Working Paper Series

The Determinants of Foreign Direct Investment
from Japan and the United States
to East Asian Countries,
and the Linkage between FDI and Trade

Shin-ya Nakamura and Tsuyoshi Oyama

Working Paper 98-11

The Determinants of Foreign Direct Investment from Japan and the United States to East Asian Countries, and the Linkage between FDI and Trade [1]

Shin-ya Nakamura and Tsuyoshi Oyama[2]

Bank of Japan

November, 1998

1. Introduction

The financial crisis of East Asian countries has again played up the importance of foreign direct investment (FDI) as a source of capital inflow into developing countries. FDI has long been considered to be conducive to the economic growth of developing countries, partly owing to its relative immobility and consequent high stake in the long-term profitability. Developing countries' dependence on FDI among total capital inflows, therefore, can often be a good indicator of the robustness of their economies against external shock.

This paper focuses on the macroeconomic determinants of FDI from Japan and the United States into East Asian countries, and the linkage between FDI and trade, and other macroeconomic variables. In this area, Goldberg and Klein (1998) published an excellent study, in which they presented the determinants and impacts of FDI from Japan and the United States into some Southeast Asian and Latin American countries using panel data analysis. Our analysis is based on their study but differs in the following points: 1) we adopt a longer sample period and more sample countries in East Asia (but

exclude Latin American countries) for the purpose of evaluating the factors behind the recent movements of FDI into the region in a quantitative manner. 2) We focus more on the structural differences among East Asian counties and classify them based on statistical tests of fixed effects models using panel data.   This examination helps to clarify how Japanese and American multinational firms position their production bases in East Asian countries within their world marketing strategies. 3) In order to avoid the problem of simultaneity among variables, we examine simultaneous equation models to confirm the validity of panel regression results.

Our study finds that East Asian countries can be classified into four groups depending on FDI from Japan and other elasticities to macroeconomic variables, and this grouping almost coincides with their economic development stages.   Moreover, we confirm that FDI from Japan into all the groups are strongly affected by changes in real bilateral exchange rates, but this is not always the case for FDI from the United States. Among different country groups, FDI into group 1 (Taiwan and Korea) responds positively to the Japanese capacity utilization, indicating their industries' integration with the Japanese economy.   Group 3 (Indonesia and the Philippines) shows that Japanese FDI is buoyed up by the yen's appreciation against the U.S. dollar.   FDI into group 4 (China and Malaysia) and, to a lesser extent, group 2 (Singapore and Thailand) are oriented more toward capturing local markets compared to the other groups.   We also find that Japanese FDI has strong trade expansion effects, which is rarely seen for U.S. FDI.

This paper is organized as follows.   Section 2 provides a brief overview of theories which attempt to explain the determinants of FDI.   Section 3 presents recent developments of FDI from Japan and the United States into East Asian countries. Section 4 examines the macroeconomic determinants of FDI from Japan and the United States into East Asian countries using panel data analysis, and classifies sample countries into several groups which share common FDI elasticities to macroeconomic factors. Section 5 extends the analysis to examine linkages between FDI and trade.   Based on the analysis in Sections 4 and 5, Section 6 presents a simple simultaneous macroeconomic model focusing on linkages between FDI and other macroeconomic variables.   Chapter 7 presents a summary of the principal findings.

2. Overview of the FDI theory

There are many theories which attempt to explain the determinants of FDI. Orthodox trade theory (e.g. Helpman and Krugman(1985) and Krugman and Obstfeld (1994)) assert that the direction and magnitude of capital flows is determined by differences in factor proportions among countries, which cannot be addressed by international trade. According to this theory, a difference in factor proportions, say, between two countries, stimulates an adjustment of real exchange rates between them and consequently encourages countries with abundant capital and labor shortages to implement FDI into countries in the opposite situation. In this case, FDI functions as one way to bridge an intertemporal gap of capital demand and supply, and, like other capital inflows, increases the production frontier of developing countries, which normally suffer a shortage of capital. Differences in factor proportions, however, cannot be the sole determinant of international capital flows, which seem to be highly volatile in comparison to a relatively stable factor endowments. Past empirical studies, for example, show a strong influence of exchange rates movements on FDI. Since changes in exchange rates directly affect factor prices (e.g. labor prices) of host countries vis-à-vis home countries, they represent one major criteria whereby many multinational firms decide their FDI. As factor proportions influence exchange rates but only to a modest degree, many other factors which affect exchange rates are assumed to influence FDI indirectly.

Besides, FDI has many features that distinguish it from other forms of capital inflows, such as loans and portfolio investments. According to Krugman and Obstfeld (1994), "[t]he distinct feature of direct foreign investment is that it involves not only a transfer of resources but also the acquisition of *control*." Thus, the determinants of FDI can be affected by factors which concern multinational firms' motives to extend controls beyond country boundaries. This also helps explains the actual movements of FDI, which are not always consistent with the direction implied by the law of factor proportions.

Certain types of market imperfections, such as the merits of "internalization," and political factors often become key concepts in explaining the motives of multinational firms to extend their control. According to the theory of internalization, "the key ingredient for maintaining a firm-specific competitive advantages is possession of proprietary information and control of the human capital that can generate new information through expertise in research, management, marketing, and technology"

(Eiteman, Stonehill, Moffett (1995)).   This internal market of multinational firms is "an efficient response to the given exogenous market imperfection in the determination of the price of information" about their operations, which is created through the process of research and ordinal operations (Rugman (1985)).   Technology transfers may be a typical example, as they are often "embodied in the knowledge of a group of individuals and cannot be packaged and sold" (Krugman, Obstfeld (1996)).   For this reason, implementations of FDI naturally lead to expansions of multinational firms' networks and are accompanied by trade between home and host countries.   In other words, FDI deepens the integration of the host countries' economies into the home countries' and thereby entails a close linkage of macroeconomic variables such as trade and GDP.

Focusing on the impacts on trades between host and home countries, Fukao and Amano(1998) identify two different types of FDI.   The first is FDI for "vertical integration," which mainly attempts to exploit the natural resources required for their final products.   The second is FDI for "horizontal integration," which builds plants for producing lines of products similar to those produced in the home country.   The main purpose of this type of FDI is to capitalize on the cheap labor of developing countries, or to respond promptly to changes in the needs of foreign markets.[3]   The effects of FDI on trades, therefore, vary according to the type of FDI.   FDI for vertical integration, for example, is likely to increase imports of natural resources from FDI host to FDI home county.   Meanwhile, as noted by the Bank of Japan (1996), and Inui and Seki (1997), FDI for horizontal integration is likely to increase exports from home to host country as well as imports from host to home country since integrated assembly lines in host countries require imports of intermediate goods for their production.[4]   Further, this type of FDI may attempt to shift export base for third markets from home to host county, leading to a decrease of exports from the home country and an increase of exports from the host country.

FDI for horizontal integration, in particular, what is intended to substitute for

---

[3]   From a slightly different perspective, Eiteman, Stonehill and Moffett (1995) classifies strategic motives of multination firms' FDI into the following five categories: (1) market seekers, (2) raw material seekers, (3) production efficiency seekers, (4) knowledge seekers, and (5) political safety seekers.

[4]   In addition, FDI (regardless of vertical or horizontal integration) is usually accompanied by a surge in imports of capital goods at the initial stage.

exports from the home country or domestic production in the host country (so-called market seekers or production efficiency seekers) is supposed to be sensitive to changes in factor prices, and subsequently to changes in exchange rates.   In this paper, we focus on the impacts of changes in exchange rates and host countries' economic growth on FDI, and on FDI's linkages with trade.   Putting it another way, this analysis is to examine the degree to which the current FDI from Japan and Unites States into East Asian countries assumes the character of market seekers or production efficiency seekers.

3. FDI into East Asian countries

As many studies point (for example, see Kohsaka(1996)), FDI has been a central part of capital inflows for many East Asian countries during recent years.   Chart 1 shows the composition of net capital inflows to eight East Asian countries since 1989. Though Taiwan and Korea recorded net outflows of FDI during this period, all other countries, particularly China, Malaysia, and Indonesia, depended on FDI for a crucial part of their net capital inflows.   According to the World Bank, the share of FDI in total net capital inflows in Asian countries was around 49 % during 1994--96, which was much higher than for Latin American countries (32 %) during this period.

Japan and the United States are major providers of FDI into East Asian countries.   As Chart 2 shows, together Japan and the United States often account for around 50 percent of the total FDI into the eight East Asian countries.   FDI amounts from Japan and the United States into this region show similar developments: they jumped around the end of the 1980s and in 1993-94, and both periods were followed by relatively stable movements (Chart 3).   These movements may reflect the timing of the liberalization of FDI by East Asian countries.   The amount of FDI from Japan, however, also coincides with the movement of the yen's exchange rate against the U.S. dollar with a one- or two-year time lag, partly verifying anecdotal claims that many Japanese export industries (especially, labor-intensive manufacturing industries) shifted their production bases to East Asian countries responding to the significant appreciation of the yen against the U.S. dollar during this period.   (For more details, for example, see Bank of Japan (1996)).

Meanwhile, the share of FDI from Japan into this region in total Japanese FDI rose rapidly from the end of the 1980s and has stabilized since 1994 (Chart 4).   This

change reflects the fact that East Asian countries (particularly, the ASEAN countries and China) increasingly became the preferred FDI destination for Japanese firms, while FDI into industrialized countries, which was mainly implemented to avoid trade friction abated once mass production bases were established. FDI from the United States jumped around the end of the 1980s and has remained level since that time.

Looking at the industry breakdown of FDI into Asian NIES, ASEAN countries and China (Table 1), a large share of FDI from Japan into all three regions is occupied by the non-manufacturing and the electrical industry, followed by the chemical and steel industries. By and large, the same features can be found in the case of FDI from the United States, as well.

4. Determinants of FDI from Japan and the United States

Goldberg and Klein (1998) identified a clear relation between real exchange rates and FDI from Japan and the United States into Southeast Asian countries (Indonesia, Malaysia, the Philippines and Thailand) . They also found that FDI from Japan into Southeast Asian countries has been very sensitive not only to changes in the yen exchange rate but also the yen-dollar exchange rate in that a dollar depreciation leads to a spur in investments from Japan. Exchange rates may affect FDI through several channels. The most significant path, however, lies in their effects on labor and other costs, which change the comparative advantages of certain goods between two countries and thus encourage the transfer of production bases from one country to another.

Although there are many other macro and micro factors which affect FDI flows, this paper follows the basic idea presented by Goldberg and Klein (1998) as stated above, and pays special attention to the effects of macroeconomic factors, particularly real exchange rates. The main reason is that as noted in the previous section, Japanese FDI into East Asian countries appears to be very sensitive to changes in exchange rates. Moreover, we are interested in the impacts of the recent volatile movements of bilateral exchange rates of the yen against the region's currencies on Japanese FDI into the region. Given the limited sample period for some data and also the relative similarities of economic structures among certain East Asian countries, we adopt an analysis based on cross-section time series panel data for identifying the determinants of FDI. Our focus is on the East Asian region covering eight countries (Taiwan, Korea, China, Malaysia,

Singapore, Indonesia, the Philippines and Thailand), which are classified into smaller groups based on similarities of the FDI elasticities to macroeconomic variables. In other words, we use the F-test to confirm the validity of an assumption of fixed elasticities among sample countries, and thereby classify them accordingly. The sample periods run from 1979 to 1997 for Japan and from 1982 to 1997 for the United States, making it possible to view factors behind the recent movements of FDI into East Asian countries.

In the panel regression, we use the following variables in the logarithms. The dependent variables are gross-base real FDI (in U.S. dollar terms) from Japan and the United States into the eight East Asian countries. The independent variables include the real bilateral exchange rates between the local currencies and the yen (REXJA), and between the local currencies and the U.S. dollar (REXUS), the real GDP of the host countries (RG), and the capacity utilization in the home countries[5] (UTJA for Japan and UTUS for the United States). Real exchange rates are the values of local currencies per yen or U.S. dollar after adjustments for inflation differences, and thus an increase in the real exchange rates of local currencies against the yen represents a depreciation of local currencies against the yen. The lag structure (contemporaneous or one-period lag, as marked by numbers after the variables) of independent variables are determined after examining the statistical significance of variables in single regressions for each East Asian country. The only exception is the host countries' GDP, for which only lagged variables are used since contemporaneous variables are likely to involve simultaneity. (Regarding the details of variables, see Data Appendix.)

Before proceeding with regression analysis using the panel data, we first examine the results of single regressions for each sample county and thereby capture clues about possible country groups which share common FDI elasticities to macroeconomic variables. Based on this information, we repeat a trial and error process of panel regressions seeking possible country groups until finding the case which cannot reject the null hypothesis that all coefficients of independent variables are the same among group countries with a 1 % statistical significance (all cases but one, however, clear the criteria of 5 % significance). Finally, based on the outcome of Hausman test, we choose the fixed effects or random effects models [6] [7]. This estimation process is also applied to

---

[5]   We use capacity utilization as an indicator of the capital expenditure of firms rather than using domestic GDP.

[6]   The fixed effects model assumes that there are common slopes, but that each cross section

other panel regressions in this paper.

(Determinants of FDI from Japan)

The results of the panel regression for FDI from Japan are shown in Table 2. They indicate that four country groups , that is, 1) Taiwan and Korea, 2) Singapore and Thailand, 3) China and Malaysia, and 4) the Philippines and Indonesia, share similar FDI elasticities to the macroeconomic variables. For example, the null hypothesis that all coefficients of independent variables are the same among the country groups cannot be rejected by a significance of 2% for group 1, 11% for group 2, 40% for group 3, and 93% for group 4.

Interestingly, the above country classification coincides clearly with differences in the economic structure and development stage of each country. Taiwan and Korea are economically the most advanced and have already established their own huge manufacturing bases. Singapore and Thailand are also advanced, but still depend on foreign firms for a large share of their industrial bases. China and Malaysia are less advanced in comparison to the above countries, and are eager to invite foreign firms to expand their supply capacities for domestic markets as well as foreign markets. Finally, the Philippines and Indonesia are the least advanced in the region, enjoy relatively abundant natural resources, and are the targets of raw material seekers.

A common feature among the four groups is FDI's high sensitivity to the yen exchange rate. For example, a 1 percent depreciation of the yen exchange rates of the previous year (REXJA$_1$) increases FDI from Japan by 2.5% for group 1, 1.2% for group 2, 2.6% for group 3 and 1.0 % for group 4. Meanwhile, the coefficients of the U.S. dollar exchange rates of the previous year (REXUS$_1$) show different signs among the groups. For example, a 1 percent depreciation of the U.S. dollar exchange rates of the

---

unit has its own intercept, which may or may not be correlated with the independent variables.   The random effects model resembles the fixed effects model but assumes that the intercepts are drawn from a common distribution with the same mean and variance.   For more details, see Hsiao (1986).

[7]   To see the existence of cross-sectional heteroskedasity and the timewise serial correlation of residuals, we also examine the cross-sectionally heteroskedastic and timewise autoregressive model, which is presented in Kmenta (1986), for the selected country groups.   We do not show these results in this paper, however, as they are not significantly different from the original outcomes.

previous year increases FDI from Japan by 2% for group 1 and 1.9% for group 4, while it decreases by 5% for group 3.   Since subtracting the coefficient of REXUS from REXJA equals the coefficient of the real bilateral exchange rate of the yen against the U.S. dollar, the above findings mean that an appreciation of the yen against the U.S. dollar increases FDI from Japan by 0.5% for group 1, 0.6% for group 2, 7.6 % for group 3 and -0.8 % for group 4.   This result implies that the effect of a strong yen vis-à-vis the U.S. dollar on FDI from Japan is relatively marginal and limited to group 3.   Meanwhile, group 1 is the only group which shows statistical significance to capacity utilization in Japan of the previous year ($UTJA_1$), implying that Japanese firms regard FDI into this country group as an alternative to their domestic capital investment.   The statistical significance of domestic GDP for groups 2 and 4 are also noteworthy as this indicates that FDI into these groups are strongly oriented toward capturing local markets.

It may be interesting to compare the above results with the findings obtained by Goldberg and Klein (1998).   Despite differences in the sample periods (1979-97 in this study versus 1978-93 or 1978-94 for Goldberg and Klein (1998)) and the country composition, the effects of changes in exchange rates and the host countries' GDP for the group 2 countries (Indonesia and the Philippines) in our study are relatively similar to their findings for Southeast Asian countries, including Indonesia, Malaysia, the Philippines and Thailand (Table 3).   Other groups have the opposite signs for FDI elasticities to the U.S. dollar exchange rate, however, and this demonstrates the importance of careful grouping of sample countries to assess the direction and size of FDI elasticities even among Southeast Asian countries.

(Determinants of FDI from the United States)

Table 4 shows the results of the panel regressions for FDI from the United States.   Three country groups emerge in the panel regression analysis as having common FDI elasticities to the macroeconomic variables.   The first group comprises Taiwan, Korea and the Philippines, the second group Indonesia, Singapore and Thailand, and the third group Malaysia and China.   This grouping is similar to the one adopted for assessing the determinants of FDI from Japan, though it is not exactly the same.

Unlike the case of determinants of FDI from Japan, FDI elasticities to the U.S. dollar exchange rate are negative for groups 2 and 3 (after netting out the coefficients of REXUS and $REXUS_1$), and insignificant for group 3.   The negative sign indicates that a

9

depreciation of the U.S. dollar exchange rate decreases FDI from the United States. This finding contrasts with that of FDI from Japan and may reflect a special feature of FDI from the United States, a large part of which is occupied by non-manufacturing industries (see Table 1) such as real estate and thus is likely to assume the character of portfolio investment. Meanwhile, a depreciation of the yen exchange rate leads to an increase in FDI from the United States for group 1 and 3. The reason is not clear, but this may imply the existence of positive relations between exports to Japan and U.S. FDI (the improved profitability of export industries attracts U.S. investment) or between Japanese FDI and U.S. FDI (Japanese FDI increases the need for other supporting industries, such as construction and financing, which then leads to an increase in U.S. FDI). The coefficient of domestic GDP is significant and positive for group 1, indicating the FDI's orientation toward domestic markets. The significant but negative coefficient of domestic GDP for group 3, however, is puzzling.

Compared to the results of determinants of FDI from Japan, the most striking difference lies in the high coefficient of determination for the estimates of FDI from Japan vis-à-vis FDI from the United States. Since FDI is assumed to be affected by many factors other than the macroeconomic variables specified in this paper, the low coefficients of determination should not be regarded as exceptional cases, but this difference in the coefficients of determination highlights the features of Japanese FDI, which is highly sensitive to changes in exchange rates.

5. FDI's impacts on the trade of East Asian countries

This section examines linkages between FDI and the host countries' imports from the home countries, and then between FDI and the host countries' exports to the home countries based on the panel data.

Again, all the variables are in the logarithms. The dependent variables are the real imports of the host countries from the home countries (IMJA for imports from Japan, and IMUS for imports from the United States) for the first analysis, and the real exports of the host countries to the home countries (EXJA for exports to Japan, and EXUS for exports to the United States) for the second analysis. Independent variables are selected following the same rules used for the previous panel regressions. They include the real bilateral exchange rates between the local currencies and the yen (REXJA), and between

the local currencies and the U.S. dollar (REXUS), the real GDP of the host countries (RG) and of the home countries (RGJA for Japanese GDP, and RGUS for U.S. GDP), and FDI from Japan and the United States (FDIJA for Japanese FDI, and FDIUS for U.S. FDI).[8]   The sample periods are the same as in the previous panel regressions.

(Determinants of imports of FDI host countries from Japan)

Table 5 shows the results of the panel regressions for imports of the FDI host countries from Japan.   F-tests of the fixed effects model indicate that there are three country groups which share common imports elasticities to the macroeconomic variables. The first group comprises Taiwan and Korea, the second group Malaysia, Singapore and Thailand, and the third group Indonesia and the Philippines.

It is noteworthy that all three groups' imports from Japan show significant and positive responses to FDI from Japan, implying a close link between FDI and imports from Japan.   With respect to responses to the yen exchange rate, the imports of groups 2 and 3 show negative responses (a depreciation leads to a decline in imports) but this effect is more than offset in the following year for group 2.   Also, the imports of groups 2 and 3 respond positively to domestic GDP and negatively to Japanese GDP though some initial effects are offset in the following year.   Meanwhile, group 1's imports do not respond clearly to the macroeconomic variables other than FDI from Japan, indicating that the imports from Japan are so strongly influenced by some structural factors such as inflows of FDI that the effects of other macroeconomic variables become less distinguished.

(Determinants of imports of FDI host countries from the United States)

Two country groups are classified (Table 6).   The first group includes Taiwan, Korea and Singapore, and the second group Malaysia, the Philippines and Thailand. Despite differences in the size of the elasticities, both groups' imports show similar features, being sensitive to the U.S. dollar exchange rate and domestic GDP while

---

[8]   Given the limited number of samples and subsequent need to limit independent variables, we omit a few independent variables for each estimation depending on their actual and potential significance.   These are FDIUS for the estimation of Japanese FDI, RGUS for the estimation of imports from the U.S., and RG for the estimation of exports to the U.S..

relatively insensitive to FDI from the United States. This result sharply contrasts with the one for the determinants of imports from Japan, which attests to the strong sensitivity to FDI from Japan and lacks of clear responses to the other macroeconomic variables. It is also noted that FDI from Japan is found significant for increasing imports from the United States for group 2.

(Determinants of exports of FDI host countries to Japan)

Table 7 presents the results of the panel regressions for exports of the FDI host countries to Japan, and indicates that four country groups are likely to have common coefficients for the independent variables. Each group's country composition is the same as in the case for the determinants of FDI, that is, 1) Taiwan and Korea, 2) Singapore and Thailand, 3) Malaysia and China, and 4) Indonesia and the Philippines.

With respect to the effects of FDI from Japan on exports to Japan, all groups except group 3 show significant and positive numbers, which again confirm the strong effects of FDI on the region's trade with Japan. The insignificant coefficients of FDI for group 3 are consistent with the previous findings that FDI into group 3 tends to be oriented toward capturing domestic markets. Exports of groups 1, 2 and 3 show positive responses to a depreciation of the lagged yen exchange rates despite indications of the J-curve effect (negative responses to contemporaneous yen exchange rates) for groups 2 and 3. However, group 4's exports only responds negatively to the contemporaneous yen exchange rates. This puzzling result may be related to the fact that this group's main exports to Japan are demand sensitive but price insensitive goods such as primary products. The signs of most groups' elasticities to the lagged domestic GDP are positive and thus counter-intuitive, but this implies that most of their export goods to Japan are not consumed domestically and thus a supply-side positive relation between exports and GDP dwarfs a demand-side negative relation.

(Determinants of exports of FDI host countries to the United States)

Two country groups are classified (Table 8). The first group includes Taiwan and Korea, and the second group Indonesia and the Philippines. Group 1's exports respond negatively to a depreciation of the U.S. dollar exchange rate at first and then positively, showing the J-curve effect. Group 2's exports respond only negatively, however. This is similar to the case for their exports to Japan (described as group 4 in

the above sub-section), and may be due to the same reason stated above. Exports of both groups respond positively to U.S. GDP and FDI from the United States. The size of their exports elasticities to U.S. FDI (0.02 to 0.03) is, however, much smaller than the elasticities to Japanese FDI, which range from 0.1 to 0.2. As with the case of imports from the United States, Japanese FDI also positively influences exports to the United States in the case of group 1, a result consistent with the previous finding that Japanese FDI into group 1 may be intended to supplement Japanese exports to third markets.

6. Simultaneous estimation of the determinants of FDI to East Asian countries and the linkage between FDI and trade

Finally, based on the findings in the previous sections, this chapter presents simultaneous equation models focusing on the determinants of FDI and FDI's interaction with other macroeconomic variables, in particular, trade. One of the reasons that we estimate simultaneous models here is to avoid the possible simultaneity which might exist among the variables used for estimating the determinants of FDI and its interaction with trade in the previous sections. For this estimation, we use the three-stage least squares method, which is applied to the following economic model:

(FDI function)

$$FDI = a_1 + a_2\,RG_1 + a_3\,REXUS_1 + a_4\,REXJA_1 + a_5\,UTJA_1$$

(Exports to Japan function)

$$EXJA = b_1 + b_2\,RGJA + b_3\,RG + b_4\,REXJA_1 + b_5\,FDIJA_1$$

(Imports from Japan function)

$$IMJA = c_1 + c_2\,RG + c_3\,FDIJA + c_4\,RGJA + c_5\,REXJA_1$$

(Exports (except to Japan) function)

$$EXO = d_1 + d_2\,RG + d_3\,REXUS_1$$

(Imports (except from Japan) function)

$$IMO = e_1 + e_2\,RG + e_3\,REXUS_1$$

(Consumption function)

$$\text{CON} = f_1 + f_2 \, \text{RG} + f_3 \, \text{RI}$$

(Capital expenditure function)

$$\text{INV} = g_1 + g_2 \, \text{RG} + g_3 \, \text{RI}$$

(Identity)

$$\text{RG'} = \text{CONS'} + \text{INV'} + \text{EXJA'} - \text{IMJA'} + \text{NEX'} + \text{OTHERS'}$$

where FDIJA_t = direct investment from Japan with t lag

RG_t = real GDP of host country with t lag

REXUS_t = real bilateral exchange rate of host country's currency against the U.S. dollar with t lag

REXJA_t = real bilateral exchange rate of host country's currency against the yen with t lag

UTJA_t = capacity utilization in Japan with t lag

EXJA_t = real exports of host country to Japan with t lag

RGJA_t = real GDP of Japan with t lag

IMJA_t = real imports of host country from Japan

EXO_t = exports (except to Japan) of host country

IMO_t = imports (except from Japan) of host country

RGUS_t = real GDP of the United States

CON_t = real consumption of host country

RI_t = real interest rate of host country

INV_t = real capital investment of host country

OTHERS = real GDP excluding real consumption, real capital investment and real net exports

All variables except those in the identity equation (marked by dash) are in logarithms.

In this model, exchange rates are treated as exogenous variables. Also, since the principal objective of this estimation is to identify interactions between FDI and the host countries' trade, some functions of the model such as consumption and investment are somewhat simplified. Based on the results of the previous sections, we use the panel data of three country groups, that is, 1) Korea and Taiwan, 2) Singapore and Thailand, and 3) the Philippines and Indonesia, which show similar reactions of FDI and trade to

changes in the macroeconomic variables.[9]

(Group 1 <Korea and Taiwan>)

The coefficients of independent variables in the FDI function changed somewhat from the estimates in Section 4 (Table 9). The yen exchange rate and the capacity utilization in Japan remain significant but the coefficient sizes become larger for the yen exchange rate and smaller for the capacity utilization. The U.S. dollar exchange rate, meanwhile, becomes insignificant and domestic GDP remains significant but the coefficient sign becomes opposite, indicating a puzzling negative relation between FDI and domestic GDP. With respect to other functions, only a few coefficients of explanatory variables show economically puzzling signs, and most of them are insignificant. The results basically confirm the findings in the previous section. FDI from Japan is highly sensitive to the yen exchange rate, and FDI strongly affects the region's trade with Japan.

Charts 5--7 show comparisons of the actual and fitted figures for FDI from Japan, exports to Japan and imports from Japan, based on the above estimates, and also present factor breakdowns of changes in these three variables. Overall, their fitted values follow their actual values reasonably well. The factor breakdown in Chart 5 illustrates that the dominant factors for changes in Japanese FDI are movements of the yen exchange rate and, to a lesser extent, of the capacity utilization in Japan. According to the model, for example, a sharp appreciation of the yen exchange rate in 1996 is likely to dampen FDI from Japan in 1997. Moreover, based on the actual figures for the independent variables in 1997 and their projections numbers for 1998[10], Japanese FDI into the region is estimated to decline further in 1998 but then pick up in 1999 mainly due to changes in the yen exchange rate.[11]

---

[9]   We omit the group which comprises Malaysia and China for this estimation because some macroeconomic variables concerning China are not available.

[10]   For obtaining the macroeconomic variables for 1998, we use the following numbers: the average exchange rates during the first half of 1998, the concensus forecasts of CPI and GDP for 1998, and the average capital utilization in Japan during the first half of 1998.

[11]   It should be noted that these estimations do not take account of special factors coming from the recent financial crisis in Asia.

As shown in Chart 6, changes in domestic GDP, FDI from Japan, and the yen exchange rates strongly affect imports from Japan. As Korea's economic growth has seen a significant decline in 1998 while FDI from Japan into the region was stagnant in 1997, imports from Japan of the group 1 countries in 1998 are likely to drop sharply even before taking into account the effects of the Asian financial crisis.[12] Further, this stagnant condition is likely to continue in the period ahead as the yen exchange rate depreciated in 1998. Meanwhile, changes in the yen exchange rate and in FDI from Japan are the main factors determining exports to Japan (Chart 7). With a relatively stable yen exchange rate in 1997, the "exports to Japan function" indicates flat exports to Japan in 1998. This did not match the substantial drop that actually took place, mainly due to a trade financing problem in Korea[13]. Group 1's exports to Japan, however, should show some recovery in the following years given the substantial depreciation of the yen exchange rate in 1998.

(Group 2 <Singapore and Thailand>)

The estimated FDI functions show slightly different variable coefficients compared to the results in Section 4 (Table 10). The yen exchange rate is significant, but its coefficient size is larger than the previous estimate. On the other hand, domestic GDP becomes insignificant. With respect to the other functions, some variables have signs which are counter-intuitive, but most of them are insignificant. The results are basically consistent with the previous findings, showing that imports from Japan are sensitive to domestic GDP and FDI from Japan, and exports to Japan are sensitive to the yen exchange rate and FDI from Japan.

As shown in Charts 8--10, the fitted values of FDI from Japan and of trade with Japan present reasonable approximations to the actual values. With respect to FDI from Japan, the factor breakdown indicates that changes in FDI are mainly swayed by changes in the yen exchange rate (Chart 8). The estimate of FDI for 1997, which indicates a substantial drop due to the appreciation of the yen exchange rate in 1996, however, is overshot by a wide margin for unknown reasons, and this deviation might help dampen

---

[12]   Real imports of the group 1 countries from Japan during the first eight months of 1998 dropped by 18.0 % on average over the same period of the previous year.

[13]   Real exports of the group 1 countries to Japan during the first eight months of 1998 dropped by 13.4 % on average over the same period of the previous year.

FDI from Japan in 1998.   Moreover, the sluggish FDI might continue in 1999 owing to declining capacity utilization in Japan in 1998.   Regarding imports from Japan, Chart 9 indicates that FDI from Japan and domestic GDP are the most influential factors.   The bleak picture for FDI from Japan and for the domestic economies in 1998 (in particular, Thailand) only attest to the current sharp drop in imports from Japan.[14]   Finally, Chart 10 illustrates that three factors, that is, the yen exchange rate, FDI from Japan and domestic GDP strongly influence group 2's exports to Japan.   After a sharp drop of exports in 1997 mainly owing to an appreciation of the yen exchange rate in 1996, we will likely see another drop in 1998 when domestic GDP declines substantially.[15]

(Group 3 <Indonesia and the Philippines>)

The estimated FDI functions are again similar to the results in Section 4 (Table 11).   The yen exchange rate and the U.S. dollar exchange rate remain significant and their coefficient sizes are slightly smaller than the previous estimates.   Regarding other functions, there are some variables, whose coefficients are significant but with signs opposite to what would normally be expected.   Especially puzzling are the responses of exports (to Japan and to other regions) to a depreciation of local currencies, which consistently show negative signs rather than the positive signs that would be expected. These results, however, are the same as in Section 4, and as stated above, this may be evidence that the main exports to Japan are demand sensitive but price insensitive goods such as primary products.   Meanwhile, a remarkable difference from the previous estimates is that FDI from Japan becomes insignificant in explaining exports to Japan. The reason is not clear, but it may imply that the export capacities created by FDI can switch their shipping markets easily depending on the demand conditions of each market.

Charts 11--13 indicate that the fitted values largely follow the trend of the actual values though not as closely as for the previous two groups.   According to Chart 11, changes in FDI from Japan are mainly subject to changes in the yen and the U.S. dollar exchange rates.   The chart indicates that FDI from Japan enters a downward trend from 1996 due to an appreciation of the yen exchange rate at first and then due to a

---

[14]   Real imports of the group 2 countries from Japan during the first eight months of 1998 dropped by 32.5 % on average over the same period of the previous year.

[15]   Real exports of the group 2 countries to Japan during the first eight months of 1998 dropped by 7.9 % on average over the same period of the previous year.

depreciation of the U.S. dollar exchange rate. Meanwhile, imports from Japan tend to be swayed by FDI from Japan, the yen exchange rate and domestic GDP (Chart 12). Given the sluggish prospect for FDI from Japan, imports from Japan are likely to fall in 1998 even before considering the effects of the financial crisis.[16] Regarding exports to Japan, Chart 13 illustrates that the yen exchange rate and Japanese GDP are the most influential factors and thus the likely contraction of the Japanese economy will surely deal a substantial blow to their exports to Japan in 1998[17].

7. Conclusion

We found that East Asian countries can be classified into several sub-groups depending on the elasticities of FDI, and of imports and exports from and to Japan and the United States to various macroeconomic variables. In the case of relation with Japan, the same country groups appear consistently for the different estimations; they are 1) Taiwan and Korea, 2) Singapore and Thailand, 3) Malaysia and China, and 4) Indonesia and the Philippines. Interestingly, this country classification generally coincides with the countries' economic development stages as well as the features of their economic structures, demonstrating that Japanese firms' FDI strategy and trade are quite sensitive to these factors.

Another finding is that FDI from Japan into this region is strongly affected by changes in real bilateral exchange rates, but this is rarely seen for FDI from the United States. Among different country groups, FDI into group 1 countries (Taiwan and Korea) is closely linked with Japanese capacity utilization, indicating their industries' integration with the Japanese economy. Group 3 (Indonesia and the Philippines) shows a substantial positive effect on Japanese FDI coming from the yen's appreciation against the U.S. dollar. This effect, however, is not observed for the other groups. On the other hand, FDI into group 4 (Malaysia and China) and, to a lesser extent, group 2 (Singapore and Thailand) is oriented more toward capturing local markets compared to the other groups. It is also noteworthy that FDI strongly affects exports and imports to

---

[16] Real imports of the group 3 countries from Japan during the first eight months of 1998 dropped by 26.7 % on average over the same period of the previous year.

[17] Real exports of the group 3 countries to Japan during the first eight months of 1998 dropped by 9.6 % on average over the same period of the previous year.

and from Japan in most cases and even exports and imports to and from the United States in some cases.   This "trade expansion effect" contrasts clearly with the trade substitution effect, which is normally expected for Japanese FDI into industrialized countries.

The estimation using the simultaneous equation models confirms the previous findings.   According to this estimation, FDI from Japan is likely to fall or remain stagnant for a while mainly due to the depressed Japanese economy and the depreciation of the yen against the U.S. dollar.   This bleak prospects for FDI, combined with the depressed Japanese and local economies, may result in a contraction of trade between Japan and East Asian countries, indicating the reversal of trade expansion effects.

Data Appendix : Sources

Japan
External Direct Investment , from Japan Ministry of Finance , "Annual Report of the Finance Bureau."
Exchange rates (bilateral U.S. dollar, annual average) , WPI , GDP , and GDP deflator , from IMF , *International Financial Statistics*.

United States
Direct Investment by destination , from Bureau of Economic Analysis (BEA).
PPI , GDP , and GDP deflator , from IMF , *International Financial Statistics*.

Taiwan
Exchange rate (bilateral U.S. dollar,annual average) and Export , from IMF ,
International Financial Statistics.
WPI , GDP , GDP deflator , Private Consumption , and Gross Fixed Capital formation , from , Directorate-General of Budget , Accounting and Statistics Executive Yuan ,
Quarterly National Economic Trends.
Export to Japan and to the United State , and Import from Japan and from the United States , from IMF , *Direction of Trade Statistics Yearbook*.

Indonesia
Exchange rate (bilateral U.S. dollar,annual average) , WPI , GDP , GDP deflator , and Export , from IMF , *International Financial Statistics*.
Export to Japan and to the United State , and Import from Japan and from the United States , from IMF , *Direction of Trade Statistics Yearbook*.
Capital Inflow (net) from World Bank , *Global Development Finance*.

Korea
Exchange rate (bilateral U.S. dollar,annual average) ,WPI , Government Bond rate , GDP , GDP deflator , Private Consumption , Gross Fixed Capital Formation , and Export , from IMF , *International Financial Statistics*.

Export to Japan and to the United States , and Import from Japan and from the United States , from IMF , *Direction of Trade Statistics Yearbook*.
Capital Inflow (net) from World Bank , *Global Development Finance.*

Malaysia

Exchange rate (bilateral U.S. dollar,annual average) , PPI , Treasury Bill rate , GDP , GDP deflator , Private Consumption , Gross Fixed Capital Formation , and Export , from IMF ,

International Financial Statistics.

Export to Japan and to the United States , and Import from Japan and from the United States , from IMF , *Direction of Trade Statistics.*

Capital Inflow (net) from World Bank , *Global Development Finance.*

Philippines

Exchange rate (bilateral U.S. dollar,annual average) , WPI , Treasury Bill rate , GDP , GDP deflator , Private Consumption , Gross Fixed Capital Formation , and Export , from IMF ,

International Financial Statistics.

Export to Japan and to the United State , and Import from Japan and from the United States , from IMF , *Direction of Trade Statistics Yearbook.*

Capital Inflow (net) from World Bank , *Global Development Finance.*

Singapore

Exchange rate (bilateral U.S. dollar,annual average) , WPI , 3M Interbank rate , GDP , GDP deflator ,   Private Consumption , Gross Fixed Capital Formation , and Export , from IMF , *International Financial Statistics.*

Export to Japan and to the United State , and Import from Japan and from the United States , from IMF , *Direction of Trade Statistics Yearbook.*

Capital Inflow (net) from World Bank , *Global Development Finance.*

Thailand

Exchange rate (bilateral U.S. dollar,annual average) , WPI , Government Bond rate , GDP , GDP deflator , Private Consumption , Gross Fixed Capital Formation , and Export , from IMF , *International Financial Statistics.*

Export to Japan and to the United State , and Import from Japan and from the United States , from IMF , *Direction of Trade Statistics Yearbook.*

Capital Inflow (net) from World Bank , *Global Development Finance.*

China

Exchange rate (bilateral U.S. dollar,annual average) , WPI , Bank rate , GDP , GDP deflator , Private Consumption , Gross Fixed Capital Formation , and Export , from IMF , *International Financial Statistics*.

Export to Japan and to the United State , and Import from Japan and from the United States from IMF , *Direction of Trade Statistics Yearbook*.

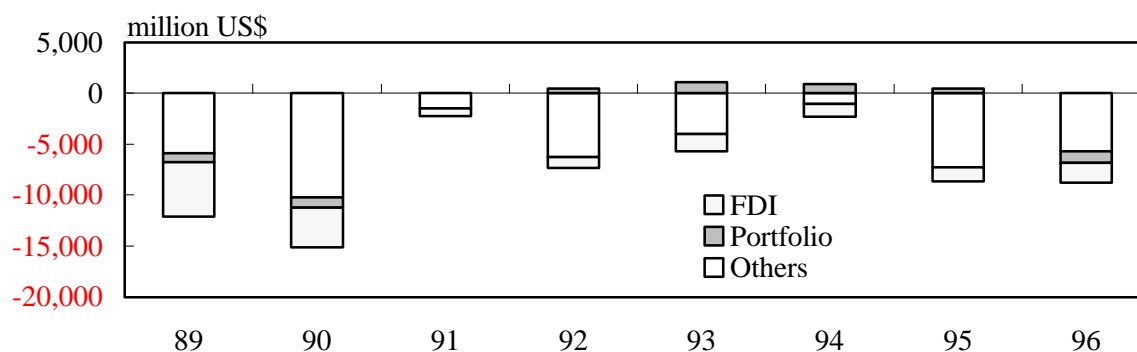Capital Inflow (net) from World Bank , *Global Development Finance*.

Reference

Bank of Japan (1996) , "Recent Developments in the External Balance" , *Quarterly Bulletin* , November

Eiteman, D., A. Stonehill and M. Moffett (1995) , *Multinational Business Finance* , Addison-Wesley Publishing Company

Export-Import Bank of Japan (1998), "Foreign Direct Investments Statistics - Asian Countries , Czech Republic , Hungary and Poland -" , *Journal of Research Institute for International Investment and Development* (in Japanese) , vol.24 no.4

Fukao, K. and T. Amano (1998) , "Direct Investment Abroad and the "Hollowing Out" of Manufacturing Industry" , *The Economic Review* (in Japanese and English Summary)

Goldberg, L., and M. Klein (1998) , "Foreign Direct Investment , Trade , and Real Exchange Rate Linkages in Developing Countries" , R. Glick eds. , *Managing Capital Flows and Exchange Rates* , Cambridge

Helpman , E. and P. Krugman (1985) , *Market Structure and Foreign Trade* , MIT Press

Hsiao, C. (1986) , *Analysis of Panel Data* , Cambridge

Inui , T. and Y. Kasuga (1997) , "*Nihon Kigyou no Taigai Chokusetsu Toushi to Boueki ni Ataeru Eikyou* (Japanese Firm's FDI and its impact on International Trade)" , Japan Development Bank *Chousa* (in Japanese)

Kmenta , J. (1986) , *Element of Econometrics* 2nd , Michigan

Kohsaka, A.(1996) , "Interdependence through Capital Flows in Pacific Asia and the Role of Japan" , T. Ito and A. Krueger eds. , *Financial Deregulation and Integration in East Asia* , Chicago

Krugman, P. and M. Obstfeld (1994) , *International Economics 3rd* , Harper Collins

Rugman, A. (1985) , "Internalization Is Still a General Theory of Foreign Direct Investment" , *Weltwirtschaftliches Archiv* , September

Chart 1-1

FDI and other capital inflows into East Asian Countries (1)

(1) Taiwan
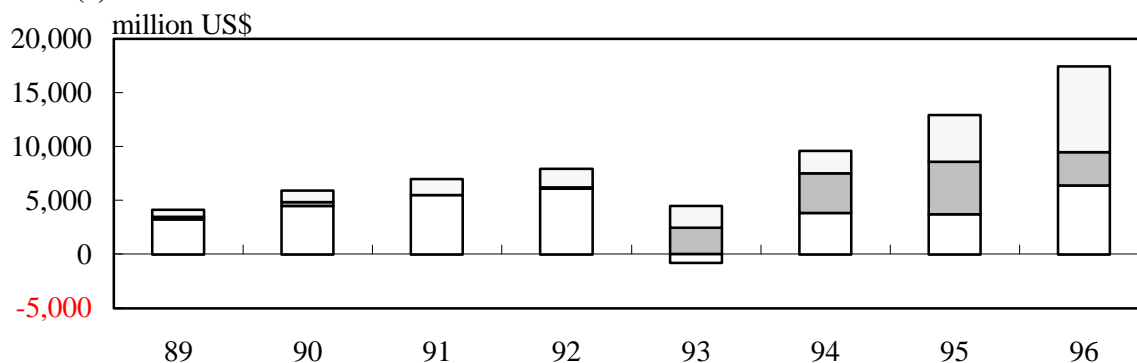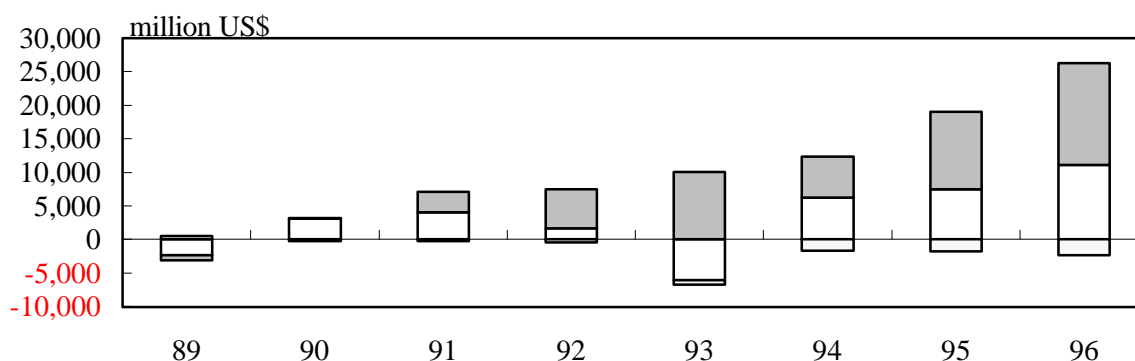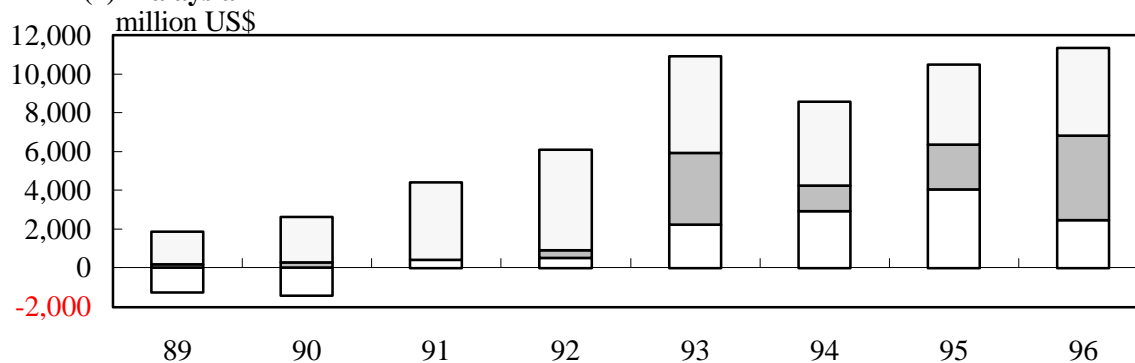
million US$

□ FDI
■ Portfolio
□ Others

(2) Indonesia

million US$

(3) Korea

million US$

(4) Malaysia

million US$

Sourses : IMF , "International Financial Statistics" ; World Bank , "Global Development Finance"

<u>**Chart 1-2**</u>

FDI and other capital inflows into East Asian Countries (2)

(1) Philippines
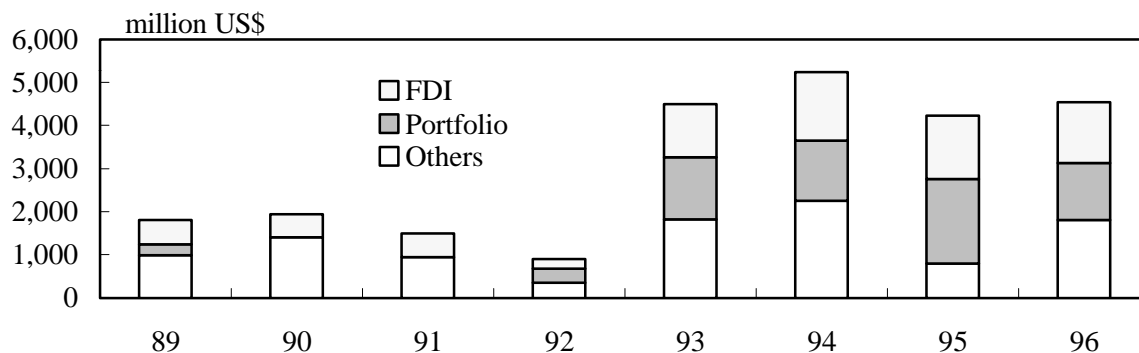
(2) Singapore
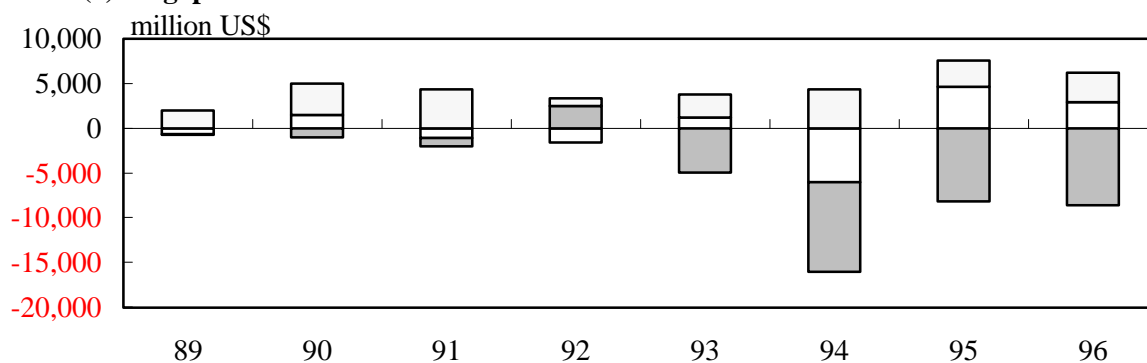
(3) Thailand
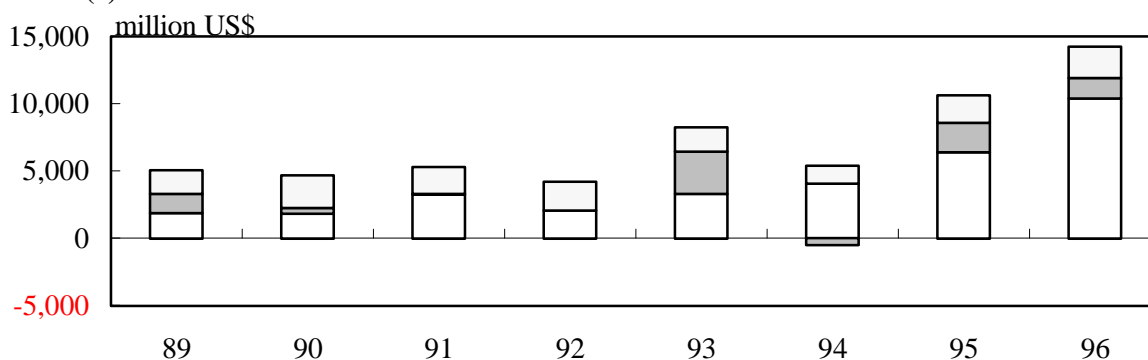
(4) China
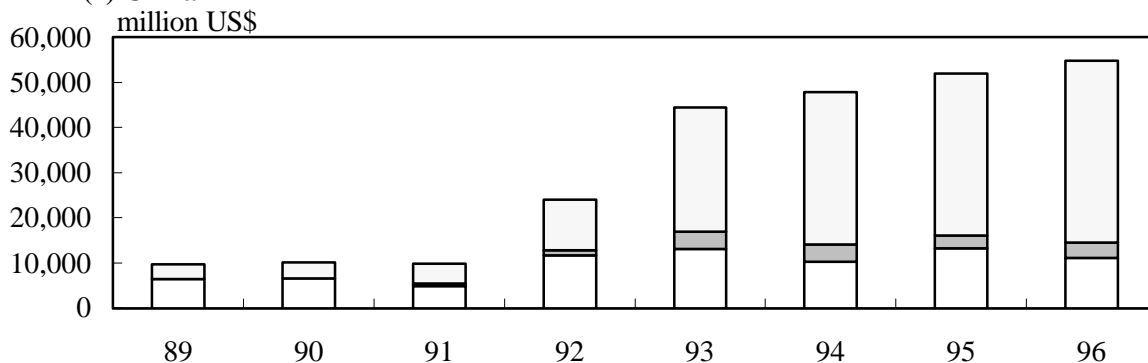
Sourses : IMF , "International Financial Statistics" ; World Bank , "Global Development Finance"

Chart 2

Shares of FDI from Japan and United States in total FDI into East Asian Countries

(1) Taiwan

(2) Indonesia

Japan

US

(3) Korea

(4) Malaysia

(5) Philippines

(6) Singapore

(7) Thailand

(8) China
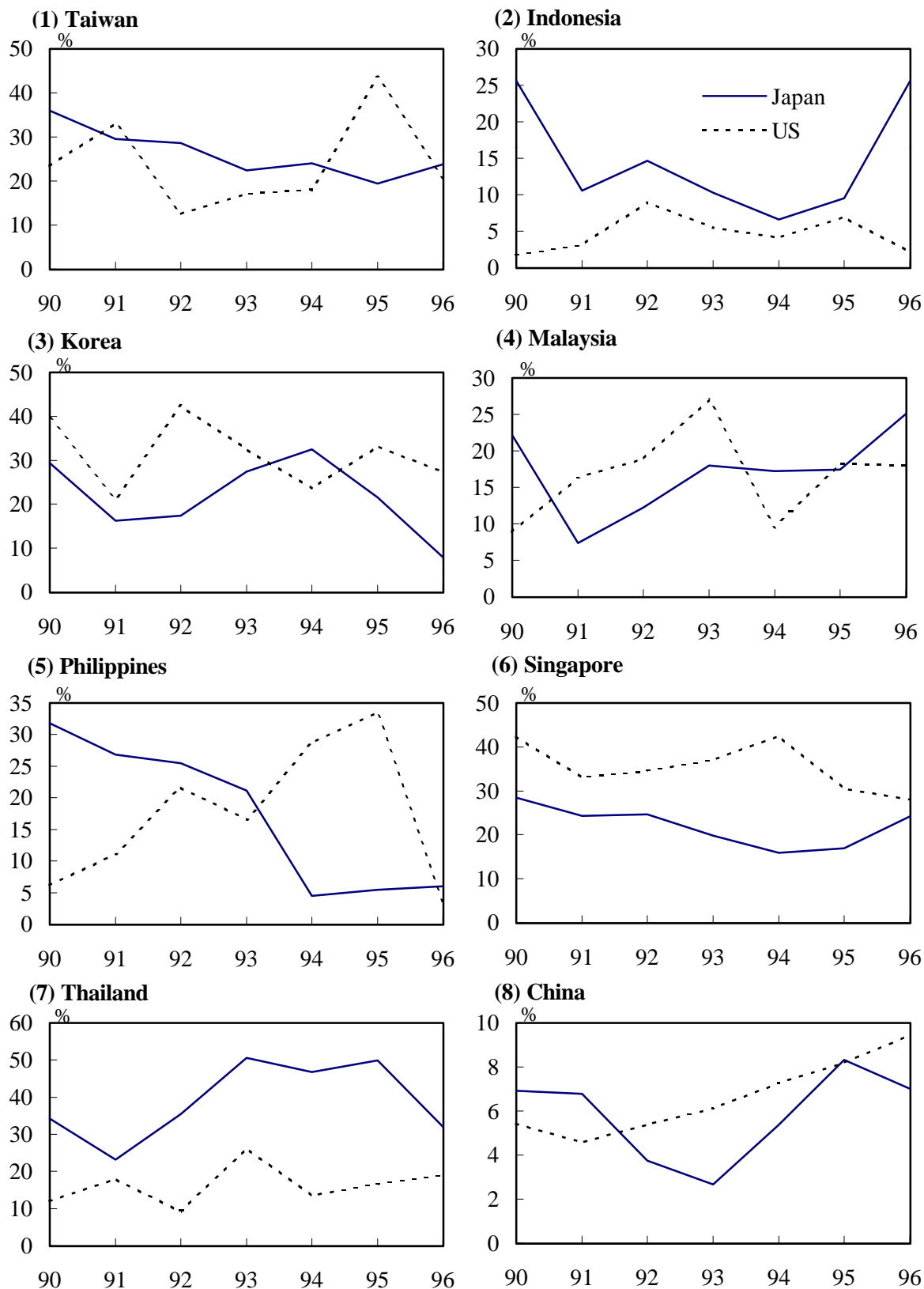
Sourses : The Export-Import Bank of Japan (1998)

Chart 3

FDI from Japan and the United States into East Asian Countries

(1) Japan
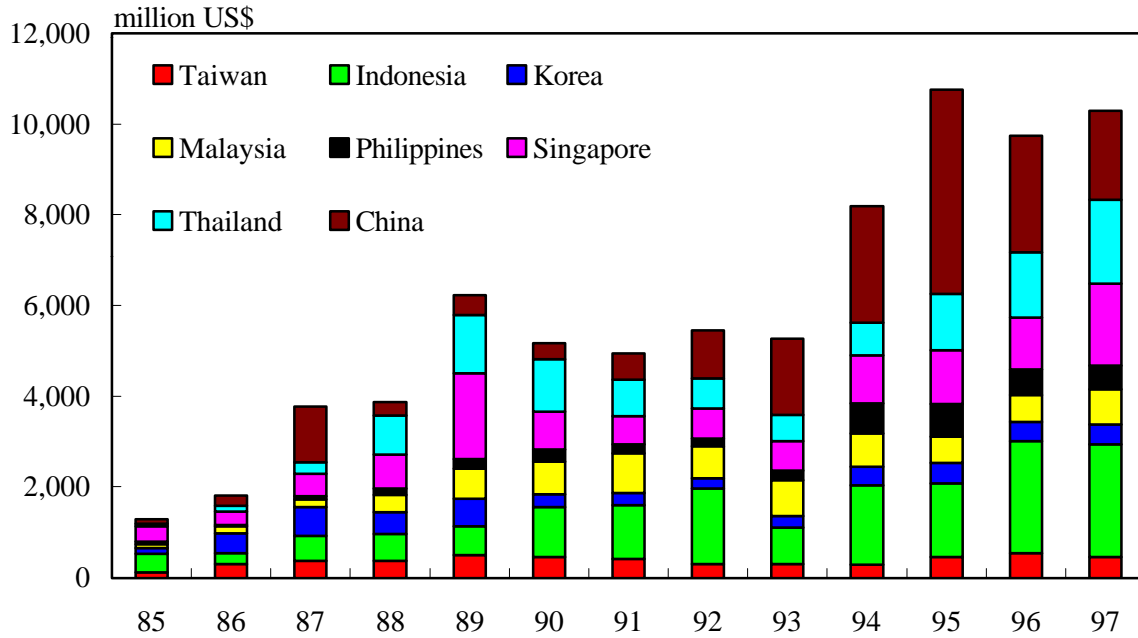
(2) United States
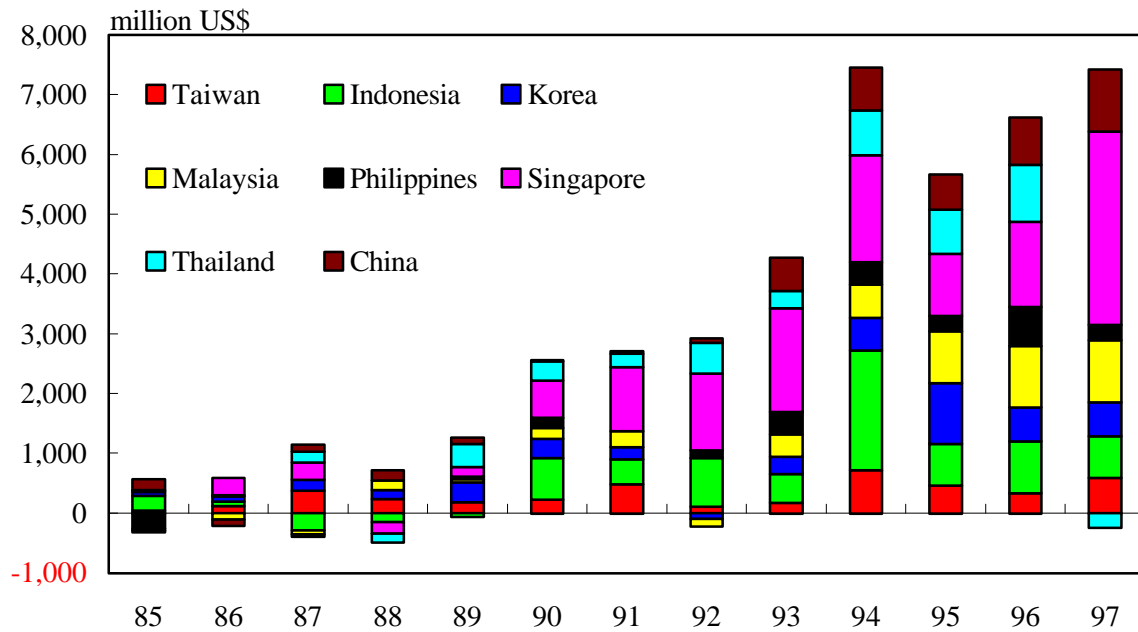
Sources : Japan , Ministry of Finance , "Anuual Report of Finance Bureau" ;
the United States , Bureau of Economic Analysis , "Direct investment by destination"

Chart 4

Share of FDI from Japan and United States into East Asian Countries in total FDI from Japan and the United States

(1) East Asian 8

(2) Taiwan and Korea

(3) Excluding Taiwan and Korea

Sources : Japan , Ministry of Finance , "Anuual Report of Finance Bureau" ;
        the United States , Bureau of Economic Analysis , "Direct investment by destination"

Table 1

FDI from Japan and the United States into East Asian Countries

(Industry Breakdown)

(1) from Japan to Asia   %

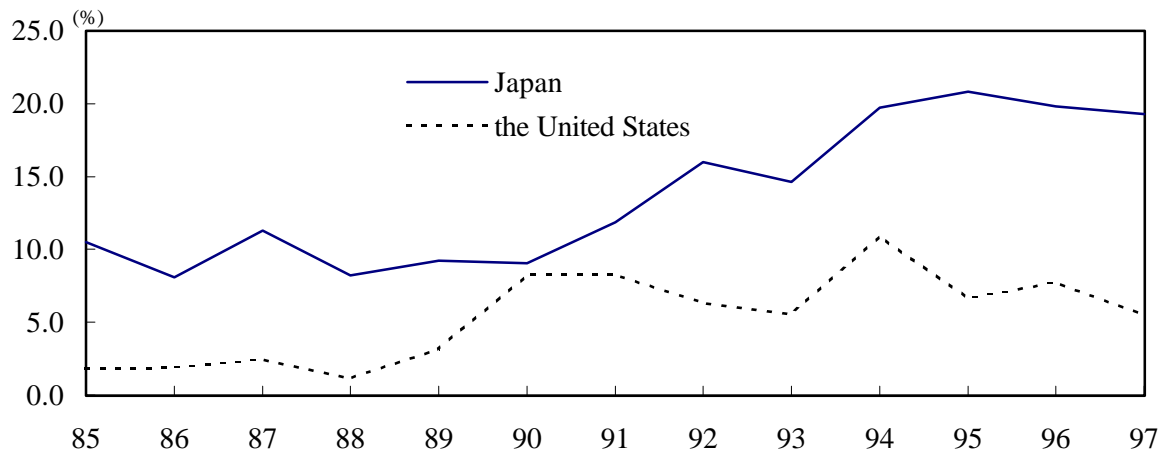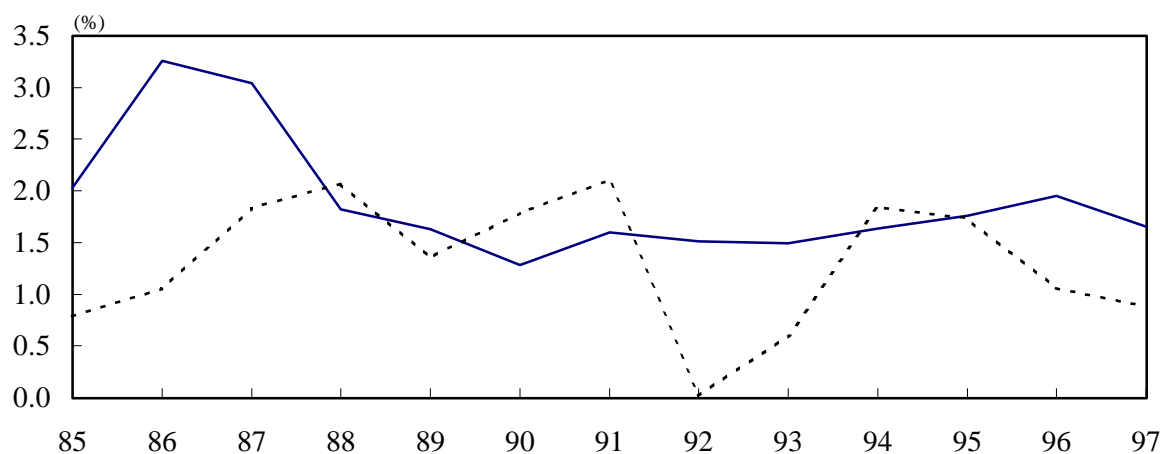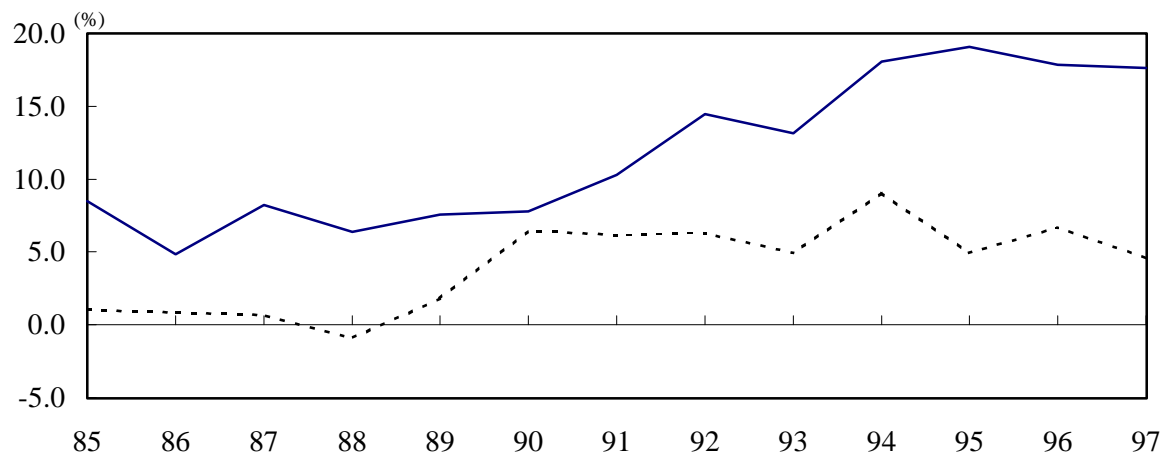|	Food	Chemical	Metal	Machine	Electric	Transpor-tation	Other Manufacturin	Non-Manufacturin
1994	1.11	16.67	4.20	3.46	8.64	2.72	12.59	50.62
1995	2.12	6.11	5.18	6.64	13.55	3.98	17.80	44.62
1996	2.66	9.81	5.21	4.19	14.71	4.29	14.30	44.84
1997	2.37	5.36	8.08	6.76	20.98	7.20	17.91	31.34

(2) from the United States to China   %

	Food	Chemical	Metal	Machine	Electric	Transpor-tation	Other Manufacturin	Non-Manufacturin
1994	3.49	7.63	3.73	N.A.	10.47	N.A.	8.12	63.15
1995	6.90	-8.43	5.36	N.A.	100.8	N.A.	6.51	-30.65
1996	8.50	8.82	0.64	N.A.	31.24	N.A.	N.A.	43.89
1997	2.38	6.24	2.63	28.43	32.21	N.A.	N.A.	25.97

(3) from the United States to Korea and Taiwan   %

	Food	Chemical	Metal	Machine	Electric	Transpor-tation	Other Manufacturin	Non-Manufacturin
1994	-0.54	20.89	-5.00	8.08	17.53	2.18	5.09	51.68
1995	-0.20	18.64	0.34	0.82	6.12	2.45	4.08	64.01
1996	5.49	17.21	-4.09	-3.44	34.14	0.93	7.91	37.77
1997	37.36	14.91	-0.69	1.54	7.69	0.54	3.77	24.98

(4) from the United States to ASEAN   %

	Food	Chemical	Metal	Machine	Electric	Transpor-tation	Other Manufacturin	Non-Manufacturin
1994	1.69	3.83	0.79	-3.14	10.33	0.23	1.35	80.83
1995	-2.23	7.09	1.13	-3.56	39.85	0.29	1.62	51.33
1996	2.65	5.08	0.69	7.16	31.42	0.25	1.49	45.99
1997	-0.91	4.43	0.60	21.91	18.47	0.24	3.32	51.69

Sourses : Japan , Ministry of Finance , "Annual Report of Finance Bureau" ;
         the United States , Bureau of Economic Analysis , "Direct investment abroad by Industry"

Determinants of FDI from Japan
(The results of panel regressions)

	Group1	Group2	Group3	Group4
	(fixed)	(random)	(fixed)	(random)
REXUS1	1.98	0.58	-4.96	1.86
	(3.12)*	(0.65)	(-6.62)*	(2.09)*
REXJA1	2.49	1.15	2.63	1.03
	(3.99)*	(2.61)*	(6.96)*	(1.98)
RG1	0.32	1.42	-0.11	0.31
	(0.75)	(3.92)*	(-0.19)	(4.79)*
UTJA1	3.52	1.92	2.44	0.47
	(2.87)*	(1.28)	(1.39)	(0.22)
Adj. R^2	0.74	0.76	0.70	0.80
F-tests				
for Ai,B=Ai,Bi	3.53	2.09	1.05	0.21
	(0.02)	(0.11)	(0.40)	(0.93)
for A,B=Ai,B	20.79	6.42	16.85	0.05
	(0.00)	(0.02)	(0.00)	(0.82)
Hausman Test	20.42	6.40	16.51	0.05
	(0.00)	(0.17)	(0.00)	(0.99)
No.obs.	36	36	36	36

Notes : 1. Group 1 comprises Taiwan and Korea.

2. Group 2 comprises Singapore and Thailand.

3. Group 3 comprises Indonesia and the Philippines.

4. Group 4 comprises Malaysia and China.

5. * means statistical significance at the 5% level. Parentheses
   under each coefficients are t-values , under F-Tests and Hausman
   Tests are p-values.

6. Ai,Bi : all countries have different intercepts *and*
   slopes (coefficients of independent variables).

   Ai,B : all countries have different intercepts *but*
   the same slopes.

   A,B : all countries have the same intercepts and slopes.

Table 3

Determinants of FDI from Japan into Southeast Asia
(The results of L.Goldberg and M.Klein(1998))

	EQ 1	EQ 2
REXUS1		-4.95
		(-4.59)*
REXJA1	0.76	2.62
	(1.08)	(3.63)*
RG1	0.86	1.50
	(0.99)	(2.01)*
RGJA	5.17	11.07
	(0.78)	(-1.93)
RGJA1	-2.66	-9.60
	(-0.41)	(-1.66)
Constant	-33.63	-5.90
	(-2.49)	(-0.46)
Adj. R^2	0.67	0.76
F-Test		
EQ1,EQ2		11.36*
No.obs.	60	60

Notes : 1. Southeast Asian countries include Malaysia , the Philippines ,
   Indonesia and Thailand .

2. * means statistical significance at the 5% level. Parentheses
   under each coefficients are t-values.

3. Coefficient signs of REXJA1 and REXUS1 are opposite to the one's
   in the original paper due to different unit currencies.

Sources : L.Goldberg and M.Klein (1998)

Table 4

Determinants of FDI from the United States
(The results of panel regressions)

	Group1	Group2	Group3
	(random)	(fixed)	(random)
REXUS	0.81	-21.48	1.46
	(0.22)	(-3.38)*	(0.36)
REXUS1	-3.39	17.57	-14.70
	(-0.90)	(2.09)*	(-2.99)*
REXJA1	2.65	-2.71	8.12
	(2.42)*	(-0.82)	(4.57)*
RG1	0.24	5.33	-0.90
	(2.71)*	(1.87)	(-2.88)*
UTUS1	1.30	-19.86	5.38
	(0.15)	(-1.69)	(0.47)
Adj. R^2	0.24	0.39	0.53
F-Test			
for Ai,B=Ai,Bi	1.97	1.27	1.30
	(0.08)	(0.30)	(0.31)
for A,B=Ai,B	0.52	6.15	1.15
	(0.60)	(0.00)	(0.30)
Hausman Test	1.04	12.07	1.15
	(0.96)	(0.00)	(0.28)
No. Obs.	45	45	30

Notes : 1. Group 1 comprises Taiwan , Korea and the Philippines.

2. Group 2 comprises Indonesia , Singapore and Thailand.

3. Group 3 comprises Malaysia and China.

4. * means statistical significance at the 5% level. Parentheses
   under each coefficients are t-values , under F-Tests and Hausman
   Tests are p-values.

5. Ai,Bi : all countries have different intercepts *and*
          slopes (coefficients of independent variables).

   Ai,B : all countries have different intercepts *but*
          the same slopes.

   A,B : all countries have the same intercepts and slopes.

Table 5

Determinants of Imports from Japan into East Asian countries
(The results of panel regressions)

	Group1	Group2	Group3
	(random)	(fixed)	(random)
REXJA	0.29	-0.41	-0.55
	(1.09)	(-2.07)*	(-2.62)*
REXJA1	0.26	0.68	0.21
	(1.15)	(2.83)*	(0.88)
RG	-0.39	4.53	4.11
	(-0.44)	(5.11)*	(5.00)*
RG1	0.92	-2.66	-3.87
	(1.02)	(-3.17)*	(-4.96)*
RGJA	-3.18	-7.06	-8.48
	(-1.59)	(-4.52)*	(-4.23)*
RGJA1	3.08	4.41	8.96
	(1.63)	(2.70)*	(4.91)*
FDIJA	-0.01	-0.01	0.22
	(-0.12)	(-0.15)	(4.44)*
FDIJA1	0.22	0.17	0.15
	(3.49)*	(4.26)*	(3.07)*
Adj. R^2	0.92	0.95	0.92
F-Test			
for Ai,B=Ai,Bi	1.22	1.48	1.46
	(0.34)	(0.18)	(0.24)
for A,B=Ai,B	0.71	42.36	0.03
	(0.41)	(0.00)	(0.86)
Hausman Test	0.71	50.31	0.03
	(1.00)	(0.00)	(1.00)
No.obs.	36	54	36

Notes : 1. Group 1 comprises Taiwan and Korea.

    2. Group 2 comprises Malaysia , Singapore and Thailand.

    3. Group3 comprises Indonesia and the Philippines.

    4. * means statistical significance at the 5% level. Parentheses
      under each coefficients are t-values , under F-Tests and Hausman
       Tests are p-values.

    5. Ai,Bi : all countries have different intercepts *and*
           slopes (coefficients of independent variables).

     Ai,B : all countries have different intercepts *but*
        the same slopes.

     A,B : all countries have the same intercepts and slopes.

Table 6

Deternimants of Imports from the United States into East Asian Countries
(The results of panel regressions)

	Group1	Group2
	(fixed)	(fixed)
REXUS	-0.44	-0.49
	(-1.56)	(-1.97)
REXUS1	-0.61	-0.47
	(-2.02)*	(-2.00)*
RG	1.98	1.52
	(3.21)*	(2.86)*
RG1	-1.28	-0.22
	(-2.12)*	(-0.44)
FDIUS	-0.02	0.01
	(-0.25)	(1.69)
FDIUS1	0.04	0.01
	(0.58)	(2.15)*
FDIJA	0.04	0.07
	(1.07)	(2.14)*
FDIJA1	0.07	0.02
	(1.91)	(0.61)
Adj. R^2	0.97	0.97
F-Test		
for Ai,B=Ai,Bi	0.64	1.61
	(0.82)	(0.16)
for A,B=Ai,B	169.04	167.32
	(0.00)	(0.00)
Hausman Test	127.16	124.19
	(0.00)	(0.00)
No. Obs.	45	45

Notes : 1. Group 1 comprises Taiwan , Korea and Singapore.

2. Group 2 comprises Malaysia , the Philippines and Thailand.

3. * means statistical significance at the 5% level. Parentheses
under each coefficients are t-values , under F-Tests and Hausman
Tests are p-values.

4. Ai,Bi : all countries have different intercepts *and*
slopes (coefficients of independent variables).
Ai,B : all countries have different intercepts *but*
the same slopes.
A,B : all countries have the same intercepts and slopes.

Table 7

Determinants of Exports to Japan from East Asian countries
(The results of panel regressions)

	Group1	Group2	Group3	Group4
	(random)	(random)	(fixed)	(fixed)
REXJA	0.10	-0.46	-0.43	-0.55
	(0.44)	(-1.74)	(-2.09)*	(-3.08)*
REXJA1	0.38	1.93	0.53	0.11
	(1.94)	(6.22)*	(2.06)*	(0.61)
RG	-0.76	-1.17	-0.30	3.19
	(-0.99)	(-1.26)	(-0.30)	(4.89)*
RG1	1.18	2.22	1.68	-3.43
	(1.51)	(2.29)*	(1.78)	(-5.42)*
RGJA	1.71	-10.86	-2.80	0.26
	(1.00)	(-5.47)*	(-1.34)	(0.17)
RGJA1	-1.46	7.64	1.16	0.26
	(-0.89)	(4.08)*	(0.56)	(0.18)
FDIJA	0.07	-0.01	0.01	0.10
	(1.24)	(-0.20)	(0.15)	(2.46)*
FDIJA1	0.17	0.22	-0.00	0.12
	(3.17)*	(3.80)*	(-0.05)	(3.08)*
Adj. R^2	0.95	0.90	0.89	0.82
F-Test				
for Ai,B=Ai,Bi	1.21	0.82	1.57	2.12
	(0.35)	(0.60)	(0.20)	(0.09)
for A,B=Ai,B	8.25	13.84	33.31	24.89
	(0.01)	(0.00)	(0.00)	(0.00)
Hausman Test	8.24	13.71	31.92	24.27
	(0.41)	(0.09)	(0.00)	(0.00)
No.obs.	36	36	36	36

Notes : 1. Group 1 comprises Taiwan and Korea.

2. Group 2 comprises Singapore and Thailand.

3. Group 3 comprises Malaysia and China.

4. Group 4 comprises Indonesia and the Philippines.

5. * means statistical significance at the 5% level. Parentheses under each coefficients are t-values , under F-Tests and Hausman Tests are p-values.

6. Ai,Bi : all countries have different intercepts *and* slopes (coefficients of independent variables).

Ai,B : all countries have different intercepts *but* the same slopes.

A,B : all countries have the same intercepts and slopes.

Table 8

Determinants of Exports to the United States from East Asian Countries
(The results of panel regressions)

	Group1	**Group2**
	(fixed)	(fixed)
REXUS	-0.82	-0.70
	(-3.35)*	(-2.29)*
REXUS1	1.38	-1.01
	(4.84)*	(-3.96)*
RGUS	1.89	7.10
	(2.04)*	(5.63)*
RGUS1	-0.73	-5.09
	(-0.72)	(-3.89)*
FDIUS	0.07	-0.05
	(0.71)	(-0.61)
FDIUS1	0.03	0.02
	(4.00)*	(2.30)*
FDIJA	0.02	0.01
	(0.37)	(0.28)
FDIJA1	0.11	0.04
	(2.89)*	(0.96)
Adj. R^2	0.95	0.94
F-Test		
for Ai,B=Ai,Bi	1.60	1.29
	(0.22)	(0.33)
for A,B=Ai,B	10.16	46.88
	(0.00)	(0.00)
Hausman Test	10.09	45.64
	(0.00)	(0.00)
No. Obs.	30	30

Notes : 1. Group 1 comprises Taiwan and Korea.

2. Group 2 comprises Indonesia and the Philippines.

3. * means statistical significance at the 5% level. Parentheses
   under each coefficients are t-values , under F-Tests and Hausman
   Tests are p-values.

4. Ai,Bi : all countries have different intercepts *and*
          slopes (coefficients of independent variables).
   Ai,B : all countries have different intercepts *but*
          the same slopes.
   A,B : all countries have the same intercepts and slopes.

Table 9
The Results of Simultaneous Equations Model
Group 1 (Taiwan and Korea)

EQ1
$$\mathbf{FDIJA} = 22.49 - 1.38*\mathbf{RG\,1} - 0.40*\mathbf{REXUS\,1} + 3.71*\mathbf{REXJA\,1} + 2.55*\mathbf{UTJA\,1} - 15.14*\mathbf{DUMMY}$$
    (1.97) (-2.80)   (-0.51)   (7.35)   (2.91)   (-6.56)

EQ2
$$\mathbf{EXJA} = 9.93 + 0.32*\mathbf{RGJA} - 0.06*\mathbf{RG} + 0.94*\mathbf{REXJA\,1} + 0.12*\mathbf{FDIJA\,1} - 6.69*\mathbf{DUMMY}$$
    (2.22) (0.44)   (-0.18)   (5.36)   (2.93)   (-4.41)

EQ3
$$\mathbf{IMJA} = 12.89 + 2.10*\mathbf{RG} + 0.49*\mathbf{FDIJA} - 2.79*\mathbf{RGJA} - 0.79*\mathbf{REXJA\,1} + 5.72*\mathbf{DUMMY}$$
    (2.69) (5.35)   (6.88)   (-3.48)   (-2.98)   (2.92)

EQ4
$$\mathbf{EXO} = -6.88 + 1.16*\mathbf{RG} + 1.04*\mathbf{REXUS\,1} - 3.34*\mathbf{DUMMY}$$
    (-4.57)(17.40)   (6.54)   (-9.50)

EQ5
$$\mathbf{IMO} = -2.80 + 1.07*\mathbf{RG} + 0.09*\mathbf{REXUS\,1} - 0.22*\mathbf{DUMMY}$$
    (-1.27)(10.95)   (0.40)   (-0.43)

EQ6
$$\mathbf{CON} = -1.37 + 1.05*\mathbf{RG} - 0.02*\mathbf{RI} + 0.17*\mathbf{DUMMY}$$
    (-2.34)(28.29)   (-0.06)   (1.47)

EQ7
$$\mathbf{INV} = 5.84 + 0.53*\mathbf{RG} - 0.10*\mathbf{RI} - 0.72*\mathbf{DUMMY}$$
    (2.21)(3.16)   (-0.67)   (-1.43)

IDENTITY
$$\mathbf{RG'} = \mathbf{CON'} + \mathbf{INV'} + \mathbf{EMJ'} - \mathbf{IMJ'} + \mathbf{EXO'} - \mathbf{IMO'} + \mathbf{OTHER'}$$

Notes : 1. All variables except in identity equation (marked by dash) are in logarithm.
        2. DUMMY represents the fixed effect of Korea.

Chart 5

FDI from Japan (Group 1)
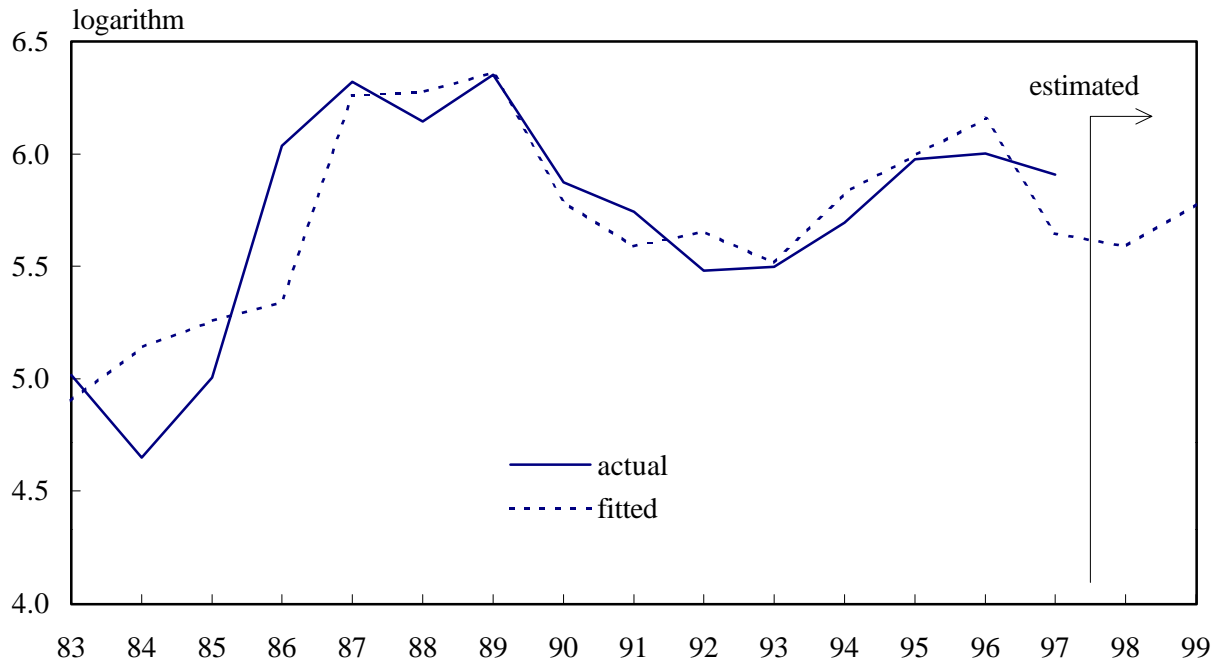
(1) Actual and Fitted
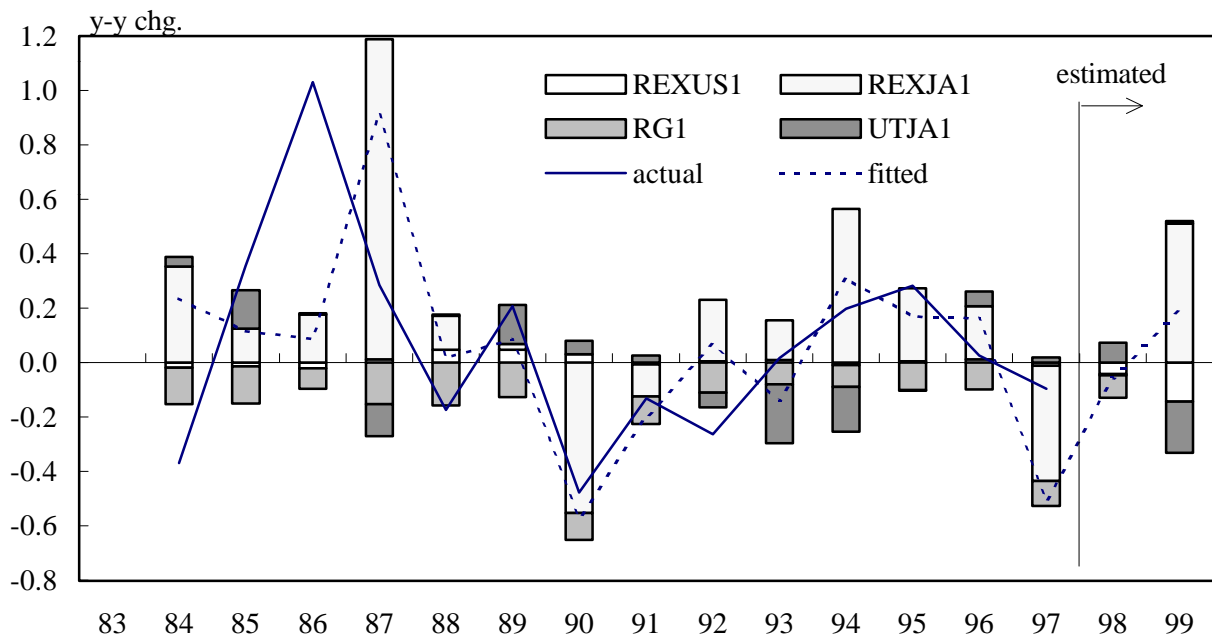
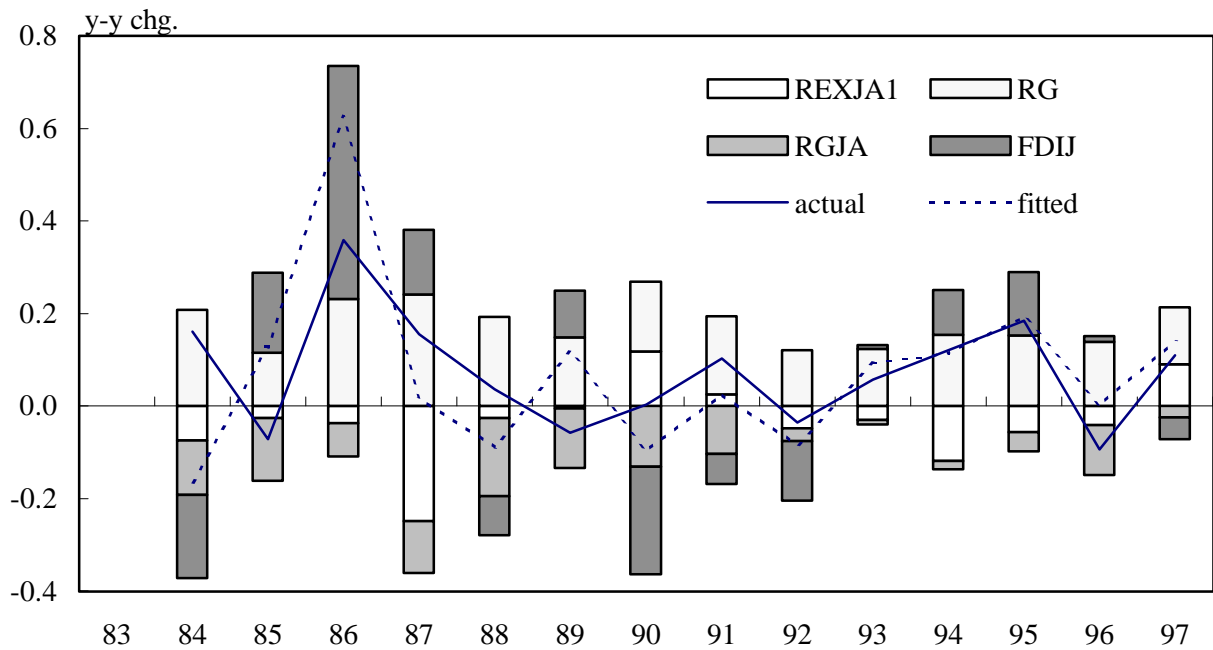## (2)Factor breakdown

Notes : Group 1 comprises Taiwan and Korea.

Chart 6

Imports from Japan (Group 1)

(1) Actual and Fitted

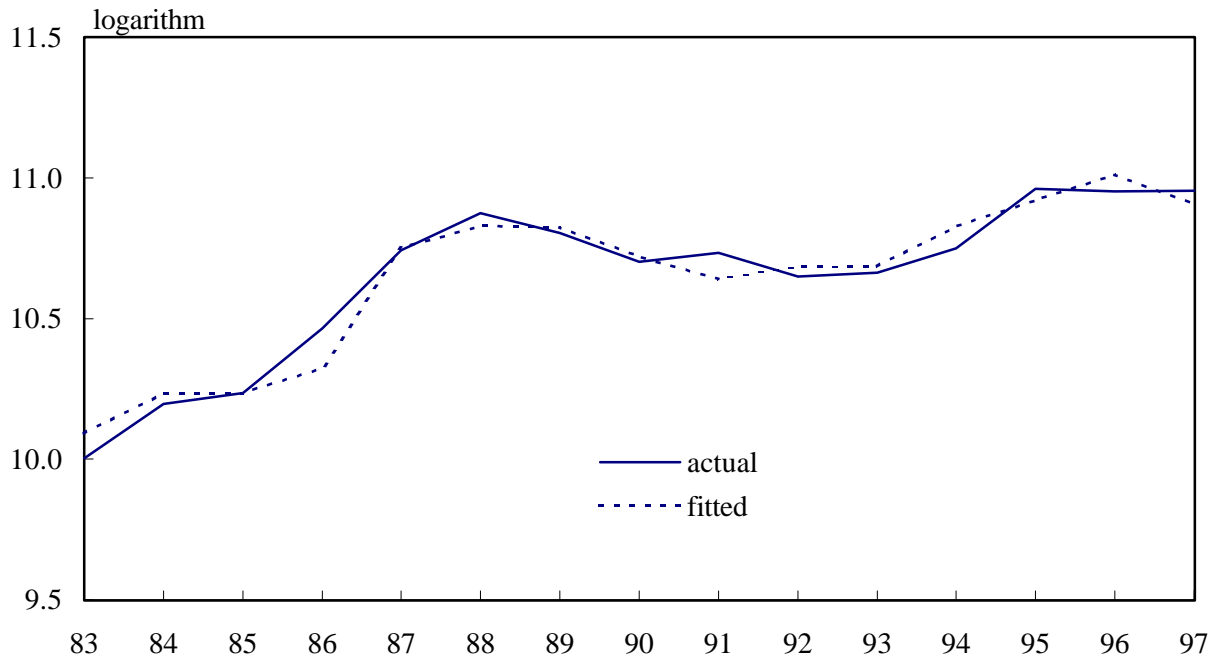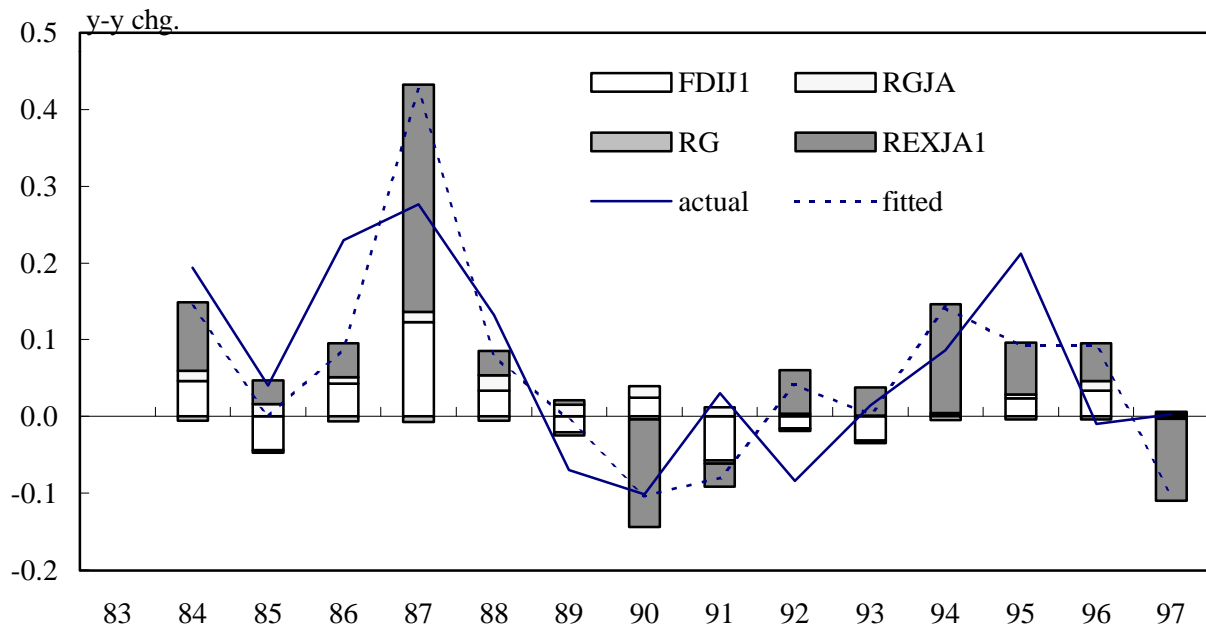logarithm

actual
fitted

(2)Factor breakdown

y-y chg.

REXJA1 RG
RGJA FDIJ
actual fitted
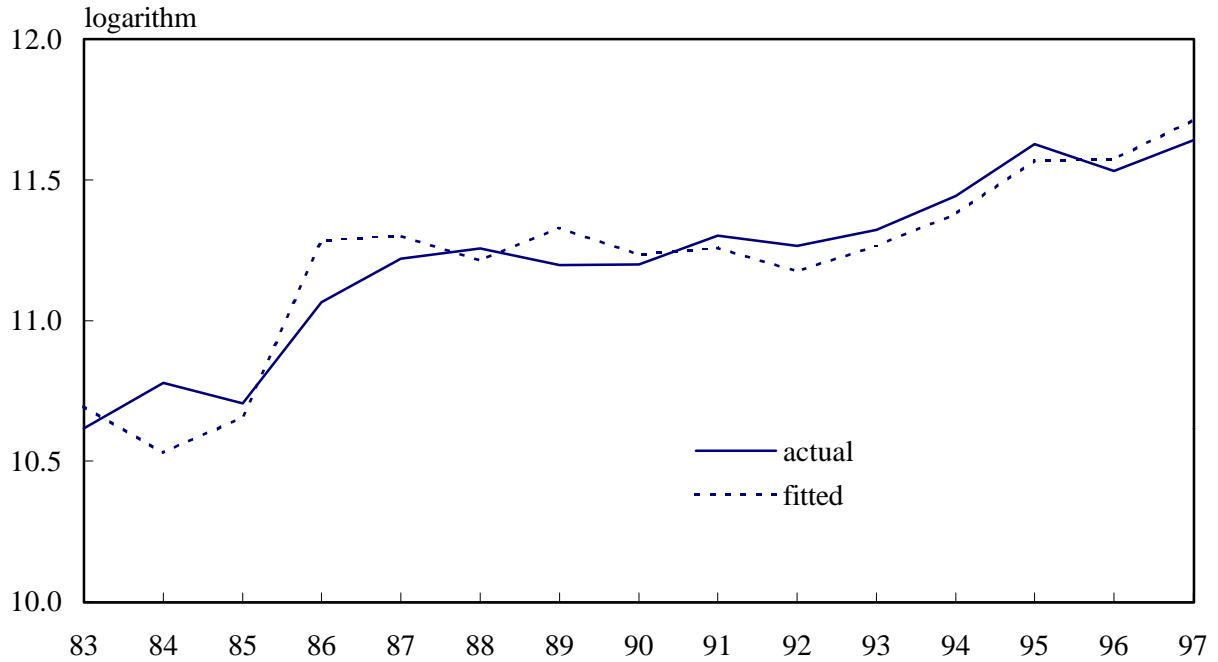
Notes : Group 1 comprises Taiwan and Korea.

Chart 7

Exports to Japan (Group 1)

(1) Actual and Fitted

(2)Factor breakdown

 Notes : Group 1 comprises Taiwan and Korea.

Table 10
The Results of Simultaneous Equations Model
Group 2 (Singapore and Thailand)

EQ1
$$FDIJA = 7.82 + 0.36*RG\textbf{1} - 0.07*REXUS\textbf{1} + 2.22*REXJA\textbf{1} + 1.01*UTJA\textbf{1} - 4.93*DUMMY$$
$$(1.01)\ (1.05)\qquad (-0.01)\qquad\quad (6.37)\qquad\quad (0.85)\qquad\quad (-2.50)$$

EQ2
$$EXJA = 25.65 - 2.12*RGJA + 1.17*RG + 0.89*REXJA\textbf{1} + 0.19*FDIJA\textbf{1} - 2.28*DUMMY$$
$$(2.66)\ (-2.30)\qquad (4.09)\qquad (4.64)\qquad\quad (4.00)\qquad\quad (-2.31)$$

EQ3
$$IMJA = 9.65 + 1.04*RG + 0.35*FDIJA - 1.02*RGJA + 0.12*REXJA\textbf{1} - 1.22*DUMMY$$
$$(0.91)\ (3.24)\qquad (5.05)\qquad\quad (-1.04)\qquad (0.42)\qquad\quad (-1.18)$$

EQ4
$$EXO = -10.53 + 1.86*RG - 0.20*REXUS\textbf{1} + 3.09*DUMMY$$
$$(-10.35)(21.85)\qquad (-0.96)\qquad\quad (6.54)$$

EQ5
$$IMO = -4.53 + 1.39*RG + 0.76*REXUS\textbf{1} - 2.28*DUMMY$$
$$(-5.72)(20.97)\qquad (4.60)\qquad\quad (-6.18)$$

EQ6
$$CON = 0.72 + 0.86*RG - 0.03*RI - 0.22*DUMMY$$
$$(3.64)(49.00)\qquad (-0.41)\qquad (-3.71)$$

EQ7
$$INV = -3.01 + 1.18*RG + 0.03*RI + 0.54*DUMMY$$
$$(-3.49)(15.34)\qquad (0.93)\qquad (2.07)$$

IDENTITY
$$RG' = CON' + INV' + EMJ' - IMJ' + EXO' - IMO' + OTHER'$$

Notes : 1. All variables except in identity equation (marked by dash) are in logarithm.
      2. DUMMY represents the fixed effect of Thailand.

Chart 8

FDI from Japan (Group 2)
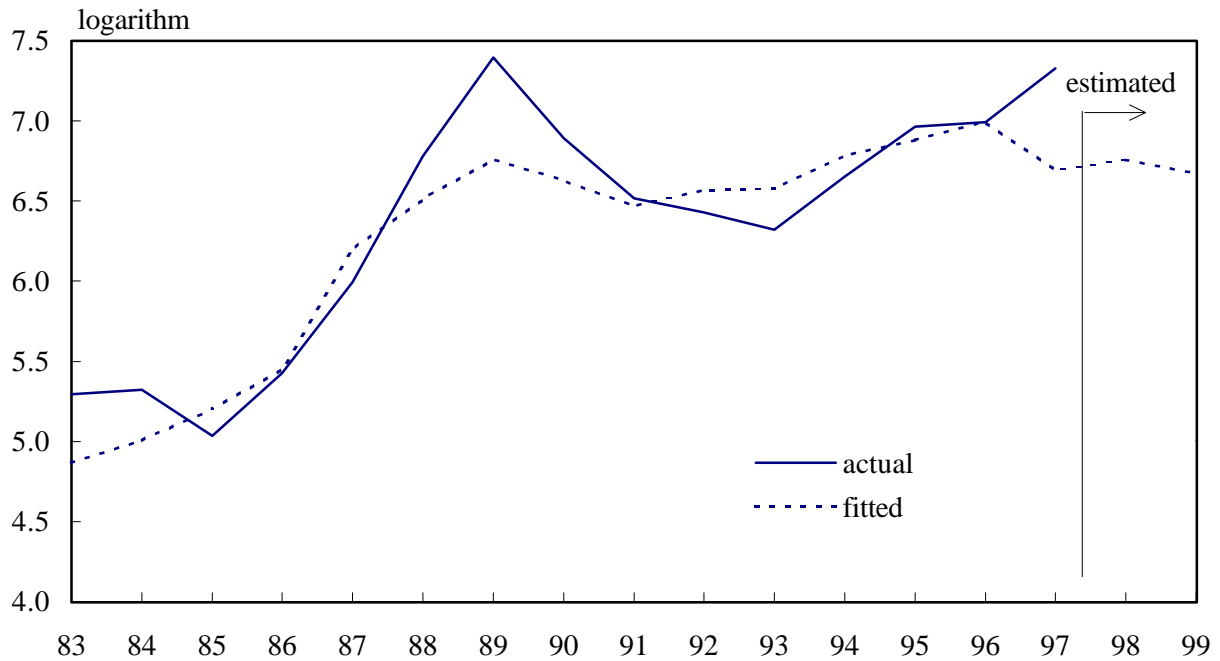
(1) Actual and Fitted
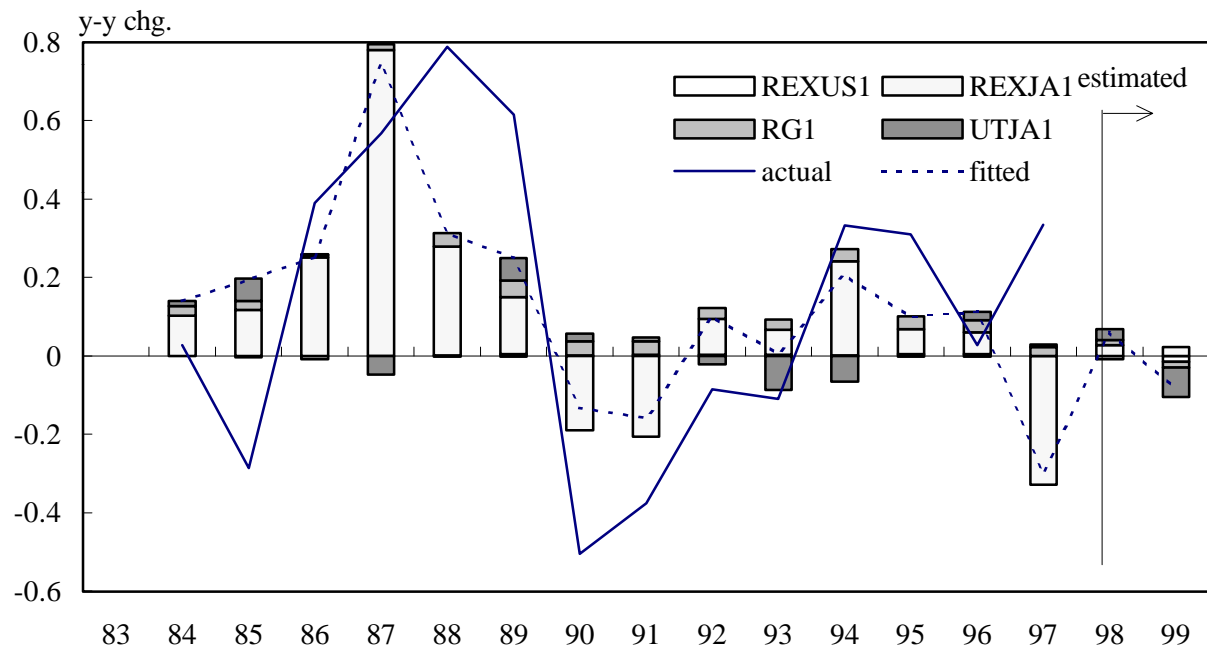
(2)Factor breakdown
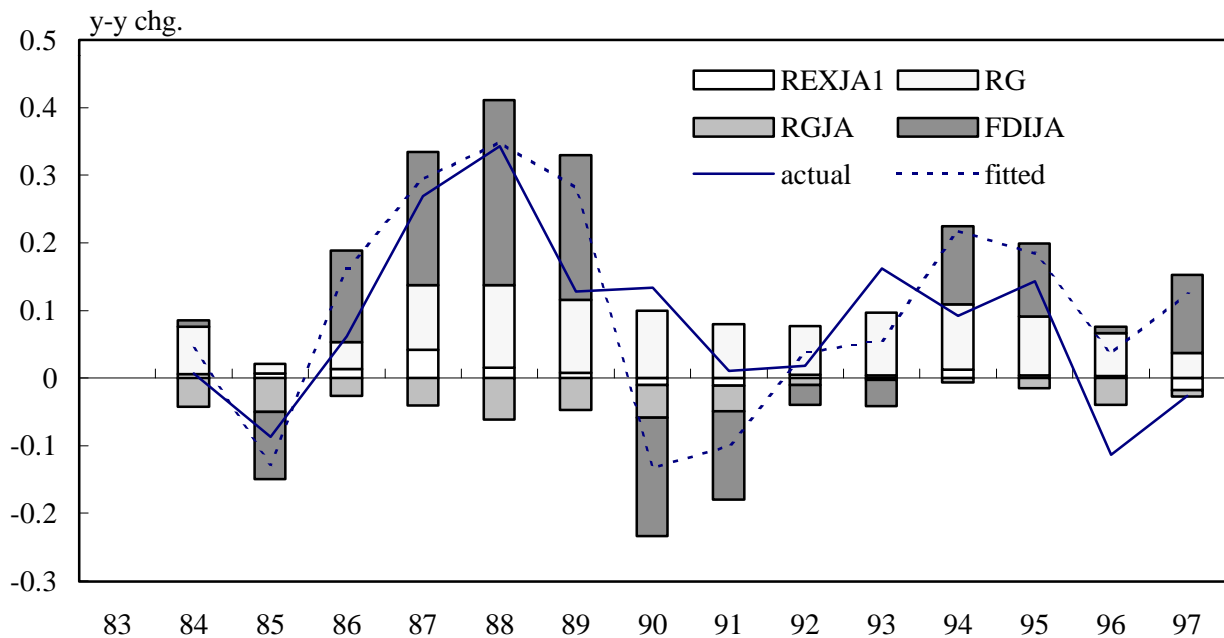

Notes : Group 2 comprises Singapore and Thailand.

Chart 9

Imports from Japan (Group 2)

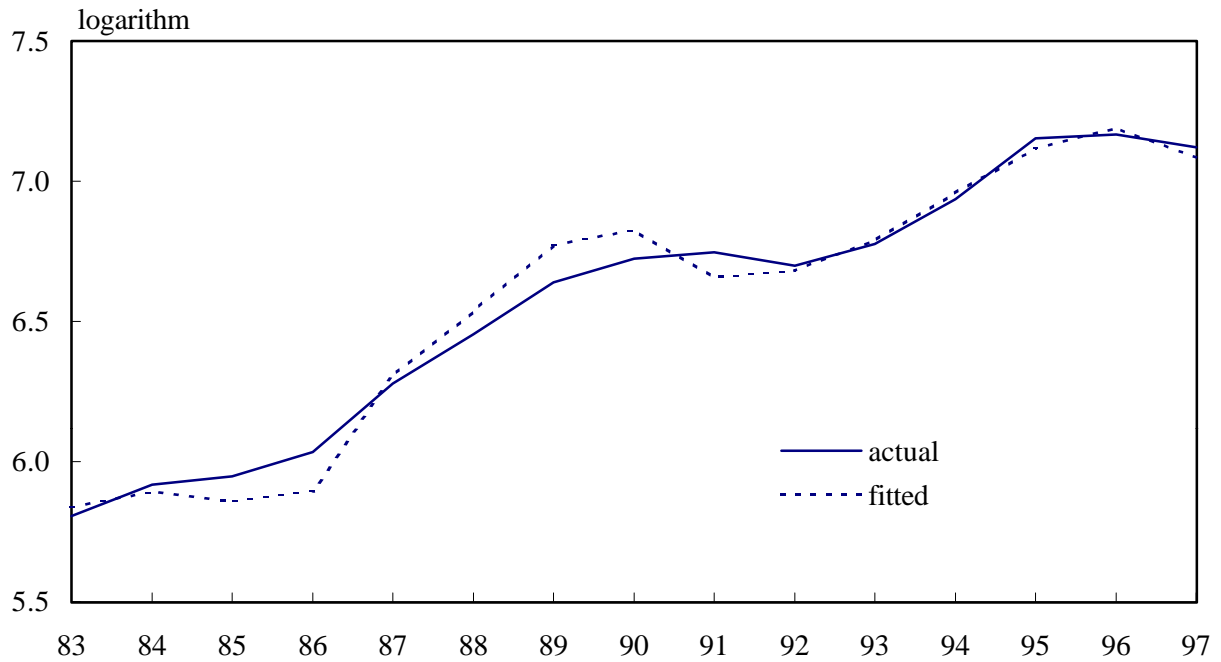**(1) Actual and Fitted**

(2)Factor breakdown

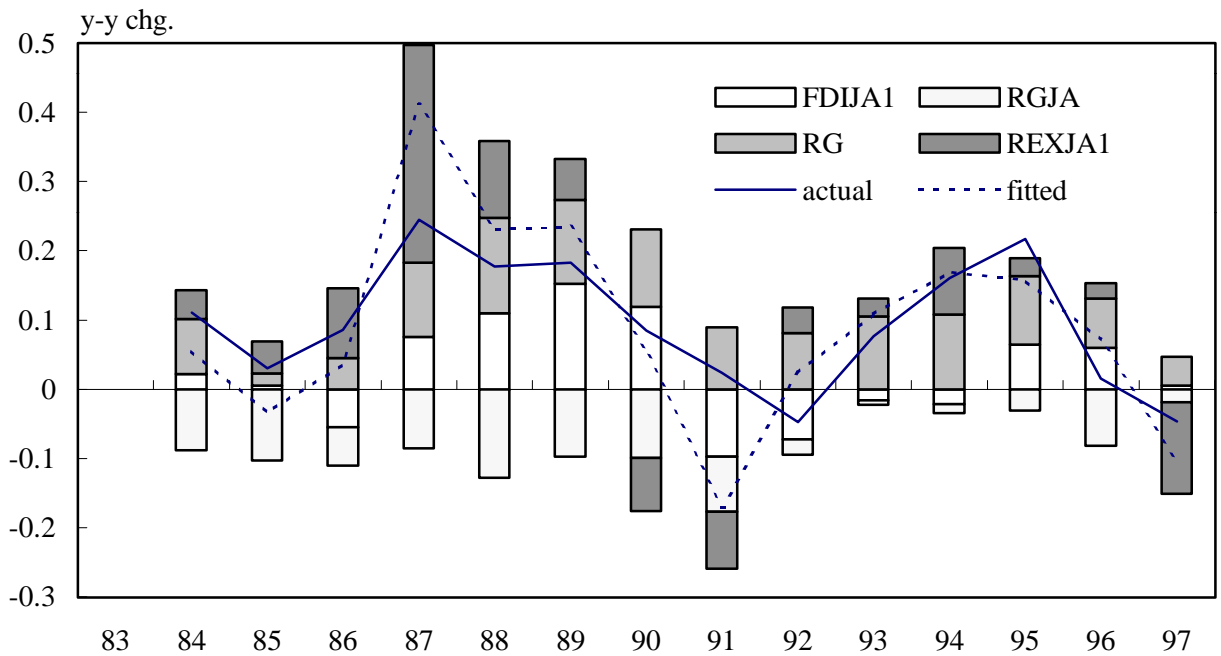Notes : Group 2 comprises Singapore and Thailand.

Chart 10

Exports to Japan (Group 2)

(1) Actual and Fitted

(2)Factor breakdown

Notes : Group 2 comprises Singapore and Thailand.

Table 11

The Results of Simultaneous Equations Model
Group 3 (Indonesia and Philippines)

EQ1
$$FDIJA = 31.41 + 0.21*RG\mathbf{1} - 3.90*REXUS\mathbf{1} + 2.14*REXJA\mathbf{1} - 0.77*UTJA\mathbf{1} - 8.09*DUMMY$$
$$\quad\quad (3.68)\ (0.44)\quad\quad (-6.53)\quad\quad\quad (7.61)\quad\quad\quad (-0.72)\quad\quad\quad (-2.85)$$

EQ2
$$EXJA = -31.77 + 3.49*RGJA - 0.08*RG - 0.78*REXJA\mathbf{1} - 0.06*FDIJA\mathbf{1} - 9.96*DUMMY$$
$$\quad\quad (-2.21)\ (2.87)\quad\quad (-0.38)\quad (-2.66)\quad\quad\quad (-0.65)\quad\quad\quad (-5.82)$$

EQ3
$$IMJA = -18.71 + 0.83*RG + 0.38*FDIJA + 1.24*RGJA - 0.46*REXJA\mathbf{1} - 1.82*DUMMY$$
$$\quad\quad (-1.41)\ (2.90)\quad\quad (2.73)\quad\quad\quad (1.13)\quad\quad (-1.97)\quad\quad\quad (-1.10)$$

EQ4
$$EXO = -9.43 + 2.01*RG - 0.68*REXUS\mathbf{1} + 2.59*DUMMY$$
$$\quad\quad (-4.88)(14.26)\quad (-3.55)\quad\quad\quad (2.69)$$

EQ5
$$IMO = -6.53 + 1.83*RG - 0.77*REXUS\mathbf{1} + 1.60*DUMMY$$
$$\quad\quad (-3.59)(14.11)\quad (-3.99)\quad\quad\quad (1.75)$$

EQ6
$$CON = -1.12 + 1.05*RG + 0.01*RI\ 0.46*DUMMY$$
$$\quad\quad (-2.18)(25.05)\quad (0.18)\quad (2.07)$$

EQ7
$$INV = -6.49 + 1.41*RG - 0.05*RI + 2.13*DUMMY$$
$$\quad\quad (-4.90)(13.13)\quad (-2.40)\quad (3.70)$$

IDENTITY
$$RG' = CON' + INV' + EMJ' - IMJ' + EXO' - IMO' + OTHER'$$
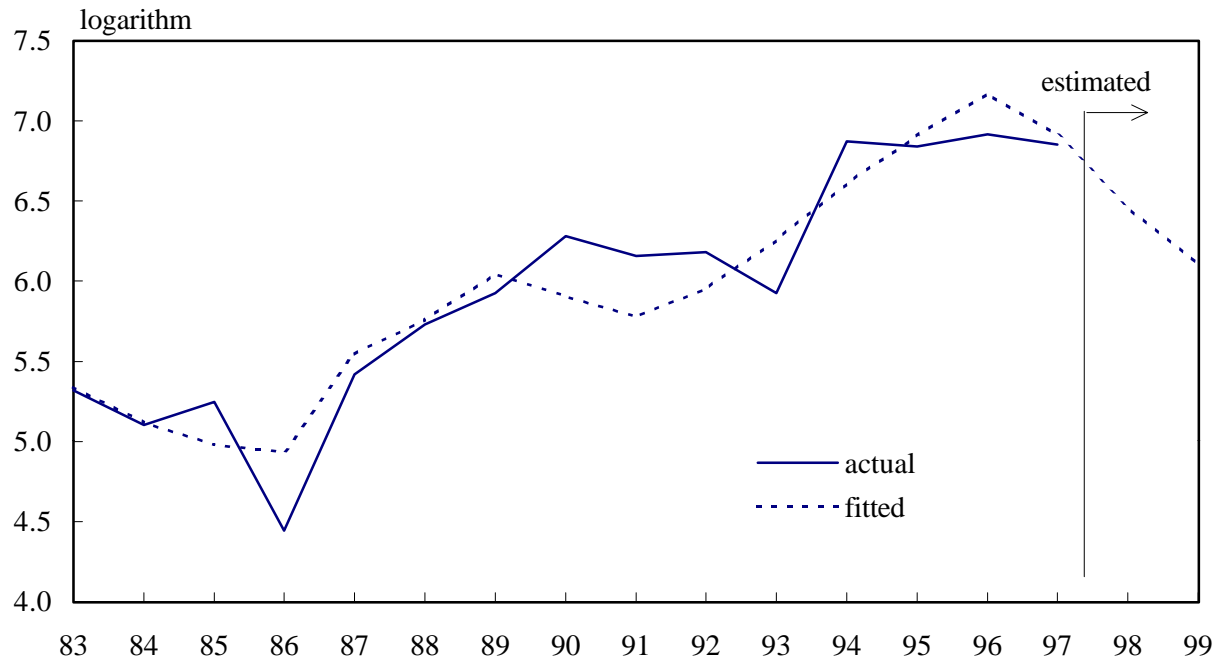
Notes : 1. All variables except in identity equation (marked by dash) are in logarithm.
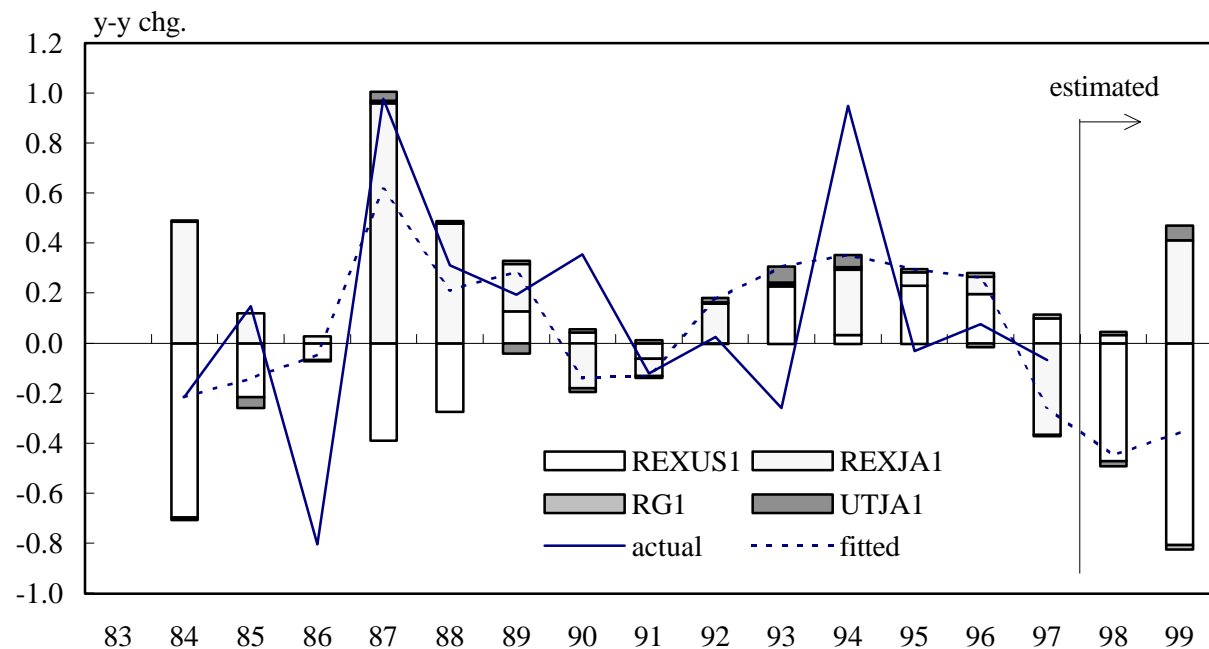   2. DUMMY represents the fixed effect of the Philippines.

Chart 11

FDI from Japan (Group 3)
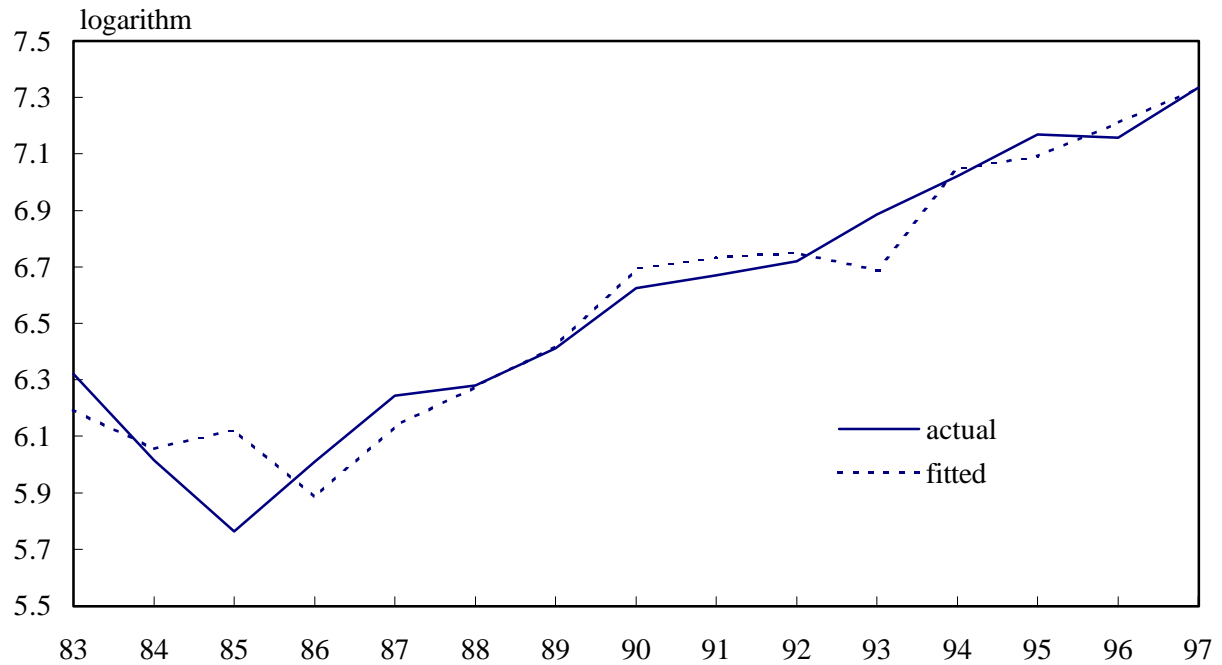
(1) Actual and Fitted

(2)Factor breakdown

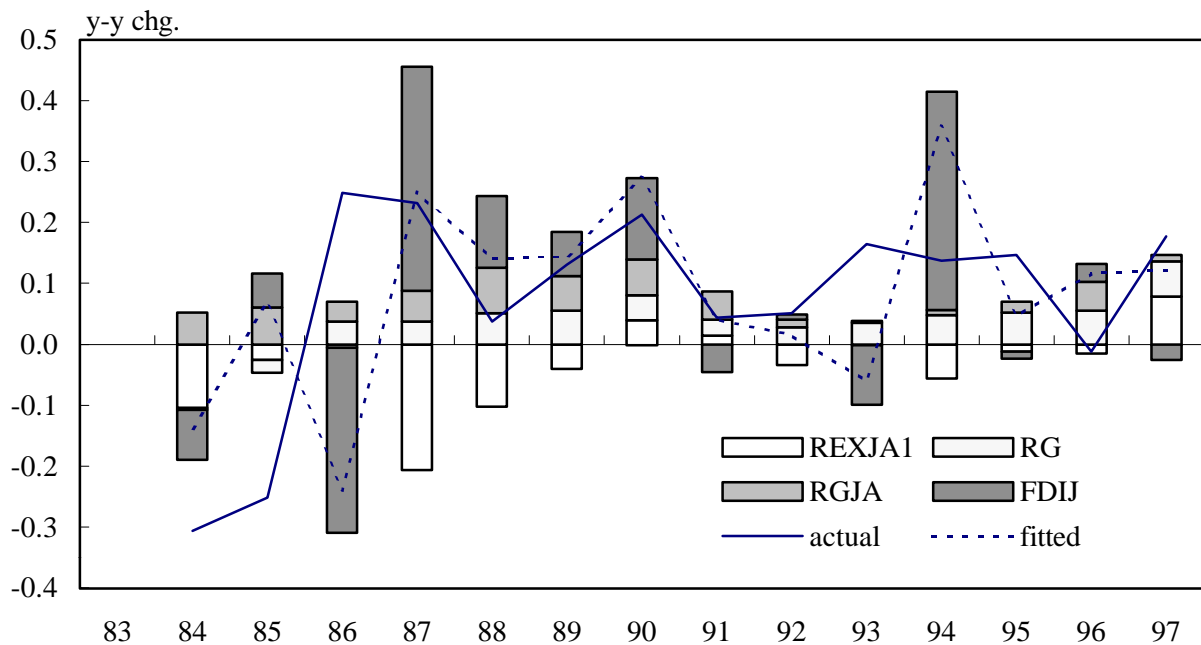 Notes : Group 3 comprises Indonesia and the Philippines.

Chart 12

Imports from Japan (Group 3)
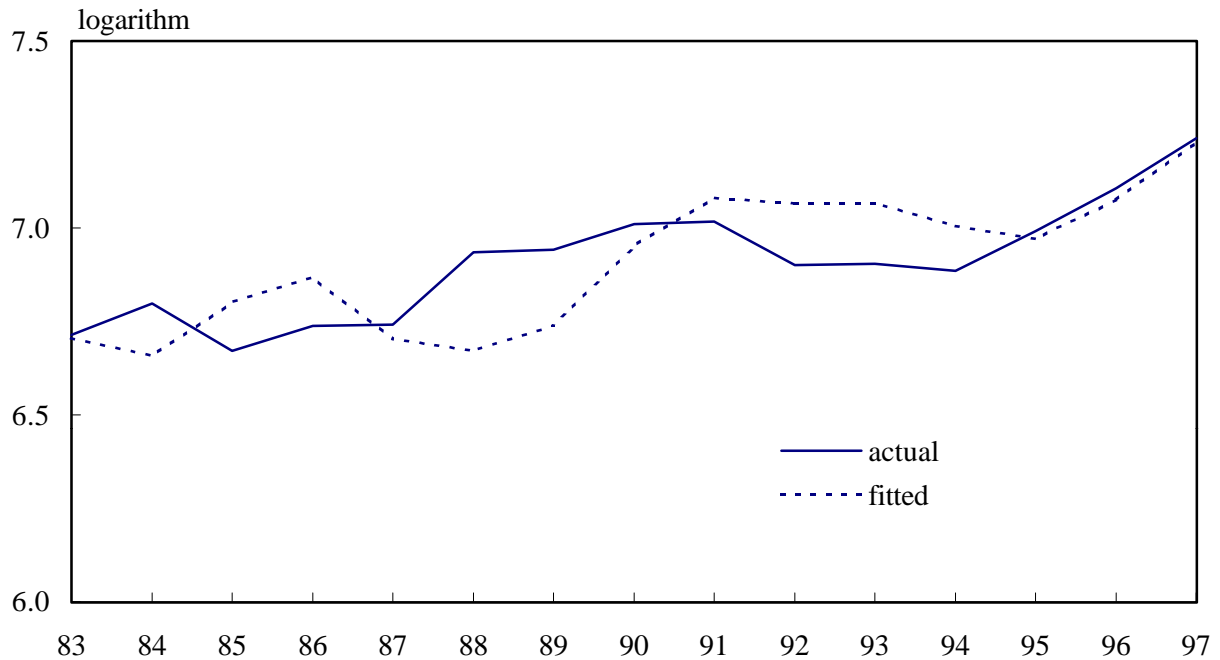
(1) Actual and Fitted

(2)Factor breakdown

Notes : Group 3 comprises Indonesia and the Philippines.
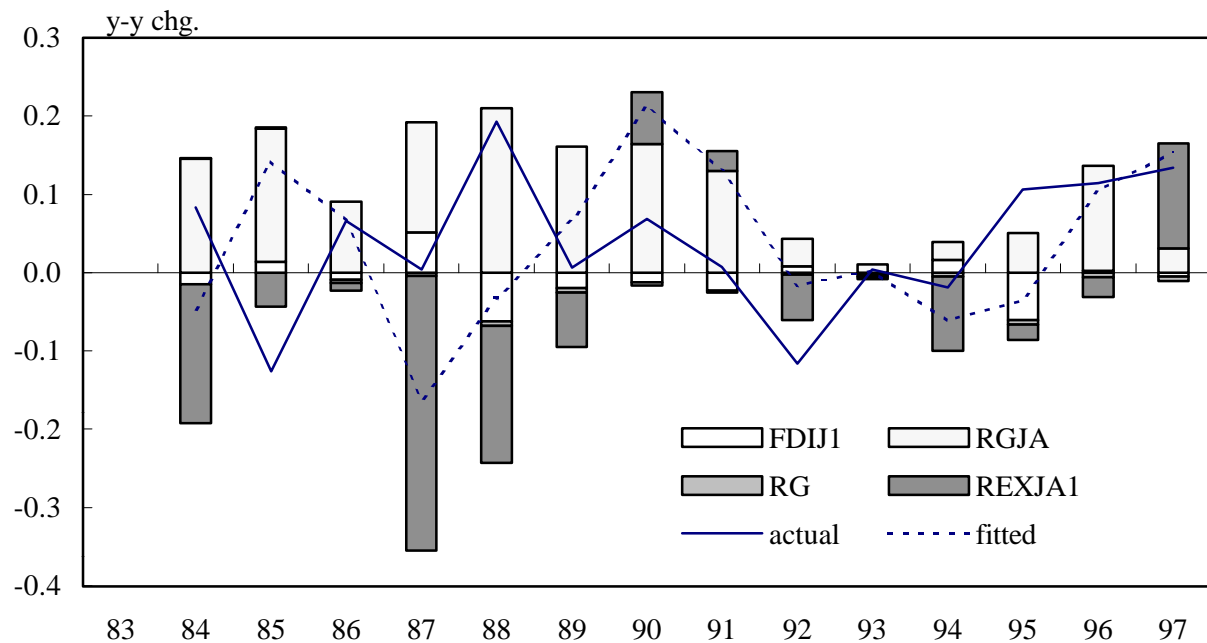
Chart 13

Exports to Japan (Group 3)

(1) Actual and Fitted

(2)Factor breakdown

Notes : Group 3 comprises Indonesia and the Philippines.