Japanese direct investment in Asia–Pacific and other regions: Empirical analysis using MITI survey data

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Abstract

Japanese foreign direct investment (FDI) increased significantly in recent years. In North America and Europe Japanese FDI is set up primarily to serve the local market, while in Asia Japanese FDI exports considerable amounts of their products to Japan and other countries. In this paper the effects on profitability, among other firm performance measures, of intra-firm and foreign-trade behavior by Japanese firms and their overseas subsidiaries are investigated empirically using the data published by the Japanese Ministry of International Trade and Industry. Our findings indicate that intra-firm trade is an important source of profits for both parent and subsidiary firms. The impact of intra-firm trade on firms' taxes payable and other related issues are also discussed.

1. Introduction

Japanese foreign direct investment increased substantially from 1980 to 1988 in most regions in the world. (Foreign direct investment involving the flow of capital from a foreign country to a host country to establish production and service facilities and to conduct business activities is distinguished from a portfolio investment in foreign countries to earn investment income such as dividends and capital gains. This distinction is not always clear-cut, however.) They amount to 22.328 billion dollars in 1988 (1.596 in 1980) for North America; 5.569 (1.186) for Asia; 9.116 (0.578) for Europe; 6.428 (0.588) for Central and South America; 0.259 (0.158) for the Middle East; 0.653 (0.13) for Africa; 2.669 (0.448) for Oceania (Economic Planning Agency [1]). The share of foreign production in the total sales revenue for the Japanese manufacturing sector also increased from 2.9% in 1980 to 4.9% in 1988. (Japanese foreign production is still small relative to the U.S. and West Germany. Foreign production ratios are 21.9% in 1987 for the U.S. and 17.3% in 1986 for West Germany.) Largest num-

bers of Japanese subsidiaries are found in Asia (Table 1).

As Nakamura [2] shows for U.S. direct investment in Japan, a substantial internal transfer of goods and services exists between U.S. parent firms and their subsidiaries located in Japan. Such an intra-firm transfer often contributes to the profitability of subsidiary firms. (There is, however, a significant difference in the patterns in foreign trade and internal transfer between Japanese and U.S. foreign direct investment (Kojima [3]).) Intra-firm trade between Japanese parent firms and their subsidiaries in Asia is believed to be a determinant of economic growth for Asian economies. It is estimated that if Japan increased its imports from NIES and ASEAN countries by 10 billion dollars, then the combined GNP of these countries could increase by 21.24 billion dollars, which amounts of 4.58% of their combined GNP for 1987. (ASEAN countries are Indonesia, Thailand, The Philippines, Brunei and Malaysia. NIES are South Korea, Singapore, Taiwan and Hong Kong. The increases in the exports to Japan, the imports from Japan and the GNP given an increase of 10 billion dollars in Japanese imports from NIES and

TABLE 1

Japanese foreign direct investment by industry and by region: 1989[a]

	North America	Central & South America	Asia	Middle East	Europe	Oceania	Africa	All
Agriculture/Forestry/Fishery	16(.007)[b]	22(.036)	25(.009)	0(0.0)	7(.005)	17(.045)	4(.024)	91(.012)
Mining	41(.019)	7(.011)	10(.003)	3(.052)	5(.003)	29(0.77)	3(.018)	98(.013)
Construction	63(.029)	15(.024)	130(.047)	16(.276)	25(.018)	10(.027)	3(.018)	262(.035)
Manufacturing	749(.345)	238(.388)	1,720(.619)	13(.224)	412(.296)	80(.214)	31(.189)	3,243(.430)
Food	61(.028)	24(.039)	78(.028)	0(0.0)	8(.006)	8(.021)	2(.012)	181(.024)
Textile	17(.008)	26(.042)	140(.050)	0(0.0)	8(.006)	4(.011)	5(.030)	200(.026)
Lumber/pulp	22(.010)	9(.015)	30(.011)	0(0.0)	2(.001)	8(0.21)	0(0.0)	71(.009)
Chemicals	86(.040)	26(.042)	238(.086)	3(.052)	55(.039)	3(.008)	1(.006)	412(.055)
Steel	40(.018)	11(.018)	62(.022)	2(.034)	4(.003)	2(.005)	6(.036)	127(.017)
Non-ferrous Metals	25(.011)	9(.015)	55(.020)	0(.0)	3(.002)	3(.008)	1(.006)	96(.013)
General Machinery	86(.040)	21(.034)	122(.044)	2(.034)	67(.048)	10(.027)	1(.006)	309(.041)
Elect., Mach.	166(.077)	55(.090)	434(.156)	3(.052)	142(.102)	8(.021)	8(.049)	816(.108)
Transp., Mach.	114(.053)	29(.047)	193(.069)	1(.017)	30(.021)	15(.040)	4(0.24)	386(.051)
Precision	33(.015)	5(.008)	74(.027)	0(0.0)	25(.018)	4(.011)	0(0.0)	141(.019)
Oil/coal	3(.001)	1(.002)	6(.002)	1(.017)	0(0.0)	2(.005)	0(0.0)	13(.002)
Other	96(.044)	22(.036)	288(.104)	1(.017)	68(.049)	13(.035)	3(.018)	491(.065)
Commerce	801(.370)	140(.288)	573(.206)	21(.362)	723(.520)	137(.366)	14(.085)	2,409(.319)
Service	126(.058)	65(.106)	118(.042)	3(0.52)	45(.032)	26(.069)	22(.134)	405(.054)
Other	370(.171)	126(.205)	202(.073)	2(.034)	174(.125)	75(.200)	87(.530)	1,036(.137)
All	2,166(1.0)	613(1.0)	2,778(1.0)	58(1.0)	1,391(1.0)	374(1.0)	163(1.0)	7,544(1.0)

Source: Calculated using data from Ministry of International Trade and Industry[4].

[a]Numbers of Japanese firms' subsidiaries by industry and by region.

[b]Numbers in parentheses represent the distribution by industry for each region.

ASEAN countries are, respectively, 1.68, 0.84 and 1.48 billion dollars for South Korea, 1.37, 1.01 and 2.46 for Taiwan, 0.94, 0.25 and 0.51 for Singapore and Hong Kong combined, and 6.01, 1.88 and 16.79 for ASEAN countries (Economic Planning Agency [1]).)

The patterns of intra-firm trade for manufacturing presented in Table 2 show that subsidiaries' ratios of exports to Japan and elsewhere to their sales revenues are considerably higher for Asia than for other regions while subsidiaries' ratios of imports from Japanese parent firms to their total procurement are highest for North America and lowest for Asia. Exports from subsidiaries to their Japanese parent firms in manufacturing in 1988 were: 5.688 billion dollars for Asia, 2.256 for North America and 0.365 for Europe. (Export/sales and import/procurement ratios vary considerably by industry also. Asian subsidiaries' export ratios are higher for food (43.5%), lumber/pulp (68.8), textile (47.7), electric machinery (56.9) and precision (68.8) than for chemicals (18.4), steel (13.8) and transportation machinery (6.8). The ratios of imports from Japan to Asian subsidiaries are high for steel (54.8%), general machinery (52.3%), electric machinery (44.3%), transportation machinery (44.4%) and precision (60.1%), but quite low for food (4.1%) and lumber/pulp (2.7%). For North American subsidiaries the

TABLE 2

Foreign trade behavior of Japanese firms' overseas subsidiaries in manufacturing

Export share in sales (%)

	North America	Asia	Europe
Local sales	93.8	59.8	95.6
Exports to:			
Japan	4.0	13.7	1.7
Other regions	2.2	26.5	2.7

Import share in procurement (%)

	North America	NIES	ASEAN	Europe
Local purchase	36.9	41.9	49.6	37.2
Imports from:				
Japan	60.8	39.2	41.9	51.6
Other regions	2.3	18.9	8.5	11.2

Source: Ministry of Industry and International Trade [4].

import ratios are also high for general machinery (51.7%), electric machinery (74.0%), transportation machinery (69.4%) and precision (81.1%), but quite low for food (2.3%) and lumber/pulp (0.1%).) It is evident that Japanese direct investment in North America and Europe is intended primarily to serve the local market. Japanese direct investment in Asia, on the other hand, appears to reflect parent firms' strategic decisions to implement, on a global basis, the international division of labor based on the level of technology. It is often argued that this type of foreign direct investment involving offshore sourcing and exporting is generally accompanied by a significant transfer of managerial capabilities embodying essential production technologies from Japanese parent firms to local subsidiaries (Economic Planning Agency [1]).

If the intra-firm transfer of the sort discussed so far between Japanese parent firms and their subsidiary firms in Asia and other regions were to contribute, on a continuing basis, to local and Japanese economies, it would be essential that such an intra-firm transfer is consistent with firms' profit maximization behavior. We should note that even if certain types of intra-firm transfer of goods and services were found to be useful for the purposes of technology transfer and maintaining an equilibrium in international trade balance, parent firms would continue intra-firm transfer policies only if such policies were consistent with profit maximization at least in the long run.

In this paper we will investigate empirically, among other things, the relationships between the transfer of internally traded goods and services and the performances of Japanese parent firms and their subsidiaries overseas. The performance measures used are the profitability for parent and subsidiary firms and subsidiary firms' employment and investment figures. The data used are grouped by industry and region and are based on the survey conducted by the Japanese Ministry of International Trade and Industry [4]. The organization of the paper is as follows: In the following section the profitability of Japanese firms' subsidiaries overseas will be empirically analyzed. The employment and investment behavior of these subsidiaries will be discussed in

Section 3. The determinants of Japanese parent firms' profitability will be considered in Section 4. The paper ends with concluding remarks in Section 5.

2. The profitability of Japanese firms' overseas subsidiaries

Under certain ideal circumstances intra-firm trade between parent firms and their subsidiaries does not matter in the parent firm's profit maximization problem. For example, if there were no taxes to be paid in either the host country or Japan and if its fully-owned subsidiaries consisted of only machines and hence no incentive problems existed, then a parent company could view its subsidiaries as part of itself and would only have to consider what it should pay its outside suppliers of goods and services and what it would receive from the buyers of its products in the external market. Only market prices would matter. Intra-firm trade would not enter the parent-firm's optimization problem except the costs of external services and goods (such as transportation services) that are required for intra-firm trade and must be purchased from the external market.

In practice tax rules for Japan and host countries are different. The taxes paid to a host country government by a subsidiary firm are not necessarily fully creditable to the taxes the parent firm owes to the Japanese government. If the local managers of a subsidiary are assessed based on the subsidiary's sales revenues or its profitability, it would make difference to them to whom they sell their products and at what prices. Are the transfer prices used for the shipment to the Japanese parent firm the same as the external market price their product could command in the market? Because of such incentive problems it is likely that the profitability and other performance measures for a subsidiary play important roles in the management of international operations. (This is particularly so for manufacturing industries which require not only local natural resources but also local labor as inputs. This type of problem may not be so serious if the only purpose of a subsidiary is to purchase certain natural resources available in the host country for its parent company. See Tsurumi [5] for an excellent discussion of transfer pricing.)

For the government of a host country the tax revenues a Japanese firm's subsidiary pays are of considerable concern. To the extent that a parent firm could claim the local taxes paid in a host country as a credit to the taxes it owes the Japanese government, a Japanese parent firm may be more interested in a subsidiary's before-tax profitability rather than its after-tax profitability. For these reasons both before-tax and after-tax profitability measures were used as dependent variables for the regression results reported in Table 3.

While the exports to and imports from a Japanese parent firm (EX.JP and IMP.JP) as well as the exports to third countries (EX.3D) and the local procurement (IMP.LC) all contribute to subsidiaries' before-tax profitability (BTP), only the exports to Japan (Ex.JP) contributes significantly to their after-tax profitability (ATP). Locating subsidiaries in NIES is a negative factor for before-tax profitability but the situation reverses for after-tax profitability. In fact, perhaps because of host countries' tax concessions and available bilateral tax credit schemes between Japan and the countries in North America, ASEAN and NIES, the after-tax income from the direct investment in these regions seems to provide high returns compared to other regions.

Negative and statistically significant effects on ATP of resource-industry dummies (Agriculture/Forestry/Fishery, Mining and Coal/Oil) show that subsidiaries operating in these industries are heavily taxed compared to subsidiaries in other industries. Since a main purpose of the Japanese subsidiaries operating in these resource industries is to secure a stable supply of raw material, this type of negative effect from taxation (income taxes, royalties, etc.) may not deter Japanese direct investment in these industries very much. Tax concessions given Japanese parent firms by a host country government for their direct investment are likely to decrease over time. This is consistent with a negative age effect on subsidiaries' after-tax profitability.

Finally using Model IV in Table 3 the adjusted tax revenues to host country governments from subsidiaries' operations are estimated to be about 18% ($= 1 - 0.823$) of the income of a subsidiary. This adjusted tax rate is considerably below the

TABLE 3

Profitability of Japanese firms' subsidiaries

	Before-tax profitability (BTP)[a]				After-tax profitability (ATP)[b]			
	(I)		(II)		(III)		(IV)	
Intra-firm trade variables[c]								
EX.JP	10.538*	(1.28)[d]	13.639**	(1.67)	4.468***	(2.00)	4.505***	(1.86)
EX.3D	13.493***	(3.49)	12.255***	(3.27)	2.049	(1.10)	2.046	(1.11)
IMP.LC	15.008***	(3.65)	14.299***	(3.75)	−1.033	(.64)	−1.030	(.64)
IMP.JP	7.979*	(1.60)	9.708***	(1.96)	1.892	(.91)	1.914	(.87)
Region dummies[e]								
N. America	−1.194	(.40)	−.581	(.20)	1.241*	(1.40)	1.247*	(1.39)
ASEAN	−.417	(.15)	−1.633	(.61)	1.117**	(1.70)	1.104**	(1.66)
NIES	−3.398*	(1.45)	−4.056**	(1.82)	1.314***	(2.18)	1.306***	(2.18)
Europe	−1.357	(.43)	−.138	(.05)	.621	(.81)	.633	(.82)
Resource-related industry dummies[f]								
Agriculture/Forestry/Fishery	−12.992**	(1.91)	−14.864**	(2.24)	−3.749**	(1.89)	−3.776**	(1.79)
Mining	2.675	(.36)	.570	(.08)	−1.997*	(1.32)	−2.016*	(1.32)
Coal/oil MFG.	−.605	(.08)	−.027	(.00)	−2.268*	(1.53)	−2.262*	(1.52)
Lumber/pulp	4.974	(.92)	3.979	(.73)	−1.684	(1.09)	−1.690	(1.10)
Manufacturing industry dummies								
Food	−3.766	(.88)	−4.941	(1.17)	−.028	(.03)	−.041	(.04)
Textile	5.105	(1.07)	3.953	(.82)	−2.318	(1.10)	−2.326	(1.10)
Chemicals	5.680	(1.23)	4.815	(1.02)	1.536	(1.18)	1.531	(1.18)
Steel	5.209	(1.015)	3.412	(.75)	−1.551	(1.12)	−1.565	(1.12)
Non-ferrous metals	5.041	(.98)	3.464	(.68)	−.962	(.81)	−.974	(.84)
General Machinery	7.236	(.88)	7.015	(.88)	−1.877	(.74)	−1.875	(.74)
Electric Mach.	.939	(.27)	−1.105	(.31)	−.204	(.24)	−.224	(.25)
Transportation Mach.	1.558	(.41)	−.614	(.16)	−.086	(.09)	−.106	(.10)
Precision	2.297	(.60)	.129	(.03)	−.855	(.76)	−.875	(.73)
Other	3.959	(.99)	5.376*	(1.46)	−.869	(.77)	−.852	(.72)
Other industry dummies								
Construction	−1.575	(.31)	.819	(.16)	1.599*	(1.57)	1.622*	(1.50)
Commerce	−1.948	(.50)	−3.028	(.79)	−.366	(.39)	−.377	(.38)
Service	7.547***	(2.08)	8.199***	(2.33)	−.588	(.49)	−.577	(.46)
Other variables								
Age	.269	(.76)	.278	(.83)	−.186***	(2.01)	−.186***	(2.02)
JP-share[g]	−.102*	(1.58)	−.103**	(1.68)	−.039**	(1.81)	−.039**	(1.79)
%JP≠W[h]	—		−.254	(.07)	—		−.002	(.11)
BTP[a]	—		—		.824***	(10.13)	.823***	(9.66)
Constant	−4.886	(1.11)	−3.063	(.71)	2.130***	(1.97)	2.145**	(1.95)
R^2	.339		.381		.914		.914	
No. of observations	144		144		144		144	

Data source: The regression results reported here were computed using data from Ministry of International Trade and Industry [4].

[a]BTP is defined to be 100 times the operating income divided by the sales.

[b]ATP is defined to be 100 times the after-tax profit divided by the sales.

[c]These variables denote a subsidiary's exports to Japan divided by its sales (EX.JP), its exports to countries other than Japan divided by its sales (EX.3D), the cost of material purchased locally divided by the total procurement (IMP.LC) and the cost of material imported from Japan divided by the total procurement (IMP.JP). EX.3D and IMP.LC are not intra-firm trade variables but included here for comparative purposes.

[d]Numbers in parentheses denote absolute t-ratios calculated using heteroskedasticity-corrected standard errors (Kmenta [6]). One, two and three asterisks denote, respectively, significance levels at 80%, 90% and 95%.

[e]These dummy variables are defined for: North America (U.S.A. and Canada), ASEAN countries (Indonesia, Thailand, The Philippines, Brunei and Malaysia), NIES (South Korea, Singapore, Taiwan and Hong Kong) and Europe(U.K., France, W. Germany, Italy, Holland, Belgium, Switzerland, Spain and other European countries). The reference group of regions not included here consists of Central and South America, Asian countries other than those in ASEAN and NIES, Middle East, Oceania and Africa.

[f]The industries whose dummies are not included in this table form the reference group. Coal and oil, and lumber and pulp manufacturing industries are listed here because of their dependence on natural resources in the host country.

[g]The Japanese parent firm's share in percent of ownership in its subsidiary.

[h]The number of Japanese workers divided by the total number of employees of a subsidiary.

TABLE 4

Employment and investment behavior of Japanese firms' subsidiaries

	Employment ($\#w$)[a]				Investment (INV)[b]			
	(I)		(II)		(I)		(II)	
Intra-firm trade variables[c]								
EX.JP	2955.	(.49)[d]	2511.3	(.67)	10052.	(.77)	8261.3	(.66)
EX.3D	14876.***	(2.65)	14376.***	(2.60)	34341.***	(2.58)	32632.***	(2.52)
IMP.LC	−964.5	(.30)	−1458.8	(.45)	−4978.3	(.62)	−6352.1	(.77)
IMP.JP	−3604.6	(.91)	−3912.8***	(.09)	11539.	(.80)	10420.	(.73)
Region dummies[e]								
N. America	15914.***	(3.51)	15932.***	(3.50)	57536.***	(2.96)	57461.***	(2.95)
ASEAN	11620.***	(3.81)	11613.***	(3.82)	2528.6	(.46)	2393.7	(.44)
NIES	15336.***	(2.66)	15428.***	(2.68)	15976.***	(2.90)	16115.***	(2.92)
Europe	3290.2*	(1.41)	3325.1*	(1.42)	−2318.6	(.34)	−2278.4	(.33)
Resource-related industry dummies[f]								
Agriculture/Forestry/Fishing	−3333.1	(.70)	−2818.9	(.61)	−37454.***	(2.53)	−35416.***	(2.44)
Mining	−2182.1	(.47)	−2236.5	(.49)	−27700.**	(1.92)	−27657.**	(1.92)
Coal/oil MFG.	−344.3	(.09)	−2855.1	(.80)	−30967.***	(2.21)	−30545.***	(2.14)
Lumber/pulp	−1933.2	(.55)	−2072.1	(.59)	−27584.***	(2.31)	−27826.***	(2.31)
Manufacturing industry dummies								
Food	−2890.	(.95)	−2760.6	(.90)	−33723.***	(2.95)	−33333.***	(2.90)
Textile	6602.9	(1.16)	6471.4	(1.14)	−26217.**	(1.82)	−26371.**	(1.82)
Chemicals	523.3	(.16)	300.4	(.09)	−19418.*	(1.48)	−20245.*	(1.52)
Steel	2333.5	(.58)	2186.1	(.54)	−12122.	(.70)	−12409.	(.71)
Non-ferrous metals	258.2	(.10)	103.7	(.04)	−26635.***	(1.96)	−26999.***	(2.12)
General machinery	5532.2***	(2.16)	519.5***	(2.06)	−24150.**	(1.87)	−24593.**	(1.88)
Electric mach.	40927.***	(2.87)	40899.***	(2.87)	4182.6	(.24)	4118.8	(.24)
Transportation mach.	19525.***	(5.07)	19473.***	(5.02)	31163.	(.72)	31017.	(.71)
Precision	1915.2	(.57)	1852.5	(.54)	−36699.***	(2.27)	−36798.***	(2.26)
Other	8879.***	(3.11)	8759.6***	(3.04)	−14796.	(1.12)	−15064.	(1.13)
Other industry dummies								
Construction	−344.3	(.09)	−310.1	(.09)	−21645.*	(1.61)	−21738.*	(1.61)
Commerce	17510.***	(2.37)	17584.***	(2.38)	−4143.3	(.22)	−3885.5	(.20)
Service	−54.	(.01)	−301.3	(.11)	−22090.**	(1.68)	−22770.**	(1.71)
Other variables								
Age	34.3	(.11)	28.6	(.09)	−1079.1	(1.10)	−1077.	(1.10)
JP-share[g]	3.48	(.07)	7.72	(.16)	−32.7	(.33)	−16.	(.16)
BTP[h]	—		18.9	(.40)	—		−28.5	(.25)
ATP[i]	−18.6	(.33)			−159.06	(1.19)	—	
Constant	−3568.2	(1.19)	−3440.6	(1.14)	28642.***	(2.40)	28804.***	(2.39)
R^2	.505		.505		.505		.354	
No. of observations	144		144		144		144	

Data source: The regression results reported here were computed using data from Ministry of International Trade and Industry [4].

[a]Employment is measured as the number of employees of Japanese firms' subsidiaries.

[b]Investment by Japanese firms' subsidiaries is measured in million yen.

[c]These variables denote a subsidiary's exports to Japan divided by its sales (EX.JP), its exports to countries other than Japan divided by its sales (EX.3D), the cost of material purchased locally divided by the total procurement (IMP.LC) and the cost of material imported from Japan divided by the total procurement (IMP.JP). EX.3D and IMP.LC are not intra-firm trade variables but included here for comparative purposes.

[d]Numbers in parentheses denote absolute t-ratios calculated using heteroskedasticity-corrected standard errors (Kmenta [4]). One, two and three asterisks denote, respectively, significance levels at 80%, 90% and 95%.

unadjusted rate of 43% ($= (4.81 - 2.74)/4.81$) calculated from the average values for BTP and ATP given in Table A1 in the data appendix. This seems to imply that in establishing their new foreign subsidiaries Japanese parent firms have considerable flexibility in reducing their tax liability to the host government. Model IV in Table 3 shows that the factors which contribute to reducing (increasing) subsidiaries' taxes payable are exports to Japanese parent firms and North American or Asian locations (resource industries, the age of a subsidiary, and Japanese parent firm's ownership share).

3. Subsidiaries employment and investment behavior

In addition to the tax revenues collected by a host government, subsidiary firms provide employment to their workers and purchase local goods and services for new production and/or service facilities. It is of interest to know, for example, if exporting to Japan generates more employment and investment activities than exporting to countries other than Japan. Regression results in Table 4 show that the exports to third countries, rather than the exports to Japan, is a significant determinant of both employment and investment. While increasing employment and investment may be the main objective of a host country's effort to attract foreign direct investment, it is not necessarily a primary objective of a foreign parent firm. It is therefore possible that certain profit maximization decisions by foreign parent firms are not consistent with the policies of a host country government.

North America, ASEAN, NIES and, to a much less degree, Europe benefited from the employment provided by Japanese subsidiaries while North America and NIES are associated with high levels of investment by these subsidiaries. Industries which are associated with high levels of employment are general, electric and transportation machineries, other manufacturing and commerce. The estimated effects of industries on subsidiaries investment in Table 4 are not likely to be precise, however, because the data used to measure investment are the amounts spent on investment in a single year (1988) while most capital investment is achieved over a period of years.

4. Japanese parent firms' profitability

Japanese parent firms assess the performance of each of their foreign subsidiaries in terms of their contributions to the parent firms' profitability. Since taxes are paid by subsidiaries as well as parent firms, it is not clear precisely how the taxes paid by foreign subsidiaries enter the capital budgeting decision processes of Japanese parent firms.

Exploratory regression results are presented in Table 5. Models I and II assume that subsidiaries' before-tax profitability (JV.BTP) affects the Japanese parent firm's before-tax profitability variable (JP.BTP) while in Model III JP.BTP depends on subsidiaries' after-tax profitability (JV.ATP). In Models IV and V parent firms' after-tax profitability (JP.ATP) depends directly on subsidiaries' profitability (JV.BTP or JV.ATP) while in Models VI and VII JP.ATP dependes on parent firms' before-tax profitability (JP.BTP) which in turn includes the effects of subsidiaries' profitability as in Models I–III. (Because of limited data availability it was not possible to use in this study certain estimation methods which could take into account the simultaneity that might exist among various vari-

TABLE 4 (Footnotes continued).

eThese dummy variables are defined for: North America (U.S.A. and Canada), ASEAN countries (Indonesia, Thailand, The Philippines, Brunei and Malaysia), NIES (South Korea, Singapore, Taiwan and Hong Kong) and Europe (U.K., France, W. Germany, Italy, Holland, Belgium, Switzerland, Spain and other European countries). The reference group of regions not included here consists of Central and South America, Asian countries other then those in Asian and NIES, Middle East, Oceania and Africa.
fThe industries whose dummies are not included in this table form the reference group. Coal and oil, and lumber and pulp manufacturing industries are listed here because of their dependence on natural resources in the host country.
gThe Japanese parent firm's share in percent of ownership in its subsidiary.
hThe number of Japanese workers divided by the total number of employees of a subsidiary.
iATP is defined to be 100 times the after-tax profit divided by the sales.

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TABLE 5

Profitability of Japanese parent firms

| | Before-tax profitability (JP.BTP)[a] | | | After-tax profitability (JP.ATP)[a] | | | |
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)
JV.BTP[b]	.19035***	.18862***	—	.02680	—	—	—
	(4.11)[c]	(3.81)		(.54)			
JV.ATP[b]	—	—	.22421***	—	.01569	—	—
			(3.08)		(.23)		
JP.BTP[f]	—	—	—	—	—	.40867***	.40222***
						(5.70)	(6.10)
%EXP[d]	.00025	—	—	.00008	—	.00008	—
	(.61)			(.34)		(.78)	
%EX–FDI[e]	.00027	.00038***	.00028*	−.00002	−.00001	−.00003	−.00005
	(.99)	(2.15)	(1.62)	(.13)	(.08)	(.32)	(.62)
%IMP[d]	.00007	—	—	.00006	—	.00007	—
	(.23)			(.37)		(.82)	
%IMP–FDI[e]	−.00032**	−.00029**	−.00022*	.00002	.00003	.00018*	.00018*
	(1.81)	(1.91)	(1.34)	(.15)	(.22)	(1.53)	(1.48)
%N. America[f]	.00041	.00043	.00053	.00049	.00052	.00022	.00016
	(.63)	(.75)	(.95)	(.98)	(1.14)	(.58)	(.44)
%Asia[f]	.00116***	.00117***	.00125***	.00109***	.00108***	.00061**	.00055*
	(2.96)	(4.84)	(5.27)	(3.10)	(3.65)	(1.80)	(1.71)
%Europe[f]	.00053	.00049	.00048	.00065*	.00058**	.00052***	.00042**
	(.69)	(.91)	(.86)	(1.63)	(1.76)	(2.05)	(1.87)
Constant	−.03646	−.03525**	−.03836***	−0.5245**	−.04922**	−.04067*	−.03459*
	(.99)	(1.94)	(2.16)	(1.70)	(2.01)	(1.55)	(1.38)
R^2	.711	.702	.683	.729	.722	.866	.862
No. of observations	18	18	18	18	18	18	18

Data source: The regression results reported here were computed using data from Ministry of International Trade and Industry [4].

[a]The before-tax and after-tax profitability of a Japanese parent firm (JP) are defined to be, respectively, the operating income and after-tax profit divided by its sales.

[b]JV.BTP and JV.ATP denote, respectively, JP's subsidiaries' total operating income and after-tax profit divided their total sales.

[c]Numbers in parentheses are absolute t-ratios calculated using heteroskedasticity-corrected standard errors (Kmenta [6]). One, two and three asterisks denote, respectively, significance levels at 80%, 90% and 95%.

[d]%EXP and %IMP denote, respectively, 100 times JP's (exports/sales) and (imports/procurement).

[e]%EXP–FDI and %IMP–FDI denote, respectively, 100 times JP's (exports to FDI/total exports) and imports from FDI/total imports).

[f]%N. America, %Asia and %Europe denote, respectively, 100 times the numbers of subsidiaries JP has in North America, Asia and Europe divided by JP's total number of foreign subsidiaries.

ables used in our regression equations.)

Since JV.ATP = $(1-\tau_{JV})$ JV.BTP where τ_{JV} is the tax rate for a subsidiary's income, estimated coefficients for JV.BTP and JV.ATP in columns II and III in Table 5 imply $\tau_{JV} = 0.159$ which is quite close to an estimate obtained using the estimation results for subsidiaries' profitability in Section 2.

Comparing regression results in columns IV–VII in Table 5, it seems that Model VII fits the data better than others. Estimated Model VII suggests that Japanese parent firms' after-tax profitability (JP.ATP) is determined primarily by their before-tax profitability JP.BTP, the imports from subsidiaries and the fractions of their subsidiaries located in Asia and Europe (%Asia and %Europe).

It is interesting to calculate the effects of intra-firm trade (%EXP–FDI and %IMP–FDI) on JP.ATP. Using the results for Models II and VII, we see that the effect on JP.ATP of a unit increase in %EXP–FDI is $(0.40222)(0.00038) = 0.000153$ while the effect on JP.ATP of a unit increase in %IMP–FDI is (-0.00029)

$(0.40222) + 0.00018 = 0.000063$. Thus intra-firm trade has small but statistically significant and positive contributions to JP.ATP. An estimate for the tax rate for a parent firm's income is calculated using the coefficient of JP.BTP in column VII as $\tau_{JP} = 1 - 0.40222 = 0.598$ which is considerably higher than our estimates for τ_{JV}. (τ_{JP} derived by regression Model VII is adjusted for the tax effects of intra-firm trade and regions where subsidiaries are located. The unadjusted tax rate is calculated from Table A1 as 0.574 ($= (0.047 - 0.020)/0.047$), which is not so different from our adjusted estimate for τ_{JP}.)

5. Conclusion

Production planning and other management problems associated with the operations of Japanese (or other foreign) firms' subsidiaries are different in several ways from the management problems for indigenous firms in a host country. Japanese manufacturing firms' subsidiaries in Asia, for example, are often set up to satisfy their parent firms' global strategies to implement the international division of labor based on different levels of technology found in various countries. Parent firms' strategies are often reflected in the transfer prices and the quantities of internally-traded goods and services. The policies on imports from and exports to Japanese parent firms as well as other countries are typically given to the management of subsidiary firms.

In this paper the effects of intra-firm trade and other factors on the profitability, employment and investment behavior of Japanese firms' subsidiaries in foreign countries as well as Japanese parent firms' profitability have been estimated using the industry-region data published by the Japanese Ministry of International Trade and Industry [4]. We find that intra-firm and external trade, as well as local sales, contribute to subsidiaries' before-tax profitability. Exports to Japanese parent firms are also found to increase subsidiaries' after-tax profitability (or, equivalently,

to reduce tax payments to the host country). Relative to other regions, ASEAN, NIES and North America appear to be associated with high after-tax profitability for subsidiaries. Subsidiaries' exports to countries other than Japan seem to contribute significantly to local employment and investment. The net effect of intra-firm trade on Japanese parent firms' profitability is estimated to be positive. Locating subsidiaries in Asia or Europe appears to increase Japanese parent firms' after-tax profitability also.

In order to analyze the performance of Japanese multinational firms it is necessary to consider the behavior of at least the following economic agents: parent firms with respect to their strategies on foreign direct investment, the Japanese government with respect to their policies on taxation and other issues, subsidiary firms with respect to their management decisions and the host country government with respect to their policies on taxation and other issues. Since the objectives of these four economic agents are not likely to be fully aligned and consistent with each other, no single economic model is likely to be able to explain all the aspects of the management behavior of Japanese multinational firms. An approach of the sort presented in this paper could be used to further investigate the empirical regularities related to Japanese firms' foreign direct investment. Empirical estimates given in this paper are tentative due to the grouped and limited nature of the data used. More precise estimates may be obtained using larger micro data sets. Such an extension of this study is currently under way.

Acknowledgment

Data Appendix

TABLE A1

Data characteristics

	Mean (std. dev.)	Minimum	Maximum
Variables used in regressions for subsidiaries (No. of observations = 8 regions & 18 industries = 144)			
Subsidiary's before tax profit (BTP)[a]	4.81 (12.62)	−48.20	60.10
Subsidiary's after tax profit (ATP)[b]	2.74 (11.01)	−50.50	55.40
Exports to Japan (EX.JP)[c]	.15 (.25)	.00	.96
Exports to third countries (EX.3D)[c]	.14 (.21)	.00	.95
Local sales (EX.LC)[c]	.58 (.38)	.00	1.00
Imports from Japan (IMP. JP)[d]	.26 (.28)	.00	1.00
Imports from third countries (IMP.3D)[d]	.08 (.16)	.00	.82
Local procurement (IMP.LC)[d]	.51 (.36)	.00	1.00
Region dummies[e]	.125 (.33)	.00	1.00
Industry dummies[f]	.055 (.23)	.00	1.00
Age of a subsidiary (Age)	7.52 (3.43)	.00	14.00
JP's share of ownership in percent (JP-share)	64.61 (26.21)	.00	100.00
Number of workers ($\#w$)	8815.20 (17898)	.00	147200.00
Investment (INV)[g]	15860.00 (43116)	−231.00	42600.00
Fractions of Japanese workers (%JP$\#W$)	5.63 (11.56)	.00	100.00
Variables used in regressions for Japanese parent firms (No. of observations = 18 (industries))			
JP's before tax profit (JP.BTP)[h]	.047 (.022)	.007	.0.90
JP's after tax profit (JP.ATP)[i]	.020 (.015)	−.022	.040
Subsidiary's before tax profit (JV.BTP)[j]	0.54 (.057)	−.002	.193
Subsidiary's after tax profit (JV.ATP)[k]	.035 (.042)	−.006	.141
JP's export-sales ratio (%EXP)[l]	13.79 (12.93)	.50	44.80
Exports to FDI (%EXP–FDI)[l]	24.11 (19.55)	1.20	64.80
JP's import-procurement ratio (%IMP)[m]	16.01 (13.75)	0.50	47.10
Imports from FDI (%IMP–FDI)[m]	20.11 (14.11)	1.50	45.20
Fractions of FDIs in:[n] N. America (%N.America)	25.89 (7.52)	8.50	41.80
Asia (%Asia)	45.13 (14.62)	10.20	70.00
Europe (%Europe)	10.29 (7.79)	.00	30.00
C.&S. America (%C&S.America)	8.95 (5.34)	.70	24.20
Middle East (%ME)	1.23 (2.22)	.00	7.70
Oceania (%Oceania)	.071 (.13)	.00	.53
Africa (%Africa)	.031 (.12)	.00	.51

Data source: Ministry of Industry and International Trade [4].

[a](Before-tax profit/sales) times 100.

[b](After-tax profit/sales) times 100.

[c]EX.JP, EX.3D and EX.LC are sales to the Japanese parent firm, sales to countries other than Japan and local sales divided by total sales, respectively.

[d]IMP.JP, IMP.3D and IMP.LC are amounts of material purchased from the Japanese parent firm, countries other than Japan and locally divided by the total procurement, respectively.

[e]North America, Central and South America, NIES, ASEAN, the Middle East, Europe, Oceania and Africa.

[f]Agriculture/forestry/fishery, Mining, Construction, Food, Textile, Lumber/pulp, Chemicals, Steel, Non-ferrous metals, General Machinery, Electric Machinery, Transportation Machinery, Precision, Coal/oil, Other manufacturing, Commerce, Service, Other industries.

[g]Measured in million yen.

[h]Before-tax income/sales.

[i]After-tax profit/sales.

[j]Subsidiaries' before-tax profit/sales.

[k]Subsidiaries' after-tax profit/sales.

[l]%EXP and %EXP-FDI are 100 times exports/sales and exports to overseas subsidiaries/sales, respectively.

[m]%IMP and %IMP-FDI are 100 times (imported material/total procurement) and (imported material from subsidiaries/procurement), respectively.

[n]100 times (Numbers of foreign subsidiaries in different regions/total number of subsidiaries).

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