terms of capital, sales, or assets. According to Riedel (1976), however, who carried out research on DFI Taiwan, the most important factor for export-oriented DFI is the availability of relatively inexpensive labor in the host country. Consequently, American firm size in terms of the number of employees is still larger than in the case of the Japanese, but the difference only becomes slightly significant at the 10% significance level.

Third, the null hypothesis which assumes that there is no difference in ownership control between American and Japanese firms in Taiwan is rejected in Table 4. American firms significantly have more majority shareholdings (74.3%) than Japanese firms (60%). Again, the t-test is significant at the 1% significance level. Table 5 presents a more detailed ownership pattern of American and Japanese DFI in Taiwan. It shows that 76.8% of U.S. investment projects in Taiwan have U.S. ownership of 50% or more, and only 23.2% have U.S. ownership of less than 50%. In other words, more than three-quarters of the U.S. investment projects in Taiwan are controlled by U.S. investors and less than a quarter are controlled by the Taiwanese partners. Table 5 also shows that Japanese firms

TABLE 5. OWNERSHIP PATTERN OF AMERICAN AND JAPANESE DFI IN TAIWAN, 1983

Ownership share	U.S.A.		Japan	
	Cases	(%)	Cases	(%)
100%	49	(49.5)	81	(22.5)
50-99%	27	(27.3)	124	(34.4)
0-49%	23	(23.2)	155	(43.1)
Total	99	(100.0)	360	(100.0)

Source: The Investment Commission, MOEA (1985), *The 1983 Survey on Foreign Direct Investment in Taiwan.*

[9] Lee's argument (1980) that Japanese DFI in Korea possesses an advantage in "location-specific" rather than "non-location-specific" marketing techniques seems not to apply to Taiwan.

in Taiwan have different patterns of ownership. Slightly over half of the Japanese investment projects in Taiwan (56.9%) involve majority shareholdings whereas the other slightly less than half exercise only minority interests. As shown above, Table 5 confirms that American investors in Taiwan prefer 100% ownership to joint-ventures or minority holdings while Japanese investors prefer just the opposite.

Finally, factor-intensity can be compared by capital, labor, R&D expenditure and intermediate goods imported. Table 4 shows that American DFI in Taiwan is more capital-intensive and "brain-intensive" than Japanese DFI. The R&D intensity is higher in American DFI in Taiwan than in Japanese DFI at the 5% significance level according to the t-test. American firms in Taiwan are more capital-intensive than Japanese firms, but only at the 10% significance level. Again, the same motivation for export-oriented DFI confirms that the difference in KL between Japanese and American firms in Taiwan is not so significant. Furthermore, the fact that around half of the intermediate goods used to produce these final goods are imported means that similar "export-processing" types of investment projects exist in Taiwan regardless of whether they are undertaken by American or Japanese firms. As was mentioned above, this could be the result of government attitudes to DFI in Taiwan. Only one possible difference is the state of the "product cycle" in that American products are relatively new and Japanese products mature, based on the fact that American DFI has a relatively high R&D intensity. This seems to support the above argument that American DFI possesses an advantage in production technology and management, which is why the American firms prefer majority ownership.

In short, the empirical data together with the t-tests show that (1) both American and Japanese firms in Taiwan are "export-processing-oriented" with no significant differences in distribution according to industry; (2) American firms in Taiwan have larger scale of operation than Japanese firms; (3) American firms tend to adopt more capital-intensive technology at the 10% significance level and more "brain-intensive" technology at the 5% significance level; and (4) American investors prefer majority ownership to minority holdings. In other words, Kojima's hypothesis is only partially verified by the empirical evidence. Specifically, differences in market orientation and choice of industry do not occur in Taiwan yet, but the differences in firm size and ownership control do exist. The reason for the rejection of the other aspects of Kojima's hypothesis may be the result of the government's selective restrictions on DFI, while the reason for the confirmation of the points outlined above may be due to American firms in Taiwan being relatively large and possessing advantages in production technology and management.

III. *The Determinants of Ptofitability and Foreign Ownership*

(a) Specification of the profit equation

Most of the determinants of a firm's profitability have been extensively analyzed in the industrial organization literature. Therefore, they will only be briefly examined here. A firm's profitability is determined by both industry and firm characteristics. The industrial concentration ratio (CR) represents market power and industrial growth (GROW) represents the dynamic market situation within which a firm operates. These two variables which are basic elements of the market structure are included in the profit equation. A

positive sign of concentration on profitability is expected. The influence of industrial growth on a firm's profitability is indeterminate and depends on the increases in demand or supply, high capacity utilization or new competitors.

Firm size (LASS)[10] and capital intensity (CAPIN) are two variables that are used to represent the scale of operations of a firm. Again the relation between profitability and the scale of operations is indeterminate and depends on the relative position of the scale of operations with reference to the minimum efficient scale (MES) and the type of cost function. When the scale of operations is less than the MES, in the case of increasing returns, the larger the scale the higher the profitability; but when the scale of operations is larger than the MES, in the case of decreasing returns, the larger the scale the lower the profitability. Thus, the sign of the scale of operations alone is a priori indeterminate.[11]

As was shown above, the control of ownership (OWN) can indicate the degree of firm-specific advantage in terms of production technology, management and marketing. The higher the share of ownership, the larger the firm-specific advantage and thus the higher the profitability. The financial structure of a firm represents its pecuniary position and does have an influence on its profitability. It is expected, by the same token, that the liability ratio (RLIA) will have a negative influence on the profitability.

The final group of explanatory variables included in the profit equation relate to the foreign sector. Because both American and Japanese DFI in Taiwan are export-processing-oriented, three variables, namely, EX, IM, and KL, are included. The high import intensity, as shown in Table 4, presents both Japanese and American investors with the need to import intermediate and producer goods from their home countries (or abroad) for the manufacturing process. Consequently, given the prices of export-processing products, the higher the import intensity (which may come about through the use of transfer prices), the higher the costs and thus the lower the profitability. The influence of EX on profitability depends on the firms' export behavior and their degree of monopoly power in the export market. The high proportion of the American firms' products that are resold to the U.S. increases the possibility that they will adopt transfer pricing. If this is the case, a negative relationship can be expected to exist between EX and profitability. The variable KL indicates the appropriateness of operational technology. The more appropriate the technology, the higher will be the profitability.

The resulting profit equation, with the expected signs indicated below each independent variable, may be specified as follows:

$$\begin{array}{cccccccccc} \text{PRO}=\text{f}\,(\text{CR}, & \text{GROW}, & \text{LASS}, & \text{CAPIN}, & \text{OWN}, & \text{RLIA}, & \text{KL}, & \text{EX}, & \text{IM}) \\ & + & + & + & + & + & - & + & + & - \\ & & - & - & - & & & - & - & \end{array}$$

(b) Estimation and Chow-test

As noted above, the firm data was gathered from the original tape of the 1983 Survey on Foreign Direct Investment in Taiwan conducted in 1985 by the Investment Commission,

[10] Other variables representing firm size are shown in Table 4. They are used to estimate the profit equation in the preliminary estimations and are dropped due to their failure in the statistical tests.

[11] If the variable can be computed as the operational scale divided by MES, a positive sign for this variable on the profitability is expected. However, the MES variable cannot be exactly computed here due to the problem of data classification.

Ministry of Economic Affairs. There were 478 firms in that survey and only the data of 437 firms are valid and used in this study. Among them, 89 are American firms and 348 are Japanese firms. The industry data, the concentration ratio and data on industrial growth are obtained from the 1981 Industry and Commerce Census of Taiwan and aggregated to arrive at the current classification. Brief definitions of the variables are given in the Appendix.

The first test is to determine whether the coefficients in the profit equation shown above differ statistically between American and Japanese firms in Taiwan. Therefore, the profit equation is estimated by first of all using a data set for all 437 firms, and then by using the 89 American firms and the 348 Japanese firms, respectively. The results are given in Table 7.

From the results, an F-ratio can be computed, as shown in Table 6, to perform the so-called "Chow-test" for which the null hypothesis is that the coefficients of the profit equation are the same between the two groups of data, i.e., American and Japanese DFI in Taiwan. Table 6 reveals that the F-ratio for the Chow-test is 7.42, which means that we can reject the null hypothesis at the 1% significance level. In other words, the determinants of profitability for American and Japanese firms in Taiwan differ from each other.

(c) Empirical results

As was shown in the second and third columns of Table 7, some coefficients in the profit equation are statistically insignificant. Therefore, the Amemiya Prediction Criterion (APC) can be used to choose explanatory variables in order to improve the fit of the equation.[12] The improved results are given in the fourth and fifth columns of Table 7. As a result, the differences in the determinants of profitability between American and Japanese investors in Taiwan can be broken down into five categories.

First, the profitability of American firms in Taiwan is negatively but insignificantly influenced by the two elements of market structure, namely, industrial growth and industrial concentration. This is probably because foreign investment in Taiwan is restricted by

TABLE 6. TESTING THE DIFFERENCE BETWEEN THE AMERICAN AND JAPANESE PROFITABILITY EQUATIONS

	U.S.A.	Japan	Total
$\bar{R}^2$	42.9	44.2	36.3
Number of firms	89	348	437
SSR	1.694	2.650	5.117
SSRU, SSRR	4.344		5.117
CHOW-test①	7.42		

1. F-ratio for CHOW-test$=\dfrac{(SSRR-SSRU)/K}{SSRU/(NA+NJ-2K)}$, where K, NA, NJ are the number of total, American and Japanese firms, respectively.

Sources: Calculated from Table 7.

[12] For the APC method, see Judge et al. (1982), p. 603.

TABLE 7. DETERMINANTS OF PROFITABILITY

	Total	U.S.A.	Japan	U.S.A.	Japan
CONST	−28.93	−7.70	−26.50	−23.30	−28.30
	(−2.91)***	(−0.23)	(−2.88)***	(−1.13)	(−3.88)***
CR	0.044	−0.224	0.112		0.114
	(0.69)	(−1.03)	(1.85)**		(2.00)**
GROW	−0.157	−0.270	−0.972		
	(−0.77)	(−0.37)	(−0.54)		
LASS	2.00	1.98	1.54	1.99	1.56
	(4.80)***	(1.69)**	(3.85)***	(1.82)**	(3.95)***
CAPIN	0.0054	−0.204	0.0053	−0.236	0.0053
	(13.22)***	(−4.55)***	(15.78)***	(−7.81)***	(15.83)***
OWN	0.025	0.076	0.021	0.065	
	(1.37)*	(1.42)*	(1.14)	(1.33)*	
RLIA	−0.140	−0.468	−0.139	−0.538	−0.140
	(−3.41)***	(−1.47)*	(−4.10)***	(−1.66)*	(−4.16)***
KL	−0.048	−0.014	−0.029		−0.030
	(−8.91)***	(−0.98)	(−4.08)***		(−4.40)***
EX	−0.027	−0.094	−0.0016	−0.074	
	(−1.94)**	(−2.19)**	(−0.12)	(−1.93)**	
IM	−0.013	0.05	−0.017		−0.016
	(−1.36)**	(0.88)	(−2.17)**		(−2.11)**
N	437	89	384		384
R^2	37.6	48.7	45.7	46.7	45.5
$\bar{R}^2$	36.3	42.9	44.2	43.5	44.5
F	28.5***	8.36***	31.6***	14.57***	48.7***
APC		0.643	0.586	0.610	0.578

t-statistics (one-tail test) are given in parentheses.
Significance levels of coefficients are ***=1%, **=5%, *=10%.
APC is the Amemiya Prediction Criterion.

government policy within the confines of the export-processing-oriented type in which the firm's performance is not influenced by market circumstances.[13] However, a significant and positive degree of industrial concentration is found in Japanese firms which conforms with our theory. The highly concentrated industries in Taiwan are domestic-market-oriented and mostly controlled by domestic entrepreneurs with protective measures.[14] Therefore, Japanese firms may enjoy high profits from concentrated industries and share them with local partners through their minority holdings.

[13] Chou (1986a) shows that industrial concentration does have a positive influence on profitability, but that this significance exists only in the domestic-market-oriented sector and not in the export-oriented sector (Chou, 1986b).

[14] A so-called "dichotomous" market structure is discussed by Chou (1986b).

Second, both LASS and CAPIN are variables used to indicate the scale of operations of a firm. There is a difference in the variables used to represent the degree of capital intensity between American and Japanese firms in Taiwan. As explained above, Japanese DFI is likely to have low capital intensity in relation to the minimum efficient scale of operations, and for American DFI the opposite situation applies. In other words, American direct investment operates in Taiwan with decreasing returns on capital and Japanese direct investment with increasing returns to capital.

Third, the impact of RLIA on profitability meets the above expectations. The variable OWN in the profit equation is significant only in American firms at the 10% significance level. This seems to indicate that Japanese investors do not obtain higher profitability from more majority holdings, but that American investors slightly gain from firm-specific advantages by means of their majority holdings. As shown above, this is because Japanese investors possess a nontransferable marketing advantage and this advantage can be realized by minority holdings through which Japanese firms seem to enjoy monopoly power.

Fourth, it seems to be the case that Japanese firms in Taiwan not only may enjoy increasing returns to scale by increasing their capital, but also by increasing the labor input. Accordingly, increasing labor, and thus decreasing KL, leads to higher profitability. A positive sign for CAPIN and a negative sign for KL jointly reveal that the scale of operations of Japanese firms in Taiwan is too small to exploit the underlying economies of scale.

Finally, the influence of trade on profitability indicates the possibility that transfer pricing is used, though in different ways, in both American and Japanese DFI. That is, American investors prefer to sell their products at low prices and Japanese investors prefer to procure intermediate goods from abroad at high prices. The reason for adopting transfer pricing is likely to be due to the restrictions on the repatriation of profits under the foreign exchange regulations and/or the high level of tax in Taiwan.

IV. *Concluding remarks*

Since the Taiwan government has imposed highly selective restrictions on foreign investment, the foreign investment in Taiwan is mostly of the "export-processing-oriented" type.[15] Therefore, significant differences in terms of market orientation and choice of industry between American and Japanese DFI do not exist in Taiwan. Hence, the evidence for Taiwan is in part inconsistent with the so-called Kojima hypothesis. As a result, firm profitability is not significantly influenced by the industrial environment. However, differences still exist in terms of the scale of operations, factor-intensity and ownership control. These differences result in the determinants of profitability being different between American and Japanese firms in Taiwan.

From the profit equation, we find that American investors in Taiwan, on the one hand, seem to make use of more capital-intensive technology, possess firm-specific advantage by means of their majority holdings and tend to sell their products at low prices. The Japanese investors, on the other hand, seem to have less capital-intensive operations, relatively

[15] Concerning the heavy role of the government in Taiwan's industrial organization, see Chou (1986a, 1986b).

small scales of operation, they do not possess firm-specific advantages in terms of ownership control, and they tend to procure their intermediate inputs from abroad at high prices. It must of course be realized that the above findings may no longer hold following the recent liberalization of foreign investment policy in Taiwan. This is a matter that merits further research.

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APPENDIX: SOURCES AND DEFINITIONS OF VARIABLES

Variable	Definition	Source
PRO	Profit before tax divided by sales (%)	(1)
CAP	Capital (million N.T. dollars)	(1)
SALE	Sales (million N.T. dollars)	(1)
TASS	Total assets (million N.T. dollars)	(1)
NASS	Net assets (million N.T. dollars)	(1)
WORK	Number of employees (man)	(1)
OWN	Foreign capital divided by total capital (%)	(1)
RLIA	Liabilities divided by net assets	(1)
EX	Exports divided by sales (%)	(1)
EXA	Exports to U.S. divided by total exports	(1)
EXJ	Exports to Japan divided by total exports	(1)
IM	Imports divided by sales (%)	(1)
IMI	Intermediates imported divided by intermediates used (%)	(1)
KL	Assets divided by total workers (%)	(1)
RD	Expenditure on R&D divided by sales (%)	(1)
CR	Concentration ratio of four largest firms in 1981 (%)	(1)
GROW	Annual growth rate of industry sales in 1976–81 (%)	(2)
LASS	Logarithm of fixed assets	(1)
CAPIN	Fixed assets divided by sales (%)	(1)

Data sources are:

(1) The original taped data of "the 1983 Survey on Foreign Direct Investment in Taiwan" conducted by the Investment Commission, Ministry of Economic Affairs.

(2) The Committee on Industrial and Commercial Censuses of Taiwan, R.O.C. (1980), *General Report of Industry & Commerce Census of Taiwan.*