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8

How Japanese Subsidiaries in Asia Responded to the Regional Crisis
An Empirical Analysis Based on the MITI Survey

Kyoji Fukao

8.1 Introduction

Japanese manufacturing subsidiaries play an important role in Asian economies. Especially in relatively advanced industries, such as electrical machinery and transport equipment, Japanese subsidiaries sometimes employ more than one-third of the total workforce employed in these industries in the Association of Southeast Asian Nations (ASEAN-4) countries (table 8.1). Japan's foreign direct investment (FDI) has provided Asian countries not only with production technology and managerial know-how but also with stable capital inflows. Therefore, the behavior of Japanese subsidiaries in Asia and the associated consequences for flows of FDI are bound to play a crucial role in shaping the regional recovery process.

Because foreign subsidiaries can rely on their parent firms' support, their operations are likely to be less influenced by the crisis. Moreover, sharp currency devaluations potentially increase affected Asian countries' attractiveness to foreign firms by reducing production costs.[1] However, as of date there is little evidence to prove such optimistic expectations be-

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1. UNCTAD (1998) stressed the importance of this mechanism. Blomström and Lipsey (1993) found that in Latin America after the debt crisis in the 1980s, foreign subsidiaries increased their exports substantially and contributed to the structural adjustment of host countries.

Table 8.1 **Share of Japan's Manufacturing Subsidiaries in Host-Country Employment, Investment, and International Trade in 1997: The ASEAN-4 Countries and Korea (in percentages)**

	Employment					
	Manufacturing Sector	Electrical Machinery[a]	Transport Equipment[a]	Investment in Plant and Equipment	Total Exports	Total Imports
Korea	1.2	2.9	2.5	0.2	2.0	1.9
Thailand	5.3	n.a.	n.a.	4.3	17.3	12.4
Indonesia	1.8	37.3	34.3	2.8	8.1	10.4
Malaysia	8.8	28.2	30.9	2.8	17.7	17.7
The Philippines	3.6	38.0	n.a.	3.1	18.1	10.4

Sources: MITI (1999a), and Belderbos, Capannelli, and Fukao (1998).
Note: n.a. = not available.
[a]Data for 1995.

cause few empirical studies on foreign subsidiaries' responses to the recent financial crisis in Asia have been carried out.[2]

Using subsidiary level data from the Japanese Ministry of International Trade and Industry (MITI) 1996 and 1997, I analyze the response of Japan's manufacturing subsidiaries in the ASEAN-4 countries and Korea to the recent Asian financial crises, which started in the second half of 1997.[3] Because about 90 percent of workers employed by Japanese subsidiaries in this region are employed by manufacturing subsidiaries, I concentrate on manufacturing subsidiaries in this paper.

The paper is organized as follows: In section 8.2 I provide a general overview of the performance of Japan's manufacturing subsidiaries after the crisis. In section 8.3, I study recent trends of Japan's FDI flows to ASEAN-4 countries and Korea. In section 8.4, using microdata of MITI surveys, I compare subsidiaries' performances and responses across industries and host countries. By subdividing subsidiaries into two groups, I also study how different characteristics of subsidiaries affected their performance and response. In section 8.5, I undertake an econometric investigation of Japanese subsidiaries' response using microdata from MITI surveys.

8.2 An Overview of the Performance of Japan's Asian Subsidiaries after the Crisis

The currency crisis had both positive and negative impacts on multinational enterprises' activities in this region. On the one hand, export-oriented subsidiaries may have benefited from the reduction of production costs caused by the sharp currency depreciation. On the other hand, local market–oriented subsidiaries were seriously hit by the decline of local demand and price increases of imported intermediate inputs.

Another consequence of host country currency depreciation are capital losses, which, indeed, a majority of Japanese subsidiaries in this region suffered. An amazingly high percentage of Japanese subsidiaries in this region had not hedged the exchange risk originating from their liabilities

2. Dollar and Hallward-Driemeier (1998), Lamberte et al. (1999), and OECF and RIDA (1999) found that both in Thailand and in the Philippines firms with foreign ties performed better than independent local firms after the crisis. There are several reports, written in Japanese, on Japanese subsidiaries' response to the crisis. Among them, JETRO (1999), MITI (1999a,c), Research Institute of International Investment and Development (1999), and Touyou Keizai Sinpou-sha (1999) are informative. Ramstetter (1999) also studies FDI flows in Thailand after the crisis. However, neither Ramstetter nor any of the Japanese studies mentioned here use detailed subsidiary-level data. Until the U.S. Department of Commerce publishes *U.S. Direct Investment Abroad, 1998* I cannot get detailed information on U.S. subsidiaries' 1998 activities in Asia.

3. The 1997 survey accounts for operations during the fiscal year through March 1998.

being denominated mainly in foreign currencies, including yen.[4] According to the MITI's *Comparative Survey of Economic Structure (Keizai Kouzou Hikaku Chousa),* conducted in December 1998 and January 1999, 50 percent of Japan's manufacturing subsidiaries in the ASEAN-4 countries and Korea had not hedged their exchange risk before the crisis. An additional 32 percent had insufficiently hedged the risk. It seems that they had ignored the exchange risk partly because of relatively stable exchange rates in the region—with the exception of Indonesia and the Philippines—over the past decades.

Critical situations in both the host countries' and the Japanese banking systems may also have had a negative effect on Japanese subsidiaries in this region. Because Japan's foreign subsidiaries borrow primarily from Japanese banks, it seems that the lending behaviors of Japanese banks and their financial subsidiaries abroad have more significant effects on Japan's nonfinancial subsidiaries in Asia than do the lending behaviors of local banks. According to MITI (1998), at the end of fiscal 1995, 64 percent of the total stock of long-term bank loans locally raised by Japan's manufacturing subsidiaries in the ASEAN-4 countries came from local subsidiaries of Japanese banks. Reflecting the financial turmoil and the declining demand for new loans, almost all of Japan's private banks have been reducing their total lending. For example, from fiscal 1996 to 1997, the Industrial Bank of Japan, the Mitsubishi Bank, and the Sakura Bank reduced their total lending by 6.0, 3.0, and 4.8 percent, respectively. In statistics provided by the Bank for International Settlements (BIS), it is reported that Japanese banks reduced their cross-border lending to East Asia by almost 20 percent in the year from June 1997 to June 1998.

Despite the reduction of loans, the majority of Japan's manufacturing subsidiaries in this region registered no complaints about the credit crunch. According to MITI (1998–99), only 28 percent replied that they have faced some difficulties in continuing their borrowing or in getting new loans. Two factors may have mitigated the negative impact of credit contraction. First, since the liberalization of Japan's financial markets in the mid-1980s, large manufacturing firms have increased their direct financing from financial markets and have become more independent from banks.[5] Second, to counter the credit crunch, the Japanese government has let state-owned banks expand their lending. From fiscal 1996 to 1997 the Export-Import Bank of Japan and the Japan Development Bank increased their total lending by 8.9 and 2.5 percent, respectively. Today, quite a number of Japanese parent firms have state-owned banks as their prime lend-

4. For example, Asian subsidiaries of Toray Industries incurred a capital loss of 11 billion yen in fiscal 1997, which is almost equal to its average annual operating profit in the region (Japan Economic Research Institute 1999).

5. However, smaller firms, which still depend on their main banks, might have been affected by the credit crunch.

ers. At the end of fiscal 1997, the Export-Import Bank of Japan was the prime lender for Nissan Motor, Honda Motor, Fujitsu, and major general trading companies, such as Mitsubishi, Mitsui, and Marubeni.

To analyze recent trends in production activity by Japan's manufacturing subsidiaries abroad, MITI's *Survey of Trends of Enterprises (Kigyou Doukou Chousa),* which is conducted on a quarterly basis, is probably the best source.

Panel A of figure 8.1 shows the change in sales (in yen) of Japan's manufacturing subsidiaries in the ASEAN-4 countries by industry. Subsidiaries in the transport equipment industry, the majority of which are local market–oriented, faced a sharp decline in total sales. According to MITI (1998), Japanese subsidiaries in the transport equipment industry in the ASEAN-4 countries sold 91.9 percent of their total sales in their host country and exported 2.5 percent to Japan, 0.9 percent to other Asian countries, and 4.7 percent outside the region in fiscal 1995. In the case of subsidiaries in the electrical machinery industry, the majority of which are export oriented, the decline in total sales was much smaller. Japanese subsidiaries in this industry in the ASEAN-4 countries sold 29.4 percent of their total sales in their host country and exported 36.2 percent to Japan, 20.3 percent to other Asian countries, and 14.1 percent outside the region in fiscal 1995.

Panel B of figure 8.1 shows changes in employment by industry. Basically, employment trends correspond to those in sales. However, compared to sales, the reduction in employment is moderate. It is interesting that although sales of subsidiaries in the transport equipment industry have dropped more sharply than have sales of subsidiaries in the textiles and garments industry, reductions in employment in the two industries were almost of the same magnitude.

8.3 FDI Flows to Asia after the Crisis

Despite the sharp decline in sales and profits in the region, Japan's FDI flows (on the basis of balance of payment statistics) to this region have increased after the crisis (table 8.2). From the period of July 1996 to June 1997 to the period of July 1997 to June 1998, Japan's FDI flows to the five countries under consideration increased by 49 percent.

According to the standard theory of FDI (Caves 1982; Dunning 1993), it is not surprising to observe increases in FDI inflows to the Asian countries hit by the financial crisis. FDI flows involve not only financial capital but also parent firms' intangible assets, such as the stock of technological knowledge, marketing know-how, and goodwill, on which stable supplier systems are based. Real capital, human resources, location, and other elements of subsidiaries are designed and organized to derive maximum returns from such intangible assets. Large transaction costs are associated

A

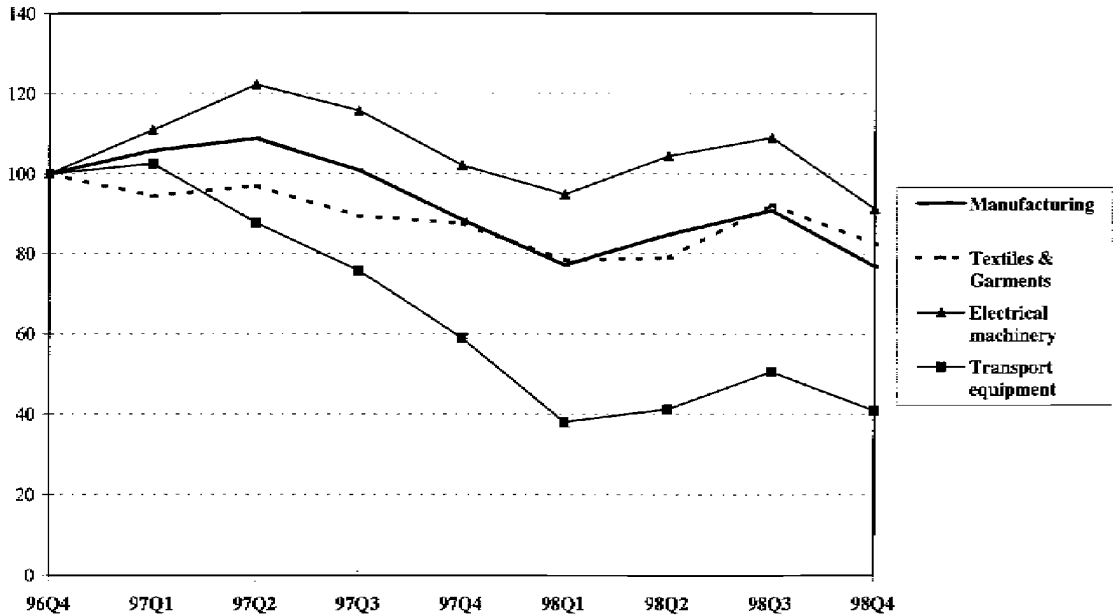

Fig. 8.1 Recent trends in sales and employment by Japan's manufacturing subsidiaries in the ASEAN-4 countries, by country (96Q4 = 100); *A*, Sales (in yen); *B*, Employment
Source: Author's calculations based on MITI (1999b).

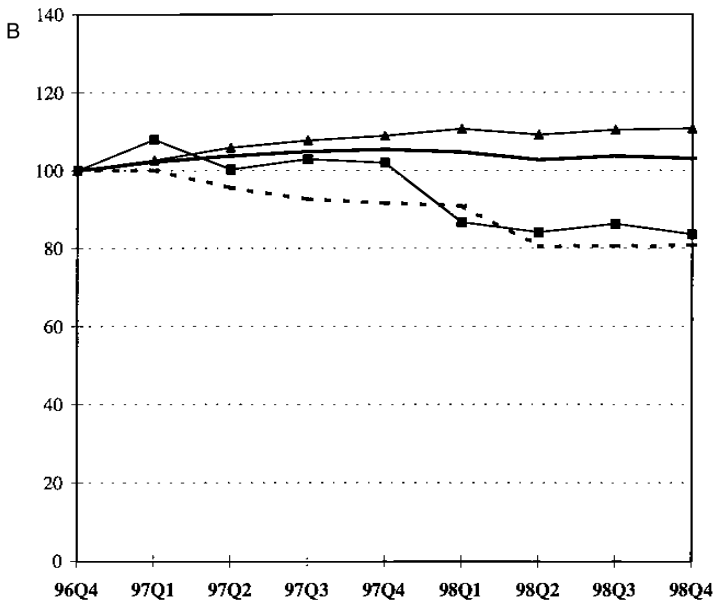
B
140
120
100
80
60
40
20
0
96Q4
97Q1
97Q2
97Q3
97Q4
98Q1
98Q2
98Q3
98Q4

Table 8.2 **Japan's Direct Investment Abroad, Capital Outflows on a BOP Statistics Basis (in billions of yen)**

	1995		1996		1997		1998
	1st half	2nd half	1st half	2nd half	1st half	2nd half	1st half
Korea	19	14	26	18	12	8	53
Thailand	41	47	65	81	91	156	146
Indonesia	32	58	73	90	98	91	93
Malaysia	11	24	31	26	51	69	48
The Philippines	29	72	41	11	16	26	43
Five countries	132	215	236	224	268	351	382
Asia	322	478	535	525	717	870	659
North America	571	302	561	687	489	447	465
Europe	79	237	162	146	215	87	204
All countries	1,049	1,080	1,275	1,273	1,609	1,536	1,835

Source: Bank of Japan, *Balance of Payments (BOP) Monthly,* various issues.

with the transfer of intangible assets among firms by arm's-length transactions. It is also costly to adjust the structure of a subsidiary to another firm's intangible assets. Thus, the resale price of a subsidiary might be much lower than the initial investment. This means that FDI is accompanied by sunk costs. If substantial sunk costs are involved, a parent firm will support its subsidiary under adversary conditions. It is also true that if there is substantial accumulation of firm-specific skills, firms will not drastically cut their employment when their sales decline.[6]

It is sometimes argued that a particular feature of the Japanese production system is a heavy reliance on long-term supplier relationships and the accumulation of firm-specific skills. If this argument is correct, we would expect Japanese parent firms to invest more actively in order to support troubled subsidiaries than do parent firms from other countries. We should also note that if this sunk cost hypothesis is correct, Japanese firms will not easily start new investment projects unless they expect substantial profits.

There are at least two other possible explanations for the increase in FDI inflows to Asia after the crisis. First, currency depreciation and the fall in asset prices in the Asian countries created a kind of a fire-sale situation for foreign firms. If foreign firms expect the Asian countries to recover in the near future, they would not want to miss the bargain. Second, the sharp currency depreciation has potentially increased affected Asian countries' attractiveness to foreign firms by reducing production costs. Foreign firms may therefore consider either establishing new export bases through

6. For a more rigorous theoretical analysis on this issue, see Fukao and Otaki (1993) and Hamermesh (1993).

Table 8.3 **The Number of New FDI Cases by Japanese Firms in the ASEAN-4 Countries and Korea, Total Number of Greenfield Investments, M&A Purchases, and New Capital Participations: All Industries**

	Korea	Thailand	Indonesia	Malaysia	The Philippines	Total
1991	14	51	47	39	16	167
1992	4	35	39	32	12	122
1993	7	28	18	26	4	83
1994	7	39	30	26	7	109
1995	25	63	47	29	43	207
1996	30	99	72	39	40	280
1997	15	65	27	24	30	161
1998	12	18	9	14	16	69

Source: Author's calculations based on Touyou Keizai Shinpou-sha (1999).

greenfield investments or expanding the production capacity of existing export-oriented subsidiaries in order to exploit the decline in production costs.[7]

These two explanations, however, are in contradiction with several statistics. According to MITI (1999b), Japan's manufacturing subsidiaries in the ASEAN-4 countries have reduced their investments in tangible fixed assets (excluding land) by 54 percent from the third quarter of 1997 to the third quarter of 1998. Even subsidiaries in the electrical machinery industry, which are the most export oriented and the least hit by the crisis, reduced their investment by 25 percent during this period. According to our data set, average employment in existing subsidiaries in the five countries declined by 5 percent from March 1997 to March 1998.

As table 8.3 shows, the number of new FDI cases by Japanese firms to the ASEAN-4 countries and Korea has declined considerably. It is interesting that although Japanese firms almost stopped new investments, they seem to be reluctant to close or sell their existing subsidiaries. Japanese firms sold or closed fifty-five subsidiaries in 1998 (table 8.6), equivalent to only 1.5 percent of the 3,680 existing subsidiaries in the five countries.

Compared with U.S. and German firms, Japanese firms made a quite limited amount of cross-border mergers and acquisitions (M&A) in the ASEAN-4 countries and Korea (table 8.4). U.S. firms are active in M&A purchases especially in the finance and communication service sectors, in which Japanese firms do not have a comparative advantage (Nikkei 1999b). Even in the manufacturing sector, however, there were only two cases of M&A purchases conducted by Japanese firms in the region in 1998 (table 8.5).

7. Perez-Quiros and Popper (1996) found that FDI is more stable over time compared with short-term investment. Frankel and Rose (1995) found that the accumulation of inward FDI reduces the probability that the host country will be hit by a currency crisis. On this issue, see also Berg and Pattillo (1998).

Table 8.4 **The Number of Japanese Subsidiaries in the ASEAN-4 Countries and Korea Which Were Closed or Sold to Local or Other Countries' Firms: All Industries**

	Korea	Thailand	Indonesia	Malaysia	The Philippines	Total
1991	4	1	4	2	2	13
1992	3	2	1	5	2	13
1993	6	3	3	3	0	15
1994	4	5	0	8	0	17
1995	8	3	1	5	0	17
1996	3	5	3	4	2	17
1997	6	8	1	5	3	23
1998	7	20	6	14	8	55

Source: Author's calculations based on Touyou Keizai Sinpou-sha (1999).

Table 8.5 **Cross-Border M&A Purchases in the ASEAN-4 Countries and Korea by Purchasing Company's Country of Origin, 1997–98 (in millions of U.S. dollars)**

	First Half 1997	Second Half 1997	First Half 1998[a]
United States	542	2,066	1,955
Singapore	145	2,001	306
Germany	556	898	872
Japan	648	223	239
Hong Kong	464	180	46
Taiwan	834	274	64
United Kingdom	616	8	252

Source: UNCTAD (1998), original data provided by KPMG Corporate Finance.
[a]Data for the first half of 1998 are preliminary.

It is interesting to note that in the case of U.S. firms, although they actively increased M&A purchases in the five countries, their FDI flows to the five countries declined considerably in 1997 (table 8.7).[8]

Putting the above pieces of evidence together, it appears that Japanese firms increased their FDI flows to the Asian countries mainly in order to financially assist their subsidiaries that were suffering from deteriorating financial conditions. Compared with U.S. and European firms, they made quite limited amounts of cross-border M&A purchases motivated to take advantage of the currency depreciation and the fall of stock prices. Cases of the establishment of new export bases through greenfield investments and capacity expansion of existing export-oriented subsidiaries motivated to exploit the decline in production cost in the Asian countries were also rare.

8. I should note that definitions for FDI flows and M&A purchases differ. For detail on this issue see UNCTAD (1998) and JETRO (1999).

Table 8.6 **The Number of New FDI Cases by Japanese Firms in the ASEAN-4 Countries and Korea in 1998, by Entry Mode and by Industry**

	Machinery	Other Manufacturing	Finance	Other Nonmanufacturing	Total
Greenfield investments	10	17	2	31	60
M&A purchases	1	1	0	0	2
New capital participations	1	0	0	6	7
Total	12	18	2	37	69

Source: Author's calculations based on Touyou Keizai Shinpou-sha (1999).

Table 8.7 U.S. Direct Investment Abroad, Capital Outflows by Country (in millions of U.S. dollars)

	1994	1995	1996	1997
Korea	390	1,051	766	761
Thailand	703	686	501	−130
Indonesia	2,061	519	686	560
Malaysia	553	1,037	963	637
The Philippines	414	269	716	291
Five countries	4,121	3,562	3,632	2,119
Asia and Pacific	13,437	14,342	12,190	13,815
Europe	34,380	52,275	35,992	60,558
Western hemisphere	17,710	16,040	16,081	23,784
All countries	73,252	92,074	74,833	114,537

Source: U.S. Department of Commerce (1998).

8.4 Detailed Analysis of Japanese Subsidiaries' Response to the Crisis

From the microdata of MITI's *Survey on Trends of Japan's Business Activities Abroad (Kaigai Jigyoukatudou Doukou Chousa),* we can get more detailed information on activities of Japanese subsidiaries; 2,346 subsidiaries in the ASEAN-4 countries and Korea answered the 1996 MITI survey. I matched individual manufacturing subsidiary data of the 1996 survey with that of the 1997 survey. I also got additional information on parent firms, such as their net profits and total assets, from their financial reports (Japan Ministry of Finance [MOF] 1998). After excluding subsidiaries that did not provide answers regarding basic information, such as sales and employment,[9] I obtained panel data of 1,101 manufacturing subsidiaries that employed 712,000 workers in March 1997.[10] According to Touyou Keizai Shinpou-sha (1999), Japan's manufacturing subsidiaries were employing 857,000 workers in the ASEAN-4 countries and Korea (299,000 in Thailand, 200,000 in Indonesia, 62,000 in Korea, 195,000 in Malaysia, and 101,000 in the Philippines) in October 1998, so our data set covers a substantial percentage of Japan's manufacturing activities in these countries. The data set includes 723 subsidiaries in Korea, Thailand, and Indonesia. Because subsidiaries in these countries were harder hit by the Asian crisis, I will primarily use the latter subset for the analysis in this section.

Table 8.8 compares local market–oriented subsidiaries with export-oriented subsidiaries in Korea, Thailand, and Indonesia. In the case of local market–oriented subsidiaries for which the exports/sales ratio is

9. I have also excluded from the data set subsidiaries suspended before March 1997, started up after April 1996, and employing fewer than twenty workers in March 1997.

10. The data set includes eighteen subsidiaries closed and ten subsidiaries suspended in fiscal 1998.

Table 8.8 **Selected Indicators of Japan's Manufacturing Subsidiaries in Korea, Thailand, and Indonesia, by Export Status**

	Exports/Sales < 50%			Exports/Sales ≥ 50%		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Sales in fiscal 1996 (millions of yen)	350	6129.6	15,357.1	177	5,329.9	10,960.2
Change in sales, fiscal 1996–97 (millions of yen)	350	−1,119.9	5,100.1	177	925.8	4,753.2
Share of subsidiaries for which sales were down	350	67.1%		177	40.1%	
Net profits in fiscal 1996 (millions of yen)	346	329.6	1,031.3	175	92.3	355.6
Change in profits, fiscal 1996–97 (millions of yen)	341	−597.7	2,105.2	172	84.2	859.4
Share of subsidiaries for which profits were down	341	78.9%		172	48.3%	
Employment in fiscal 1996	350	444.0	696.5	177	799.4	1,343.6
Change in employment, March 1997–March 1998	350	−17.6	135.6	177	3.8	339.0
Share of subsidiaries employing fewer workers	350	46.0%		177	41.2%	
Exports/sales ratio in fiscal 1996	350	9.0%	13.9	177	85.6%	16.4
Imports–total procurement ratio in fiscal 1996	276	44.2%	34.5	144	59.3%	34.1
Change in imports–total procurement ratio, fiscal 1996–97	246	−0.9%	27.6	125	−3.9%	24.0
Exports to Japan in fiscal 1996	347	169.3	1,041.7	175	2,716.8	8,681.3
Change in exports to Japan, fiscal 1996–97 (millions of yen)	305	158.6	2,431.7	159	317.0	1,998.4
Capital equity owned by Japanese parent(s), fiscal 1996	350	411.5	742.3	177	1,169.7	4,520.9
Percentage of equity shares owned by Japanese parent(s), March 1997	350	52.8%	21.4	177	75.3%	25.4
Net increase in Japanese capital participation rate, March 1997–March 1998	350	1.5%	10.0	177	1.1%	14.3
Share of subsidiaries in which Japan's capital participation rate was increased	350	11.7%		177	10.7%	

Source: Author's calculations based on the MITI data set.

Note: *N* = number of observations.

smaller than 50 percent, average sales and profits declined substantially. On average, they also reduced their employment slightly: 79 percent of local market–oriented subsidiaries employ fewer workers. In contrast with this, export-oriented subsidiaries were able to increase their sales by 17 percent and almost doubled their profits. However, compared with their exports before the crisis and with the increase in exports achieved by local market–oriented subsidiaries, the increase in exports by export-oriented subsidiaries does not seem spectacular at all. Moreover, although export-oriented subsidiaries have enjoyed increases in sales and profits, they appear to have hesitated to expand their production capacity, and their average workforce increased by less than 1 percent.

Table 8.9 compares the impact of the crisis across industries in Korea, Thailand, and Indonesia. The table reveals a number of interesting facts. First, as we have already seen, local market–oriented subsidiaries, such as those in the chemical and metal products industry, the transport equipment industry, and in what I have labelled low-tech industries (such as foodstuffs, wood products, etc., but excluding textiles and garments), were hardest hit. It is interesting that the average performance of subsidiaries in the textiles and garments industry was not very good, although their average exports/sales ratio was high. We can partly explain this by the difference in export destinations. According to MITI (1998), ASEAN-4 subsidiaries in this industry sold 35 percent of their total exports within Asia excluding Japan, and exported only 22 percent to Japan in fiscal 1995. In contrast to this, subsidiaries in the electrical machinery industry exported 51 percent of their total exports to Japan. Subsidiaries in the textiles and garments industry might have been hit not only in their local markets but also in their export markets in Asia.

Second, the elasticity of employment to changes of sales, $(\Delta employ/employ)/(\Delta sales/sales)$, is quite different between industries. In the case of the textiles and garments industry, the chemical and metal products industry, and the low-tech industries, the elasticity was greater than one. In the case of the general machinery and precision instruments industry and the transport equipment industry, the elasticity was smaller than 0.4. Parent firms of subsidiaries in the textiles and garments industry and the low-tech industries are relatively small and have lower profit rates on the whole. In contrast, the majority of subsidiaries in the general machinery and precision instruments industry and the transport equipment industry has large parent firms making a substantial profit. Possibly, subsidiaries in the machinery industry were able to maintain their employment levels because of support from parent firms.[11]

11. According to MITI (1998), 62 percent of parent firms of subsidiaries in the textiles and garments and the low-tech industries had paid-in capital of less than one billion yen. In the case of subsidiaries in the transport equipment industry and the general machinery and precision instruments industry, 59 percent of parents had paid-in capital of more than one billion yen.

Table 8.9 **Selected Indicators of Japan's Manufacturing Subsidiaries in Korea, Thailand, and Indonesia, by Industry**

	Textiles & Garments			Chemical & Metal Products			Electrical Machinery		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Sales in fiscal 1996 (millions of yen)	71	2,929.9	3,838.2	215	5,641.1	12,495.5	145	8,535.7	12,114.3
Change in sales, fiscal 1996–97 (millions of yen)	71	−95.7	982.8	215	−157.6	2,500.9	145	1,359.7	5,803.8
Share of subsidiaries for which sales were down	71	54.9%		215	61.4%		145	39.3%	
Net profits in fiscal 1996 (millions of yen)	71	−22.2	441.4	206	156.9	742.6	126	280.9	525.1
Change in profits, fiscal 1996–97 (millions of yen)	71	−108.6	541.8	204	−504.6	1,940.3	120	14.8	1,126.7
Share of subsidiaries for which profits were down	71	63.4%		204	71.6%		120	52.5%	
Employment in fiscal 1996	71	642.3	594.7	215	402.8	637.1	145	958.7	1,263.6
Change in employment, March 1997–March 98	71	−44.3	258.7	215	−38.3	259.6	145	−20.6	397.0
Share of subsidiaries employing fewer workers	71	40.8%		215	41.9%		145	44.8%	
Exports-sales ratio in fiscal 1996	43	63.4%	37.6	156	21.6%	30.4	114	55.3%	40.0
Imports–total procurement ratio in fiscal 1996	29	36.7%	35.0	121	47.9%	36.7	97	63.2%	31.2
Change in imports–total procurement ratio, fiscal 1996–97	26	8.9%	20.9	106	1.6%	30.8	86	−5.0%	23.5
Exports to Japan in fiscal 1996	43	502.7	698.7	156	301.3	1,762.3	116	3,186.4	10,363.9

(*continued*)

Table 8.9 (continued)

	Textiles & Garments			Chemical & Metal Products			Electrical Machinery		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Change in exports to Japan, fiscal 1996–97 (millions of yen)	40	−27.4	427.5	136	45.5	275.8	100	617.7	1,973.8
Capital equity owned by Japanese parent(s), fiscal 1996	71	309.2	533.7	215	756.8	3,954.2	145	945.4	1,491.3
Percentage of equity shares owned by Japanese parent(s), March 1997	71	57.3%	21.1	215	54.7%	22.9	145	73.0%	26.3
Net increase in Japanese capital participation rate, March 1997–March 98	71	3.4%	14.8	215	0.9%	12.9	145	2.6%	12.4
Share of subsidiaries in which Japan's capital participation rate was increased	71	21.1%		215	11.6%		145	11.0%	
	General Machinery & Precision Instruments			Transport Equipment			Low Tech Industries		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Sales in fiscal 1996 (millions of yen)	68	3,665.3	6,667.8	114	16,224.4	39,428.8	110	4,475.4	10,109.7
Change in sales, fiscal 1996–97 (millions of yen)	68	−186.4	2,455.2	114	−4,077.4	15,444.1	110	−479.4	2,188.5
Share of subsidiaries for which sales were down	68	55.9%		114	70.2%		110	62.7%	
Net profits in fiscal 1996 (millions of yen)	65	256.9	721.5	110	848.1	2,017.1	103	294.1	−453.0

Change in profits, fiscal 1996–97 (millions of yen)	63	32.4	580.0	109	−731.0	1,788.1	100	−254.7	−21.2
Share of subsidiaries for which profits were down	63	55.6%		109	79.8%		100	59.0%	
Employment in fiscal 1996	68	281.3	413.3	114	820.2	1,531.9	110	571.1	874.3
Change in employment, March 1997–March 98	68	2.5	36.4	114	−74.7	306.2	110	−67.3	7,229.4
Share of subsidiaries employing fewer workers	68	41.2%		114	55.3%		110	31.8%	
Exports-sales ratio in fiscal 1996	46	29.5%	36.6	96	15.5%	27.9	72	42.6%	43.4
Imports–total procurement ratio in fiscal 1996	39	50.2%	34.3	86	52.5%	31.1	56	31.8%	35.8
Change in imports–total procurement ratio, fiscal 1996–97	30	−4.1%	34.8	82	−1.8%	25.1	49	−7.5%	18.8
Exports to Japan in fiscal 1996	47	747.2	2,642.1	97	308.7	1,820.6	72	513.3	915.8
Change in exports to Japan, fiscal 1996–97 (millions of yen)	38	−180.0	2,365.5	95	458.8	4,353.3	63	−33.7	323.6
Capital equity owned by Japanese parent(s), fiscal 1996	68	603.8	1,344.3	114	453.5	625.2	110	508.5	1,182.5
Percentage of equity shares owned by Japanese parent(s), March 1997	68	65.2%	25.4	114	50.6%	21.5	110	57.1%	25.4
Net increase in Japanese capital participation rate, March 1997–March 98	68	3.6%	16.6	114	2.1%	10.8	110	−0.4%	10.6
Share of subsidiaries in which Japan's capital participation was increased	68	11.8%		114	14.0%		110	10.0%	

Source: Author's calculations based on the MITI data set.

Note: N = number of observations.

Third, trends in subsidiaries' exports to Japan are also quite different across industries. Subsidiaries in the transport equipment industry, the electrical machinery industry, and the chemical and metal products industry have increased their exports to Japan considerably. In contrast, exports to Japan by subsidiaries in the other industries have declined.

Fourth, subsidiaries in the electrical machinery, the general machinery and precision instruments industry, and the low-tech industries have reduced their imports/total procurement ratio by more than 4 percent.

Economic conditions in the ASEAN-4 countries and Korea did not deteriorate in the same way. The performance of Japanese subsidiaries was also different across the five host countries. Figures 8.2 and 8.3 show recent trends in these countries' real exchange rates and manufacturing production indexes. The currency crisis spread from Thailand to the other ASEAN-4 countries very quickly in July 1997, whereas the Korean won started depreciating four months later. The sharp decline in production in Thailand preceded the recession in the other four countries. In the case of the Philippines, the impact of currency depreciation on the macroeconomy was relatively moderate in 1997.

Our data set covers subsidiaries' activities of fiscal 1996 and 1997. Therefore, the selected indicators for the subsidiaries in the different countries shown in table 8.10 correspond to macroeconomic trends before March 1998. According to table 8.10, subsidiaries in Thailand have experienced the sharpest decline in sales and profits. Here, 71 percent of all subsidiaries registered a decline in profits. However, subsidiaries in Thailand did not reduce their employment substantially. Subsidiaries in Korea, in contrast, reduced their employment levels considerably while experiencing modest declines in sales and profits. One possible explanation for this difference runs as follows. Japanese subsidiaries in Thailand are generally younger than subsidiaries in Korea.[12] Younger subsidiaries tend to be equipped with more advanced machinery. Changes in economic conditions in host countries also sometimes make locational advantages of old subsidiaries obsolete, so subsidiaries in Thailand may have been better positioned than subsidiaries in Korea. Many Japanese parents seem eager to support their subsidiaries in Thailand. In the case of Thailand, the percentage of subsidiaries in which Japan's capital participation rate increased amounted to 14.7 percent, which was the highest among the five countries.

It is also interesting that subsidiaries in Thailand actively increased their exports to Japan. According to table 8.10, Japanese manufacturing subsidiaries in Thailand increased their exports to Japan by 85 billion yen (371

12. In my data set, the majority of Japan's manufacturing subsidiaries in Korea were established before 1987. In the case of Thailand, about three-fourths of manufacturing subsidiaries were established after 1987.

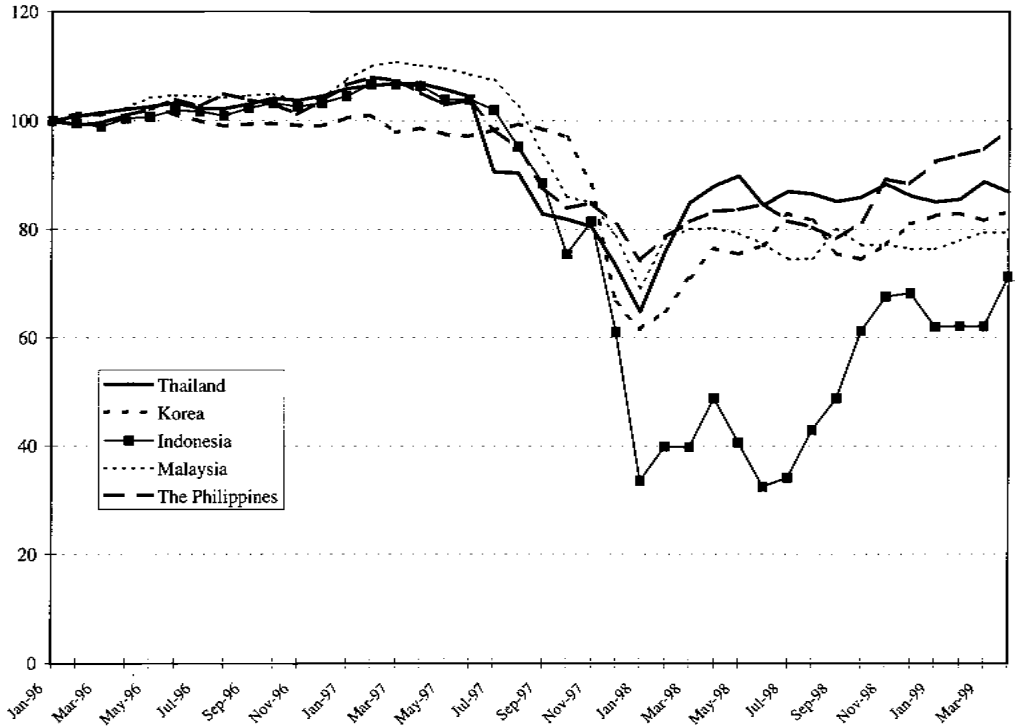

Fig. 8.2 Recent trends in real effective exchange rates of the ASEAN-4 countries and Korea (January 1996 = 100)

Source: Author's calculations based on J. P. Morgan's real "broad" effective exchange rates.

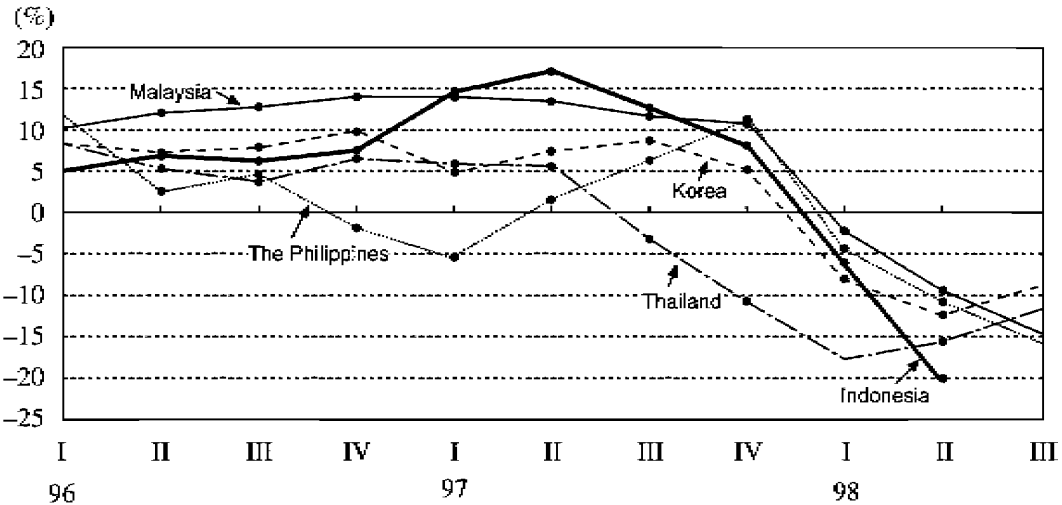

Fig. 8.3 Index of manufacturing production (change over the same quarter of the previous year), by country
Source: MITI (1999c).

Table 8.10 **Selected Indicators of Japan's Manufacturing Subsidiaries in the ASEAN-4 Countries and Korea, by Country**

	Korea			Thailand			Indonesia		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Sales in fiscal 1996 (millions of yen)	159	7,657.2	15,394.5	340	8,025.4	23,127.7	224	5,819.3	13,212.9
Change in sales, fiscal 1996–97 (millions of yen)	159	−11.5	3,236.3	340	−1,136.3	9,708.2	224	64.4	3,202.3
Share of subsidiaries for which sales were down	159	57.2%		340	60.6%		224	52.7%	
Net profits in fiscal 1996 (millions of yen)	153	278.1	474.6	319	318.9	1,155.3	209	297.4	1,305.9
Change in profits, fiscal 1996–97 (millions of yen)	152	−23.7	392.3	310	−548.6	2,263.5	205	−177.3	968.1
Share of subsidiaries for which profits were down	152	59.2%		310	71.0%		205	61.0%	
Employment in fiscal 1996	159	342.1	561.2	340	626.7	1,120.4	224	800.0	1,050.4
Change in employment, March 1997–March 98	159	−45.9	236.1	340	−25.6	201.9	224	−63.1	628.3
Share of subsidiaries employing fewer workers	159	50.3%		340	47.9%		224	29.9%	
Exports-sales ratio in fiscal 1996	119	27.1%	35.6	256	35.1%	39.2	152	40.1%	40.9
Imports–total procurement ratio in fiscal 1996	101	43.2%	32.3	215	52.1%	36.0	112	50.8%	35.6
Change in imports–total procurement ratio, fiscal 1996–97	92	−1.5%	25.1	190	−2.3%	29.2	97	−1.0%	22.3
Exports to Japan in fiscal 1996	122	883.5	2,954.8	257	1,261.4	6,912.1	152	712.6	2,497.4

(*continued*)

Table 8.10 (continued)

	Korea			Thailand			Indonesia		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Change in exports to Japan, fiscal 1996–97 (millions of yen)	111	119.3	1,877.6	228	370.5	2,974.5	133	26.0	465.6
Capital equity owned by Japanese parent(s), fiscal 1996	159	521.0	1,183.1	340	596.7	1,186.8	224	833.3	3,861.2
Percentage of equity shares owned by Japanese parent(s), March 1997	159	57.8%	26.5	340	56.6%	24.7	224	64.7%	23.6
Net increase in Japanese capital participation rate, March 1997–March 98	159	1.7%	10.7	340	2.2%	13.5	224	1.0%	13.1
Share of subsidiaries in which Japan's capital participation rate was increased	159	8.8%		340	14.7%		224	12.1%	

	Malaysia			The Philippines		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Sales in fiscal 1996 (millions of yen)	275	8,423.1	13,884.0	103	6,098.2	11,249.7
Change in sales, fiscal 1996–97 (millions of yen)	275	84.8	3,730.2	103	864.7	6,410.1
Share of subsidiaries for which sales were down	275	50.5%		103	31.1%	
Net profits in fiscal 1996 (millions of yen)	260	275.5	1,142.5	92	380.8	966.9

Change in profits, fiscal 1996–97 (millions of yen)	249	−123.3	97.4	90	−200.5	1,042.9
Share of subsidiaries for which profits were down	249	57.4%		90	55.6%	
Employment in fiscal 1996	275	682	924.2	103	763.2	1,527.7
Change in employment, March 1997–March 98	275	−38.5	475.8	103	32.3	282.5
Share of subsidiaries employing fewer workers	275	49.1%		103	35.0%	
Exports-sales ratio in fiscal 1996	208	52.7%	40.5	80	55.7%	46.0
Imports–total procurement ratio in fiscal 1996	173	58.1%	35.8	68	69.7%	35.0
Change in imports–total procurement ratio, fiscal 1996–97	152	−1.5%	24.1	60	−6.2%	20.4
Exports to Japan in fiscal 1996	202	1,676.3	6,123.5	81	1,700.7	5,059.1
Change in exports to Japan, fiscal 1996–97 (millions of yen)	186	209	2,500.3	73	1,103.5	6,482.4
Capital equity owned by Japanese parent(s), fiscal 1996	275	972.7	1,884.4	103	704	978.5
Percentage of equity shares owned by Japanese parent(s), March 1997	275	75.2%	29.7	103	74.7%	30.2
Net increase in Japanese capital participation rate, March 1997–March 98	275	2.0%	14.8	103	2.9%	14.5
Share of subsidiaries in which Japan's capital participation was increased	275	5.5%		103	9.7%	

Source: Author's calculations based on the MITI data set.

Note: N = number of observations.

million yen times 228 subsidiaries). This is a considerable amount compared to the current account deficit of Thailand, which stood at $3 billion in 1997. Even under the serious economic conditions in Thailand, export-oriented subsidiaries were better off. According to my data set, subsidiaries with exports/sales ratios exceeding 50 percent increased their average sales by 20 percent and saw their profits rise by 66 percent. However, they increased their workforce by only 2 percent.

Although their average sales have increased, subsidiaries in Indonesia and Malaysia experienced a decline in profits and cut their workforce substantially. Among the five countries, only subsidiaries in the Philippines increased their average workforce. Seventy-five percent of subsidiaries in the Philippines were employing more workers in March 1998 than in March 1997. They also increased their average exports to Japan by 65 percent.

Subdividing Japan's manufacturing subsidiaries in Korea, Thailand, and Indonesia into two groups, tables 8.11 through 8.14 show how several characteristics of subsidiaries affected their performance and response.

Subsidiaries majority-owned by Japanese firms were generally more export oriented than were minority-owned ones (table 8.11). There is a 19 percent gap in the average exports/sales ratio between the two groups. Many developing countries have linked export performance requirements with restrictions on capital participation rates for foreign investors. Local market–oriented foreign subsidiaries are usually required to be joint ventures with a local partner as the majority owner. According to the Japan Machinery Center for Trade and Investment (1997), many Japanese subsidiaries in Asia reported that they are restricted by such linkage policies. Because of their local market–oriented characteristics, minority-owned subsidiaries were more severely hit by the crisis. After the crisis, all the five countries relaxed their regulations on capital participation rates for foreign firms (Japan External Trade Organization [JETRO] 1999). Such policy changes certainly contributed to the substantial increase in Japan's capital participation rate, especially in the case of minority-owned subsidiaries. In the case of minority-owned subsidiaries, 17 percent of all subsidiaries experienced an increase in the Japanese capital participation rate.

In table 8.12, subsidiaries are subdivided by value added per worker. This shows that the decline in sales was more moderate in the case of subsidiaries with a value added per worker of less than 1.5 million yen. This is probably due to the fact that these subsidiaries were more export oriented. Moreover, despite the stable trend in sales, these subsidiaries reduced their employment more substantially. One possible explanation is that subsidiaries with a high value added per worker are reluctant to lay off workers because these have accumulated considerable firm-specific skills.

Table 8.13 shows that subsidiaries owned by larger parents were hit harder, but these subsidiaries expanded their exports to Japan greatly. Probably, with the help of their large parent firm this type of subsidiary

Table 8.11 **Selected Indicators of Japan's Manufacturing Subsidiaries in Korea, Thailand, and Indonesia, by Japan's Capital Participation Rate**

	Japan's Participation Rate < 50%			Japan's Participation Rate ≥ 50%		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Sales in fiscal 1996 (millions of yen)	361	7,242.7	18,187.8	362	7,279.2	19,644.1
Change in sales, fiscal 1996–97 (millions of yen)	361	−1,021.2	6,059.2	362	−14.1	7,936.5
Share of subsidiaries for which sales were down	361	68.7%		362	46.1%	
Net profits in fiscal 1996 (millions of yen)	340	315.8	1,011.7	341	290.5	1,171.3
Change in profits, fiscal 1996–97 (millions of yen)	331	−552.7	2,077.3	336	−80.6	1,051.0
Share of subsidiaries for which profits were down	331	75.5%		336	55.1%	
Employment in fiscal 1996	361	536.6	864.0	362	698.7	1,137.9
Change in employment, March 1997–March 98	361	−62.6	462.7	362	−20.8	304.6
Share of subsidiaries employing fewer workers	361	46.8%		362	39.0%	
Exports-sales ratio in fiscal 1996	261	19.4%	30.7	266	49.8%	40.6
Imports-total procurement ratio in fiscal 1996	204	39.9%	34.6	224	58.5%	33.4
Change in imports-total procurement ratio, fiscal 1996–97	180	0.3%	26.5	199	−3.7%	26.6
Exports to Japan in fiscal 1996	263	260.8	1,191.4	268	1,760.0	7,134.4
Change in exports to Japan, fiscal 1996–97 (millions of yen)	230	195.2	2,802.5	242	232.5	1,626.2
Capital equity owned by Japanese parent(s), fiscal 1996	361	306.1	590.6	362	999.7	3,253.8
Percentage of equity shares owned by Japanese parent(s), March 1997	361	42.0%	14.6	362	76.6%	21.0
Net increase in Japanese capital participation rate, March 1997–March 98	361	3.7%	13.1	362	−0.2%	12.2
Share of subsidiaries in which Japan's capital participation rate was increased	361	17.2%		362	8.0%	

Source: Author's calculations based on the MITI data set.

Note: *N* = number of observations.

Table 8.12 **Selected Indicators of Japan's Manufacturing Subsidiaries in Korea, Thailand, and Indonesia, by Value Added per Worker**

	Value Added per Worker < 1.5 million yen			Value Added per Worker ≥ 1.5 million yen		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Sales in fiscal 1996 (millions of yen)	149	2,010.8	4,134.1	364	8,551.1	22,342.4
Change in sales, fiscal 1996–97 (millions of yen)	149	260.2	1,232.2	364	−1,042.0	8,013.2
Share of subsidiaries for which sales were down	149	43.0%		364	61.8%	
Net profits in fiscal 1996 (millions of yen)	145	52.7	468.7	356	343.8	965.2
Change in profits, fiscal 1996–97 (millions of yen)	144	−113.8	451.9	349	−428.7	1,721.4
Share of subsidiaries for which profits were down	144	58.3%		349	68.2%	
Employment in fiscal 1996	149	648.1	980.7	364	590.6	1,037.7
Change in employment, March 1997–March 98	149	−107.5	712.4	364	−26.0	167.3
Share of subsidiaries employing fewer workers	149	43.6%		364	48.6%	
Exports-sales ratio in fiscal 1996	130	52.0%	42.7	326	29.0%	36.4
Imports-total procurement ratio in fiscal 1996	123	45.9%	36.5	305	51.2%	34.6
Change in imports-total procurement ratio, fiscal 1996–97	106	−2.2%	19.5	273	−1.6%	28.9
Exports to Japan in fiscal 1996	130	412.6	1,002.9	330	976.1	3,561.6
Change in exports to Japan, fiscal 1996–97 (millions of yen)	119	129.8	942.5	300	284.2	2,787.2
Capital equity owned by Japanese parent(s), fiscal 1996	149	375.9	712.5	364	782.7	3,195.9
Percentage of equity shares owned by Japanese parent(s), March 1997	149	62.3%	25.8	364	60.5%	24.4
Net increase in Japanese capital participation rate, March 1997–March 98	149	0.9%	12.8	364	1.5%	10.3
Share of subsidiaries in which Japan's capital participation rate was increased	149	11.4%		364	10.7%	

Source: Author's calculations based on the MITI data set.

Note: *N* = number of observations.

Table 8.13 **Selected Indicators of Japan's Manufacturing Subsidiaries in Korea, Thailand, and Indonesia, by Total Assets of the Prime Parent Firm**

	Total Assets of the Prime Parent Firm < 100 Billion Yen			Total Assets of the Prime Parent Firm > 100 Billion Yen		
	N	Mean	Std. Dev.	*N*	Mean	Std. Dev.
Sales in fiscal 1996 (millions of yen)	129	3,011.8	9,181.3	397	10,160.7	23,969.6
Change in sales, fiscal 1996–97 (millions of yen)	129	397.5	5,005.8	397	−1,129.2	8,906.2
Share of subsidiaries for which sales were down	129	55.0%		397	56.9%	
Net profits in fiscal 1996 (millions of yen)	127	73.1	351.7	366	419.8	1,395.7
Change in profits, fiscal 1996–97 (millions of yen)	127	−71.4	1,290.1	358	−453.9	2,011.2
Share of subsidiaries for which profits were down	127	64.6%		358	65.9%	
Employment in fiscal 1996	129	374.3	859.9	397	722.6	947.8
Change in employment, March 1997–March 98	129	1.9	77.2	397	−77.2	515.9
Share of subsidiaries employing fewer workers	129	41.9%		397	43.3%	
Exports-sales ratio in fiscal 1996	115	37.9%	39.7	236	31.5%	37.0
Imports-total procurement ratio in fiscal 1996	94	53.1%	31.7	188	48.3%	36.8
Change in imports-total procurement ratio, fiscal 1996–97	86	−1.0%	21.5	159	−0.6%	30.2
Exports to Japan in fiscal 1996	118	1,353.6	9,116.9	236	1,123.2	3,693.3
Change in exports to Japan, fiscal 1996–97 (millions of yen)	111	46.7	499.7	199	339.7	3,342.9
Capital equity owned by Japanese parent(s), fiscal 1996	129	395.1	824.5	397	717.9	1,313.1
Percentage of equity shares owned by Japanese parent(s), March 1997	129	60.2%	23.9	397	57.8%	24.6
Net increase in Japanese capital participation rate, March 1997–March 98	129	1.0%	11.0	397	2.5%	13.0
Share of subsidiaries in which Japan's capital participation rate was increased	129	9.3%		397	14.9%	

Source: Author's calculations based on the MITI data set.

Note: *N* = number of observations.

was able to switch from local sales to exports.[13] An increase in the Japanese capital participation rate has also been more common in this group of subsidiaries.

8.5 Econometric Analysis of Subsidiaries' Responses to the Crisis

Because Japanese subsidiaries seem to be characterized not by nimbleness but by perseverance, we study which types of subsidiaries are reluctant to cut their workers when their sales are declining. As we have seen in table 8.9, the elasticity of employment to changes in sales, (Δemploy/employ)/(Δsales/sales), is quite different across industries. Using the microdata for Japanese subsidiaries in the ASEAN-4 and Korea, as I explained in the previous section, I estimate determinants of subsidiaries' elasticities of employment to a negative change in sales.

In order to estimate determinants of subsidiaries' elasticities of employment to a negative change in sales, I use the following model:

$$(1)\quad GEMP_i = \alpha_0 + \alpha_1 SIGNGSAL_i * GSAL_i + \alpha_2(\beta_0 + \beta_1 CHAR_i) * (1 - SIGNGSAL_i) * GSAL_i + \alpha_3 EXCH_i + u_i,$$

where i is the index for subsidiaries; GEMP is the growth rate of employment from March 1997 to March 1998; GSAL is the growth rate of sales from fiscal 1996 to fiscal 1997; SIGNGSAL is a dummy variable which takes the value 1 if and only if GSAL > 0; CHAR denotes a certain characteristic that might affect the elasticity; EXCH is the depreciation rate of the host country's currency against the U.S. dollar from fiscal 1996 to fiscal 1997 (comparison between two annual averages);[14] and u is the usual error term.

As CHAR, I tried the following six variables.

13. According to Nikkei (1999a) and a personal interview, both Toyota Motor Co. and Nissan Motor Co. started exports of their Thai-made pickup trucks "Hilux" and "Dutsan" to Australia, after the crisis, in order to support their Thai subsidiaries. Toyota also increased exports of its Thai-made diesel engine to Japan. We should note that not all the Japanese subsidiaries in the region have easily expanded their exports. For example, in contrast with the case of Thailand, Japanese automobile companies could not substantially increase exports from their Indonesian subsidiaries because of two problems (Fujimoto and Sugiyama 1999). First, since their Indonesian models have low local content compared to their Thai and Malaysian counterparts, improvements of price competitiveness by Indonesian currency depreciation were limited. Second, designs of their Indonesian models, which are mainly van- or minibus-type commercial vehicles, were too adapted to the Indonesian market for export to other regions.

14. All five countries experienced currency depreciation in this period. Theoretically, the relationship between the size of currency depreciation and the growth rate of a subsidiary's employment is ambiguous. Since currency depreciation will increase a subsidiary's optimal employment-sales ratio, it might have a positive effect on the subsidiary's employment. On the other hand, the size of currency depreciation indicates the seriousness of the currency crisis and might have a negative relationship with the subsidiary's employment.

1. ASSET: Total assets of the prime Japanese parent firm, in March 1997 (billion yen).
2. PROF: The net profit/total asset ratio of the prime Japanese parent firm, in fiscal 1996.
3. KEI: Total number of workers employed in the host country by the manufacturing subsidiaries whose parents belong to the same vertical *keiretsu* (corporate group) as subsidiary *i*'s parent divided by subsidiary *i*'s own employment, in March 1997; information on vertical *keiretsu* relationships among parents were taken from Touyou Keizai Shinpou-sha (1998).
4. CAP: Capital participation rate of Japanese firms, in March 1997.
5. LOBO: Subsidiary's long-term local borrowing from non-Japanese banks divided by its owned capital, in March 1996. (The source of this data is MITI 1996).
6. VALUE: Subsidiary's value added per worker in fiscal 1997 (million yen).

A subsidiary owned by a large parent firm, by a parent with higher profit rate, or by a parent with a greater *keiretsu* networks in the same host country is likely to get the parent firm's or *keiretsu*-related subsidiaries' support easily, and tends to keep its employment unchanged. Japanese parents will be more eager to support their subsidiary if their capital participation rate is higher. Thus I expect negative coefficients for ASSET, PROF, KEI, and CAP.

According to Dollar and Hallward-Driemeier (1998) and Lamberte et al. (1999), firms with foreign ties performed better than independent local firms in Thailand and the Philippines after the crisis. Firms with foreign ties tend to have a higher capacity utilization level and keep employment after the crisis. One probable reason for this difference is that firms with foreign ties can get parent firms' support. Another probable reason is that firms with foreign ties tend to be less exposed to the local economy in several aspects. First, firms with foreign ties have a higher exports/sales ratio than independent local firms, on average (Dollar and Hallward-Driemeier 1998) and are likely to be less hard hit by contraction of local demand. In table 8.8, we have already seen that Japanese subsidiaries with higher export/sales ratios performed much better than other subsidiaries.[15] Second, firms with foreign ties are less connected with local banks and local financial markets. They tend to finance their funds from parent firms or from banks of their home countries. In the recent Asian currency crisis, almost all the crisis-hit countries took contracting monetary policy and invited financial crisis. Under such a financial crunch, foreign subsidiaries

15. According to Japan Overseas Economic Cooperation Fund's (OECF's) enterprise survey, which covers both firms with foreign ties and local independent firms, export-oriented firms tend to keep their production after the crisis in Thailand (OECF and Japan Research Institute of Development Assistance [RIDA] 1999).

less connected with local banks are likely to be able to keep their employment. I include LOBO as an explanatory variable to test this hypothesis.

It is sometimes argued that the Japanese production system depends more on the accumulation of firm-specific skills. This means that Japanese FDI is accompanied by large sunk cost. If substantial sunk costs are involved, a parent firm will support its subsidiary under adversary conditions. It seems that firm-specific skills play a more important role in subsidiaries with higher value added per worker, so I expect a negative coefficient for VALUE.[16]

Equation (1) can be transformed into the following equation:

$$(2)\quad GEMP_i = \alpha_0 + \alpha_1 GSAL_i + (\alpha_2\beta_0 - \alpha_1)(1 - SIGNGSAL_i) * GSAL_i + \alpha_2\beta_1 CHAR_i * (1 - SIGNGSAL_i) * GSAL_i + \alpha_3 EXCH_i + u_i.$$

Since GSAL and SIGNGSAL are endogenous variables, I estimated equation (2) by the following two-step method. In the first step, I estimated a linear model for GSAL by OLS and two Tobit models for (1 − SIGNGSAL) ∗ GSAL and CHAR ∗ (1 − SIGNGSAL) ∗ GSAL. In the second step, I estimated equation (2) by ordinary least squares (OLS) using the predicted values of GSAL, (1 − SIGNGSAL) ∗ GSAL, and (1 − SIGNGSAL) ∗ CHAR ∗ GSAL in place of actual values of the explanatory variables.

For the linear model and the first Tobit model for (1 − SIGNGSAL) ∗ GSAL, I used the following variables as exogenous explanatory variables: EXP, which equals [subsidiary's exports/sales ratio in fiscal 1996] ∗ EXCH; IMP, which equals [subsidiary's imports/procurement ratio in fiscal 1996] ∗ EXCH; EXPE, which equals number of months of production since start of operations as of March 1996; CAP; country dummies (the dummy for Indonesia was omitted); and thirteen industry dummies (the dummy for the food product industry was omitted).

Equation (1) in table 8.14 is the result of the linear model estimation for GSAL by OLS. It is found that subsidiaries which have a higher exports/total sales ratio and are located in a country experiencing greater currency depreciation tended to have a higher growth rate of sales. It is confirmed that export-oriented subsidiaries were less hit by the Asian currency crisis. It is also found that younger subsidiaries have the higher growth rate of sales. Capital participation rate of Japanese firms has positive effect on the growth rate of sales. The coefficient of the term [subsidiary's imports/

16. I should note that there are many other factors, such as the capital-labor ratio, the capacity utilization level, and so on that might affect value added per worker, and VALUE is a quite indirect indicator of the importance of firm-specific skills.

Table 8.14 **Determinants of the Growth Rate of Subsidiary's Sales**

	Eq. 1	Eq. 2	Eq. 3	Eq. 4	Eq. 5
EXP	0.292	0.545	0.555	0.531	0.387
	(2.594)**	(3.662)***	(3.732)***	(3.607)***	(3.554)***
IMP	0.038	−0.049	−0.045	0.0063	0.105
	(0.324)	(−0.328)	(−0.302)	(0.043)	(0.908)
EXPE	−0.00072	−0.00081	−0.00084	−0.00083	−0.00074
	(−4.292)***	(−3.925)***	(−4.051)***	(−4.078)***	(−4.383)***
CAP	0.210				
	(3.105)***				
ASSET		−0.023			
		(−1.136)			
PROF			0.104		
			(0.143)		
KEI				0.00023	
				(0.096)	
Korea	−0.070	−0.056	−0.043	−0.015	−0.079
	(−1.143)	(−0.704)	(−0.553)	(−0.200)	(−1.260)
Malaysia	−0.099	−0.039	−0.035	−0.047	−0.079
	(−1.947)*	(−0.620)	(−0.552)	(−0.768)	(−1.556)
The Philippines	0.096	0.358	0.354	0.345	0.118
	(1.527)	(4.281)***	(4.231)***	(4.207)***	(1.864)*
Thailand	−0.087	−0.074	−0.072	−0.075	−0.103
	(−1.825)*	(−1.258)	(−1.226)	(−1.276)	(−2.151)**
Textiles	−0.028	0.0032	0.0019	0.040	−0.025
	(−0.233)	(0.022)	(0.013)	(0.273)	(−0.204)
Pulp, Paper, and Paper Products	−0.209	−0.081	−0.129	−0.023	−0.193
	(−1.213)	(−0.375)	(−0.603)	(−0.115)	(−1.112)
Chemicals	0.078	0.104	0.117	0.142	0.081
	(0.679)	(0.785)	(0.886)	(1.048)	(0.701)
Petroleum and Coal Products	−0.219	−0.314	−0.298	−0.303	−0.213
	(−0.878)	(−1.018)	(−0.965)	(−0.978)	(−0.851)

(*continued*)

Table 8.14 (continued)

	Eq. 1	Eq. 2	Eq. 3	Eq. 4	Eq. 5
Ceramics and Stone Products	0.030	0.042	0.062	0.087	0.032
	(0.239)	(0.288)	(0.419)	(0.577)	(0.249)
Iron and Steel	0.059	0.123	0.111	0.126	0.059
	(0.451)	(0.825)	(0.727)	(0.835)	(0.447)
Non-Ferrous Metals	0.189	0.222	0.236	0.260	0.212
	(1.430)	(1.423)	(1.517)	(1.642)	(1.598)
Metal Products	0.104	0.163	0.167	0.194	0.120
	(0.793)	(1.066)	(1.090)	(1.244)	(0.910)
Industrial Machinery	−0.070	0.086	0.095	0.111	−0.033
	(−0.553)	(0.567)	(0.626)	(0.712)	(−0.264)
Electrical Machinery	0.072	0.171	0.182	0.198	0.102
	(0.666)	(1.359)	(1.438)	(1.519)	(0.930)
Transportation Equipment	0.0052	0.027	0.038	0.052	0.0056
	(0.047)	(0.205)	(0.292)	(0.387)	(0.050)
Precision Instruments	0.034	0.117	0.132	0.203	0.065
	(0.216)	(0.630)	(0.707)	(1.032)	(0.409)
Miscellaneous	−0.080	−0.111	−0.099	−0.069	−0.054
Manufacturing	(−0.701)	(−0.778)	(−0.697)	(−0.467)	(−0.469)
Constant	−0.0062	0.062	0.033	0.0055	0.087
	(−0.053)	(0.473)	(0.249)	(0.041)	(0.763)
N	599	387	387	397	599
F-value	5.01	5.06	4.99	4.95	4.71
Prob $>$ F	0.000	0.000	0.000	0.000	0.000
Adjusted R^2	0.1236	0.1811	0.1782	0.1733	0.1105

Notes: Numbers in parentheses are t-values. N = number of observations.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

procurement ratio] * EXCH was not significant. Estimated coefficients of country dummies show that subsidiaries in the Philippines and Indonesia performed better than those in the other three countries. After controlling for the subsidiary's characteristics and country-specific factors, there is no significant additional variation in the growth rate of sales across industries. In equations (2)–(4), I tried several different specifications by replacing CAP with other characteristics of subsidiaries, such as, ASSET, PROF, and KEI. However, the coefficients of these variables were not significant, so I used the predicted value of GSAL by equation (1) for the second step. For the first Tobit model for (1 − SIGNGSAL) * GSAL, I used the same explanatory variables as equation (1) of table 8.14, and for the second Tobit model for CHAR * (1 − SIGNGSAL) * GSAL, I used the same explanatory variables as equation (1) of table 8.14 plus CHAR.[17]

Table 8.15 shows the results of the second step of estimating equation (2) for six CHAR variables. Negative and significant estimated coefficients of ASSET and KEI imply that a subsidiary owned by a large parent firm or owned by a parent with a greater *keiretsu* network in the same host country tends to keep its employment unchanged. These findings seem to imply that parent firms' support is important for subsidiaries to keep their employment. Contrary to my hypothesis, it is found that subsidiaries with higher Japanese capital participation rate (CAP) tend to keep their employment. The coefficient of PROF and LOBO were insignificant. The latter result implies that I could not confirm the hypothesis that foreign subsidiaries less connected with local banks are likely to be able to keep their employment. I have also found that if a subsidiary has high value added per worker, it will tend to keep its employment. To check the robustness of the results, I estimated equations that include several CHAR variables at one time (equations [12]–[14]). In these regressions, the estimated coefficients of ASSET, KEI, and VALUE did not change substantially and were still significant, but the coefficient of CAP became insignificant.[18]

8.6 Conclusions

After the financial crisis in Asia, Japanese firms increased their FDI flows to the ASEAN-4 countries and Korea mainly in order to support

17. For PROF * (1 − SIGNGSAL) * GSAL, I estimated a linear model because PROF can take negative values.

18. I also tried reduced-form regressions of linear models directly, with change in employment as the dependent variable. Table 8.16 shows the results of these new regressions. Although the simple linear models do not fit the data well, the results are not inconsistent with my other results, which are summarized in tables 8.14 and 8.15. Positive estimated coefficients of EXP imply that subsidiaries which have higher exports-total sales ratios and are located in countries that experienced greater currency depreciation tend to have higher growth rates of employment. Positive and significant estimated coefficients of KEI and VALUE imply that subsidiaries which are owned by a parent with a greater *keiretu* network in the same host country or have high value added per worker tend to keep their employment.

Table 8.15 Determinants of the Elasticity of Employment to Changes in Sales

	Eq. 6	Eq. 7	Eq. 8	Eq. 9	Eq. 10	Eq. 11	Eq. 12	Eq. 13	Eq. 14
GSAL	0.171	0.174	0.177	0.453	0.426	0.299	0.179	0.233	0.094
	(1.216)	(1.228)	(1.275)	(3.274)***	(3.309)***	(2.364)**	(1.269)	(1.612)	(0.657)
(1 − SIGNGSAL) * GSAL	0.221	0.011	0.272	−0.236	−0.740	−0.025	0.533	0.024	0.773
	(0.821)	(0.042)	(1.084)	(−1.072)	(−2.296)**	(−0.119)	(1.816)*	(0.057)	(2.606)**
EXCH	−0.248	−0.241	−0.172	−0.073	−0.267	−0.120	−0.279	−0.413	−0.203
	(−1.171)	(−1.117)	(−0.850)	(−0.345)	(−1.326)	(−0.630)	(−1.318)	(−1.821)*	(−0.974)
ASSET * (1 − SIGNGSAL) * GSAL	−0.00016						−0.00019	−0.00018	−0.00018
	(−1.943)*						(−2.214)**	(−2.093)**	(−2.160)**
PROF * (1 − SIGNGSAL) * GSAL		−1.864							
		(−0.513)							
KEI * (1 − SIGNGSAL) * GSAL			−0.040				−0.042	−0.036	−0.036
			(−2.644)***				(−2.736)***	(−2.319)**	(−2.025)**
LOBO * (1 − SIGNGSAL) * GSAL				−0.00902					
				(−0.340)					
CAP * (1 − SIGNGSAL) * GSAL					0.826			0.750	
					(2.136)**			(1.625)	
VALUE * (1 − SIGNGSAL) * GSAL						−0.020			−0.030
						(−2.908)***			(−4.296)***
Constant	0.121	0.096	0.096	0.031	0.098	0.059	0.164	0.205	0.141
	(1.330)	(1.053)	(1.099)	(0.318)	(1.168)	(0.727)	(1.775)*	(2.146)**	(1.548)
N	387	387	397	466	599	581	382	382	372
F-value	2.81	1.91	3.61	5.04	4.98	4.81	3.78	3.61	5.29
Prob > *F*	0.0255	0.1079	0.0066	0.0006	0.0006	0.0008	0.0023	0.0017	0.0000
Adjusted R^2	0.0184	0.0094	0.0257	0.0336	0.0260	0.0256	0.0352	0.0394	0.0799

Notes: Numbers in parentheses are *t*-values. *N* = number of observations.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

Table 8.16 **Determinants of the Growth Rate of Subsidiary's Employment**

	Eq. 15	Eq. 16	Eq. 17	Eq. 18	Eq. 19
EXP	0.104	0.116	0.134	0.124	0.088
	(1.688)*	(1.632)	(1.895)*	(1.755)*	(1.180)
EXCH	−0.161	−0.221	−0.216	−0.161	−0.209
	(−1.042)	(−1.295)	(−1.296)	(−0.928)	(−1.171)
ASSET		0.00040			
		(0.488)			
KEI			0.0038		
			(2.894)**		
VALUE				0.00470	
				(2.185)**	
IMP					0.0288
					(0.365)
N	743	496	503	626	599
F-value	0.59	0.63	1.14	0.79	0.49
Prob > *F*	0.886	0.859	0.311	0.697	0.955
Adjusted R^2	−0.0084	−0.0120	0.0046	−0.0054	−0.0140

Notes: Estimated coefficients of industry dummies and constant terms are omitted. *N* = number of observations.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

their troubled subsidiaries. The number of new FDI cases (including acquisitions), however, declined substantially. Expansions of existing subsidiaries were also very rare. In Korea, Thailand, and Indonesia, export-oriented subsidiaries, which are defined as subsidiaries with exports/sales ratios greater than 50 percent, increased their sales by 17 percent and almost doubled their profits; but they expanded their average employment by less than 1 percent. Although new investments and capacity expansions were rare, Japanese subsidiaries persevered in maintaining employment levels. The persistence of Japanese companies is shown by the fact that even local market–oriented subsidiaries barely reduced employment levels despite sharp declines in sales and profits. Parent firms supported their affiliates by raising their paid-up capital and helped their local market–oriented subsidiaries, such as those in the transport equipment industry, boost their exports substantially.[19] It seems that the prime cause of Japa-

19. Japanese parent firms also took several other measures to support their subsidiaries in the region. Toyota expanded its project to invite workers of developing countries to Japan for on-the-job training after the crisis. In order to keep skilled workers of subsidiaries in ASEAN countries, Toyota doubled the number of invited workers from the region to about 500 in fiscal 1998. This project was supported by the Association for Overseas Technical Scholarship (AOTS), whose activity is partly financed by the Japanese government. According to a personal interview, several parent firms transferred their profit to their subsidiaries in the region by transfer pricing.

nese subsidiaries' export increase is not production expansion by export-oriented subsidiaries but the struggle for survival by previously local market–oriented subsidiaries.

Since Japanese subsidiaries seem to be characterized not by nimbleness but by perseverance, I studied what type of subsidiaries were reluctant to cut their workforces even when their sales were declining. Using econometric analysis on subsidiary-level data, I found that a subsidiary's elasticity of employment to a negative change of sales depends upon several characteristics of the subsidiary. I found that a subsidiary owned by a large parent firm or owned by a parent with a greater *keiretsu* network in the same host country tends to maintain its employment levels. This finding seems to imply that parent firms' support is important for subsidiaries to maintain their employment levels. I also found that if a subsidiary has a high value added per worker, it will tend to keep its employment level.

Probably, Japanese parent firms cannot exploit host countries' currency crisis and the "fire sale" of local firms in part because they themselves are in trouble due to the deep recession in Japan. In order to explain the perseverance of Japanese parent firms, we need another hypothesis. One possible explanation is that they are patient because of sunk costs. It is sometimes argued that the Japanese production system depends more on long-term supplier relationships and the accumulation of firm-specific skills. This means that Japanese FDI is accompanied by large sunk costs. If substantial sunk costs are involved, a parent firm will support its subsidiary under adverse conditions. Long-term commitments inevitably incur larger losses when investments fail. The emphasis on long-term relationships is thought to have made Japanese firms sensitive to risk and wary of making new investments, including corporate acquisitions. Unfortunately, my data set covers too short a period, and statistics on U.S. subsidiaries' activities for 1998 are not yet available. By expanding the time span of my analysis and by comparing Japanese subsidiaries' response with that of U.S. subsidiaries, we may be able to obtain more rigorous results in the future.

What lessons can be learned from these recent experiences? First it was confirmed that direct investment is a much more reliable form of capital movement than quick-at-flight portfolio investment and international bank loans in an economic crisis.[20] Second, optimistic expectations that weak currencies of the host countries would naturally bring about an increase in direct investment have proved to be mistaken. To be able to return to the desirable conditions before the Asian economic crisis, where direct investment was the nucleus around which the intraregional division of labor developed and economic growth continued, Japan and other foreign governments would need to support direct investment actively.

20. Analysis by the United Nations Conference on Trade and Development (UNCTAD 1999) also confirms this fact.

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Comment Mario B. Lamberte

Let me start by saying that I learned a lot from this paper. Indeed, there are very few studies that have analyzed the effects of the regional financial

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