

# DISCUSSION PAPERS IN ECONOMICS

## The Chaotic Attractor of Foreign Direct Investment - Why China? A Panel Data Analysis

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# The Chaotic Attractor of Foreign Direct Investment - Why China? A Panel Data Analysis

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## Abstract

We explain why China is a “chaotic” or “strange” attractor of FDI. It is an “attractor” because its FDI inflows increased steadily even though the world FDI inflows have decreased considerably in recent years. It is indeed “strange,” since its rates of FDI return are below the world average and predictions of its economic collapse are abundant. We find that Hong Kong and Taiwan are predominant players (40 to 60% of total FDI), followed by the United States and EU, and the size of investment is generally very small. The concept of the China Circle should be expanded to the East Asia Circle, which is experienced by Taiwan and Korea in earlier decades. We also considered some important characteristics, including the regional distribution, geographic proximity, and cultural similarity of these countries. To avoid spurious regressions, we use panel unit root and cointegration tests developed in the last few years. The results from panel data regressions explain our observations quite satisfactorily.

JEL classification: F21; F23; C23; O53; F41

*Keywords:* FDI in China, Determinants of FDI, Economic Crisis in China, Cultural Similarity, Panel unit roots and Cointegration tests

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## 1. Introduction

A “chaotic attractor,” also called a “strange attractor,” is a mathematical term referring to a special set to which dynamic trajectories converge (are attracted). There trajectories are sensitive to initial conditions in that two nearby trajectories follow essentially different paths

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after a short time (strange), and their paths cannot be predicted (chaotic) (Gabisch and Lorenz, 1989). This paper uses the term figuratively, and, as a first step, investigates its statistical implications. In examining the world trend of foreign direct investment (FDI), we have found that despite a considerable decr

UNCTAD data. In Section 3, we explain why China has been a “strange” attractor, that is, despite predictions of imminent or near future collapse of its economy, it has still attracted massive FDI. We then, in Section 4, identify the major investors in China, and examine their country or ethnic characteristics in Section 5. Based on these findings, in Section 6, we propose a panel data analysis, after a brief review of current literature on the determinants of FDI. Section 7 concludes.

## 2. The world trend of FDI – China as an attractor

China opened her 14 coastal cities (Dalian, Qingdao, Shanghai, etc) only in early 1985, and published the “Regulation on Encouraging Investment by Foreign Firms” in late 1986 (CPCB, 2002, 67). But the economic reform and FDI intensified only after Deng Xiaoping’s southern tour in early 1992. Thus, FDI in China is a recent phenomenon (see the columns of Figures 1 and 2, which are explained below). Table 1 shows the amount, growth rates, and world share of FDI in major regions and countries<sup>2</sup> from 1991 to 2002. Levels are shown in bold face and in billions of US dollars. The FDI inflow average during the recent period (1997-2002) was US\$ 853 billion per year, which is a 235% (or 3.35 times) increase over the annual average of US\$ 254 billion of the earlier period (1991-1996). Thus the world FDI increased rapidly. However, it also fluctuated abruptly. It almost tripled from US\$ 482 billion in 1997 to US\$ 1,400 billion in 2000, but fell more than 50% to a mere US\$ 650 billion in 2002. The coefficient of variation<sup>3</sup> is 39%. Thus, the world capital inflows have been volatile in almost all regions and countries. Table 1 shows that volatility has been higher among the developed economies, which have accounted for, on average, 73% of the world FDI inflows. The United States (62% CV) experienced the greatest fluctuation, then Japan (52%), followed by the European Union (50% CV).

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Place Table 1 here  
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By comparison, the volatility in developing economies is subdued (15% CV), although their aggregate world share of FDI inflows has averaged only 24% in the recent period. The ASEAN5 countries (Indonesia, Malaysia, Philippines, Thailand, and Vietnam) as a whole have consistently lost FDI inflow since 1997, except in 2002, and have fluctuated substantially (63%

CV), although their world share has been about 1% in the recent period. The FDI inflows to the NIEs (Asian Newly Industrializing Economies: South Korea, Taiwan, Singapore, and Hong Kong), have increased considerably between the two periods, except for Singapore, but they also have had a higher degree of fluctuation, especially Hong Kong and Taiwan. Their fluctuation has even exceeded that of the developed economies. The sudden increase in FDI in Hong Kong and Taiwan in 2000 might be due to foreign firms' anticipation of emerging opportunities in China after China's accession to WTO, and their desire to "park funds" in Hong Kong and Taiwan.<sup>4</sup> After 2001, these funds have gone directly into China rather than "routing" through Hong Kong and Taiwan, explaining the drastic decrease in FDI in these two economies in the subsequent two years. A similar explanation may be applied to the decrease in FDI in Korea and Singapore in 2001 and 2002, after their FDI's relocated to China.

China and India are two major exceptions in the world. FDI inflows in both countries have increased steadily since 1997, except for a slight decrease in 1998 and 1999, and both countries showed an increase in FDI inflows even during 2001 and 2002. Comparing the two periods, Chinese FDI increased only 76%, and Indian FDI 170%, and China had the smallest volatility (10% CV) among the regions and countries in Table 1 during this period. However, in terms of world shares, India had consistently less than 1%, while China attracted 3% to 10% of world FDI. In 2002, Chinese FDI inflow was US\$ 52.7 billion, 8.1% of the world share, greatly exceeding the inflow to the United States, US\$ 30 billion, which was 4.6% of the world share. In other words, when the developing countries, especially the governments in the Asia-Pacific regions, were starving for FDI during 2001 and 2002, China alone attracted as much as a quarter to a third of the foreign capital flowing into developing economies.

### **3. The strange attractor**

What makes China so attractive for FDI, and who are the major investors in China? It is certainly not attractive because of the high rate of return on FDI. Table 2 shows the rates of return based on FDI income divided by the average FDI stock between the beginning and the end of the year (UNCTAD, 2003, Annex). For individual investment projects, the average return on FDI in China from 1999 to 2002, was 5.9%, lower than the world average of 6.5% as well as the developed countries average of 6.7%, and only about 1.5% higher than the developing economies average of 4.4%. Among the 10 Asian countries listed in Table 2, the return from

FDI in China<sup>5</sup> was 5.9%, much less than the average returns of these 10 countries, 7.7%, and less than 50% of that in Hong Kong (12.5%), Malaysia (12.3%), Papua New Guinea (11.3%), and Philippines (7.3%). More generally, to see the low rates of return on investment in China from another angle, Table 3 shows the returns ( $q_m$ ) on corporate investment (not necessarily FDI) as a fraction of the costs of capital<sup>6</sup> in 47 countries (Gugler, Mueller, and Yurtoglu, 2003). China's return on investment was mere 45% of its cost, ranked 43<sup>rd</sup>, much lower than those of ASEAN4, and only about one-half of that of India. For comparison, we also include the rates of return on investment in some South American countries. Except for Brazil and Peru, their rates of return were also higher than those of China. Despite the low rates of return on investment, China has attracted a great deal of FDI, as we have seen in Table 1, while all other countries were not attracting, or even losing, foreign capital, especially Hong Kong. Apparently, the law of supply and demand of foreign capital has not been working in the Chinese case.

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Furthermore, a recent Global Competitiveness Report by World Economic Forum (WEF, 2003) ranked China's economic prospects over the next few years as 44<sup>th</sup> out of 82 countries in the world, due to its deteriorating public infrastructure, severe political corruption, and underdeveloped legal system, etc. China ranked<sup>8</sup> far below Taiwan (5<sup>th</sup>), Singapore (6<sup>th</sup>), Korea (18<sup>th</sup>), Hong Kong (24<sup>th</sup>), Malaysia (29<sup>th</sup>), and Thailand (32<sup>nd</sup>). With these potential economic, social, and political problems or disasters, it is indeed "strange" that China still can attract so much FDI.

#### **4. The major players**

Who are the players in China's capital market, and what are their motives? Table 4 shows the major players in China's actual (instead of approved) FDI market,<sup>9</sup> based on Chinese sources. The data consist of cases in 1,000, amount in US\$ million (m) or US\$ billion (b), and the size (amount per case) in US\$ million. Levels are in bold face fonts. They are divided into the cumulative FDI up to 1999, and the FDI in 2002. The data are then grouped into six regions. We define the Asian developed countries (ADC), consisting of Japan, Taiwan, Singapore, and Korea. As usual, if Hong Kong is added, we denote it as ADC+. The cases and amount of FDI from Macao are very small compared with those from Hong Kong; nevertheless, we have listed Macao in the ADC+ group for reference. Other regions include North America, consisting of the United States and Canada; the ASEAN4, consis

the cumulative

average size of the investment increased to US\$ 1.5 million, an increase of 50%, but still a very small amount indeed.<sup>12</sup>

Note also that the percentage distribution and the rankings of the cases and amounts for most countries in the list in 2002 did not change much compared with the corresponding cumulative cases and amount up to 1999.

At a disaggregate level, Table 4 shows that, up to 1999, 86% of the cases and 75% of the total amount came from the ADC+, and Hong Kong alone contributed about half of the total cases (54%) and amount<sup>13</sup> (50%). This predominance has decreased recently, but Hong Kong still had 31% of total cases and 34% of total FDI in China in 2002. The size of the Hong Kong investment doubled in 2002, to US\$ 1.6 million, indicating a closer tie between China and Hong Kong, but, due to a general increase in the size of investments from other countries, its ranking improved only from 18<sup>th</sup> to 14<sup>th</sup>.

The Japanese and Taiwanese investments were a distant second, slightly less than 8% of the total amount for each country up to 1999 and also in 2002, but the number of Taiwanese cases (13% to 14%) was consistently twice as large as the number of Japanese to 14%)(d03 TcCpit for each coT







FDI inflows were concentrated in the Eastern Region: 80% of the cases up to 1999, which increased to 85% in 2002; 86% of the amount up to 1999, which increased slightly to 87% in





subcontractors also moved to China (the agglomeration effect). This explains, despite the political risk, the increase in the size and amount of investment from these two countries in recent years (Table 4), and also explains the investment from Hong Kong (Figure 2).

These attitudes and calculations are reflected in various surveys of ADC companies who invested in China. Table 8 shows survey results of the reasons for investment in China. In 1998, in Taiwan's survey of the automobile parts industry invested in China, as much as 86% and 64% of the firms, respectively, wanted to take advantages of lower production cost and easier access to the resources, while 64% was attracted by new market opportunities. Thus, lower production cost and easier access to resources were the predominant reasons for investment. Similar results were obtained in Japan's 2001 survey (78%) and Korea's survey (43%). For these firms, the new market opportunity were not as important, as shown by a comparison of Taiwan (64%), Japan 2001 (55%), and Korea (36%). Only in the 1986 survey of Japan it was indicated that new market opportunities played a predominant role (82% versus 23%). This was because, in the early years, only the larger Japanese MNC invested in China. Other reasons, like following own and other industries (the agglomeration effects) appear to be recent phenomena and of secondary importance for the Japanese FDI, while increasing exports and China's FDI policy (tax holidays, etc.) were not important for the Korean FDI. Thus, the survey results show that the major variables in conventional theory of FDI, low labor cost and market opportunity, have still held in the case of China with different degrees of emphasis.

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Place Tables 8 and 9 here  
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Table 9 shows a survey of problems faced by the Taiwanese and Japanese FDI firms in China. The basic problem appears to be the confusing legal system (68% for Taiwanese and 53% for Japanese), which may result in corruption (45%) and administrative inefficiency (64% and 14%). These are consistent with some of the reasons of incoming economic crises expounded in Section 3 above.

## 6. A panel data analysis

Conventional analysis of FDI has been based on FDI among the developed economies, or from developed countries to developing countries. There are two types of multinational



except the relative exchange rates, are found to be panel stationary at levels. Since their independent variables include time-invariant variables like geographic distance and “total cultural distance” (inappropriately using Taiwan as proxy for China), to avoid multicollinearity, the regression coefficients are estimated by using OLS and the random effects models. They find that relative wage rates, relative market size, exports, imports, country risk, and cultural differences are highly significant in determining FDI inflows to China. However, relative real exchange rate and geographic distance are not significant.

In our panel data analysis, based on Table 4, we concentrate our analysis on only five major investors from Hong Kong, Japan, Taiwan, Korea, and the United States, which together comprise 84% of FDI cases and 77% of FDI amount before 1999, and 74% of total FDI cases and 65% of FDI amount in 2002. Our purpose is to find the determinants of FDI in China by the major investing countries by grouping cultural factors and political and economic risk together in the fixed effect model of the panel data analysis, using unbalanced panel data<sup>27</sup> from 1986 to 2002. Based on the theory of MNC, as explained above, and recent study of FDI in general, our dependent variable is the log-value of FDI to China (FDI), which is deflated by China’s GDP deflator. The independent variables include market size (GDPX), wage differential (WRATIO), and openness (OPEN). We also include real exchange rate (EXRATE) as the financial variable, as it is considered to be one of the important financial determinants of international capital flows. These four variables are explained briefly below.

First, we have the two economies’ interaction variable, GDPX (in log value), which is the product of the  $i^{\text{th}}$  economy’s real GDP and China’s real GDP, each being deflated by its own GDP deflator. This variable measures the size of markets as envisioned by the horizontal MNC model, and has been used in Rauch and Trindade (2002), although they appear to have a hard time rationalizing the interaction variable, GDPX, as the product of the real GDP of the  $i^{\text{th}}$  economy and China’s real GDP, each being deflated by its own GDP deflator. This variable measures the size of markets as envisioned by the horizontal MNC model, and has been used in Rauch and Trindade (2002), although they appear to have a hard time rationalizing the interaction variable, GDPX, as the product of the real GDP of the  $i^{\text{th}}$  economy and China’s real GDP, each being deflated by its own GDP deflator.



Second, we have the logarithm of the ratio, WRATIO, of the real annual wage of the home country over that of China, the annual wages being deflated by the consumer price indexes of each country. This ratio captures the advantage of factor differentials as emphasized by the vertical MNC model. Rauch, et al. (2002) and Gao (2003) use the logarithm of GDP per capita between the  $i^{\text{th}}$  economy and China as the proxy for the wage/technology differential. However, since this proxy can be interpreted in many ways, and since real wage statistics are available, this





Japan, in that order, have smaller negative fixed effects than the United States. This would be because the United States, and to a lesser degree Japan, is unable to take full advantage of cultural similarity and ethnicity.

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We have also estimated the FEM in equation (1) using 60 balanced observations: 12 observations from 1991 to 2002 each from the five cross-section units. We find that the estimation results are very similar to the results in Table 12 using the unbalanced data sets. To save space, we do not present the results here. In addition to running the fixed effects model, we have also considered the random effects model. However, since our countries consist of ADC+ and the United States chosen from Table 4, not selected by random sampling from the population, it is not appropriate to estimate the panel regression using the random effects method.<sup>29</sup>

In general, our empirical findings support the theory that market size, wage differential, openness, and country characteristics, except for exchange rate, are the most important factors in attracting FDI in China for these five economies.<sup>30</sup>

### C. Dynamic panel model

The dynamic model at the right-hand side of Table 12 considers the agglomeration effect explicitly by including FDIP, the one period lagged dependent variable as an independent variable in equation (1), that is,

$$FDI_{it} = \alpha_0 + \alpha_1 FDIP_{it} + \alpha_2 GDPX_{it} + \alpha_3 WRATIO_{it} + \alpha_4 OPEN_{it} + \alpha_5 EXRATE_{it} + \epsilon_{it}. \quad (2)$$

where FDIP is the past FDI which captures the motive for FDI firms which follow the investment of its own or other industry to invest in China. The estimation results show that the coefficient of WRATIO becomes insignificant and that of EXRATE becomes highly significant at the 1% level. The interpretation here is that if a firm follows its own and other industries in investing in China, the group externality accrued to the firm, like convenience in acquiring intermediate materials, information exchange, and increase in the firm's competition and bargaining power against the local labor, etc., may render low wage rates unimportant. On the

other hand, increase in investment projects after the firms follow each other in investing in China increases the export activities and competition, making the exchange rates important in determining FDI inflows.

The dynamic model also makes country characteristics, as indicated by the fix effects, insignificant for the ADC+, but not for the United States. The intercept of the USA is a negative large value and significant at the 5% level. This means that under the group effect, the negative factors still affect FDI inflows, but the impact on the ADC+ become less important and not significant. For the United States, cultural similarity and ethnicity, geographic distance to China, potential crisis in Chinese economy and society, etc., still work heavily against US FDI inflows to China.

Furthermore, we have also tried to estimate the autoregressive distributed lag model (ARDL) by extending the lag length of FDI to 2 and 3 as the independent variables in equation (2). The estimates are not much influenced by the additional lags of FDI.<sup>31</sup>

## **7. Conclusions**

This paper examines why China has attracted so much FDI in recent years while the world FDI inflows to other countries have been decreasing considerably, and many developing countries have been starving for FDI. In fact, available funds for fast developing countries have apparently been redirected and reallocated to China. The attraction is not that China has higher rates of return from investment, nor that it is an economically, politically, or socially stable and competitive country. On the contrary, the predictions of its collapse, if not imminent, are abundant. Our statistics show clearly that over one-third to one-h

We also find that, while the amount of foreign investment in China has been large, the size of investment per case has been quite small, merely one to two millions in US dollars, internalizing the political and social risk in China. Another evidence of uniqueness is that the ethnic investments have been concentrated in China's Eastern coastal cities and region, roughly distributed along the line of linguistic similarity and geographic proximity, and FDI inflows have shown a division of labor among themselves: The Hong Kong and Taiwanese firms finding niches in trading and restaurants and small-scale manufacturing, and the American and EU firms in large scale real estate, public services, transportation, and communication.

To evaluate the determinants of FDI in China, instead of applying the cross-section or time-series analysis, we propose a panel data analysis. After testing panel unit roots and cointegration to ensure no spurious regressions, the estimation results show that the fixed effects are negative and highly significant for each and every country, implying that although China appears to be the "chaotic" or "strange" attractor of FDI,

the estimation results also show how predictions could take place: there is a possibility of sudden oinp of capital inflows (1998) to China when real income, wage differential, or the degree of openness falls certain threshold levels. Furthermore, if some of the potential adversities that China might Wolf, et al. (2003) come true, or the inveoiors were indeed allured to the expectation of "million consumers' market" and the boom in FDI turns out to be a bubble, then considering the extreme volatility of FDI inflows, as shown in Table 1, future FDI inflows to China indeed can be predicted (chaotic).

The dire prediction notwithoianding, we found that, for the five  
 l wage differential affect FDI to China positively, consistent with the theory  
 ll as vertical models of MNC. The implication is that, admittedly, for the  
 United States

substituted by the agglomeration effect and exchange rate in the dynamic model. The positive effect of openness on FDI inflows indicates that FDI and trade are complementary. They grow together in the case of China, like the cases of Japan, Taiwan, and Korea a decade or two ago. The effect of change in exchange rate on FDI is positive, indicating Yuan depreciation will make labor and assets in China cheaper and increases FDI. The effect is weakly significant in the static model but highly significant in the dynamic model.

In general, while the conclusions of this paper must be qualified by the data and short time series, it appears that our fixed effects model can explain why China has been a “strange attractor of FDI,” and why it is unpredictable or “chaotic.” The estimation results explain our observations quite satisfactorily.

### **Appendix: Data sources**

Hong Kong, including Macao, (HKM), Japan (JPN), and the United States (USA) have annual FDI data from 1986 to 2002, Taiwan (TWN) has annual FDI data from 1989 to 2002, all in US dollars, from China Statistical Yearbook and various official websites, in particular, <http://www.mofcom.gov.cn> (December 2003, in Chinese). Korea’s annual data (KOR) from 1990 to 2002 are taken from Lee (2003). US GDP in billion US\$ is from WDI (2003). GDP in billion US\$ for other countries, China’s imports from the home country, and China’s exports to the home country, in billion US\$, are taken from ICSEAD (2003). The GDP deflator and exchange rates (annual average rates) are from IMF (2003), except that Taiwan’s data are taken from ICSEAD (2003). Wages in manufacturing (men and women) and consumer price general indexes (1990=100) are taken from labor statistics (LABORSTA), the International Labor Office website. Non-linear interpolation has been applied to the wage series of Japan and Korea.

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## Footnotes

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<sup>1</sup> In this paper, China means the China Proper, or the Chinese mainland, separate from Hong Kong and Macao.

<sup>2</sup> The data are taken from the data annexes of UNCTAD, 2003. Note that, the FDI inflow amounts of developed economies and developing economies somehow do not sum to the world total, apparently FDI from free ports (see Table 4) are not included.

<sup>3</sup> The coefficient of variation here is defined as the ratio of unbiased (or sample) standard deviation divided by the mean and then multiplied by 100.

<sup>4</sup> UNCTAD (2001, 25). In the 2001 survey of over 3,000 foreign transnational corporations (TNC) in Hong Kong, 45% planned to increase investment in China, 93% considered the investment climate in China to be favorable or very favorable in the next five years (ibid).

<sup>5</sup> Michel Plummer commented on the original paper that “Firms don’t immediately expect a return from their investments, gives one explanation of China’s low return. They often take quite a while before they generate income that would show up in the BOP. Given that DFI inflows in China are relatively NEW, perhaps this could explain why rates of return are low ... the return on the huge increase in the denominator will only show up in the numerator after a while.” However, if Table 3 is any indication, China’s rates of return on investment are still very low even if we consider the period from 1994 to 1999.

<sup>6</sup> The  $q_m = r/i$  where  $r$  is the return on a firm’s investment, and  $i$  is its cost of capital, and is the marginal Tobin’s  $q$ . It is “the change in the market value of a firm divided by the change in its capital stock (investment) that caused it” (Gugler, et al., 2003, 9), and is an ordinary least-squares estimate for each country. Note that, conceivably, the rates of return on FDI investment should be higher than the genera 0.001 Tw -23.448

<sup>13</sup> Part of the Hong Kong investment is actually either Taiwanese investment or Chinese capital from China in disguise, or round-tripping (UNCTAD, 2001, 25).

<sup>14</sup> For a detailed account of investment by overseas Chinese in ASEAN to China, see Lee (1998), and other articles in Twu (1998).

<sup>15</sup> More than half of Hong Kong's FDI outflows are routed to these free ports, some of the funds are channeled to China, and a sizeable portion even goes back to HK, or through HK to China. "Perhaps as much as 40 per cent of total FDI inflows to Hong Kong ... in 1998 was 'Hong Kong-tax haven routing.' Indeed, British Virgin Islands became the fourth largest source of FDI in China during 1999-2000, whereas Hong Kong's outward FDI directly to the mainland decreased since 1998." (UNCTAD, 2001, 25).

<sup>16</sup> At this point a satirist might ask "those Chinese Marxists/Communists please stand up!"

<sup>17</sup> "With the help of capital from Taiwan, the industrial belt stretching from Shenzhen to Dongguan has emerged as the world's largest supplier of information equipment. More than half of the roughly 13,000 foreign companies in Dongguan were ... from Hong Kong, but Taiwan ... has ... 4,000 firms (... Japanese companies 300). Of world production ... southeast China commands shares of 90% for mice, 60% for keyboards, and 50% for personal computers. ... 50% for copiers and printers. ... some 80% to 90% of the parts for such devices can be procured in an area within one-hour distance. The Zhujiang Delta has turned into a veritable battlefield ... It is said that for every firm that successfully moves into China, there is another firm that fails." (Seki, 2003).

<sup>18</sup> For the details of FDI from Hong Kong, Taiwan, and Korea in China, see various chapters in La Croix, Plummer, and Lee (1995), Lee (1996).

<sup>19</sup> The primitive and imperfect legal regime in China made Western MNC wary about security and stability, but benefit overseas Chinese (especially those from Hong Kong) because of cultural and linguistic links (Wei, 1998, 336), perhaps through Guanxi and corruption.

<sup>20</sup> Apparently, Taiwan's relation to China is similar to Sri Lanka's to India, and Hong Kong's relation to China is similar to that of foreign territories along the coast of India, such as Goa (Portugal), Mahe (France), Karikal (France), Pondichery (France), etc., to India. However, India is short of countries like Japan and the United States to "exploit" these territories to develop, and in turn, to "exploit" India. Here is the uniqueness of China, while the Indians may be aghast to such a notion.

<sup>21</sup> Our emphasis on cultural similarity and geographical proximity is not new. In Hsiao and Hsiao (1996, 272), we have pointed out that "So far as Japanese investment (in Taiwan) is concerned, geographic proximity, historic ties, and socio-linguistic similarity might have played a more important role than the political stability." Similar statements can be applied to the case in South Korea. Most Taiwanese and Koreans spoke Japanese after WWII (Hsiao and Hsiao, 2003). The Chinese case today is merely a repetition of history, with stronger ties on ethnicity and cultural similarity.

<sup>22</sup> "In the 1980s and the early 1990s, ... Chinese government ... systematically suppressed local entrepreneurs" for the sake of FDI, local "silk manufacturing, ivory sculptures, herbal medicine, ... are populated by foreign firms." (IMF, 2002).

<sup>23</sup> To attract Taiwanese investment in the Xiamen Special Economic Zone, "The first goal was to promote *détente* between the two sides of the straits and to increase unification prospects. ... The "hot tide" of Taiwan investment ... obliged the Taiwan authorities to retreat, ... induced large changes in Taiwan's policies vis-à-vis the mainland." (Wei and Zhu, 1995, 119).

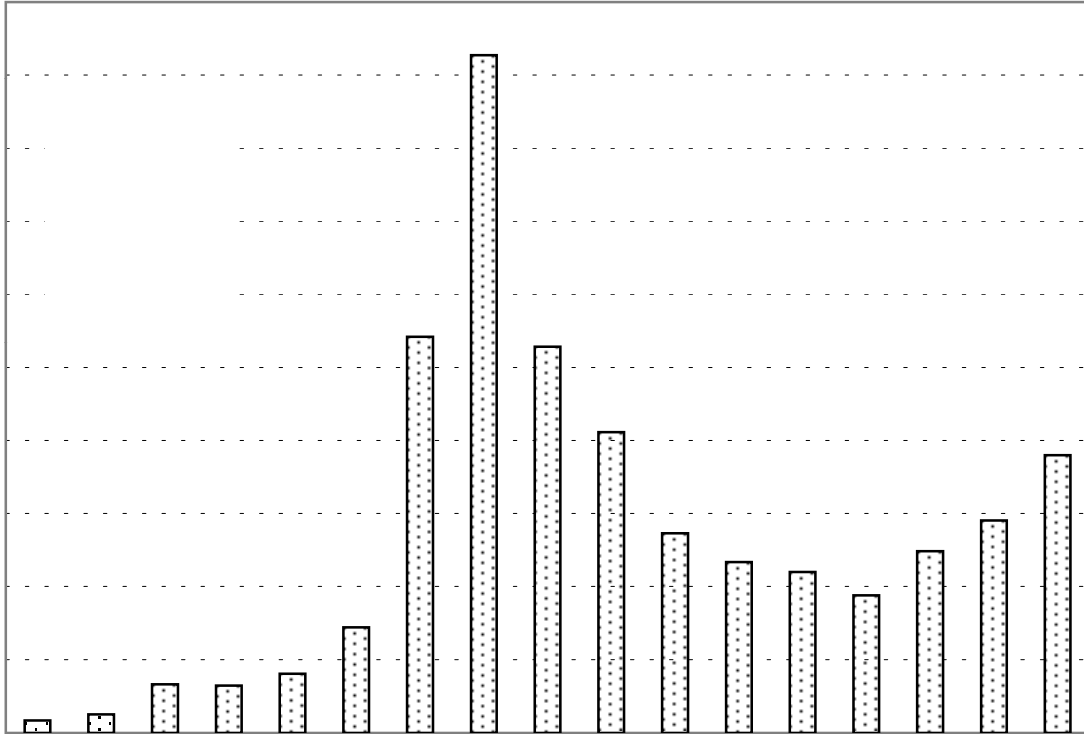
<sup>24</sup> Almost 500 Chinese missiles are aiming at Taiwan along the Eastern coast of China. The Taiwan Strait is one of the most insecure areas in the world.

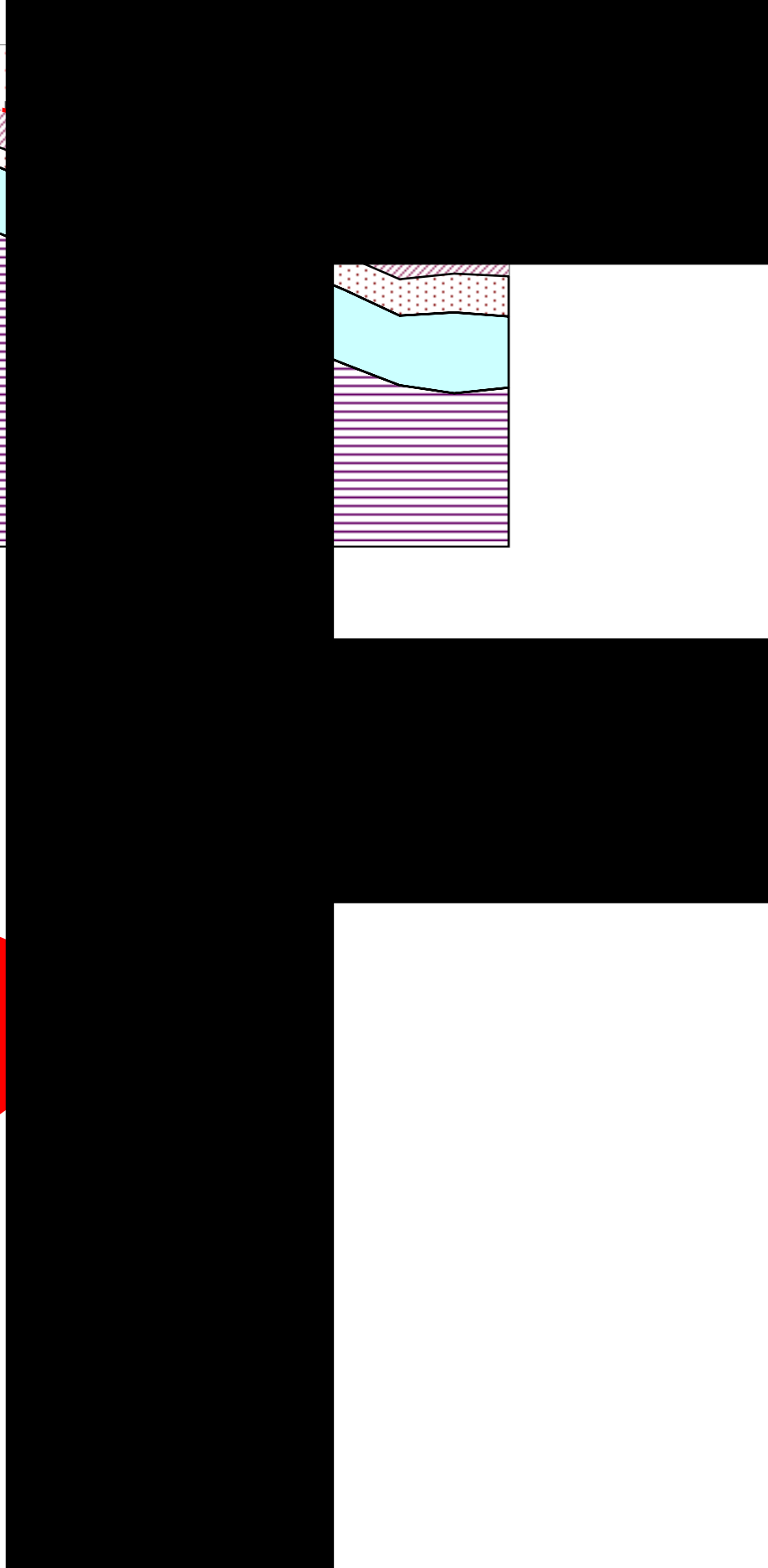
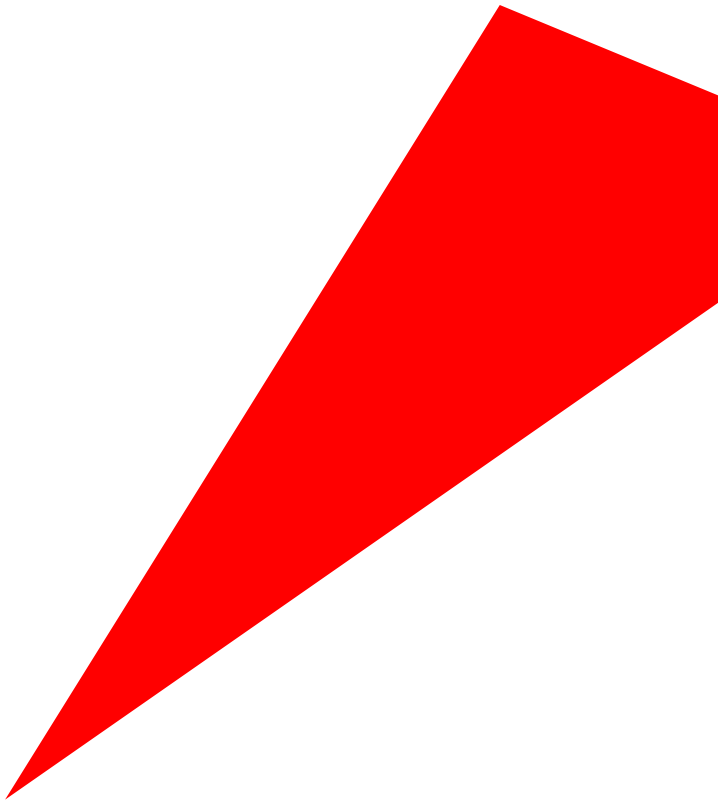
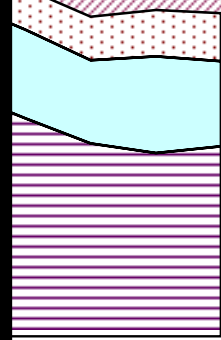
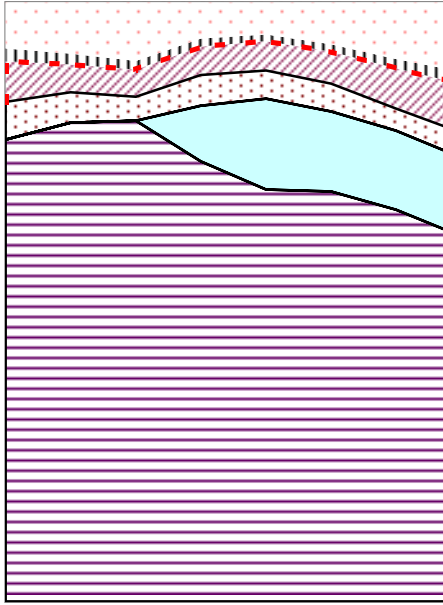
<sup>25</sup> Note also that the scale of Taiwanese FDI in China is also "substantially smaller than Taiwanese FDI in other low wage countries," such as Malaysia and Thailand (Chung, 1997, 168).

<sup>26</sup> In Xiamen in the early 1990s, Taiwanese "Small-to-medium-size projects (less than US\$ 1 million) accounted for about 65 percent of all projects. ... and returned profits almost immediately. ... projects are labor intensive. Nevertheless, .. technology and management were more advanced than Chinese firms,

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most of the Taiwan firms' products were exported overseas. ... Europe and American (75 percent), Japan (10 percent),...". (Wei and Zhu, 1995. 117-118). Chung (1997, 187-188) noted that, as Taiwanese exporters face harsh international competition, even savings of 8% (3% on direct labor and 5% on indirect cost) by producing in China, as compared with 5% in ASEAN, are "enough to attract FDI into China at the expense of the ASEAN countries."







**Table 1. FDI inflows, by host region and country, 1991-2002** (% and US\$ billion)

	Avg/yr 1991-96	1997	1998	1999	2000	2001	2002	Avg/yr 1997-02
<b>World</b>	<b>254.3</b>	<b>481.9</b>	<b>686.0</b>	<b>1079.1</b>	<b>1393.0</b>	<b>823.8</b>	<b>651.2</b>	<b>852.5</b>
Growth rate(%)		89	42	57	29	(41)	(21)	235
World share(%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
CV(%)								39
<b>Developed economies</b>	<b>154.6</b>	<b>269.7</b>	<b>472.3</b>	<b>824.6</b>	<b>1120.5</b>	<b>589.4</b>	<b>460.3</b>	<b>622.8</b>
Growth rate(%)		74	75	75	36	(47)	(22)	303
World share(%)	60.8	56.0	68.8	76.4	80.4	71.5	70.7	73.1
CV(%)								49
<b>European Union</b>	<b>87.6</b>	<b>127.9</b>	<b>249.9</b>	<b>475.5</b>	<b>683.9</b>	<b>389.4</b>	<b>374.4</b>	<b>383.5</b>
Growth rate(%)		46	95	90	44	(43)	(4)	338
World share(%)	34.4	26.5	36.4	44.1	49.1	47.3	75	

**Table 1 (Cont'd). FDI in flows, by host region and country, 1991-2002**

	Avg/yr 1991-96	1997	1998	1999	2000	2001	2002	Avg/yr 1997-02
<b>South, East &amp; SE Asia</b>	<b>56.1</b>	<b>100.1</b>	<b>90.1</b>	<b>105.3</b>	<b>138.7</b>	<b>97.6</b>	<b>88.6</b>	<b>103.4</b>
Growth rate(%)		78	(10)	17	32	(30)	(9)	84

	Rates of Return on FDI, selected economies (%)				
	1999	2000	2001	1999-2002	
	rkg	rkg	rkg	Avg	rkg
World average	<b>7.1</b>	<b>6.8</b>	<b>5.5</b>	<b>6.5</b>	
Developed countries average	7.4	7.1	5.7	6.7	



**Table 4. Cumulative FDI into China, 1979-1999, and 2002** (% and US\$)

1979-1999						2002					
Case		Amount		Size		Case		Amount		Size	
%	<i>Rkg</i>	%	<i>Rkg</i>	<b>m</b>	<i>Rkg</i>	%	<i>Rkg</i>	%	<i>Rkg</i>	<b>m</b>	<i>Rkg</i>

**Table 5. FDI by Region in China, 1979-1999, and 2002**

Unit	Cases						Amount						Size			
	Up to 1999			2002			Up to 1999			2002			Up to 99	2002		
	t	%	rkg	t	%	rkg	b	%	rkg	b	%	rkg	m	m	rkg	
<b>Total</b>	<b>342</b>	100		<b>34</b>	100		<b>308</b>	100		<b>53</b>	100		<b>0.9</b>		<b>1.5</b>	
<b>Eastern region</b>																
1 Guangdong	<b>80</b>	23	1	<b>6</b>	17	2	<b>87</b>	28	1	<b>11</b>	21	1	<b>1.1</b>	5	<b>2.0</b>	7
2 Jiangsu	<b>38</b>	11	2	<b>6</b>	17	1	<b>37</b>	12	2	<b>10</b>	19	2	<b>1.0</b>	6	<b>1.8</b>	13
3 Fujian	<b>26</b>	8	4	<b>2</b>	5	9	<b>30</b>	10	3	<b>4</b>	7	5	<b>1.1</b>	4	<b>2.1</b>	6
4 Shanghai M	<b>20</b>	6	5	<b>3</b>	9	5	<b>25</b>	8	4	<b>4</b>	8	4	<b>1.2</b>	3	<b>1.4</b>	19
Subtotal	<b>164</b>	48		<b>16</b>	48		<b>179</b>	58		<b>30</b>	56		1.1 a		1.8 a	
5 Shandong	<b>26</b>	8	3	<b>4</b>	12	3	<b>18</b>	6	5	<b>5</b>	9	3	<b>0.7</b>	18	<b>1.2</b>	26
6 Liaoning	<b>19</b>	6	6	<b>2</b>	6	6	<b>13</b>	4	7	<b>3</b>	6	6	<b>0.7</b>	21	<b>1.6</b>	16
7 Beijing M	<b>15</b>	4	9	<b>1</b>	4	10	<b>13</b>	4	8	<b>2</b>	3	10	<b>0.9</b>	11	<b>1.3</b>	23
8 Tianjin M	<b>13</b>	4	10	<b>1</b>	2	12	<b>12</b>	4	9	<b>2</b>	3	12	<b>0.9</b>	8	<b>1.9</b>	9
9 Zhejiang	<b>17</b>	5	7	<b>3</b>	10	4	<b>10</b>	3	11	<b>3</b>	6	7	<b>0.6</b>	25	<b>0.9</b>	29
10 Central Adm**	<b>2</b>	0	30	<b>0</b>	0	34	<b>8</b>	3	12	<b>0.3</b>	1	25	<b>5.1</b>	1	<b>67.9</b>	1
11 Hebei	<b>9</b>	3	11	<b>0</b>	1	16	<b>6</b>	2	15	<b>1</b>	1	17	<b>0.7</b>	19	<b>1.6</b>	14
12 Hainan	<b>9</b>	3	12	<b>0</b>	1	23	<b>6</b>	2	16	<b>1</b>	1	19	<b>0.7</b>	20	<b>2.2</b>	5
Subtotal	<b>110</b>	32		<b>13</b>	37		<b>85</b>	28		<b>16</b>	31		0.8 a		1.3 a	
City (in province)																
<i>Shenzhen (Guangdong)</i>	<b>16</b>	5	8	<b>2</b>	6	7	<b>14</b>	4	6	<b>3</b>	5	8	<b>0.8</b>	13	<b>1.4</b>	21
<i>Xiamen (Fujian)</i>	<b>5</b>	1	24	<b>0</b>	1	18	<b>10</b>	3	10	<b>1</b>	1	18	<b>2.2</b>	2	<b>1.6</b>	15
<i>Qingdao (Shandong)</i>	<b>6</b>	2	16	<b>2</b>	5	8	<b>5</b>	2	18	<b>2</b>	4	9	<b>0.8</b>	14	<b>1.2</b>	24
<i>Dalian (Liaoning)</i>	<b>8</b>	2	13	<b>1</b>	2	13	<b>7</b>	2	13	<b>2</b>	3	11	<b>0.9</b>	10	<b>1.9</b>	8
<i>Ninpo (Zhejiang)</i>	<b>5</b>	1	23	<b>1</b>	3	11	<b>3</b>	1	21	<b>1</b>	2	15	<b>0.7</b>	15	<b>1.0</b>	28
<b>Eastern total*</b>	<b>274</b>	80		<b>29</b>	85		<b>265</b>	86		<b>46</b>	87		<b>1.0</b>		<b>1.6</b>	
<b>Central total</b>	<b>42</b>	12		<b>3</b>	8		<b>26</b>	9		<b>5</b>	10		<b>0.6</b>		<b>1.8</b>	
<b>Western total</b>	<b>23</b>	7		<b>1</b>	3		<b>15</b>	5		<b>1</b>	2		<b>0.6</b>		<b>1.3</b>	
<b>Grand Total#</b>	<b>342</b>	99		<b>33</b>	96		<b>306</b>	100		<b>52</b>	98		<b>0.9</b>		<b>1.6</b>	

Sources: Same as Table 4.

\* The provinces and municipality total. The cities in italics are included in the provinces.

\*\* Central Administrative Departments. The 2002 data do not list this item, but list only "Others." The 2002 list does not include Sichuan, Zhongqin and Guizhou. The "Others" in 2002 consists only of 4 cases with the amount of 271.6 million, resulting in the size of \$67.9 million.

# The columns do not add to 100% due to rounding. Ranking (rkg) is taken for all 20 provinces, five autonomous regions, three municipalities, the five cities shown in the table, and "others."

a = average; b = US\$ billion; m = US\$ million; t = thousand.

**Table 6. Approved FDI by Industry, 1979-2002, 2002**

Item Unit	Approved 1979-2002						Appr'd 02		Actual 02					
	Cases		Amount		Size	Amount		Cases		Amount		Size		
	1000	%	US\$ b	%	US\$ m	US\$ b	%	1000	%	US\$ b	%	US\$ m		
<b>Total</b>	<b>424</b>	<b>100</b>	<b>828</b>	<b>100</b>	<b>2.0</b>	<b>83</b>	<b>100</b>	<b>34</b>	<b>100</b>	<b>53</b>	<b>100</b>	<b>1.5</b>		
<b>Primary industry</b>	<b>12</b>	<b>3</b>	<b>16</b>	<b>2</b>	<b>1.3</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>1.1</b>		
<b>Secondary Industry</b>	<b>325</b>	<b>77</b>	<b>566</b>	<b>68</b>	<b>1.7</b>	<b>61</b>	<b>74</b>	<b>25</b>	<b>74</b>	<b>39</b>	<b>73</b>	<b>1.5</b>		
Manufacturing	<b>310</b>	<b>73</b>	<b>524</b>	<b>63</b>	<b>1.7</b>									
Construction	<b>10</b>	<b>2</b>	<b>23</b>	<b>3</b>	<b>2.3</b>									
Transp and commun.	<b>5</b>	<b>1</b>	<b>19</b>	<b>2</b>	<b>4.0</b>									
<b>Tertiary Industry</b>	<b>87</b>	<b>21</b>	<b>247</b>	<b>30</b>	<b>2.8</b>	<b>20</b>	<b>24</b>	<b>8</b>	<b>23</b>	<b>13</b>	<b>25</b>	<b>1.6</b>		
Trading and restaurants	<b>21</b>	<b>5</b>	<b>26</b>	<b>3</b>	<b>1.2</b>									
Real estate and pub services	<b>45</b>	<b>11</b>	<b>181</b>	<b>22</b>	<b>4.0</b>									
Health, sports, & soc welf	<b>1</b>	<b>0</b>	<b>5</b>	<b>1</b>	<b>4.6</b>									
Edu, culture, and arts	<b>1</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>1.6</b>									
Science and technology	<b>3</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>1.1</b>									
Others	<b>15</b>	<b>4</b>	<b>28</b>	<b>3</b>	<b>1.9</b>									

Sources: Same as Table 4. b = billion, m = million.





**Table 10. Panel unit root tests of the Variables**

**Table 11. Johansen Cointegration tests:  
GDPX, WRATIO, and EXRATE**

Country	Max eigenvalue statistic Null hypothesis: rank = r			k
	r = 0	r ≤ 1	r ≤ 2	
Hong Kong	50.664 (0.000)***	23.027 (0.002)***	2.000 (0.157)	2
Taiwan	34.973 (0.000)***	10.037 (0.210)	4.561 (0.033)**	1
Korea	57.850 (0.000)***	8.711 (0.311)	1.135 (0.287)	1
Japan	52.562 (0.000)***	12.367 (0.100)*	5.603 (0.018)**	2
USA	49.917 (0.000)***	24.760 (0.001)***	18.543 (0.000)***	2
Fisher Chi-sq. panel cointeg.	89.906 (0.00000)***	37.253 (0.00005)***	39.505 (0.00002)***	

Notes:

Test equation includes constant and linear deterministic trend, and the p-values are in the parentheses.

\*\*\* (\*\*, \*) denotes rejection of the null hypothesis at the 1% (5%, 10%) level.

**Table 12. Panel Data Regression - the Fixed Effects Model**

Dependent variable: FDI				Unbalanced observations: 73			
	Static Model			Dynamic Model			
	Coefficient	t-value	p-value	Coefficient	t-value	p-value	
<i>Intercept</i>							
HKM-C	-14.056	-4.59	0.00 ***	-2.811	-1.09	0.28	
TWN-C	-15.083	-4.07	0.00 ***	-2.223	-0.73	0.47	
KOR-C	-15.392	-3.23	0.00 ***	-0.454	-0.12	0.91	
JPN-C	-19.725	-4.20	0.00 ***	-2.671	-0.68	0.50	
USA-C	-23.123	-6.27	0.00 ***	-6.614	-2.00	0.05 **	
<i>Slope</i>							
FDIP				0.585	8.10	0.00 ***	
GDPX	1.409	6.88	0.00 ***	0.409	2.15	0.04 **	
WRATIO	0.779	2.87	0.01 ***	0.063	0.30	0.77	
OPEN	0.750	4.91	0.00 ***	0.308	2.55	0.01 ***	
EXRATE	0.576	1.40	0.17 *	0.776	2.67	0.01 ***	
Adjusted R <sup>2</sup>	0.886			0.943			
d.w. (d)	1.339						

Note:

\*\*\* (\*\*, \*) denotes significant at the 1% (5%, 20%) level, respectively.