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JAPANESE FOREIGN DIRECT INVESTMENT TO EAST ASIA AND EXCHANGE RATE POLICIES —SOME LONGER TERM POLICY IMPLICATIONS AFTER THE CRISIS—

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Abstract: This paper examines the policy implications of the changes in East Asian exchange rate policies after the financial turmoil in 1997 on Japanese foreign direct investment (FDI) to East Asia based on data covering 1978 to 2000. Our estimates reveal that Japanese FDI have been stimulated by the decline in East Asian real exchange rates (RER) against the yen and by establishment of Japanese production networks in the host countries. In exchange rate policy perspective, we recommend East Asian countries to avoid volatility and misalignment of their RERs against both the yen and the dollar. Regional arrangements aimed to stabilize the RERs between ASEAN members will help to promote Japanese FDI.

1. INTRODUCTION

The appreciation of the yen against the dollar after the Plaza Accord in 1985 motivated Japanese multinational firms to shift their production network to East Asia as

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Table 1. Regional Distribution of Japanese FDI Outflows, 1978–2000.
Value (1,000$), Fiscal Year (April/March)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
World	**4,541,869**	**4,931,767**	**4,632,737**	**8,858,815**	**7,649,567**	**8,103,357**	**10,113,146**	**12,180,685**	**22,270,115**	**33,311,056**	**46,973,115**	**65,481,872**
North America	1,386,207	1,439,811	1,602,185	2,554,101	2,909,786	2,714,933	3,572,938	5,643,244	10,456,881	15,393,304	22,665,280	33,184,177
Europe & Central Asia	321,080	418,418	572,734	793,153	865,734	981,759	1,926,123	1,918,150	3,456,539	6,566,356	9,099,299	14,280,958
East Asia	1,337,369	967,002	1,177,204	3,316,645	1,378,070	1,769,423	1,602,366	1,414,433	2,309,025	4,838,754	5,526,397	7,855,531
China	n.a.	13,500	11,863	25,795	18,493	2,955	114,194	99,858	226,356	1,226,499	296,234	425,319
Korea	222,133	94,759	35,083	73,194	103,165	129,042	106,702	133,767	435,533	646,858	482,904	578,900
Hong Kong	158,494	224,715	155,805	329,101	401,013	562,524	411,723	131,068	502,301	1,072,488	1,661,781	1,813,874
Tawian	39,549	38,667	47,217	54,437	54,645	103,023	64,691	114,142	290,525	367,401	372,367	479,683
Singapore	173,945	255,381	139,888	266,338	180,256	322,065	224,810	338,969	302,176	494,399	747,102	1,864,743
Indonesia	610,182	149,780	529,396	2,434,148	409,650	373,562	373,825	408,266	249,769	545,445	585,507	609,111
Malaysia	47,942	33,457	146,337	31,047	82,534	139,637	142,143	79,296	158,035	163,324	387,135	654,146
Philippines	53,476	102,200	78,318	71,947	34,139	64,948	45,655	60,654	20,581	72,379	134,480	195,209
Thailand	31,648	54,543	33,297	30,638	94,175	71,667	118,623	48,413	123,749	249,961	858,887	1,234,546
Latin America & Caribbean	541,397	1,154,922	555,080	1,124,571	1,451,115	1,787,879	2,189,374	2,399,843	4,643,118	4,575,337	5,914,383	4,730,647
Others	955,816	951,614	725,534	1,070,345	1,044,862	849,363	822,345	805,015	1,404,552	1,937,305	3,767,756	5,430,560

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
World	**57,688,280**	**42,211,340**	**34,987,999**	**37,333,091**	**41,883,453**	**52,698,502**	**49,728,192**	**54,738,724**	**39,852,221**	**65,307,654**	**49,821,463**
North America	27,962,684	19,359,276	15,237,077	16,346,013	19,155,369	24,262,957	24,365,107	21,891,033	10,719,232	24,397,939	13,143,692
Europe & Central Asia	14,461,731	9,470,436	7,241,182	8,277,451	6,383,884	8,795,604	7,634,580	11,363,449	13,686,643	25,267,543	25,030,158
East Asia	7,033,773	5,945,972	6,322,587	6,769,825	9,478,886	12,153,496	11,387,952	11,251,465	6,033,689	6,682,952	5,857,384
China	352,890	584,134	1,090,524	1,757,001	2,625,147	4,592,142	2,599,316	2,015,076	1,041,282	735,266	1,019,942
Korea	289,081	264,693	229,465	260,167	411,367	460,633	430,478	448,430	295,978	959,186	834,167
Hong Kong	1,802,348	935,586	762,489	1,301,579	1,153,755	1,175,999	1,539,543	704,937	588,580	950,424	959,532
Tawian	450,729	411,493	296,879	308,396	285,985	467,066	539,782	456,373	219,121	279,430	522,758
Singapore	850,653	621,556	690,559	661,289	1,077,264	1,215,495	1,154,809	1,849,683	622,459	942,295	434,417
Indonesia	1,115,685	1,208,905	1,690,985	856,472	1,768,609	1,645,893	2,500,060	2,549,752	1,052,366	899,040	424,377
Malaysia	736,591	892,656	725,348	801,858	755,117	589,584	591,879	802,407	502,723	514,613	237,777
Philippines	264,597	205,275	166,086	211,865	668,607	735,555	578,880	531,023	370,490	603,905	469,336
Thailand	1,171,200	821,672	670,251	611,198	733,035	1,271,130	1,453,203	1,893,785	1,340,690	798,792	955,078
Latin America & Caribbean	3,272,443	2,525,370	2,392,646	2,904,396	4,091,637	3,375,222	3,295,572	5,537,561	6,131,072	6,022,466	4,795,666
Others	4,957,649	4,910,287	3,794,506	3,035,405	2,773,677	4,111,223	3,044,981	4,695,217	3,281,586	2,936,755	994,562

Note: Data is notification and fiscal year basis.

Source: http://www.mof.go.jp (accessed date 08/07/2001)

Table 1 (continued). Regional Distribution of Japanese FDI Outflows, 1978–2000.
Share (World=100), Fiscal Year (April/March)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
World	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
North America	30.5	29.2	34.6	28.8	38.0	33.5	35.3	46.3	47.0	46.2	48.3	50.7
Europe & Central Asia	7.1	8.5	12.4	9.0	11.3	12.1	19.0	15.7	15.5	19.7	19.4	21.8
East Asia	29.4	19.6	25.4	37.4	18.0	21.8	15.8	11.6	10.4	14.5	11.8	12.0
China	n.a.	0.3	0.3	0.3	0.2	0.0	1.1	0.8	1.0	3.7	0.6	0.6
Korea	4.9	1.9	0.8	0.8	1.3	1.6	1.1	1.1	2.0	1.9	1.0	0.9
Hong Kong	3.5	4.6	3.4	3.7	5.2	6.9	4.1	1.1	2.3	3.2	3.5	2.8
Tawian	0.9	0.8	1.0	0.6	0.7	1.3	0.6	0.9	1.3	1.1	0.8	0.7
Singapore	3.8	5.2	3.0	3.0	2.4	4.0	2.2	2.8	1.4	1.5	1.6	2.8
Indonesia	13.4	3.0	11.4	27.5	5.4	4.6	3.7	3.4	1.1	1.6	1.2	0.9
Malaysia	1.1	0.7	3.2	0.4	1.1	1.7	1.4	0.7	0.7	0.5	0.8	1.0
Philippines	1.2	2.1	1.7	0.8	0.4	0.8	0.5	0.5	0.1	0.2	0.3	0.3
Thailand	0.7	1.1	0.7	0.3	1.2	0.9	1.2	0.4	0.6	0.8	1.8	1.9
Latin America & Caribbean	11.9	23.4	12.0	12.7	19.0	22.1	21.6	19.7	20.8	13.7	12.6	7.2
Others	21.0	19.3	15.7	12.1	13.7	10.5	8.1	6.6	6.3	5.8	8.0	8.3

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
World	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**
North America	48.5	45.9	43.5	43.8	45.7	46.0	49.0	40.0	26.9	37.4	26.4
Europe & Central Asia	25.1	22.4	20.7	22.2	15.2	16.7	15.4	20.8	34.3	38.7	50.2
East Asia	12.2	14.1	18.1	18.1	22.6	23.1	22.9	20.6	15.1	10.2	11.8
China	0.6	1.4	3.1	4.7	6.3	8.7	5.2	3.7	2.6	1.1	2.0
Korea	0.5	0.6	0.7	0.7	1.0	0.9	0.9	0.8	0.7	1.5	1.7
Hong Kong	3.1	2.2	2.2	3.5	2.8	2.2	3.1	1.3	1.5	1.5	1.9
Tawian	0.8	1.0	0.8	0.8	0.7	0.9	1.1	0.8	0.5	0.4	1.0
Singapore	1.5	1.5	2.0	1.8	2.6	2.3	2.3	3.4	1.6	1.4	0.9
Indonesia	1.9	2.9	4.8	2.3	4.2	3.1	5.0	4.7	2.6	1.4	0.9
Malaysia	1.3	2.1	2.1	2.1	1.8	1.1	1.2	1.5	1.3	0.8	0.5
Philippines	0.5	0.5	0.5	0.6	1.6	1.4	1.2	1.0	0.9	0.9	0.9
Thailand	2.0	1.9	1.9	1.6	1.8	2.4	2.9	3.5	3.4	1.2	1.9
Latin America & Caribbean	5.7	6.0	6.8	7.8	9.8	6.4	6.6	10.1	15.4	9.2	9.6
Others	8.6	11.6	10.8	8.1	6.6	7.8	6.1	8.6	8.2	4.5	2.0

the real exchange rate (RER) of East Asian currencies depreciated against the yen in countries adopting a *de facto* dollar pegged exchange rate regime. As shown in Table 1, Japanese FDI to East Asia increased from US$2,309 million in 1986 to US$12,153 million in 1995. Even after the RER of some East Asian countries started to appreciate against the yen from April 1995 reflecting the appreciation of the dollar against the yen (Sazanami and Yoshimura (2002)), large Japanese FDI outflow continued in 1996 and in 1997.

At the outbreak of the Asian financial crisis, some East Asian countries like Thailand, Indonesia, Korea and the Philippines swiftly let their currencies fell and subsequently ended their dollar pegged exchange rate regime. The adjustment in exchange rates brought some recovery in Japanese FDI outflow to Korea, Singapore and the Philippines in 1999, and to Thailand in 2000. However, the total Japanese FDI outflow to East Asia in 2000 was US$5,857 million, only 51% of the corresponding outflow in 1996.

After a brief overview of Japanese FDI outflow to East Asia from 1978 to 2000 in Section 1, the paper is organized as follows. Section 2.1 presents findings in a number of previous studies that focus on the relationships between RER and FDI. In Section 2.2, we discuss the role of exchange rate policies in East Asian countries before and after the financial crisis. Our estimation results of the RER of four currencies – the rupiah, the won, the peso and the baht – against the dollar as well as against the yen during this period are presented to show how policy changes after the financial crisis have affected their movements. In Section 2.3, we find a very high correlation in cross-correlation matrix of four East Asian RERs from 1995 to 2000. Section 3.1 describes our research design and data used for estimation. Results of our estimation are presented in Section 3.2. Our major findings and related policy issues on future exchange rate policies in East Asia are summarized in Section 4.

2. FOREIGN DIRECT INVESTMENT, REAL EXCHANGE RATES AND RELATED POLICY ISSUES

2.1. Relationship between Real Exchange Rates and Foreign Direct Investment

The depreciation of the dollar from the late 1970s had generated dramatic increase in FDI inflows to the United States. During this period, U.S. assets became cheaper to foreign investors like Japanese who held the yen. Froot and Stein (1991) found that, between 1973 and 1988, a regression of *de-trended* FDI as a percent of U.S. GNP against the U.S. RER indicated that a 10% depreciation induced about $5 billion additional FDI to the United States (Froot and Stein (1991, Figure 1)). The study was based on the model that assumed an improvement in foreign investor's wealth position to the extent of holding more wealth in non-dollar dominated form. The depreciation of the dollar improves the relative wealth position of the foreign investors and subsequently lowers their relative cost of capital against the domestic investors. The total foreign capital inflows into the United States were divided into foreign official and foreign private inflows that were further subdivided into FDI, foreign investment in U.S. Treasury securities, and foreign portfolio investment in corporate stocks and bonds. Each item was deflated

by U.S. GNP and regressed on the real value of the dollar and a time trend. The empirical results indicated that the value of the dollar present significantly negative sign only for FDI among various types of capital inflows. When FDI inflows were subdivided into thirteen separate industries,[1] all of the thirteen coefficients on the exchange rate were negative and five of them were statistically significant. Among the eight types of inflows[2] whose sensitivity to RERs were tested, mergers and acquisitions (M&A), new plants and joint ventures transactions were statistically significant.

Klein and Rosengren (1994) also examined whether a large increase in the foreign ownership of land and capital in the United States from the early 1970s was caused by the depreciation of the dollar that lowered the cost of acquisition to foreign investors (relative wealth hypothesis). In addition, the study questioned whether the depreciation of the dollar made foreign investors to choose the United States as an industrial location (relative labor cost hypothesis). In their study, FDI was divided into four subset data on the inflows[3] to the United States. The correlation coefficients of RER (between the dollar and the currencies of seven industrial countries investing in the United States) and FDI indicated that a depreciation (appreciation) of the RER increased (decreased) FDI on the period from 1979 to 1991. All estimated correlation coefficients except real estate industry were statistically significant at the 5% level. The regression results also revealed that, in addition to the RER, a real wealth variable[4] promoted FDI inflows to the United States at 5% level of significance. Regression on foreign M&A of the U.S. assets relative to total M&A in the United States revealed strong negative relationship with the RER. The relative wage cost variable, represented by the ratio of wage costs in the United States to wage costs in the investing country, was statistically insignificant in all four subsets data on FDI inflows to the United States.

In Japan, increased FDI outflow to ASEAN and China from the late 1980s was perceived as a threat to domestic employment and industrial competitiveness. The danger of "hollowing out of Japan" caused by the yen appreciation became one of the important issues from the mid-1990s. Bayoumi and Lipworth (1998) tested the determinants of FDI outflows from Japan to twenty Asian trading partners, focusing on the business conditions of Japan and host country[5] as well as the RER. The study found that the RER and the business conditions of Japan and host country's lagged investment were statistically significant determinants of FDI for the sample period of 1982–1995. During this period, the bilateral FDI flows significantly affected trade patterns between Japan and

[1] Thirteen industries are 1) all industries, 2) petroleum, 3) manufacturing—subdivided into 4) food, 5) chemicals, 6) fabricated metals, 7) machinery, 8) other manufacturing—, 9) trade, 10) finance, 11) insurance, 12) real estate and 13) other industries.

[2] Eight types of inflows are 1) mergers and acquisitions (M&A), 2) equity increase, 3) real estate, 4) new plant, 5) joint ventures, 6) plant expansion, 7) other expansion and 8) no type listed.

[3] Four types of inflows are 1) total outlays in International Trade Administration (ITA) data, 2) total outlays in Bureau of Economic Analysis data, 3) M&A in ITA and 4) real estate purchase subset data in ITA.

[4] A real wealth variable is defined as an index of the value of the U.S. stock market relative to an index of value of the stock markets in the investing countries.

[5] The business condition of Japan and the host country is defined as domestic investment in Japan and the host country, respectively.

the host countries in East Asia. While Japanese FDI outflows increased Japanese exports to the host countries in the short-run, the high stock of Japanese FDI in the host countries produced a long-run positive effect on Japanese imports from the host countries. One of the interesting findings of the study was that, although the depreciation of East Asia's RERs can stimulate Japanese FDI to East Asia, poor business condition in Japan could more than offset the stimulating effect from the fall in the RER.

Ito (2000) attributed the increased FDI outflows from Japan to Asia from the late 1970s to the cost conscious behavior of Japanese manufacturing firms. The persistent appreciation of the yen against the dollar motivated these firms to shift their production sites to Asian countries. The study employed the yen/dollar exchange rate lagged one year to reflect the persistency of changes in the exchange rate and the growth of the host country to reflect expectation for future growth as independent variables determining Japanese FDI to eight countries in East Asia.[6] For the sample period from 1976 to 1996, only the growth rate variable was found to be statistically significant in the case of a pooled sample of eight countries. As for individual country study, the exchange rate variable was found statistically significant only in the case of Singapore and Hong Kong. The Philippines was the only country where both growth and exchange rate variables were statistically significant. In the remaining five countries, only the growth variable was statistically significant.

2.2. *Real Exchange Rates and Exchange Rate Policies in East Asia*

From early 1995, the RERs of East Asian countries that adopted a *de facto* dollar pegged exchange rate regime started to appreciate against the yen reflecting the appreciation of the dollar against the yen. The appreciation weakened the price competitiveness of these East Asian countries and subsequently deteriorated their current account balance. The most typical case was Thailand. Between January 1995 and May 1997, the RER of the Thai baht appreciated as much as 21% against the yen while it appreciated only 3.3% against the dollar (Sazanami and Yoshimura 1999, Figure 4). The depreciation of the yen motivated Japanese firms to reduce the production in East Asian affiliates and to increase their production in domestic plants. The shift decreased intra-firm imports from the East Asian affiliates to Japan. In addition, during this period, increase in imports from China was eroding the share of other Asian countries in the Japanese market.

The low interest rate policy in Japan aimed to recover from the recession widened the spread among East Asian interest rates. In addition to the widening of the spreads, Ogawa (1999) finds that the decline in the yen against the dollar that started in 1995 increased the interest rate differential between the baht and the yen to exceed those between the baht and the dollar. By the end of June 1996, total claims of Japanese banks in Asia amounted to $115.4 billion and the claim against Thailand topped the list of Asian countries at $37.5 billion (Sazanami and Yoshimura (1999, Table 2)). Financial institutions including non-banks in Thailand were using short-term capital inflow to invest in

[6] Eight countries in East Asia are Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan and Thailand.

speculative real estate market and emerging market bonds. When the massive inflows of short-term capital were reversed into outflow, Thailand terminated the *de facto* dollar pegged exchange rate regime and let the baht to fall in July 1997. The contagion of financial crisis in Thailand triggered the currency devaluation in neighboring East Asian countries. After the downfall of their currencies, most of the East Asian countries abandoned the *de facto* dollar pegged exchange rate regime and introduced more flexibility in managing their exchange rates.

In order to examine the changes in exchange rate policies in East Asian countries after 1997 aimed to avoid the misalignment of their RERs against the dollar and the yen which evidently was one of the causes of the financial crisis, we estimated the RERs of the rupiah, the won, the peso and the baht against the yen and the dollar, respectively.[7] Four East Asian countries were selected because they all experienced the downfall of their exchange rate against the dollar in 1997. Malaysia was excluded from our estimation as Malaysia introduced the dollar pegged exchange rate regime and at the same time controlled capital inflow from September 1998. The period covers the pre-crisis as well as the post-crisis period, from January 1995 to December 2001.

Figures 1–4 show that the monetary authorities of the Philippines, Indonesia, Korea, and Thailand terminated the *de facto* pegs against the U.S. dollar in the third quarter of 1997. By the end of 1998, four countries had adjusted their overvaluation of the RERs from the long-run equilibrium rates shown in the horizontal axis against the dollar as well as against the yen. From January 1999, we find surprisingly similar coordinated movements of RERs against the dollar in the four currencies.

Questions related to choosing exchange rate regime that meets their respective policy goals have attracted much interest in discussion among academics and officials in monetary authorities and international organization. Ito, Ogawa and Sasaki (1998) advocated that pegging East Asian currencies to the optimal basket weights of the yen and the dollar would minimize the fluctuation of economic growth rates and trade balances. They found that economic fluctuation and trade imbalance would be reduced at the estimated optimum currency weights where the weights of the yen relative to the dollar were higher than actual weights for the sample periods of 1981 to 1996. Gan Wee Beng (2000) pointed out that East Asian monetary authorities had assigned greater weights to the yen at the expense of the U.S. dollar in their currency baskets from July 1997. He concluded that East Asian currency market became more stable when authorities allowed their exchange rates to float more flexibly by responding to their economic fundamentals. Corden (2001) in a seminar at the IMF stressed that developing countries should choose their exchange rate regimes according to specific economic circumstances.

East Asian countries have two policy objectives which are closely interrelated after the financial crisis. The first is to regain the macro-economic stability that helps to assure foreign investors' confidence. The second objective is to maintain export competitiveness that allows continued outward-oriented growth. The World Bank (2002,

[7] Model for the estimation follows Sazanami and Yoshimura (1999).

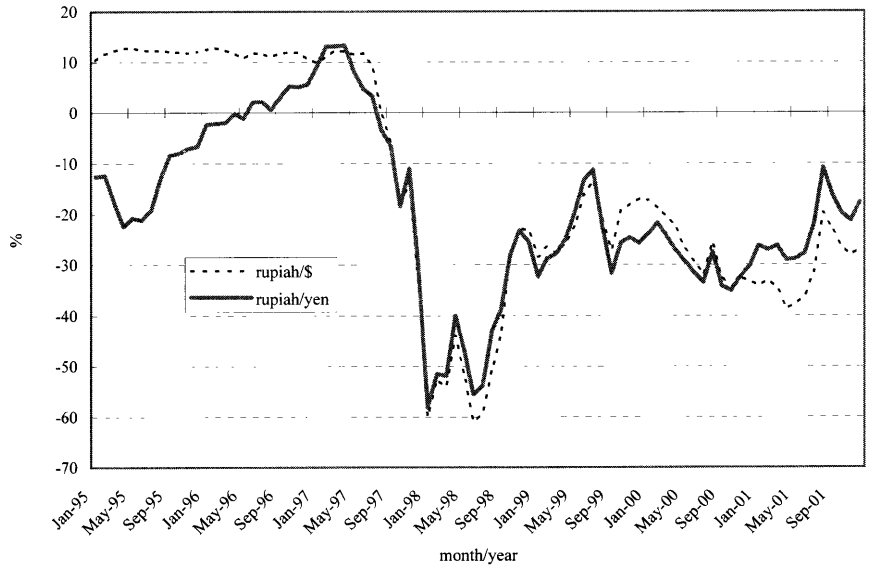

Figure 1. The degree of misalignment: the rupiah against the dollar and the yen.

Figure 2. The degree of misalignment: the won against the dollar and the yen.

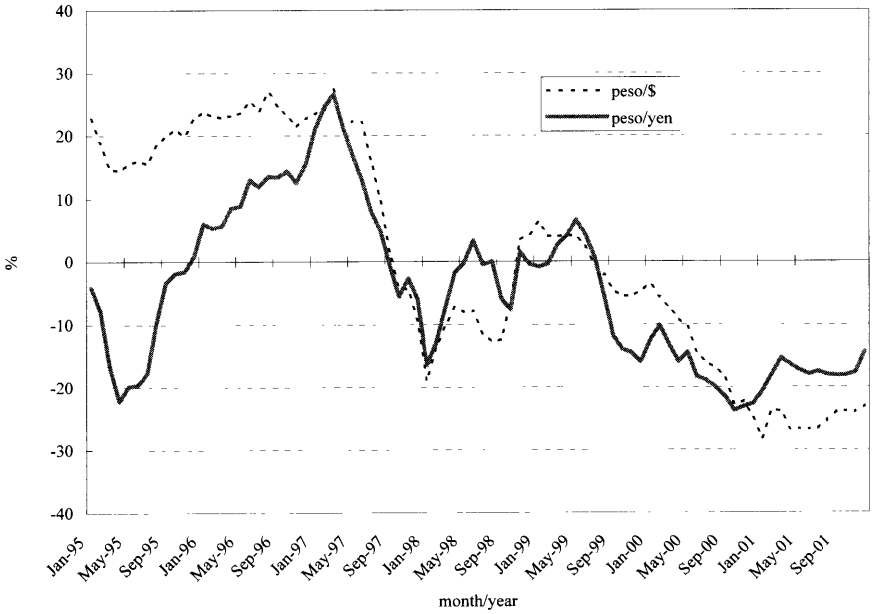

Figure 3. The degree of misalignment: the peso against the dollar and the yen.

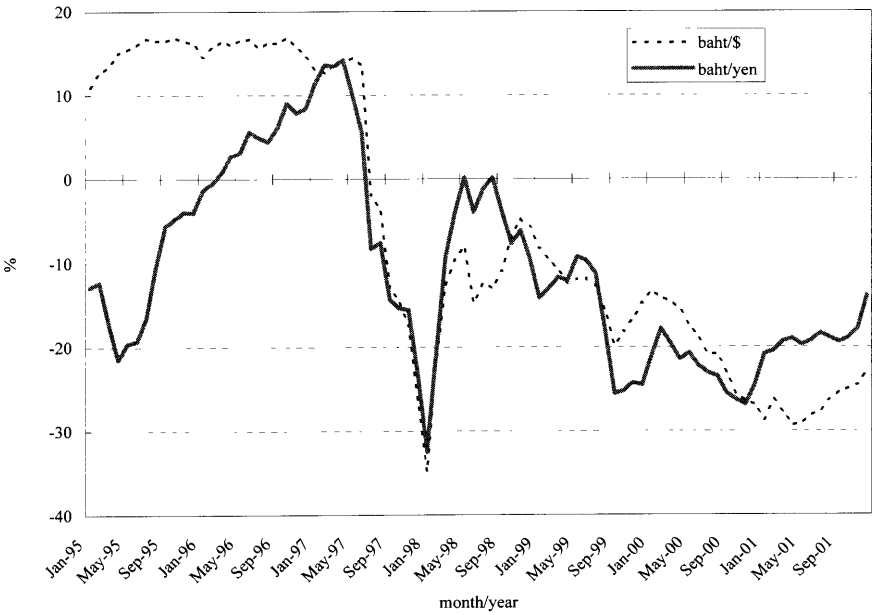

Figure 4. The degree of misalignment: the baht against the dollar and the yen.

p39, Box 2.2) finds that out of ten largest FDI recipient countries seven are also the developing countries with the largest exports. Nicolas (2002) recommends the East Asian countries to have exchange rate policies that avoid both misalignment and short-term volatility in real effective exchange rates if they wish to maintain their export competitiveness.

2.3. Regional Exchange Rate Arrangements in East Asia

The recent Asian financial turmoil taught us the lesson that the misalignment of the RER in a single regional member currency and the subsequent instability in its exchange rate can trigger the fall in exchange rate of other currencies. What East Asian countries need is not only the stability of the RERs against the dollar and the yen but also between the regional members' currencies. The coordinated exchange rates movement in four East Asian currencies—the rupiah, the won, the peso and the baht – in previous section after January 1999 suggest the possibility of having regional exchange rate arrangements in the near future.

From the mid-1980s, East Asian countries and Japan deepened their regional interdependence primarily without any establishment of formal regional arrangements. Urata (1998) found that, in East Asia, the share of intra-regional trade and investment in the world total had increased primarily by market forces, namely due to the high rate of economic growth led by liberalization of trade and FDI. In exchange rate policy field, most of the countries in East Asia were adopting a *de facto* dollar-pegged exchange rate system until the Thai government let the baht to float in July 1997 as noted earlier.

The system benefited foreign investors in assuring macro-economic policy discipline in East Asian countries in keeping price of tradable goods in line with world price in U.S. dollars. The system promoted Japanese multinationals in establishing their affiliates in East Asia as it reduced exchange rate risks provided that the yen/dollar rate remained stable. The sharp appreciation of the yen against the dollar after the Plaza Accord in 1985 had motivated Japanese multinationals to continuously shift their manufacturing affiliates to East Asian countries. When Japanese FDI outflow to East Asia increased from $1.4 billion in 1985 to $12.2 billion in 1995, the share of manufacturing in total FDI increased from 27.1% to 56.1%.

Mismatch between a *de facto* dollar-pegged exchange rate system and the growth of East Asian countries led by trade and FDI became apparent when the dollar started to appreciate from 83.6 yen to a dollar in April 1995 to 122.6 yen to a dollar in March 1997. As noted in the previous section, the RERs of major East Asian currencies were not only continued to be overvalued against the dollar but started to appreciate continuously against the yen (Figures1-4). This period coincided with the liberalization of financial markets in the East Asian countries, Thailand and Korea in particular. Total net private capital inflow to East Asian countries increased from $47.4 billion in 1994 to $91.2 billion in 1996 (Institute of International Finance (1998)).

Policy efforts to support a *de facto* dollar pegged exchange rate system by purchasing the dollar on the one hand and trying to sterilize its impact on the money supply on the other had accelerated capital inflow. When sterilization policy was found insufficient,

capital inflow increased money supply and subsequently raised price of various assets. At the end of 1996, 61% of claims against the local East Asian banks were of maturity of one year of less. The large inflows to Thailand quickly reversed when foreign banks withdrew such short-term loans. The downfall of the Thai baht in July 1997 was contagious to other East Asian currencies, forcing the devaluation.

After the crisis, we find more diversity in exchange rate arrangements in the East Asian countries. While Korea and Thailand shifted to currency basket type arrangements, increased exchange rate flexibilities were introduced in Indonesia and the Philippines (Kawai (2002a)). Malaysia pegged the ringgit to the dollar in September 1998 and at the same time introduced control on capital movements.

In March 1997, the currency swap arrangements were agreed by five ASEAN countries (Indonesia, Malaysia, the Philippines, Singapore and Thailand). But it did not prevent the currency attack a few months later.[8] After the financial crisis, the Chiang Mai Initiative established in May 2000 enlarged the member of currency swap arrangements to include China, Korea and Japan. When ASEAN plus three reviewed the Chiang Mai Initiative in April 2001, the ASEAN member countries all agreed on the importance of strengthening the surveillance of the member countries' economies and coordinating the dialogues with China, Korea and Japan to prevent the recurrence of financial crisis. However, their views as well as positions differed among the ASEAN members and between the three non-ASEAN countries on specific issue as exchange rate arrangements.

In spite of their failure in launching the formal type of exchange rate arrangements after the Asian financial crisis, Figures 1–4 in the previous section revealed surprising similarity in the movements of the RERs of Indonesian rupiah, Korean won, the Philippine peso and Thai baht against the dollar as well as against the yen. Since East Asian economies and ASEAN countries are so interdependent with each other as well as closely linked to the world market, building regional exchange rate arrangements that contribute to assure stability of the RER among the member countries as well as with developed countries—Japan, the United States and the EU—has become one of the most important post-crisis policy issues.

To see if the current managed float system under different exchange rate arrangements in the four countries—the rupiah, the won, the peso and the baht—can substitute the *de facto* dollar pegged system before the finance crisis, we calculated the cross-correlation matrix of RER against the yen and against the dollar in the five East Asian countries—Korea, Singapore, Indonesia, the Philippines and Thailand – in Table 2.[9] The periods were subdivided into three periods: pre-crisis period (January 1995–June 1997), post-crisis adjustment period (July 1997–December 1998) and the most recent post-crisis period (January 1999–December 2001).

From Table 2, we find that pre-crisis cross-correlations of the five countries' RERs against the yen show very high correlation ranging from 0.921 to 0.995. They are higher

[8] "Regional financial cooperation in East Asia is still in its infancy stage" (Kawai (2002b, p. 99))

[9] We eliminate other countries such as Malaysia and China since they adopt a dollar pegged exchange rate system.

Table 2. Cross-Correlations of East Asian RERs against the Dollar and the Yen.

Dollar

January 1995–June 1997

	Korea	Singapore	Indonesia	The Philippines	Thailand
Korea	1.000				
Singapore	0.465	1.000			
Indonesia	0.850	0.173	1.000		
The Philippines	0.481	−0.261	0.776	1.000	
Thailand	0.908	0.451	0.921	0.585	1.000

July 1997–December 1998

	Korea	Singapore	Indonesia	The Philippines	Thailand
Korea	1.000				
Singapore	0.778	1.000			
Indonesia	0.686	0.854	1.000		
The Philippines	0.791	0.940	0.850	1.000	
Thailand	0.837	0.746	0.506	0.649	1.000

January 1999–December 2001

	Korea	Singapore	Indonesia	The Philippines	Thailand
Korea	1.000				
Singapore	0.692	1.000			
Indonesia	0.729	0.906	1.000		
The Philippines	0.654	0.850	0.823	1.000	
Thailand	0.700	0.851	0.845	0.974	1.000

Yen

January 1995–June 1997

	Korea	Singapore	Indonesia	The Philippines	Thailand
Korea	1.000				
Singapore	0.930	1.000			
Indonesia	0.937	0.974	1.000		
The Philippines	0.921	0.979	0.993	1.000	
Thailand	0.936	0.995	0.989	0.992	1.000

July 1997–December 1998

	Korea	Singapore	Indonesia	The Philippines	Thailand
Korea	1.000				
Singapore	0.376	1.000			
Indonesia	0.558	−0.097	1.000		
The Philippines	0.719	0.616	0.614	1.000	
Thailand	0.762	0.442	0.180	0.492	1.000

January 1999–December 2001

	Korea	Singapore	Indonesia	The Philippines	Thailand
Korea	1.000				
Singapore	0.462	1.000			
Indonesia	0.270	0.110	1.000		
The Philippines	0.513	0.428	0.727	1.000	
Thailand	0.659	0.659	0.619	0.925	1.000

For notes and sources, see Table 1.

than their RERs against the dollar that ranged from −0.261 to 0.921. The adjustments of the five countries' RER during the financial crisis from July 1997 to December 1998 were evidently coordinated with the relationship with the dollar than the yen. The cross-correlations of the five countries' RERs against the dollar ranged between 0.506 and 0.940 while against the yen ranged between −0.097 and 0.762. The cross-correlations of five countries' RERs against the dollar and the yen show that the trends in adjustment period continued to December 2001. Namely, cross-correlations of the five countries' RERs against the dollar ranged between 0.692 and 0.974 while those against the yen ranged from 0.110 to 0.925.

Another interesting finding in Table 2 is that cross-correlation coefficients between the ASEAN member countries—Singapore, Indonesia, the Philippines and Thailand—are higher than those between the ASEAN members and Korea. Coordinated stability of RERs between ASEAN member countries will help these countries in attracting Japanese FDI, in particular manufacturing FDI that aims to build intra-firm production networks in ASEAN region.

These findings suggest that instead of a *de facto* dollar pegged exchange rate regime, the four ASEAN countries are introducing a *de facto* dollar exchange rate arrangements, or managed float system, in stabilizing currencies within the four as well as against their trading partners. As for the Japanese yen, a *de facto* dollar pegged exchange rate regime contributed to the stability of the five East Asian RERs against the yen as well as between the five currencies in the region. Another interesting finding in Table 2 is that cross-correlation coefficients between the ASEAN member countries—Singapore, Indonesia, the Philippines and Thailand—are higher than those between Korea.

3. EMPIRICAL ANALYSIS

3.1. Research Design and Data

Benchmark model

Our model aims to assess the statistical significance of RERs as the determinants of FDI from Japan to the East Asian countries for the sample period from 1978 to 1999. In our study, RER is defined as:

$$RER = \frac{S/P}{1/P^*} = \frac{SP^*}{P}, \tag{1}$$

where S is the nominal exchange rate of East Asian currencies against the Japanese yen, P stands for the producer price index or wholesale price index of the host country and P^* denotes the wholesale price index of Japan. The benchmark regression equation used in our analysis is:

$$\ln \frac{FDI_t^i}{GDP_t^i} = \alpha_1 \ln RER_t^i + \alpha_2 \ln RERA_t^i + \varepsilon_t^i, \tag{2}$$

where superscript i refers to the country and subscripts t refers to the time. Dependent variable, FDI_t^i/GDP_t^i, is the ratio of real FDI outflows from Japan to East Asian respective countries to host country's real GDP, GDP_t^i. As the depreciation of host countries'

currency will improve foreign investor's wealth position (Froot and Stein (1991)), the sign of α_1 is expected to be negative.

In addition to RER, as in Sazanami and Yoshimura (1999), we also include a dummy variable to capture the effect of the Asian crisis through RER on FDI. Dummy variable, $RERA_t^i$, takes one after 1997 and zero otherwise. Sazanami and Yoshimura (2002) finds sharp fall in the RERs of the East Asian currencies against the yen in 1997. As East Asian countries abandoned *de facto* dollar pegs at the time of Asian crisis, the fall reflected adjustment of misalignments of East Asian RERs against the yen from long-run equilibrium rates. The misalignments against the yen started from 1995 when the dollar appreciated against the yen. $RERA_t^i$ tries to distinguish whether the financial market turmoil in 1997 had statistically significant influence on Japanese FDI outflow to East Asia.

Alternative specifications

Following Klein and Rosengren (1994), we include relative labor cost variable, RLC_t^i, as an independent variables in the equation (2). Recent theory of international trade has emphasized the importance of "region" in trade (Krugman (1991)). In Europe where national boundaries became less important, regional factor gained importance for multinational enterprises in their choice of production sites (Yamawaki, Barbarito and Thiran (1998)). This "regional" or "agglomeration" effect is also observed in Japanese firms. According to Head, Ries and Swenson (1995), Japanese firms preferred to locate their manufacturing affiliates in the region where Japanese production has "agglomerated." In order to capture the "agglomeration" effect, equation (2) also includes $CUMFDI^i_{t-1}/GDP^i_{t-1}$ that is defined as the one-year lagged cumulative total of Japan's FDI to the host country scaled by host country's GDP.

$$\ln \frac{FDI_t^i}{GDP_t^i} = \alpha_1 \ln RER_t^i + \alpha_2 \ln RERA_t^i + \alpha_3 \ln RLC_t^i + \alpha_4 \ln \frac{CUMFDI^i_{t-1}}{GDP^i_{t-1}} + \varepsilon_t^i . \quad (3)$$

The sign of α_3 is expected to be positive since the rise in Japanese per capita income relative to host country's income motivates Japanese manufacturing firms to shift their production location to save the cost of production (Ito (2000)). We expect positive signs in α_4 where "agglomeration" effect in East Asia accelerates Japanese FDI.

It is important to examine whether ASEAN regionalization affects the relationship between RER and FDI. To capture the regional and time-specific effects, we introduced two types of regional dummy variables: $ASEAN4_t^i$ and $ASEAN4S_t^i$.

To capture the ASEAN-specific regionalization effects, $ASEAN4_t^i$ takes one for ASEAN4 countries—Indonesia, Malaysia, the Philippines and Thailand—and zero for otherwise. $ASEAN4S_t^i$ takes one for ASEAN4 plus Singapore and zero for otherwise. $ASEAN4_t^i$ is introduced in our study for two reasons. Firstly, we found very high cross-country correlations in Japanese outward FDI to ASEAN countries for sample period of 1979–2000 (Appendix Table 1). Cross-country correlation coefficients ranged from 0.504 in case of Malaysia and Indonesia, and to 0.871 in case of Thailand and Singapore. Such close link between Japanese FDI and the member countries reflects Japanese

firms' preference to locate affiliates in the ASEAN where they have built production network generating the strong "agglomeration" effects.

Secondly, the recent emergence of China as a major industrial center in East Asia is threatening ASEAN member countries' vested advantage in attracting Japanese FDI (Kuroda (2001)). China's joining the WTO can provide an opportunity for opening up its potential domestic market to ASEAN countries. However, at the same time, ASEAN countries must strengthen regional co-operation to compete with China in attracting Japanese FDI. In our study, we try to investigate the level of statistical significance in the ASEAN dummy for different manufacturing industries—food industry, textile industry, wood and pulp industry, chemical industry, precision machinery, general machinery, electrical machinery and transportation machinery—to assess the importance of "regional" factor as a determinant of Japanese FDI outflow to the East Asian countries:

$$\ln \frac{FDI_t^i}{GDP_t^i} = \alpha_1 \ln RER_t^i + \alpha_2 \ln RERA_t^i + \alpha_3 \ln RLC_t^i + \alpha_4 \ln \frac{CUMFDI_{t-1}^i}{GDP_{t-1}^i} + \alpha_5 ASEAN4_t^i + \varepsilon_t^i \tag{4}$$

and

$$\ln \frac{FDI_t^i}{GDP_t^i} = \alpha_1 \ln RER_t^i + \alpha_2 \ln RERA_t^i + \alpha_3 \ln RLC_t^i + \alpha_4 \ln \frac{CUMFDI_{t-1}^i}{GDP_{t-1}^i} + \alpha_5 ASEAN4S_t^i + \varepsilon_t^i . \tag{5}$$

Data

The nominal exchange rates are annual averages expressed in local currency units against the U.S. dollar (IMF (2001, line rf)). Exchange rates of the East Asian currencies against the yen are obtained by applying the U.S. dollar against the Japanese yen. For the tradable price-based deflator, we used producer price index or wholesale price index data, reported in IMF (2001, line 63). The Indonesian producer price index data excludes petroleum products (IMF (2001, line 63a)). The Malaysian producer price index data are missing for number of years. The RER is computed based on equation (1) and normalized assuming the value in 1990 as 100.

Nominal FDI data is obtained from the website of the Japanese Ministry of Finance (http://www.mof.go.jp), and converted into dollars by applying annual average nominal exchange rates in the respective years. In our regression analysis, we follow Bayoumi and Lipworth (1998) in deflating real FDI by the GDP deflator. The nominal exchange rate is based on IMF (2001, line rf), except for Taiwan. For Taiwan, it is based on the *Taiwan Statistical Databook* published by the Council for Economic Planning and Development, Republic of China (2000). The GDP deflators are taken from the World Bank (2001) except for Taiwan where the GDP deflator was from the Council for Economic Planning and Development, Republic of China (2000).

Relative labor cost is measured by taking the ratio between Japanese per capita GDP to the host country's per capita GDP in 1995 prices. Per capita GDP in host countries are from World Bank (2001). Taiwan's per capita GDP is taken from the Council for Economic Planning and Development, Republic of China (2000). Although the International Labour Office (ILO) wage index is a more desirable wage index for our analysis, the limited availability of data on East Asia made it difficult to use ILO wage index in our estimation. FDI_t^i, RLC_t^i, GDP_t^i and $CUMFDI_t^i$ are in 1995 prices. The basic statistics of variables are summarized in Appendix Table 2.

3.2. Estimation results

Table 3, Table 4 and Table 5 show the estimated relationship between the RER and Japanese FDI outflows to East Asia (*FDI/GDP*) as in our benchmark model and alternative specifications. Feasible generalized least square estimation method was applied to assess the statistical significance in all three tables.[10] Table 3 includes dummy variable (*RERA*) which takes one for years after 1997 and zero otherwise to assess if policy change before and after Asian financial crisis had statistically significant influence on the relationship between the *RER* and *FDI/GDP*. Table 4 introduces two independent variables, relative labor cost (*RLC*) and the "agglomeration" variable (*CUMFDI/GDP*) in addition to *RER*. Table 5 aims to assess ASEAN regional effects dummy (*ASEAN4* or *ASEAN4S*) in addition to *RER*, *RERA*, *RLC* and *CUMFDI/GDP* in attracting Japan's FDI. Regressions in each table are applied to total FDI outflows, FDI in all industry, manufacturing total and in manufacturing subsectors such as food, textile, wood and pulp, chemical, precision machinery, general machinery, electrical machinery and transportation machinery in Table 3, Table 4 and Table 5.

Estimation results of equation (2) are presented in Table 3. In Table 3, the coefficients of *RER* are negative and statistically significant at 1% level in total FDI outflows as well in total manufacturing FDI and FDI in manufacturing subsectors. These results are consistent with the findings of Froot and Stein (1991). It is interesting to note that the coefficients of *RERA* were found statistically significant only in precision machinery and electrical machinery at 1% level of significance. This result implies that the decline in the RER attracts Japanese FDI to East Asia but the policy changes after the Asian financial crisis of 1997 did not have statistically significant effect on the relationship between the two.

Table 4 shows the estimation results of equation (3). All the coefficients of RER show the expected negative signs and are statistically significant. Similarly, the coefficients of *CUMFDI/GDP* are positive and statistically significant at 1% level in all the

[10] Feasible generalized least squares (FGLS) are used when elements of the variance-covariance matrix of the disturbances are unknowns in a nonspherical disturbance model. FGLS estimator is obtained as follows. Suppose that the generalized linear regression model is: $\mathbf{y} = \mathbf{X}\beta + \varepsilon$, $[\varepsilon|\mathbf{X}] = \mathbf{0}$, $E[\varepsilon\varepsilon'|\mathbf{X}] = \sigma^2\Omega$, where Ω is a positive definite matrix but it contains unknown parameters. Let small set of unknown parameters, θ, satisfy $\Omega = \Omega(\theta)$. Suppose that $\hat{\theta}$ is a consistent estimator of θ. If we use $\hat{\Omega} = (\hat{\theta})$ instead of Ω, $\hat{\Omega}$ is asymptotically equivalent to Ω because of plim$\hat{\theta} = \theta$. Therefore, FGL estimator, $\hat{\hat{\beta}}$, is obtained from $\hat{\hat{\beta}} = (\mathbf{X}'\hat{\Omega}^{-1}\mathbf{X})^{-1}\mathbf{X}'\hat{\Omega}^{-1}\mathbf{y}$. For more details, see Greene (2000).

Table 3. Regressions of Real Exchange Rate on Japan's Outward FDI.

	All industry (total FDI outflows)		Manufacturing total		Food industry		Textile industry		Wood and pulp industry	
ln *RER*	−1.194***	−1.213***	−1.341***	−1.351***	−2.307***	−2.289***	−2.115***	−2.130***	−2.159***	−2.152***
	[36.62]	[34.77]	[37.87]	[35.52]	[38.09]	[35.29]	[41.28]	[39.11]	[31.32]	[28.92]
ln *RERA*	0.012	0.024*	−0.010	−0.004	0.015	0.003	0.000	0.009	0.019	0.015
	[1.02]	[1.73]	[0.77]	[0.24]	[0.68]	[0.10]	[0.02]	[0.42]	[0.87]	[0.57]
Trend		−0.080		−0.039		0.088		−0.063		0.025
		[1.52]		[0.68]		[0.86]		[0.81]		[0.28]
N	161	161	161	161	115	115	140	140	140	140
Log-L	−216.1	−214.87	−230.73	−230.5	−205.86	−205.47	−235.81	−235.48	−267.47	−267.45
AIC	2.71	2.71	2.89	2.90	3.61	3.63	3.40	3.41	3.85	3.86
	Chemical industry		Precision machinery		General machinery		Electrical machinery		Transportation machinery	
ln *RER*	−1.919***	−1.921***	−1.696***	−1.683***	−1.936***	−1.958***	−1.808***	−1.862***	−1.884***	−1.858***
	[39.15]	[36.44]	[37.10]	[33.97]	[35.52]	[33.41]	[36.18]	[34.66]	[34.35]	[32.06]
ln *RERA*	0.008	0.010	−0.057***	−0.068***	−0.009	0.004	0.034**	0.063***	−0.011	−0.027
	[0.48]	[0.46]	[3.56]	[3.44]	[0.53]	[0.17]	[1.99]	[3.08]	[0.54]	[1.15]
Trend		−0.011		0.079		−0.075		−0.166**		0.152
		[0.13]		[1.04]		[1.05]		[2.23]		[1.51]
N	159	159	157	157	156	156	160	160	142	142
Log-L	−287.7	−287.68	−267.08	−266.98	−278.77	−278.25	−279.24	−277.35	−256.46	−255.21
AIC	3.64	3.66	3.43	3.44	3.60	3.61	3.52	3.50	3.64	3.64

Notes: 1) Feasible generalized least squares are used for estimation. Figures in brackets are t-values.

2) ***, **, * indicate statistically significant at the 1%, 5% and 10% level, respectively.

3) AIC means Akaike's Information Criteria and Log-L means log-likelihood.

4 ln *RERA*: ln *RER* × After the Asian financial crisis dummies, which takes one if year > 1997 and zero otherwise.

5) For other notes and sources, see Appendix Table 2.

Table 4. Regressions of Real Exchange Rate on Japan's Outward FDI with Relative Wages and Afflomeration Effects.

	All industry (total FDI outflows)		Manufacturing total		Food industry		Textile industry		Wood and pulp industry	
ln *RER*	−0.339***	−0.351***	−0.558***	−0.569***	−1.044***	−1.051***	−1.323***	−1.320***	−0.983***	−0.983***
	[6.91]	[7.00]	[8.67]	[8.79]	[5.53]	[5.57]	[8.15]	[8.08]	[5.23]	[5.22]
ln *RERA*		−0.030		−0.031		−0.061		−0.007		0.024
		[0.90]		[0.80]		[0.81]		[0.08]		[0.29]
ln *RLC*	0.179***	0.178***	0.238***	0.236***	0.249***	0.246***	0.362***	0.359***	0.192**	0.192*
	[4.18]	[4.16]	[5.00]	[4.98]	[2.94]	[2.90]	[4.38]	[4.31]	[1.96]	[1.96]
ln(*CUMFDI/GDP*)	0.935***	0.929***	0.833***	0.829***	0.636***	0.638***	0.563***	0.565***	0.693***	0.690***
	[19.21]	[19.01]	[14.77]	[14.76]	[6.04]	[6.06]	[7.34]	[7.33]	[9.23]	[9.15]
Trend	−0.087***	−0.083***	−0.055***	−0.050***	−0.061***	−0.053**	−0.022	−0.021	−0.035*	−0.038*
	[10.96]	[8.63]	[6.29]	[4.77]	[3.26]	[2.48]	[1.07]	[0.88]	[1.82]	[1.72]
N	161	161	161	161	140	140	140	140	113	113
Log-L	−137.92	−137.51	−166.35	−166.04	−221.85	−221.51	−243.68	−243.71	−172.81	−172.77
AIC	1.76	1.77	2.12	2.12	3.23	3.24	3.54	3.55	3.13	3.15
	Chemical industry		Precision machinery		General machinery		Electrical machinery		Transportation machinery	
ln *RER*	−0.988***	−0.987***	−0.927***	−0.923***	−0.578***	−0.598***	−0.579***	−0.608***	−1.459***	−1.441***
	[11.02]	[10.99]	[9.78]	[9.50]	[5.71]	[5.83]	[7.48]	[7.60]	[10.48]	[10.24]
ln *RERA*		0.007		0.071		−0.061		−0.077		0.142*
		[0.11]		[1.14]		[0.99]		[1.46]		[1.68]
ln *RLC*	0.235***	0.235***	0.155**	0.156**	0.339***	0.340***	0.281***	0.271***	0.485***	0.489***
	[2.92]	[2.92]	[2.51]	[2.52]	[4.21]	[4.29]	[4.16]	[4.04]	[4.79]	[4.82]
ln(*CUMFDI/GDP*)	0.738***	0.737***	0.597***	0.591***	0.920***	0.918***	0.853***	0.839***	0.431***	0.426***
	[10.68]	[10.63]	[9.96]	[9.76]	[12.96]	[12.91]	[15.08]	[14.70]	[6.09]	[6.03]
Trend	−0.001	−0.002	−0.062***	−0.071***	−0.067***	−0.057***	−0.056***	−0.044***	−0.042**	−0.059***
	[0.06]	[0.11]	[4.44]	[4.23]	[5.05]	[3.54]	[4.94]	[3.13]	[2.31]	[2.80]
N	159	159	157	157	156	156	160	160	142	142
Log-L	−252.41	−252.4	−237.45	−237.29	−227.59	−227.17	−213.39	−212.69	−233.92	−232.55
AIC	3.23	3.24	3.08	3.09	2.97	2.98	2.72	2.72	3.35	3.35

Notes: 1) Feasible generalized least squares are used for estimation. Figures in brackets are t-values.
2) ***, **, * indicate statistically significant at the 1%, 5% and 10% level, respectively.
3) AIC means Akaikc's Information Criteria and Log-L means log-likelihood.
4) For other notes and sources, see Appendix Table 2.

estimations. Such results suggest that Japanese firms try to locate affiliates in East Asia to enjoy the advantages of "agglomeration". All coefficients of *RLC* are positive and statistically significant except in wood and pulp and in precision machinery industries. The result supports previous study as Ito (2000), namely a rise in Japanese labor costs relative to East Asian labor costs promotes Japanese FDI from cost conscious Japanese manufacturing firms.

As for the coefficients of *RERA*, we found statistical significance only in the transportation machinery industry at the 10% level of significance. After controlling the effects of relative labor costs and agglomeration, the impacts of Asian Crisis are vanished in precision and electrical machinery industries. This result implies that the impacts of the Asian financial crisis on Japan's FDI are negligibly small in almost all the industries.

Estimation results of equations (3) and (4) are shown in Table 5. From this table, we find that the coefficients of RER are negative and their level of significance range between 1% and 5% in total FDI and in total manufacturing FDI as well as in its subsectors. Among the variables included in the regression, the coefficients of *CUMFDI/GDP* are positive and show 1% level of significance in all the estimations. The coefficients of *RLC* are positive and show 1% level of significance in total manufacturing, food, textile, general machinery, electrical machinery and transportation machinery.

Regional effects by industries are estimated by adding *ASEAN4S* and *ASEAN4* to the regressions. Regional dummies are positive and have statistically significant influence on increasing Japanese FDI in manufacturing total, food and general machinery industries. In precision machinery, and wood and pulp industries, the coefficients of *ASEAN4* and *ASEAN4S* show statistical significant positive signs. In all industry, chemical industry and electrical machinery industry, the coefficients of *ASEAN4S* are positive and statistically significant. On the other hand, the coefficients of *ASEAN4* are positive and statistically significant in transportation machinery while negative and statistically significant in textile industry.

The coefficients of *RERA* are statistically significant only in transportation at 10% level of significance. Such results suggest policy changes at the time of the Asian financial crisis did not give statistically significant influence on Japanese FDI to East Asian industrial subsectors except for transportation industry at a low significant level.

4. SUMMARY OF OUR FINDINGS AND RELATED POLICY ISSUES

Our estimation results on Japanese FDI to East Asia for total FDI, total manufacturing FDI and FDI in manufacturing subsectors are consistent with previous studies that find a decline in the RER increase FDI. In addition, accumulated total of Japanese FDI relative GDP of East Asian countries (*CUMFDI/GDP*) reflecting so-called "agglomeration effect" have statistically significant positive effect on Japanese FDI in all the estimation. The finding implies that while the high rates of growth in Japanese FDI to East Asia as experienced in the early 1990s to build Asian production networks promoted further increase in annual outflow from Japan, any downturn can lead to slowdown in the

Table 5. Regressions of Real Exchange Rate on Japan's Outward FDI: Regional Effects.

	All industry (total FDI outflows)				Manufacturing total				Food industry			
ln *RER*	−0.347***	−0.360***	−0.454***	−0.468***	−0.543***	−0.553***	−0.620***	−0.628***	−0.940***	−0.948***	−0.909***	−0.921***
	[6.94]	[7.03]	[7.67]	[7.83]	[8.04]	[8.13]	[6.97]	[7.05]	[4.27]	[4.30]	[3.34]	[3.37]
ln *RERA*		−0.030		−0.033		−0.032		−0.028		−0.059		−0.059
		[0.91]		[1.03]		[0.83]		[0.71]		[0.80]		[0.79]
ln *RLC*	0.143**	0.143**	0.084*	0.081	0.270***	0.269***	0.209***	0.207***	0.306***	0.302***	0.282***	0.277***
	[2.28]	[2.28]	[1.65]	[1.59]	[4.31]	[4.33]	[3.72]	[3.71]	[3.20]	[3.15]	[2.91]	[2.86]
ln(*CUMFDI/GDP*)	0.915***	0.908***	0.809***	0.802***	0.856***	0.853***	0.779***	0.776***	0.695***	0.698***	0.703***	0.703***
	[16.79]	[16.61]	[13.19]	[13.12]	[13.19]	[13.17]	[9.90]	[9.88]	[5.73]	[5.75]	[4.89]	[4.89]
ASEAN4	0.106	0.106			−0.108	−0.111			−0.246	−0.239		
	[0.80]	[0.81]			[0.74]	[0.76]			[1.04]	[1.01]		
ASEAN4S			0.375***	0.376***			0.140	0.138			−0.188	−0.181
			[3.26]	[3.32]			[0.92]	[0.91]			[0.69]	[0.66]
Trend	−0.087***	−0.082***	−0.078***	−0.072***	−0.056***	−0.051***	−0.051***	−0.046***	−0.067***	−0.059**	−0.070***	−0.061**
	[10.82]	[8.51]	[9.14]	[7.17]	[6.41]	[4.85]	[5.45]	[4.18]	[3.27]	[2.57]	[3.09]	[2.46]
N	161	161	161	161	161	161	161	161	140	140	140	140
Log-L	−137.66	−137.24	−133.74	−133.22	−166.02	−165.69	−166.58	−166.32	−220.99	−220.66	−221.58	−221.26
AIC	1.77	1.78	1.72	1.73	2.12	2.13	2.13	2.14	3.23	3.24	3.24	3.25
	Chemical industry				Precision machinery				General machinery			
ln *RER*	−1.003***	−1.002***	−1.331***	−1.330***	−1.055***	−1.051***	−1.179***	−1.193***	−0.579***	−0.598***	−0.547***	−0.566***
	[9.07]	[9.07]	[9.69]	[9.68]	[8.34]	[8.28]	[7.48]	[7.45]	[5.75]	[5.86]	[4.55]	[4.70]
ln *RERA*		0.007		0.022		0.093		0.090		−0.063		−0.063
		[0.12]		[0.34]		[1.46]		[1.43]		[1.04]		[1.02]
ln *RLC*	0.229***	0.229***	0.167*	0.168*	0.065	0.061	0.152**	0.151**	0.417***	0.415***	0.359***	0.361***
	[2.59]	[2.59]	[1.80]	[1.81]	[0.79]	[0.73]	[2.40]	[2.39]	[4.53]	[4.65]	[4.06]	[4.17]
ln(*CUMFDI/GDP*)	0.729***	0.728***	0.555***	0.552***	0.509***	0.501***	0.484***	0.467***	0.929***	0.927***	0.938***	0.937***
	[8.86]	[8.79]	[5.80]	[5.76]	[6.26]	[6.20]	[5.78]	[5.49]	[13.09]	[13.05]	[11.60]	[11.67]
ASEAN4	0.042	0.043			0.453*	0.491*			−0.306	−0.305		
	[0.20]	[0.20]			[1.77]	[1.89]			[1.48]	[1.51]		
ASEAN4S			0.696***	0.702***			0.500**	0.537**			−0.106	−0.114
			[2.90]	[2.92]			[2.07]	[2.20]			[0.55]	[0.60]
Trend	0.000	−0.001	0.015	0.011	−0.056***	−0.068***	−0.051***	−0.061***	−0.067***	−0.057***	−0.068***	−0.058***
	[0.00]	[0.07]	[0.96]	[0.62]	[3.86]	[3.95]	[3.46]	[3.55]	[5.03]	[3.52]	[5.01]	[3.53]
N	159	159	159	159	157	157	157	157	156	156	156	156
Log-L	−252.42	−252.41	−252.04	−251.98	−236.52	−236.07	−235.73	−235.26	−226.62	−226.13	−227.45	−226.99
AIC	3.24	3.25	3.23	3.25	3.08	3.08	3.07	3.07	2.97	2.98	2.98	2.99

	Textile industry				Wood and pulp industry			
ln *RER*	−1.159***	−1.159***	−1.189***	−1.188***	−1.175***	−1.174***	−1.266***	−1.264***
	[6.42]	[6.40]	[5.82]	[5.80]	[5.35]	[5.34]	[5.47]	[5.46]
ln *RERA*		−0.032		−0.009		0.020		0.026
		[0.40]		[0.11]		[0.24]		[0.32]
ln *RLC*	0.436***	0.431***	0.386***	0.383***	0.123	0.123	0.153	0.152
	[5.30]	[5.17]	[4.52]	[4.44]	[1.19]	[1.18]	[1.60]	[1.58]
ln(*CUMFDI/GDP*)	0.636***	0.639***	0.617***	0.618***	0.610***	0.608***	0.581***	0.579***
	[7.64]	[7.62]	[6.76]	[6.74]	[6.81]	[6.78]	[6.34]	[6.30]
ASEAN4	−0.568**	−0.569**			0.450*	0.449*		
	[2.14]	[2.13]			[1.65]	[1.65]		
ASEAN4S			−0.307	−0.306			0.553**	0.553**
			[1.08]	[1.07]			[2.06]	[2.06]
Trend	−0.035	−0.030	−0.032	−0.031	−0.028	−0.031	−0.029	−0.032
	[1.62]	[1.23]	[1.43]	[1.21]	[1.44]	[1.38]	[1.50]	[1.46]
N	140	140	140	140	113	113	113	113
Log-L	−241.28	−241.21	−243.1	−243.14	−171.53	−171.49	−170.87	−170.82
AIC	3.52	3.53	3.54	3.56	3.12	3.14	3.11	3.13
	Electrical machinery				Transportation machinery			
ln *RER*	−0.566***	−0.599***	−0.650***	−0.681***	−1.580***	−1.574***	−1.527***	−1.524***
	[7.25]	[7.43]	[7.83]	[7.86]	[10.25]	[10.20]	[9.14]	[9.10]
ln *RERA*		−0.075		−0.076		0.149*		0.147*
		[1.43]		[1.45]		[1.80]		[1.75]
ln *RLC*	0.237***	0.235***	0.261***	0.251***	0.354***	0.347***	0.444***	0.438***
	[2.94]	[2.98]	[3.86]	[3.73]	[2.82]	[2.75]	[3.83]	[3.76]
ln(*CUMFDI/GDP*)	0.853***	0.840***	0.822***	0.809***	0.353***	0.339***	0.393***	0.380***
	[15.18]	[14.78]	[14.24]	[13.84]	[4.22]	[4.06]	[4.52]	[4.36]
ASEAN4	0.192	0.168			0.505*	0.539*		
	[1.08]	[0.95]			[1.68]	[1.81]		
ASEAN4S			0.329**	0.326**			0.208	0.253
			[2.40]	[2.31]			[0.72]	[0.88]
Trend	−0.058***	−0.046***	−0.054***	−0.042***	−0.032*	−0.049**	−0.037**	−0.054**
	[5.04]	[3.21]	[4.75]	[2.93]	[1.73]	[2.34]	[1.97]	[2.51]
N	160	160	160	160	142	142	142	142
Log-L	−212.85	−212.26	−210.64	−210.09	−232.83	−231.27	−233.69	−232.2
AIC	2.72	2.73	2.70	2.70	3.35	3.34	3.36	3.35

Notes: 1) Feasible generalized least squares are used for estimation. Figures in brackets are t-values.

2) ***, **, * indicate statistically significant at the 1%, 5% and 10% level, respectively.

3) AIC means Akaike's Information Criteria and Log-L means log-likelihood.

4) *ASEAN* indicates ASEAN-4 (Indonesia, Malaysia, the Philippines and Thailand) dummy variable while ASEANS indicates ASEAN-4 plus Singapore dummy variable.

5) For other notes and sources, see Appendix Table 2.

following years. Hence the slow recovery of Japanese FDI to ASEAN after the financial crisis may be due to this negative "accumulative effect". Dummy variable (*RERA*) introduced to distinguish policy changes before and after the financial crisis was not statistically significant in FDI in all industry, in total manufacturing as well as in most of FDI in manufacturing subsectors. Theses findings are consistent with the stability we find in FDI inflow to East Asian countries at the time of the financial crisis. Indeed, FDI was the only item in private capital flows to the East Asian that was positive in 1997 (Institute of International Finance (1998)).

As noted earlier, the World Bank (2002, p. 39, Box 2.2) finds that out of the ten largest FDI recipients, seven are also developing countries with the largest exports. Based on our findings in the previous sections, we highlight a number of policy issues related to the reestablishment of trade and exchange rate regimes that will help to attract FDI and promote export-oriented growth in the East Asian countries, and in ASEAN in particular.

The recent surge of Japanese FDI to China and Hong Kong motivated the ASEAN member countries to strengthen their industrial ties by accelerating the formation of the ASEAN Free Trade Area (AFTA).[11] They try to lower intra-regional trade barrier by reducing tariffs to 5% for the initial ASEAN member countries by 2002, for Vietnam by 2003, for Laos and Myanmar by 2005 and for Cambodia by 2006. The tariff reduction will help to rationalize productions fragmented within the ASEAN members. In order to assess the regional effect in attracting Japanese FDI, we introduce the ASEAN4 dummy that includes Indonesia, Malaysia, the Philippines and Thailand and the ASEAN4 plus Singapore dummy to capture the "entrepot center" effects of Singapore in the ASEAN region. The ASEAN4 plus Singapore dummy gave better results than the ASEAN dummy showing a positive and statistically significant influence in attracting Japanese FDI to East Asia. The ASEAN4 plus Singapore dummy is positive and statistically significant at 1–5% level in total FDI and in chemical, precision and electrical machinery industries. On the other hand, ASEAN4 dummy is statistically significant in textile industry at 5% level, but statistically significant in wood and pulp, precision machinery and transportation machinery industries only at 10% level of significance. Our estimation results show the importance of regionalization in East Asia in terms of reducing intra-regional trade barriers in helping to increase Japanese FDI inflows.

The financial crisis of 1997 taught us the lesson, that the other important regional policy to attract Japanese FDI to AFTA is regional exchange rate arrangements that will jointly avoid misalignment and excessive volatility of their currencies against both the dollar and the yen. If AFTA aims to promote intra-ASEAN trade and to build united regional market with 500 million inhabitants, exchange rate arrangements that to stabilize exchange rate movements within the region will become necessary. Our study finds that the ASEAN member countries' officials may be fully aware of the importance of managing exchange rates after the financial crisis. In spite of the diversity

[11] See, Box.2.3 Round-tripping of capital flows between China and Hong Kong (World Bank (2002, p. 41)).

Appendix Table 1. Cross-country Correlations of Japan's Outward FDI between 1979 F/Y and 2000 F/Y.

	China	Korea	Hong Kong	Taiwan	Singapore	Indonesia	Malaysia	The Philippines	Thailand
China	1.000								
Korea	0.339	1.000							
Hong Kong	0.395	0.530	1.000						
Taiwan	0.456	0.726	0.646	1.000					
Singapore	0.567	0.503	0.650	0.538	1.000				
Indonesia	0.571	0.037	0.223	0.216	0.529	1.000			
Malaysia	0.546	0.352	0.660	0.572	0.717	0.504	1.000		
The Philippines	0.830	0.487	0.417	0.421	0.684	0.616	0.627	1.000	
Thailand	0.600	0.416	0.635	0.565	0.871	0.600	0.790	0.734	1.000

For notes and sources, see Table 1.

Appendix Table 2. Basic Indicators and Correlation Matrix of Variables.

Basic indicators	N	Mean	S.D.	Min.	Max.
ln(*FDI/GDP*) =ln(*FDI/GDP*)	189	−5.515	1.247	−11.251	−2.773
ln(real exchange rate) =ln*RER*	161	4.601	0.200	4.047	5.232
ln *RER*×Crisis Dummy =ln *RERA*	161	0.640	1.575	0.000	4.741
ln(relative labor cost) =ln*RLC*	189	2.489	1.324	0.470	5.132
ln(cumlative FDI/FGDP) =ln(*CUMFDI/GDP*)	188	−3.665	1.427	−9.473	−1.542
ASEAN4	189	0.444	0.498	0.000	1.000
ASEAN4S	189	0.556	0.498	0.000	1.000
Trend	189	11.000	6.071	1.000	21.000

Correlation matrix	ln(*FDIGDP*)	ln *RER*	ln *RERA*	ln *RLC*	ln(*CUMFDI/GDP*)	*Trend*	*ASEAN4*	*ASEAN4S*
ln(*FDI/GDP*)	1.000							
ln *RER*	−0.069	1.000						
ln *RERA*	−0.030	−0.230	1.000					
ln *RLC*	−0.179	0.200	−0.127	1.000				
ln(*CUMFDI/GDP*)	0.708	−0.274	0.249	−0.424	1.000			
Trend	0.160	0.209	−0.066	0.601	0.010	1.000		
ASEAN4	0.519	0.231	−0.068	0.240	0.342	0.768	1.000	
ASEAN4S	0.134	−0.705	0.580	−0.171	0.558	−0.085	−0.118	1.000

Notes: *FDI*: Japanese outward FDI to each country (1995 prices).
GDP: Foreign partner country's GDP (at 1995 prices).
RER: real exchange rate.
RLC: Japanese per capita GDP relative to each country's per capita GDP (at 1995 prices).
CUMFDI: cumulative value of Japan's outward FDI (1995 prices).
ASEAN4: ASEAN-4 (Indonesia, Malaysia, the Philippines and Thailand) dummy variable that takes one if host country and zero otherwise.
ASEAN4S: ASEAN-4 plus Singapore dummy variable that takes one if host country belongs to ASEAN-4 or Singapore zero otherwise.

Sources: World Bank (2001) *World Development Indicators* [CD-ROM], Washington D.C.: World Bank.
Council for Economic Planning and Development (2000) *Taiwan Statistical Databook*, Council for Economic Plannning and Development, Republic of China.
International Monetary Fund (2000) *International Financial Statistics* [CD-ROM], Washington, D.C.: IMF.
Ministry of Finance (2000) http://www.mof.go.jp/1c008.htm (accessed date 12/24/00)

in the ASEAN member countries' exchange rate regimes introduced after the Asian crisis, our study finds that while the exchange rate regime for the rupiah, the won, the peso and the baht have become more flexible after the financial crisis, they are managed to avoid the overvaluation of their RERs against both the dollar the yen after they have adjusted their exchange rates between July 1997 and December 1998. In addition, the cross-correlation coefficients of East Asian RER against the dollar are even higher after the financial crisis than before. We also found that the correlation coefficients of RER against the dollar between Singapore and other ASEAN members are higher than those between Korea and ASEAN members. Such findings suggest that the East Asian countries are substituting a *de facto* dollar pegged exchange rate regime before the financial crisis to what can be named as "a *de facto* dollar coordinated exchange rate regime" with "managed flexibility" as advocated in Nicolas (2002). The change helps to achieve the stability of the RER of the East Asian countries not only against the dollar but also between the regional currencies, which in turn help to promote Japanese FDI outflows to East Asia.

REFERENCES

Bayoumi, Tamim and Lipworth, Gabrielle (1998) "Japanese Foreign Direct Investment and Regional Trade," *Journal of Asian Economics*, **9**(4): 581–607.

Beng, Gan-Wee (2000) "Exchange-rate Policy in East Asia after the Fall: How Much Have Things Changed?" *Journal of Asian Economics*, **11**(4): 403–430.

Corden, W. Max (2001) " 'Developing Countries' Choice of Exchange Rate Regimes," *IMF Survey*, **30**(3): 44–46.

Council for Economic Planning and Development, Republic of China (2000) *Taiwan Statistical Databook*: Council for Economic Planning and Development, Republic of China.

Froot, Kenneth A and Jeremy C. Stein (1991) "Exchange Rates and Foreign Direct Investment: An Imperfect Capital Markets Approach," *Quarterly Journal of Economics*, **106**(4): 1191–1217.

Greene, William H. (2000) *Econometric Analysis*, 4th ed.: Prentice Hall.

Head, Keith, John Ries and Deborah Swenson (1995) "Agglomeration Benefits and Location Choice: Evidence from Japanese Manufacturing Investments in the United States," *Journal of International Economics*, **38**(3/4): 223–247.

Institute of International Finance (IIF) (1998) *Capital Flows to Emerging Market Economies*, Washington, D.C.: IIF.

International Monetary Fund (IMF) (2001) *International Financial Statistics* [CD-ROM], Washington, D.C.: IMF.

Ito, Takatoshi (2000) "Capital Flows in Asia," in Sebastian Edwards ed., *Capital Flows and the Emerging Economies*, Chicago and London: University of Chicago Press: 255–296.

———, Eiji Ogawa, and Yuri Nagataki Sasaki (1998) "How Did the Dollar Peg Fail in Asia?" *Journal of the Japanese and International Economies*, **12**(4): 256–304.

Kawai, Masahiro (2002a) "Exchange Rates Arrangements in East Asia: Lesson from the 1997–98 Crisis" Institute for Monetary and Economic Studies, Discussion Paper #2002-E-17. (available from the web site: <http://www.boj.or.jp/ronbun/ronbun_f.htm>.

——— (2002b) "Global, Regional and National Approaches to the International Financial Architecture: Lessons from the East Asian Crisis," *International Economy*, Screening Series **7**: 65–108.

Klein, Michael W. and Eric Rosengren (1994) "The Real Exchange Rate and Foreign Direct Investment in the United States: Relative Wealth vs. Relative Wage Effects," *Journal of International Economics*, **36**(3–4): 373–389.

Krugman, Paul R. (1991) *Geography and Trade*, Cambridge, MA: MIT Press.

Kuroda, Atsuo (2001) *Made in China* (*Meido in China*), Tokyo: Toyokeizai Shinnposha. [In Japanese]

Nicolas, Françoise (2002) "The Future of Exchange Rate Policies in East Asia: A Case for Managed Flexibility," in Pierre-Bruno Ruffini ed., *International Trade and Capital Flows in Economic Restructuring and Growth: European and East Asian Experiences*, Le Havre: University of Le Havre Press, 214–239.

Ogawa, Eiji (1999) "The Internationalization of the Yen and the Asian Economic Crisis," in Japan Center for International Finance ed., *Merits and Demerits of Pegged Exchange Rate Regime*, Tokyo: Japan Center for International Finance, 87–100. [In Japanese]

Sazanami, Yoko and Seiji Yoshimura (1999) "Restructuring East Asian Exchange Rate Regimes," *Journal of Asian Economics*, **10**(4): 509–523.

———— and ———— (2002) "Exchange Rate Misalignment before and after the Asian Crisis," in Pierre-Bruno Ruffini ed., *International Trade and Capital Flows in Economic Restructuring and Growth: European and East Asian Experiences*, Le Havre: University of Le Havre Press, pp. 240–250.

Urata, Shujiro (1998) "Regionalization and the Formation of Regional Institutions in East Asia" in Kiichiro Fukasaku, Fukunari Kimura and Shujiro Urata eds., *Asia & Europe: Beyond Competing Regionalism*, Brighton, UK: Sussex University Press: 13–44.

World Bank (2001) *World Development Indicators* [CD-ROM], Washington, D.C.: World Bank.

———— (2002) *Global Development Finance*, Washington, D.C.: World Bank.

Yamawaki, Hideki, Luca Barbrito and Jean-Marc Thiran (1998) "US and Japanese Multinationals in European Manufacturing: Location Patterns and Host Region/Country Characteristics" in Kiichiro Fukasaku, Fukunari Kimura and Shujiro Urata eds., *Asia & Europe: Beyond Competing Regionalism*, Brighton, UK: Sussex University Press: 161–179.