

THE IMPACT OF REAL EXCHANGE RATES ON JAPANESE DIRECT INVESTMENT IN CHINA' S MANUFACTURING: AN EMPIRICAL ASSESSMENT

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Abstract: This paper analyzes the role of real exchange rate in determining Japanese FDI in China. Using the data of Japanese direct investment in China's nine major manufacturing sectors from 1989 to 2000, the paper conducts regression analysis with both time series and panel data. The empirical results show that there exists a significantly positive correlation between the bilateral real exchange rate and the inflows of Japanese direct investment to China. Specifically, the appreciation of Yen generally stimulated the inflows of Japanese direct investment while the depreciation of Yen leading to a decrease of the investment. To a large extent, the rise and fall of Japanese direct investment in China over the period is attributed to the fluctuations of the bilateral real exchange rate. As the sharp devaluation of Yuan in early 1990s was triggered by merging China's official exchange rate with market rates, the policy shift on the exchange rate regime should be credited for the surge of FDI inflows.

Key Words: *FDI, Exchange Rate, Manufacturing*
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1. Introduction

China has been very successful in attracting foreign direct investment in the last two decades. Over the period 1979 to 2000, FDI inflows in China accumulated more than \$340 billions. Even worldwide contraction in FDI failed to undermine China's FDI boom. According to UNCTAD (2002), globally foreign direct investment flows declined by nearly half in 2001. Despite of the sharp reduction, China still managed to absorb \$46.8 billions FDI in the same period, representing a 15 percent increase over the preceding year. It is expected the trend will sustain in the coming years due to China's accession to the WTO. China's unprecedented success in attracting FDI has drawn much attention of both academic scholars as well as policy makers. How to explain China's FDI boom and what major factors determining China's FDI are, have become a prime topic among scholars. As a consequence, a plethora of literature, for instance, Lardy (1995), Chen (1996), Henly et al (1999) Zhang (2001), etc., has emerged. Most of these studies identify market size, labor cost, preferential policies, openness, geographic proximity, and political stability as primary factors driving foreign investment into China. The theoretical foundation of the current literature lies on conventional FDI theory which interpreting FDI activities through industrial organization theory. The literature substantially enhances our understanding about why China is so attractive to foreign investors. However, the role of exchange rates in determining FDI inflows into China has been largely ignored in the literature, despite of the fact that Chinese Yuan had been devaluated sharply in early 1990s, due to the change of China's exchange rate regime. Few studies investigate to what extent the drastic devaluation contributed to the surge of foreign direct investment in China.

The mechanism that exchange rates affect FDI flows has been modeled in a few theoretical studies (e.g., Kohlhagen, 1977; Cushman, 1985; Froot and Stein, 1991). Most of these studies reach a conclusion that a devaluation in the value of FDI hosting country's currency stimulates inflows of foreign direct investment and conversely an appreciation lead to a reduction in FDI inflows. Fundamentally, there are two channels through which exchange rates impact FDI: wealth effect channel and relative production costs channel. A devaluation by FDI receiving country gives rise to a reduction in local production costs in term of foreign currency, raising profits of export-oriented foreign investors accordingly. Higher return naturally attracts more

FDI inflows. The wealth effect—relative wealth of foreign investors to domestic investors is raised by the devaluation, encourages foreign investors acquiring more domestic assets. A few empirical studies, including Klein (1994), Dewenter (1995), Goldberg and Klein(1997), Blonigen (1997), and Bayoumi and Lipworth (1998), provide evidences supporting the theoretical arguments.

Along with changing foreign exchange regime, China devaluated its currency a few times in early 1990s. Average nominal exchange rate of Chinese Yuan to the US dollar rose sharply from 3.76Yuan/Dollar in 1989 to 8.62Yuan/Dollar (China Statistics Yearbook, 2001), more than 56% devaluation of Chinese Yuan. Measured in real exchange rate, the value of Yuan also declined 35% in the same period¹. The dramatic devaluation obviously enhanced China's comparative advantage in domestic production costs. For multinational enterprises, the potential wealth effect and the relative production costs reduction induced by the deliberate devaluation are simply too large to ignore. It is highly likely that the surge of foreign investments inflows in 1990s was substantially fueled by the devaluation. Given that China's FDI boom actually started in early 1990s, it is reasonable to stipulate that the devaluation contributed substantially to the FDI boom.

Further, more than 50 percent of China's exports is now produced by companies with foreign investment, implying that majority FDI in China is export-oriented. Theoretically speaking, domestic market oriented foreign direct investment may not benefit from the devaluation of hosting country's currency, because a decrease in production cost resulted in by the devaluation can be offset by a corresponding decrease in sales revenues, if both being measured in foreign currency. On the other hand, it is not the case for export-oriented FDI. The segmentation between production locations and product markets confines the impact of the devaluation only to local production cost rather than sales prices in global market. Efficient capital market hypothesis is another reason that the role of exchanger rates is generally ignored in the context. It presumes that possible higher return induced by currency devaluation of hosting country will disappear as soon as domestic firms chase the higher return through borrowing foreign currency denominated loans. The efficient

¹ Real exchange rate of Chinese Yuan to the US dollar in 1989 and 1994 are 140.85 and 91.51 respectively (IMF Financial Statistics). Higher value indicates a real appreciation of Chinese Yuan.

market assumption, nonetheless, does not hold in China, which still imposes tight control on international capital mobility. Its capital account has not been liberalized yet. Therefore, the potential capital return differential between domestic and foreign capitals due currency devaluation can only be erased by continuous foreign capital inflows.

In addition, despite the fact that aggregate FDI inflows into China have been increasing continuously since 1990, examining the inflows by their sourcing countries yields different picture. Not FDI inflows from all countries show the same non-decreasing pattern. Specifically, direct investment from Japan fluctuated with a few peaks and troughs during the period 1989 to 2000. The fluctuation cannot be simply attributed to variations of explained by structure variables. Usually these variables are constant, at least in short run, or move in the direction supporting further inflows. For instance, to maintain consistency and stability, governments do not change preferential treatments in short-run. Hence, it would be inappropriate to attribute the large swing of inflows to these structure variables. Ascribing the fluctuation to changes of exchange rates would be worth to investigate.

Although China the largest FDI recipient among developing countries has drawn a lot of attention, few systematic studies examine the role of exchange rate in the context of China' FDI. This paper attempts to offset the gap in the literature and investigate to what extent China's deliberate devaluation and changing exchange rate regime contributed to its FDI boom. Specifically, this study analyzes Japanese direct investment in China's manufacturing sectors and examines how inflows from Japan are affected by the devaluation of Yuan. There are three reasons for concentrating on direct investment by Japanese multinational enterprises. First of all, Japanese multinational enterprises have been one of major FDI sources for China. They invested more than \$2.9 billion in 2000, making Japan the third largest single source. Secondly, Japanese FDI in developing country is traditionally trade-oriented. Investing in developing countries is a strategy employed by Japanese multinational enterprises to strengthen their global competitiveness. Motivations of Japanese multinational enterprises differ with American multinational enterprise, which often extended their oligopoly power through investing abroad (Kojima, 1982). Therefore, direct investment from Japan should be relatively sensitive to variations of exchange

rates. Finally, under the existing foreign exchange rate regime of China, Yuan is pegged to the US dollar. The volatility of the bilateral exchange rate between Yen and Dollar is fully transmitted to the bilateral exchange rate between Yen and Yuan, providing an excellent starting point to explore the issue. Given the dynamics of Yen to Yuan, the research is not limited by a discrete exchange rate with limited variations.

The paper proceeds as follows. Section II describes Japanese direct investment in China's major manufacturing sectors and fluctuations of the real exchange rate between Yen and Yuan. It emphasizes the correlation between investment inflows and the exchange rate. Section 3 reviews theoretical studies explaining channels that exchange rates impact FDI flows. Section 4 presents econometric models used for testing the correlation and the estimates of the models based on both time series and panel data. The final section summarizes findings of the paper and their policy implication.

2. The Stylized Facts of Japanese Direct Investment in China

China started its aggressive campaigns for promoting foreign direct investment in early 1980s, direct investment from Japan, in particular the investment in China's manufacturing did not pick up until early 1990s. The rapid growth of inflows actually began in 1991, and then peaked in 1995. Inflows from Japan during the period 1990 to 2000 show a few prominent characteristics. First of all, while Japanese direct investment rose sharply during the period, annual inflows fluctuated drastically. Secondly, cyclical pattern of inflows closely followed the fluctuation of the bilateral real exchange rate of Yen to Yuan, implying the possibility that Japanese multinational companies took the advantage of Yen appreciation for their investments. Finally, sectoral composition of Japanese FDI in China changed substantially, aligning with relatively labor-intensive sectors.

Figure 1 illustrates trends of Japanese direct investment in China's manufacturing and non-manufacturing sectors. Before 1991, majority of Japanese direct investment had been concentrated in non-manufacturing sector, mainly resource based industries. Inflows in manufacturing sector were moderate. For example, only 23.6 billion Yen

was invested in manufacturing sector in 1990, even lower than the inflows in non-manufacturing sector. An unprecedented investment boom started in 1991 as direct Japanese investment in manufacturing sector jumped to 41.9 billion Yen, 70 percent higher than the investment in the preceding year. Direct investment from Japan continued to grow at roughly 90 percent annual rate and reached its peak in 1995 with 336.8 billion Yen, which is more than twelve times higher compared with that of 1989. While the growth of inflows into non-manufacturing was not as impressive as into manufacturing sector, inflows to non-manufacturing sector surged to 85 billion Yen, more than tripled compared with that of 1990. The rising trend, however, reversed abruptly as Japanese direct investment in manufacturing sector plunged to 203 billion Yen, 40 percent lower than the peak level. The contraction of inflows continued until 1999, in which only 60 billion Yen, less than 20 percent of the peak level, was invested in manufacturing sector. With no exception, the inflows into non-manufacturing also followed the same fashion and decreased substantially over the same period, dropping to 19.8 billion Yen, which is less than a quarter percent of its peak level. Direct investment from Japan resumed its growth in 2000 and 2001, but at moderate rates.

The fluctuation of Japanese FDI in China is simply too large to be attributed to small variations of structure variables. It is necessary to appeal to cyclical factors that affect returns and costs to investments, such as exchange rates. For illustrating the correlation between Japanese direct investment inflows and real exchange rates, Figure 2 graphs annual inflows from Japan into China's manufacturing sector, along with average real exchange rate of Yen to Yuan during the period 1989 to 2000. Higher value of the real exchange rate represents an appreciation of Japanese Yen. It is straightforward to observe a striking correlation between inflows from Japan and the movement of real exchange rate. The fluctuation of inflows coincided closely with changes of real exchange rate. As Japanese Yen appreciated against Chinese Yuan, a significant increase in capital inflows from Japan occurred in the following period. A real depreciation in the value of Yen was subsequently followed by a decrease in direct investment from Japan. The pattern revealed by the figure indicates that Japanese multinational enterprises strategically took the advantage of exchange rate fluctuation, making more direct investment as Yen appreciated and lowering the pace of their investment while Yen depreciated.

Coinciding with the cyclical movement, sectoral composition of direct investment from Japan also experienced significantly changes. Since 1990, the focus of Japanese direct investment has gradually shifted to manufacturing, which has received substantially more investment than non-manufacturing. During the period 1989 to 2000, direct investment from Japan in manufacturing sector accumulated 1.5 trillion Yen, almost tripled cumulative inflows in non-manufacturing sector. The excessive concentration of inflows in manufacturing sector reflects the transition of Japanese direct investment from natural resources based industries to relatively labor intensive industries in which China has comparative advantages. It is well-known that Japanese industries are very competitive in manufacturing. Combining their matured technology and global marketing strength with China's relatively cheap labor definitely enhances their global competitiveness. Disaggregating the inflows by major manufacturing sectors provides further detailed evidences that direct investment by Japanese multinational enterprises has aligned with highly labor intensive sectors in China's manufacturing industry (see table 1). For instance, Japanese companies in 1989 only invested 1.4 billion Yen in China's textile industry, accounting for merely 5 percent of inflows, much less than what received by Electrical and Machinery sectors. However, the scale of inflows in Textile sector rose sharply and jumped to 45.5 billion Yen in 1995. The total investment in Textile industry over the period 1989 to 2000 amounted to 196 billion Yen, enabling Textile the second largest in terms of FDI inflows from Japan. It is worth to notice that most of textile products made by Japanese invested firms serve Japanese market rather than for China's domestic market. Therefore, surging Japanese FDI to Textile industry reflects the international division of labor, requiring that foreign direct investment should originate from investing country's comparatively disadvantage industry, which is potentially a comparatively advantaged industry in the hosting country (Kojima, 1982). With total 391 billion Yen cumulative investment in the same period, electrical sector continued to maintain its leading position in receiving Japanese FDI among all manufacturing sectors. Following Textile sector, Machinery became the third largest sector in terms of Japanese direct investment inflows and received total 190 billion Yen, 12.7 percent of total cumulative Japanese FDI in manufacturing

industry from 1989 to 2000. According to OECD classification², both Electrical and Machinery belong to medium-high-technology industries. With matured production technology and production process in the sectors, labor cost should play a key role in determining competitiveness of the industries. The inflows in the four low technology industries Food, Textile, Lumber& paper, and Metal, accounted for almost 30% of the total cumulative investment over the period, much higher than in 1989. Considering detailed composition of Japanese direct investment in China's manufacturing industry, we can infer that Japanese multinational enterprises' investment in China is the continuation of their traditional flying-gees investment pattern in Asian countries, in which comparative advantages of hosting countries largely determine the direction of capital flows.

3. Exchange Rates and FDI: A Literature Review

For multinational enterprises engaging in greenfield foreign direct investment, the most significant benefit of an devaluation on hosting country's currency is relatively low production costs. The depreciation leads to a reduction in costs of all production inputs that are purchased locally, such as labor, land, and intermediate inputs. Lower production cost gives rise to higher return of capitals, attracting more inflows of FDI. It is particular important for export-oriented FDI since the segmentation between production location and products market can prevent sales price from being impacted by the devaluation. Examining the effect of exchange rate on FDI, Kohlhagen (1977) used a static firm model analyzing the effect of a devaluation on the relative profitability and location decisions of multinational enterprises. He argued that the multinational enterprise tends to increase its production capacity in foreign country for serving domestic market, if foreign currency is devaluated against domestic currency. Cushman (1985) considered a two periods dynamic model in which the firm maximizes future real profits expressed in the domestic currency. Cushman included not only the level of exchange rates, but also the expected volatility of exchange rates. Having analyzed four models of direct investment, which differ in production location and product market, Cushman inferred that the direct effect of risk-adjusted expected real appreciation in the value of home country's currency will

² OECD Science, Technology and Industry Scored Board 2001—Towards a Knowledge Based Economy.

lower foreign investors production costs, thus stimulating inflows of foreign direct investment. As an extension of Cushman (1985), Benassy-Quere (2001) examined the trade-off between exchange rate depreciation and its volatility in terms of their effect on FDI inflows. He argued that the negative impact of excessive volatility on FDI inflows might defuse apparent attractiveness induced by the currency depreciation.

The wealth channel of exchange rates' effect on FDI is modeled by Froot and Stein (1991). Assuming imperfect information on the return of firm-specific assets, they argued that the appreciation of foreign currency actually increases relative wealth of foreign investors and thus lowers the price of domestic assets in term of foreign currency. Although domestic investors could borrow foreign currency denominated loans given perfect capital mobility assumption, the presence of asymmetric information on the return of assets makes it more expensive to acquire the domestic assets by bank loans than by firms' internal capitals. Therefore, the wealth effect induced by real exchange rate appreciation would raise the leverage of foreign firms on acquiring domestic assets. Using the data on FDI flows to the US from seven industry countries over the period 1979 to 1991, Klein and Rosengren (1994) examined the relative importance of wealth channel and labor cost channel in determining FDI flows to the United States. With regards to their analysis, wealth channel is more significant than labor cost channel in determining foreign direct investment.

Blonigen (1997) provides an alternative view on how domestic currency devaluation leads to different bidding prices between foreign and domestic investors when both bidding for domestic firm-specific assets, thus inducing more foreign direct investment inflows. He argued that the appreciation of foreign currency enables foreign investors to offer higher prices for domestic firm-specific assets than domestic bidders, because foreign investors can access foreign market, which is segmented from domestic market and cannot be accessed by domestic bidders. Blonigen tested his hypothesis based on the Japanese acquisition activities in the US. The empirical findings demonstrate that the appreciation of Japanese Yen to US dollar resulted in a significant increase in Japanese acquisition activities in the US.

Most of Empirical research on the context are based on the experienced of industrialized countries, in particular, the United States. Goldberg and Klein (1997) offered a comprehensive study concentrating on the role of real exchange rates in determining FDI flows from Japan and the United States to Southeast Asia and Latin America. Their empirical results indicate that the appreciation of Yen and US dollar did boost direct investment from Japan and US to these areas.

4. Empirical Analysis on the linkage between the Real Exchange Rate and Japanese Direct investment in China

As showed in figure 1, Japanese direct investment in China's manufacturing sector far exceeded the investment in its non-manufacturing sector. In other words, inflows in the manufacturing from 1989 to 2000 dominated the scene of Japan FDI in China. Hence, the empirical analysis below exclusively focuses on the manufacturing sector. Inflows in the manufacturing sector are divided into 9 sub-sectors: Food, Lumb & Pulp, Chemical, Metal, Textile, Electrical, Machinery, Transportation Equipment, and Others. The effect of the real exchange rate is examined for each individual sector. All FDI data are based on the statistics of Japanese Ministry of Finance. The data measures only the capital flows that actually crossing the border between China and Japan, thus the reinvestment by Japanese companies operating in China is not included. Following the practices of the literature (e.g., Froot and Stein, 1991, Klein, 1995; Goldberg & Klein, 1995; etc.), this paper employs the following simple specification:

$$\log(FDI_t / GDP_t) = \alpha + \beta_1 t + \beta_2 \log(g_t) + \beta_3 \log(e_{t-1}) + \varepsilon_t \quad (1)$$

GDP: China' real GDP,

FDI: Japanese FDI in a manufacturing sector,

t: time trend,

g:GDP growth rate of China,

e: the real bilateral exchange rate between Yen and Yuan.

According to the model specification, dependent variable is defined as the ratio of annual inflows in a manufacturing sector to China's real GDP in the same period. With respect to FDI theory, rising size of an economy generally raises its gravity to foreign direct investment, assuming other factors constant. It is referred as market size effect. Adjusting FDI flows by real GDP eliminates the influence of rising GDP

on the scale of FDI inflows. In other words, the specification actually models the variation of FDI inflows that is determined by other factors. Independent variables include time trend, GDP growth rate, and lagged bilateral real exchange rate. The time trend may catch the momentum of FDI inflows. Real GDP growth rate is usually considered as a proxy for average rate of return to capitals. Higher real GDP growth rate is expected to encourage more inflows of Japanese direct investment. The coefficient of real GDP growth rate should be positive. The last independent variable, the bilateral real exchange rate is defined as

$$e_t = e_{nt} \frac{CPI_{Japan_t}}{CPI_{China_t}} \quad (2)$$

Where e_{nt} is nominal exchange rate (Yuan/Yen), the value of Yen in terms of Yuan. Thus, an increase in the real exchange rate represents Yen's appreciation. If as expected, Yen appreciation relative to Yuan leads to an increase in direct investment inflows from Japan, the coefficient of the real exchange rate should be positive. The idea of using lagged real exchange rate rather the one in the current period is originated from the intuition sparked by figure 2, showing unambiguously there exists a time lag between Yen's appreciations and increases in the inflows. Two references real exchange rates: the real exchange rate of Yuan to Dollar and Yen to Dollar are used for calculating the real exchange rate. With the two references real exchange rates, equation (2) can be rewritten as

$$e_t = \frac{(\$ / CPI_{ust}) / (Yen / CPI_{jt})}{(\$ / CPI_{ust}) / (Yuan / CPI_{ct})} \quad (3)$$

The denominator of the right side in equation 3 is the real exchange rate between Yan and US Dollar, the numerator the real exchange rate between Yen and US dollar. Both reference real exchange rates are collected from IMF financial statistics.

Table 2 summarizes the estimates for all nine sectors. The estimated coefficients of the real exchange rate in all regressions are positive and highly significant, indicating that an appreciation of Yen does increases Japanese direct investment in China, consistent with the theoretical expectation. Except for Chemical sector, the

coefficients of the real exchange rate in all sectors are statistically significant at 5 percent. The empirical results show that the appreciation of Yen is generally associated with an increase in Japanese FDI flows to China's manufacturing. Similarly, the depreciation of Japanese Yen leads to the declination of the inflows. Note that both the dependent variable and the real exchange rate are in logarithm. The coefficients of the real exchange rate measure the elasticity of Japanese FDI to the real exchange rate. With respect to the estimates, the elasticities across all nine sectors exceed one, demonstrating that the direct investment by Japanese is very elastic to the variation of the real exchange rate. For instance, a one percent real appreciation of Yen gives rise to an expected 2.83 percent increase in the inflows to Textile sector, and an expected 2.31 percent increase in the inflows to Electric sector. The elasticity in Machinery sector is even higher with an estimate 3.28. Relatively high elasticity further proves the sensitivity of Japanese direct investment to the fluctuations of the real exchange rate. As far as the significance of GDP growth rate is concern, not all coefficients of GDP growth rate in the nine sectors are significant. Measured at 5 percent significance, only the coefficients in the regressions of Electrical and Transports are significantly positive. Although empirical results failed to show that GDP growth rate significantly drove Japanese direct investment inflows into the rest of sectors, it is inappropriate to infer that GDP growth rate does not matter for the direct investment in these sectors. One possible explanation is that, a 9 percent or even higher level GDP growth rate is indifferent with a 7 percent for Japanese companies, because both are significantly higher than the GDP growth of Japan, thus dropping from 9% to 7% will not lead to a reduction in Japanese FDI inflows.

One of the caveats of the individual regressions may be the small sample size used in the estimation. Due to the limit of data availability, only twelve years data are used for each individual sector. Although the positive correlation between Japanese FDI and the real exchange rate are consistently significant across all sectors, the relatively small sample size may lead to biased estimates, undermining the reliability and robustness of the estimates. In order to remedy the problem, I pooled all samples together and estimated a similar model with the pooled data. As indicated by the individual regression results, estimated constants of these regressions differ substantially. Hence, a fixed factor model should be more appropriate than the one

with a homogeneous constant. Specifically, the fixed factor model for the panel data analysis is defined as

$$\log(FDI_{it}/GDP_t) = \alpha_i + \beta_1 t + \beta_2 \log(g_t) + \beta_3 \log(e_{t-1}) + \varepsilon_t \quad (4)$$

in which α_i is a sector-specific constant. The definitions for the rest of variables are same as in equation (1). To estimate β_i , the following transformed model is employed

$$\log\left(\frac{FDI_{it}}{GDP_t}\right) - E\left[\log\left(\frac{FDI_{it}}{GDP_t}\right)\right] = \beta_1 [t - E(t)] + \beta_2 [\log(g_t) - E(\log(g_t))] + \beta_3 [\log(e_{t-1}) - E(\log(e_{t-1}))] + \varepsilon_t$$

Table 3 reports the estimates of equation (5). There are no estimates for factor-specific constants, because all variables in equation are measured as the deviations from their corresponding means. The estimated coefficient of the lagged real exchange rate is 2.772, statistically significant at 1 percent, implying that an appreciation in Japanese Yen leads to an expected increase of Japanese direct investment in the following period. The coefficient of real GDP growth rate is also positive and statistically significant at one percent. The empirical result based on the fix-factor model is consistent with the reference derived from the individual regressions. A fixed-factor model, including an additional independent variable, the real exchange rate in current period, is also estimated. According to the estimates summarized in Table 3, adding the new independent variable does not change the results. Actually, the coefficient of the exchange rate in current period is statistically insignificant, indirectly supporting the original model specification that there exists a time lag between the real appreciation of Yen and an increase in inflows. The specification is consistent with business investment practices that there exist time lag between investment planning and the execution of the plan.

The simple specifications of both (3) and (4) do not include many structure variables such as market size, relative wages, tariffs, tax rates, etc. There are a few rationales for not considering these variables in this research. With regards to the definition of the dependent variable (FDI/GDP), the impact of market size in FDI inflows has been filtered out from the dependent variable. The FDI inflows considered in the model

should be independent of the market size. Tax heaven hypothesis for FDI determination is generally tested with cross-country data, creating variation for relative tax rates between FDI sourcing countries and FDI hosting countries. The FDI flows in the context, however, are the one from a single source country to another single host country. Therefore, the relative tax rate between the two should be time-invariant and have no impact on the variation of the inflows. Jumping over tariff-wall hypothesis on FDI motivation applies only to domestic market oriented FDI. As argued before, majority FDI in China, particularly Japanese direct investment, are export-oriented. Tariffs should be irrelevant. The relative wage of a Japanese worker to a Chinese worker can be defined as $e_{nt} \cdot (w_J/w_C)$. Since nominal wage difference between China and Japan is very large, the change (w_C/w_J) over the period under consideration is relatively small compared with the change of exchange rate e_{nt} . In other words, the variation of the relative wage should be attributed mainly to the fluctuation of the exchange rate, which has been included in the model as a key independent variable. Consequently, it is not necessary to include the relative wage as an additional independent variable.

Two factors contributed to the drastic fluctuation of the bilateral real exchange rate between Yen and Yuan over the period 1989 to 2000. One is the changing exchange rate regime in China in late 1993, causing a sharp devaluation of Chinese Yuan. The other is that Yuan is pegged to the US dollar, leading to Yuan depreciates against Yen whenever dollar depreciates against Yen. The sharp devaluation has been given credits for boosting China's exports, but few studies recognize the important contribution of the devaluation to China's surging FDI inflows. The empirical results presented here unambiguously demonstrate that China's deliberate devaluation contributes significantly to rising inflows of FDI. The devaluation performs critical role in determining the inflows of FDI to China, especially for export-oriented FDI. The drastic devaluation not only enhances China's comparative advantage in exporting sectors, but also increases its competitiveness in attracting FDI, which in turn drives further exports growth.

5. Conclusion

In 1990s, China experienced two significant phenomenon: FDI boom and sharp devaluation of Chinese Yuan. While the former has attracted substantial attention,

few systematic studies investigate the linkage between the two. Although the sharp devaluation raised the relative wealth of foreign investors and reduced China's local production costs in terms of foreign currency, which are recognized as critical factors determining FDI flows, the contribution of Yuan's drastic devaluation in early 1990s to China's FDI has been largely ignored. This paper applies a different approach investigating the determinants of FDI in China. Specifically, it emphasizes the role of exchange rate. For examining the linkage between China's FDI inflows and exchanger rate, this paper analyzes the effect of the bilateral real exchanger rate between Japanese Yen and Chinese Yuan on Japanese direct investment in China's manufacturing. Using the data of Japanese direct investment in China's nine major manufacturing sectors from 1989 to 2000, the paper conducts regression analysis with both time series and panel data. The empirical results show that there exists a significantly positive correlation between the bilateral real exchange rate and the inflows of Japanese direct investment to China. Specifically, the appreciation of Yen generally stimulated the inflows of Japanese direct investment while the depreciation of Yen leading to a decrease of the investment. To a large extent, the rise and fall of Japanese direct investment in China over the period is attributed to the fluctuations of the bilateral real exchange rate. As the sharp devaluation of Chinese Yuan in early 1990s was triggered by merging its official exchange rate with its market rates, China's policy shift on its exchange rate regime should be credited for the surge of FDI inflows.

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Appendixes

Table 1 Japan's FDI Flows to China by Major Manufacturing Sectors
(100 millions Yen)

Sectors	1989		1995		2000		Cumulative FDI: 1989~2000	
	Value	Share (%)	Value	Share (%)	Value	Share (%)	Value	Share (%)
Food	18.22	6.61	136.92	4.07	23.42	2.79	928.39	6.18
Textile	14.53	5.27	455.33	13.52	29.99	3.57	1,961.29	13.05
Lumber&Pulp	1.90	0.69	67.50	2.00	5.97	0.71	235.54	1.57
Chemical	15.03	5.45	137.83	4.09	66.00	7.85	1,003.59	6.68
Metal	8.15	2.96	347.09	10.31	45.97	5.47	1,255.48	8.35
Machinery	57.33	20.80	463.14	13.75	94.54	11.25	1,903.93	12.67
Electrical	106.77	38.73	904.36	26.85	356.61	42.44	3,915.01	26.05
Transport	1.56	0.57	370.10	10.99	98.76	11.75	1,540.42	10.25
Others	52.15	18.92	485.38	14.41	119.04	14.17	2,282.29	15.19
Total	275.69	100.00	3,367.69	100.00	840.34	100.00	15,026.87	100.00

Source: Monthly Statistics by Japanese Ministry of Finance

Table 2 The Effect of Real Exchange Rates on Japanese FDI in China's Major Manufacturing Sectors

Dependent variable $\log(\text{FDI}_{it}/\text{GDP}_t)$	Independent Variables				Adjusted R	# obs
	α	t	$\log(g_t)$	$\log(e_{t-1})$		
Food	-14.59 (3.70)	-0.11 (0.06)	0.50 (0.58)	2.78 (1.02)**	0.70	11
Textile	-14.64 (3.21)	-0.258** (0.05)	1.13* (0.50)	2.83** (0.89)	0.87	11
Lumber& Pulp	-22.31 (6.35)	-0.11 (0.06)	0.50 (0.58)	2.78** (1.02)	0.70	11
Chemical	-10.43 (3.43)	0.04 (0.06)	0.17 (0.54)	1.82 (0.94)*	0.59	11
Metal	-17.65 (3.03)	-0.09 (0.05)	-0.07 (0.48)	3.81*** (0.84)	0.81	11
Machinery	-13.83 (3.69)	-0.16** (0.06)	-0.34 (0.58)	3.28*** (1.02)	0.67	11
Electrical	-12.68 (3.19)	-0.09 (0.05)	1.16** (0.50)	2.31** (0.89)	0.80	11
Transport	-19.64 (2.45)	0.12** (0.04)	1.54*** (0.39)	3.16*** (0.68)	0.94	11
Others	-9.59 (2.39)	-0.07 (0.04)	0.78* (0.38)	1.67** (0.66)	0.78	11

*, **, and *** indicate statistic significances at 10%, 5%, and 1% respectively. Numbers in parentheses are standard errors.

Table 3 The Impact of Real Exchange Rates on Japanese FDI in China's Manufacturing

Dependent variable $\log(FDI_{it}/GDP_t)$	Independent Variables				Adjusted R	# obs
	t	$\log(g_t)$	$\log(e_{t-1})$	$\log(e_t)$		
Fixed Factor Model without e_t	-0.023** (0.010)	0.035*** (0.011)	2.722*** (0.361)		0.569	99
Fixed Factor Model With e_t	-0.020* (0.011)	0.044*** (0.015)	2.942*** (0.443)	-0.600 (0.652)	0.572	99

*, **, and *** indicate statistic significances at 10%, 5%, and 1% respectively. Numbers in parentheses are standard errors.

Figure 1

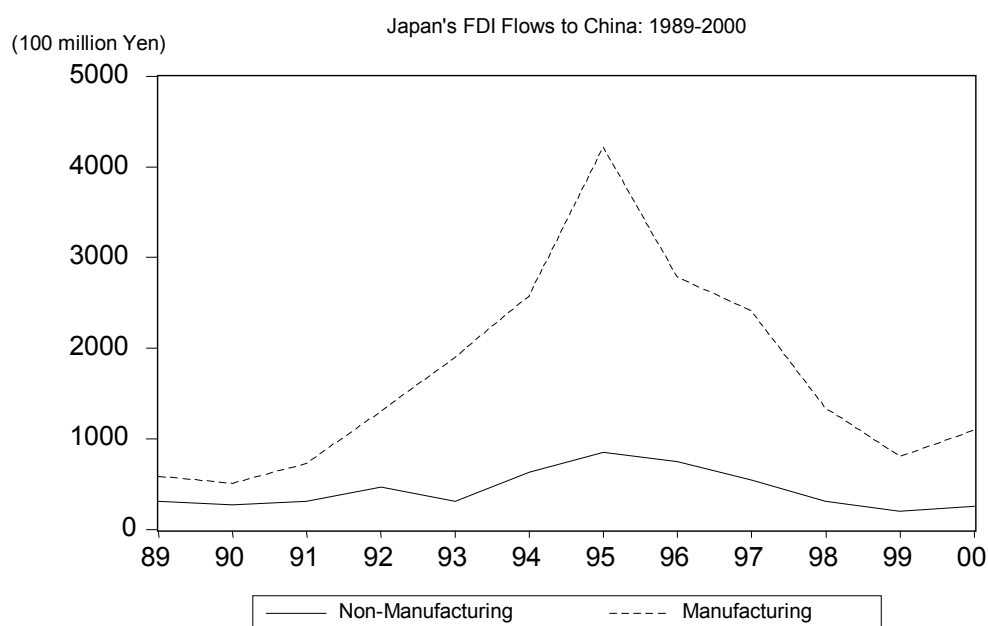
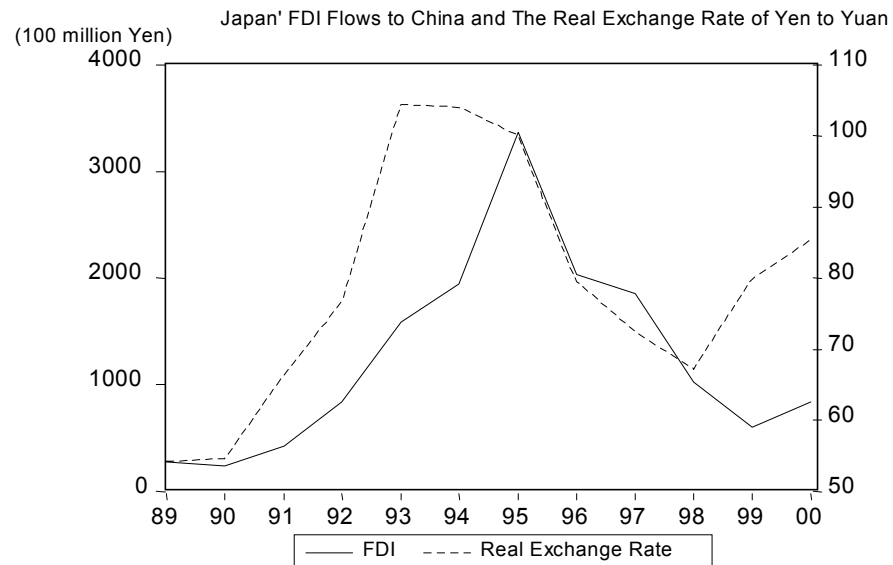


Figure 2



*The real exchange rate of 1995=100. High value of the real exchange rate indicates the appreciation of Japanese Yen. The FDI flows include only the investments in manufacturing industries.