

Korea's FDI into China: Determinants of the Provincial Distribution*

Chang-Soo Lee**

The major findings of this paper are as follows. First, the distance variable is a very significant factor in Korean investors' choice of FDI location in China. Second, the effect of openness and infrastructure are not identified as determinants of Korean FDI in China, whereas they are with statistical significance in the case of world FDI. Third, market-size related variables do not have a substantial effect on the location of Korean FDI in China because Korean investors are not always motivated by local market-related factors; rather, Korean investors locate in China to engage in processing trade activities. Fourth, China's abundance of skilled labor, investment promoting policies, internal reforms, and ethnic ties are major determinants of location for Korea's FDI. This stems from the participation of the Korean affiliates in China in the international segmentation of production, which is closely linked to processing trade.

Keywords: FDI into China, Determinants of the Provincial Distribution, Gravity Equation

JEL Classification: F21, F23, P33

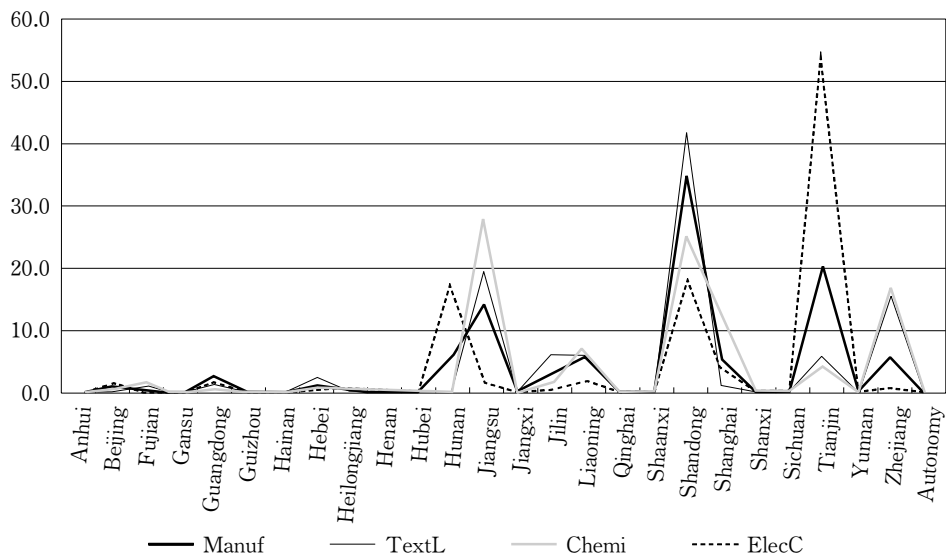
I. Introduction

Economic ties between Korea and China strengthened greatly in the 1990s as the two countries became important trade partners to each other. Korea's FDI into China is thought to have contributed greatly to this process. Figure 1 shows the provincial distribution of Korea's FDI (manufacturing as a whole, textiles, clothing and leather products, petroleum and chemical products, and electronics

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** Research fellow. Korea Institute for International Economic Policy, E-mail: cslee@kiep.go.kr

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<Figure 1> Geographical Distribution of Korea's FDI (2001)

and telecommunications equipment) in 2001, indicating that Tianjin, Shandong, Jiangsu and Liaoning have larger inflow shares than other provinces. What are the major factors that determine this geographical pattern?

Some Korean investors (particularly small and medium-sized enterprises) are motivated by China's low production costs, while others (large conglomerates) are in pursuit of local sales. Thus, Korean investors are not all influenced by the same local factors in determining the location of their investments. Identifying the significant factors is an important issue as it can reveal whether the main motivation of Korea's FDI into China has shifted from China's low production costs to the Chinese market (Jee, 2002; Kim 1999).

It is also likely that the determinants of Korean FDI into China are closely related to how Korean companies operate in China: they are largely engaged in processing trade and participate in the international segmentation of production, as observed by the OECD (2000) and Urata and Kawai (1998; 2002). Korea's FDI into China increases Korean exports to China since Korean affiliates in China import large amounts of intermediate goods and parts from Korea. Korean affiliates in China also export large amounts of their final goods to third countries, increasing China's trade volume and trade surplus with third countries such

as the United States (Lee, 2002). Degree of internal reforms, abundance of skilled labor, investment promoting policies, and ethnic ties in Chinese provinces are crucial in attracting Korean FDI in this regard.

Identifying the determinants can reveal whether Korean investment in China can be explained by the so-called bandwagon effect. Insignificance of local factors in choice of location would be evidence of such a phenomenon. Similarly, we can test whether the factors determining Korea's FDI into China are similar to those of world FDI as a whole. This issue is also important because it can provide some information on the characteristics of investment behavior peculiar to Korean investors.

The purpose of this paper is to identify the major factors determining the location of Korea's FDI across 25 Chinese provinces, comparing the results with those of world FDI as a whole, and to understand why those factors are important. Considering the characteristics of processing trade and international segmentation of production of Korea's FDI into China, three arguments are constructed in section II and evaluated in the last section. The arguments are as follows. (1) The local market does not strongly influence location in the case of Korean FDI. (2) The factors closely linked with processing trade and international production network, such as internal reforms, investment promoting policies and ethnic ties, are crucial in the choice of location. (3) The distance variable is very significant in the gravity estimation because of its relation to processing trade.

To answer these arguments, we estimate the generally specified equations for the determinants of FDI: a gravity equation on the one hand and Demurger's equation on the other hand. The basic questions regarding these estimation approaches are as follows. Can the gravity equation explain the geographical distribution of Korean FDI in China? Are the determinants of Korea's FDI into China similar to those of the world FDI into China?

The structure of this paper is as follows. Section II introduces the basic facts regarding Korean FDI into China, highlighting the importance of processing trade and international segmentation of production. Then, three arguments are constructed, considering those facts. Section III verifies empirically whether the gravity equation can explain the provincial location of Korea's FDI. In particular, we have a spe-

cial interest in whether the distance variable is significant. Section IV estimates Demurger's foreign investment equation using data for the world and Korea. Then, the determinant factors of Korea's FDI are compared with those of the world FDI in terms of choice of location. The second part of this section presents a reduced-form equation to identify and compare the determinants of geographical distribution of Korean FDI and world FDI. Major findings of this section are as follows: First, the share of FDI into China motivated by local sales is smaller in the case of Korean investors than in other cases. Second, internal reforms, abundance of skilled labor, investment promoting policies and ethnic ties were major determinants of location of Korea's FDI. Section VI summarizes the results of the previous sections and evaluates the three basic arguments of this paper.

II. Korea's FDI into China: Processing Trade and International Segmentation of Production

Lee (2002), a survey study on Korean affiliates in China, shows the basic feature of Korean FDI into China: processing trade and international segmentation of production, which are also identified as the main characteristics of world FDI into China (OECD, 2000; Demurger, 2000). It is highly plausible that the determinants of Korean FDI into China are closely linked with these characteristics. This section constructs three hypotheses on the determinants of locational distribution of Korea's FDI into China in this regard.

To obtain information about the processing trade and international segmentation of production activities of the Korean affiliates in China, investors were surveyed through one-to-one interviews (see Lee, 2002 for the details). <Table 1> shows the basic structure of the information sought by the survey on the procurement structure of intermediate goods and parts as well as the sales structure of final goods of Korean affiliates in China. Intermediate goods and parts are procured from local suppliers (A) and foreign imports (B), which is the sum of imports from home country (C) and those from the third country (B-C). Intra-firm pro-

〈Table 1〉 Survey Results Report Form (percent)

Intermediate goods Procurement		Final goods sales	
Local procurement	A	Local sales	A'
Import procurement	B	Export sales	B'
Import from home countries	C	Export to home country	C'
Import from the third countries	B-C	Export to the third countries	B'-C'
Intra-firm procurement share	F	Intra-firm sales share	F'

Note: $A + B = A' + B' = 100\%$.

curement share is simply the intra-firm trade share in total procurement of intermediate goods and parts. Similarly, the total sales of final goods of the affiliates in China are equal to the sum of local sales (A') and export sales (B'), which consists of re-exports to home country (C') and exports to a third country (B'-C'). Intra-firm sales share is just the intra-firm trade share in the affiliates' total sales.

Low (high) share of local sales (A') would support the argument that Korean FDI into China is less (more) motivated by local sales than in the general case as the theory predicts. The results of the survey indicate that this share is just 29.3 percent (〈Table 2〉).¹⁾ When we look at shares by area, the Bohai gulf region (Beijing, Tianjin, Shandong and Hebei), which is the location of the majority of Korea's FDI, and the Yangtze river delta region (Shanghai, Jiangsu, Zhejiang, Anhui), which is expected to attract Korean FDI motivated by local sales, record very low local sales shares. When we look at shares by industry, the two main industries of textiles, clothing and leather, and electrical and electronic equipment account for a 12.6 percent and 25.2 percent share of local sales. Thus, these survey results indicate that market size is not a substantial factor in determining the location of Korea's FDI. This is the first argument that we evaluate in Section V.

The second point derived from 〈Table 2〉 is that the activities of Korea's af-

1) This is 69.7 percent in the large conglomerate sample and 23.8 percent in the sample of small and medium-sized enterprises. These contrasting results between two samples lead to the projection that local sales becomes the major determinant in the future, considering the long-term trend of the increasing share of large conglomerates in the total FDI into China. However, the survey of 2002 shows that it is not the case at the moment.

〈Table 2〉 Procurement and Sales Structure: Korea's Affiliates in China

	A	C	B-C	F	A'	C'	B'-C'	F'
By size								
Total	42.4	43.9	3.7	39.7	29.3	20.2	50.5	24.9
Conglomerate	48.6	43.7	7.7	40.5	69.7	10.3	20.1	16.2
SMEs	41.6	43.9	14.5	39.6	23.8	21.5	54.7	26.1
By area								
Three northeastern provinces	51.4	35.0	13.6	29.3	36.6	20.9	42.5	23.8
Bohai gulf region	39.4	47.3	13.3	43.0	25.9	21.3	52.8	28.3
Yangtze delta region	60.0	30.5	9.5	29.0	14.0	11.4	56.0	15.8
Guangdong	45.0	38.8	16.2	41.7	40.9	6.7	46.4	11.2
By industry								
Food, beverages and tobacco	74.0	20.9	36.7	20.6	45.6	18.2	36.2	13.0
Textiles, clothing and leather	36.1	48.6	25.3	45.3	12.6	17.3	70.0	32.0
Wood and wood products	61.2	20.5	18.3	30.2	36.0	17.3	46.7	29.0
Publishing, printing and reproduction of recorded media	40.0	50.0	10.0	60.0	27.5	35.0	47.5	37.5
Chemicals and chemical products	50.3	20.3	29.4	27.7	58.3	27.1	14.6	29.5
Rubber and plastic products	44.2	52.3	3.5	48.2	33.7	7.2	59.1	27.9
Non-metallic mineral products	76.0	22.0	2.0	24.0	12.0	47.0	41.0	8.0
Metal and metal products	30.8	58.8	10.4	34.6	49.8	6.9	43.3	6.9
Machinery and equipment	44.0	54.6	1.4	31.5	65.5	30.8	3.7	15.6
Electrical and electronic equipment	31.3	51.3	17.4	49.5	25.2	24.7	50.1	24.2
Motor vehicles and other transport equipment	68.8	30.0	1.3	3.8	11.3	53.8	35.0	13.8

filiates in China contribute to the international segmentation of production, which is closely linked to processing trade.

Procurement share of intermediate goods from home country (C) and export sales share (B') could be clear indicators of the processing trade activities of Korean affiliates in China. The share of imports from Korea in intermediate goods procurement (C) is about 44 percent, irrespective of the size of firms, and 48.6 and 51.3 percent in textiles and clothing, and electrical and electronic equipment. A large part of these imports corresponded to the supply of inputs from parent firms to their affiliates and can thus be characterized as intra-firm trade. This intra-firm procurement share (F) is about 40 percent in our survey. Export sales share (B') is also very high. In particular, export sales to third countries

($B'-C'$) constitute a large share, amounting to 50.5 percent (20.1 percent in large conglomerates and 54.7 percent in SMEs). Export sales to third countries in the textiles and clothing, and electrical and electronic equipment industries also record 70.0 percent and 50.1 percent, respectively. Thus, we can say that FDI activities in China are closely related to processing trade.²⁾

〈Table 2〉 also provides empirical evidence of how China has participated in the international segmentation of production. Foreign invested enterprises (FIEs) in China play a crucial role in this by importing large amounts of intermediate goods and parts mainly from a home country (C) and export processed products to third countries ($B'-C'$) such as the United States and Japan, as well as the home country. The international sales and procurement structure, with foreign affiliates accounting for an overwhelming share of processing activities suggests that China plays the role of a production base for parent companies which have relocated segments of production in China. Thus, it is quite clear that China is involved in the international segmentation of the production process, specializing in the assembly and transformation of imported intermediate goods for export. In particular, foreign firms have transferred the downstream, labor intensive stages of production to China. This specialization in assembling operations has been well entrenched in the textile industry and has risen rapidly in the electric and electronic equipment industry (OECD, 2000).

Survey data on the sales and procurement structure of affiliates suggest that Korean firms are utilizing China as a production base for processing trade. Thus, we can construct the second argument that some factors related to the processing trade (imports of intermediate goods and exports of final goods to a third country) and production activities (assembling, processing and production) of Korean affiliates are crucial considerations in the choice of location of Korea's FDI. Those factors include degree of internal reforms, abundance of skilled

2) FIE processing activities have led to bilateral trade patterns, which help illustrate the reorganization of production which has taken place in Asia (with China becoming an assembly base for finished products for the supply of world markets). For instance, foreign affiliates in China recorded a large surplus from their processing trade with the EU and the US. They had a relatively balanced processing trade with Japan, an indication that intra-firm trade played an important part in Japan-China two-way trade. However, they had a large processing trade deficit with Taiwan and South Korea (OECD, 2000).

labor, investment promoting policies, and ethnic ties, etc. Internal reforms and investment policies with tax incentives (for example, specialized economic zones) are important in terms of the processing trade of Korean affiliates in China, while human capital abundance (H2) and internal reforms are influential factors related to the production activities of the Korean affiliates.

Distance is also a significant factor for location of FDI because the distance variable, an indicator for trade costs as well as investment costs, is closely linked to processing trade. This is the last argument of this study.

III. Can the Gravity Framework Explain the Provincial Distribution of Korea's FDI?

There is a long tradition of empirical research on the determinants of FDI. Lipsey and his co-authors, Eaton and Tamura (1996, 1994) have provided a variety of gravity models. This section conducts empirical analyses to explain the choice of locations for Korea's FDI into 25 Chinese provinces using the analytical framework of Lipsey (1999a) that finalizes the tradition of research by Lipsey and his colleagues.

The general implication of the gravity estimation is that the host provinces with a larger market size, faster economic growth and higher degree of economic development will provide more and better opportunities for foreign companies, and therefore, will attract more FDI. Can this hypothesis be verified in the case of Korea's FDI into Chinese provinces? In the case of U.S. FDI activity, the factors of market size (*GDP*) and growth rates (*GGDP*), per capita income (*CGDP*), distance, tax rates (*TaxPolicy*) and human capital abundance (*H*) account for about half the variation among developing host countries. Lipsey's equation is specified as follows:

$$\log(FDI_{ij}) = \alpha + \beta_1 \log GDP_j + \beta_2 GGDP_j + \beta_3 \log(CGDP_j) \\ + \beta_4 \log(DISTANCE_{ij}) + \beta_5 TaxPolicy_j + \beta_6 H_j + u_j$$

We estimate this gravity equation across 25 provinces in China that have re-

ceived FDI from Korea and examine whether this gravity approach works. Each FDI location is measured by the stock of investment in it using data from the Export-Import Bank of Korea. The data for three important independent variables, market size measured by nominal GDP (log value), growth in the host country's GDP and GDP per capita, are from the *China Statistical Yearbook*. Distances of the host provinces from Korea are measured by great circle distance available from <http://www.indo.com>. We use the number of special economic zones as a measure of the taxation and investment policy on FDIs in the host provinces. Secondary education attainment and secondary and tertiary education attainment (% of total population, H1 and H2 respectively) are also used as explanatory variables indicating the level of human capital accumulation (abundance of skilled labor) (see Appendix <Table 1> for list of variable names).

We expect host country market size to be positively related to Korea's FDI stock. A common motive behind FDI is to increase local sales. Especially in the case of FDI into areas in the Yangtze River delta region such as Shanghai, Jiangsu province and Zhejiang province, expansion of local sales is a particularly important motive for Korean firms. But local sales are not as important for Korean FDI in other provinces. For FDI in the other provinces, export sales to Korea and to third countries are more important than local sales. It is not certain whether the per capita income of the host country and the growth rate in GDP are positively related to Korea's FDI. The effect of per capita income, beyond that of market size, presumably reflects the orientation of Korean-based firms toward goods and services typically purchased by higher income consumers. In addition, a large coefficient for the growth rate in GDP implies the existence of market-driven factors beyond the effects of GDP and per capita GDP (Lipsey). Considering that Korean products are not always for higher income consumers, the sign of per capita income would be uncertain. On the other hand, the sign of growth rate in GDP would be uncertain considering that low production costs and exporting to a third country are the major motives for a relatively large share of the FDI undertaken by Korean firms in China. Distance from Korea can have a negative effect on Korea's FDI. A greater distance from Korea makes a foreign operation more difficult and expensive to supervise, and there-

fore might discourage investment. However, the complementarity between investment and trade is a more important reason for a negative coefficient for the distance variable, as it measures trade costs as well as investment costs. Investment and tax policies measured by special economic zones in host provinces should presumably have a positive effect on Korea's investment. Finally human capital abundance measured by secondary or secondary and tertiary school attainment could have a positive effect on FDI location.

First, we estimate Lipsey's gravity equation with all the explained variables included for two periods, 1994~1997 and 1998~2000.³⁾ We also take into account other variables measuring infrastructure quality and internal reforms of provinces. Extension length of railway (RAIL) or area of paved roads (ROAD) are good indicators of infrastructure while the share of the state sector in industrial output (STATE) is a good indicator of internal reforms. The results showed that Lipsey's original equation did not work because it uses GDP growth rate: only GDP per capita is significant with a positive coefficient for market size (GDP), whereas GDP growth rate and tax and investment policy (SEZ) are not significant at all. The implication is very clear. The market-related effects on attracting Korea's FDI are not big enough to be caught by GDP and GDP per capita.

We estimate the equation again after deleting the insignificant GDP growth rate, and the two best results are reported in <Table 3>. We focus on the 1994~1997 period because the next period is severely influenced by the Asian financial crisis. Model I shows that Lipsey's gravity equation can successfully explain the distribution of Korea's FDI across 25 Chinese provinces: the coefficients for GDP, GDP per capita and distance variables have right signs and statistically significant values at the 99percent level. Chinese provinces with larger market size, higher GDP per capita and closer distance from Seoul attracted more Korean FDI than other provinces.

However, we should be cautious in endorsing the gravity results. First, the

3) We can find changes in the volume and the regional and sectoral composition of Korea's FDI in the period after the Asian financial crisis compared to the earlier period from 1992, which is the year that the two countries launched the normalization of diplomatic relations between them. For this reason we focus on the two periods of 1994~1997 and 1998~2000.

〈Table 3〉 The Gravity Estimation

	1994~1997		1998~2000	
	Model I	Model II	Model I	Model II
Intercept	-2.28 (-0.2)	31.5 ⁺ (1.8)	-16.28 (-1.0)	8.57 (0.3)
Nominal GDP (log value)	1.27** (2.9)	1.44* (2.5)	0.88 (1.4)	0.56 (0.6)
GDP per capita (log value)	2.91** (4.2)	-0.07 (-0.1)	3.81** (4.2)	2.07 (1.1)
Distance (log value)	-3.19** (-3.2)	-3.45** (-3.8)	-2.38 ⁺ (-1.8)	-2.72* (-1.9)
State	-3.03 (-1.4)	-7.22* (-2.8)	-2.18 (-0.6)	-7.49 (-1.2)
Road		-0.81 (-1.2)		-0.44 (-0.4)
H		20.12* (2.1)		0.09 (0.8)
SEZ2		0.10 ⁺ (2.1)		0.12 (1.3)
Adjusted R^2 (Prob. F)	0.25** (0.00)	0.26** (0.00)	0.24** (0.00)	0.25** (0.0)

Notes: 1) Figures in parentheses are t -statistics.

2) **, *, and ⁺ denote significance at the 99%, 95%, and 90% levels, respectively.

effect of the distance variable should be considered. It is a well-known fact that Chinese reform measures were adopted only in a few coastal provinces in the first stage of development and Chinese economic growth was sustained by these provinces. The capital cities of these provinces happen to be close to Seoul in distance. Thus, the distance variable may be closely related to variables for internal reforms or openness (trade's share in GDP), and therefore, the degree of its effect on the provincial distribution of FDI may be overestimated. But this possibility is very low considering the correlation coefficients between distance and related variables. The second point to consider is that the GDP per capita is not independent of other explanatory variables. That is, factors such as human capital abundance (H), tax and investment policy (SEZ) and openness may be interrelated. High per capita GDP could be a result of abundant human capital, opening of the economy and investment stimulating policies. In fact, it is highly

probable considering the corresponding correlation coefficients. They are 0.68, 0.55 and 0.56, respectively.

Model II, with three more independent variables—infrastructure (ROAD), human capital (H2) and tax and investment policy (SEZ2)—shows that is the case. The coefficient for GDP per capita becomes negative and statistically insignificant. But the coefficients of internal reforms (STATE), human capital abundance (H2) and investment stimulating policies (SEZ) come to have the right signs with statistical significance. Thus, we can conclude that the gravity equation explains the distribution of Korea's FDI across Chinese provinces, even though the market related effect is not so big, and second, that human capital abundance, internal reforms and tax and investment policies are significant determinants attracting Korean FDI.

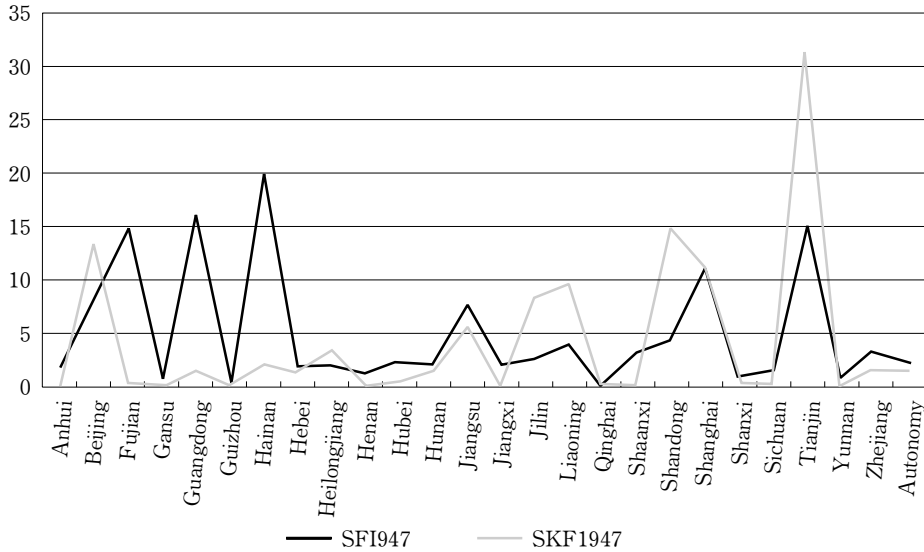
IV. Comparing the Determinants of Geographical Structure: Korean FDI and World FDI

1. Demurger's Foreign Investment Equation

Using Demurger's theoretical framework, this section compares the determinants of geographical structure of Korea's FDI with that of the world FDI into China. Are the determinants of Korea's FDI similar to that of the world FDI? <Figure 2> shows the geographical distribution of world FDI and Korean FDI across Chinese provinces. Korean investment share (SKFI) is relatively lower in Fujian, Guangdong and Hainan provinces, and higher in Tianjin, Shandong, Liaoning and Jilin provinces than foreign investment as a whole.

Berthelemy and Demurger (2000) derive two theoretical equations, the growth equation and foreign investment equation. They present important findings on Chinese economic growth after solving two simultaneous equations,⁴⁾ but we focus

4) The basic result of their study is that foreign investment was the predominant factor in China's growth (the engine of growth process), and that the open door policy is important in attracting foreign capital and technology.



Note: The data are adjusted to different levels for comparison purposes.

〈Figure 2〉 Foreign Investment Share: World vs. Korea

on the investment equation only to highlight the differences between the determinants of Korean FDI and world FDI distribution.⁵⁾ The foreign investment equation is

$$s_{FI} = \beta_0 + \beta_1 Y + \beta_2 g_Y + \beta_3 Rail + \beta_4 Open + \beta_5 Coll + \beta_6 s_{FI-1}$$

where Y is per capita GDP, $Rail$ is railway network length per square kilometer, $Open$ is the ratio of trade flows (export plus import) over GDP, and $Coll$ is the collective production in industrial output (see Appendix 〈Table 1〉).

Demurger’s specifications indicate that the geographic selectiveness of the openness policy and internal reforms is obviously the fundamental factor in the distribution of foreign investment. Openness (the ratio of the sum of exports and imports to GDP, OPEN) is introduced as an indicator of the degree of imple-

5) The growth equation is

$$g_Y = \alpha_0 + \alpha_1 g_L + \alpha_2 s_I + \alpha_3 s_{FI} + \alpha_4 g_{EXP} + \alpha_5 h + \alpha_6 h^* s_{FI}$$

where g_Y is the annual growth rate of real GDP, g_L is the annual growth rate of labor, s_I is the ratio of total investment in fixed assets to GDP, s_{FI} is the ratio of foreign investment to GDP, g_{EXP} is the growth rate of exports and h is the number of people over the total population who have completed a primary or secondary school education.

mentation of opening reforms (openness to trade). The collective production in industrial output (the share of collective enterprises in industrial output: COLL)⁶⁾ is also included in the explanatory variables as an indicator of the degree of internal reforms. Similarly the state production in industrial output (the share of state enterprises in industrial output: STATE) can be defined as an indicator of the degree of internal reforms (negative). Moreover, a good infrastructure, can be an important determinant of investment decisions, especially in the non-coastal provinces.⁷⁾ Finally, the actual and potential size of the host province's market proxied by per capita GDP levels and economic growth rates are also important factors attracting foreign investment. But note that GDP growth rate was found to be an unimportant factor in the preceding section. All things being equal, FDI is thus more likely to be directed to the provinces which are more open to the outside the world, and which have a higher per capita income, an industrial sector less dominated by state-owned enterprises, and a more developed physical infrastructure.⁸⁾

To compare the determinants of Korean FDI and world FDI into Chinese provinces, we estimate Demurger's original foreign investment equation using the data for the world and Korea. The results are inadequate because the growth equation is not estimated simultaneously with the foreign investment equation. Taking this into account, re-estimation results of the equation are reported in <Table 4>. In the case of foreign investment share in GDP (the FDI share in GDP in every province, SFI), the estimated coefficients for an open door policy (OPEN), internal reform measures (STATE) and GDP per capita have the right

6) These collective-owned enterprises, including in particular township and villages' enterprises (TVEs), are usually said to have been the most dynamic. Contrary to the state sector, they may have benefited relatively more from both technical progress and the introduction of market economy mechanisms. It is indeed the case that provinces in which the share of collective enterprises, as opposed to state enterprises, is higher have experienced higher growth performance.

7) A high quality infrastructure can reduce the costs and time involved in transporting goods, thus facilitating both domestic and foreign trade. All things being equal, one may expect foreign investors to prefer provinces where there is good access to transportation facilities.

8) It is also noteworthy that human capital introduced in the growth equation represents the interaction between FDI and human capital. Consequently, the marginal effect of foreign investment on the growth of China's provinces rises in proportion to the share of educated people in the overall population.

signs and are statistically significant in 1994~1997. Human capital abundance (H1), as well as OPEN, STATE and GDP per capita have the right signs and show statistical significance in 1998~2000. This leads us to the same conclusion as Demurger that provincial development (market size, GDP per capita), the degree of internal reforms (COLL or STATE), opening reforms and skilled labor abundance are the main determinants of the provincial distribution of FDI. However, our result of a negative coefficient for the RAIL variable does not support Demurger(2001)'s argument that transport facilities are a key differentiating factor in explaining the geographical structure of FDI into China. This issue is investigated further in the next section.

Now, we examine the case of Korea's investment in China (Korea's FDI share in GDP in every province, SKFI). The estimation of 1994~1997 shows that the coefficients for GDP per capita and two infrastructure variables (ROAD and RAIL) are statistically significant, while other important variables in the world case are not even included in the specified estimation. The effect of infrastructure variables on the attraction of FDI is uncertain because the two related variables show different signs with statistical significance. It is notable that the degree of internal reforms (COLL), showing statistical insignificance in 1994~1997, turns out to cause a positive effect on the inflow of Korean FDI in 1998~2000. But it should be noted that Korea's case is quite different from the case of world FDI (SFI) in that open door policy reforms measured by openness are not an important factor in attracting FDI at all. This fact supports the argument that some cases of Korean FDI into China are not motivated by local considerations such as reform policies but by the worsening business environment within Korea due to such factors as increases in wage rates.

2. Determinants of the Provincial Distribution of FDIs:

Final Identification

Although <Table 4> provides the determinants of geographical distribution of world and Korean FDI into China in the same framework, we cannot fully explain to what extent they differ. This difficulty arises from a low adjusted R^2

<Table 4> Main Determinants of FDI: Demurger's Equation

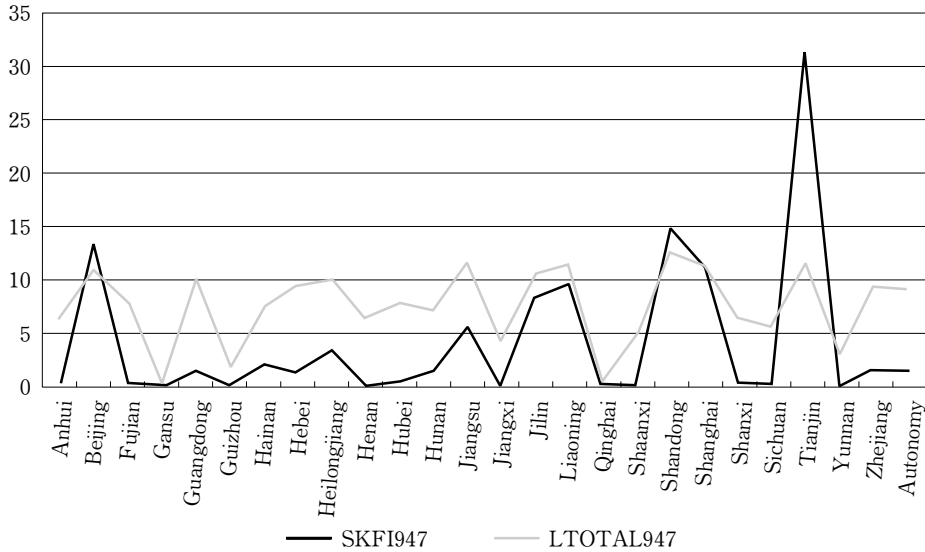
	1994~1997		1998~2000	
	World	Korea	World	Korea
Intercept	4.43 (0.3)	-4.42 (-0.6)	-11.7* (-1.8)	3.30 (0.7)
GDP per capita (log value)	2.57+ (1.9)	1.46* (2.6)	1.98** (3.4)	0.30 (0.8)
Open door policies (Openness, %)	1.23** (3.5)		1.25** (4.8)	
Internal reforms (Coll)		0.92 (1.7)		5.61** (2.6)
Internal reforms (State)	-6.18+ (-1.7)		-5.29** (-2.2)	
Infrastructure (Road)		-1.39** (-3.2)		-0.71** (-2.6)
Infrastructure (Rail)	-2.52* (-2.6)	0.92* (2.2)	-0.37 (-0.7)	0.17 (0.6)
Human capital abundance (H1)	-0.47 (1.2)		0.32** (2.8)	
Human capital abundance (H2)				
Adjusted R^2 (Prob.F)	0.24** (0.0)	0.18** (0.0)	0.23** (0.0)	0.16** (0.0)

Notes: 1) Figures in parentheses are t -statistics.

2) **, *, and + denote significance at the 99%, 95%, and 90% levels, respectively.

(0.18) in the Korean case on the one hand, and from a correlated relationship between GDP per capita and other explanatory variables on the other hand. The first problem can be solved by changing the dependent variable from foreign investment share to foreign investment log value, which shows similar trends but with a different degree of fluctuation (see <Figure 3>). The second problem, that many determinants of provincial distribution of FDI are also important factors in increasing GDP per capita at the same time, can be overcome by replacing GDP per capita with other independent variables. This is our job in this section now.

<Table 5> reports the final results of our estimation on the geographical structure of foreign investment across Chinese provinces. <Figure 4> and <Figure 5> compare the actual and fitted value of foreign investment of the world and



<Figure 3> Share and Log Value of Korea's Foreign Investment : 1994 ~ 1997

Korea, giving us excellent estimation results in terms of statistics.

The estimation results of the worldwide foreign investment into Chinese provinces are quite consistent with our expectation. We focus on the 1994~1997 period. First, the effect of openness to international trade and access to international markets on FDI distribution measured by openness is positive with a statistical significance at the 99 percent level. Adopting an export promotion development strategy, China has implemented economic reforms and open door policies and has made an effort to promote trade by concluding several bilateral trade arrangements and adopting unilateral actions. In the 1990s there was substantial progress in reducing tariff barriers and a series of preferential policies to encourage international trade were also formulated and implemented. Duty exemptions for intermediate products used in the production of exports have been particularly important in boosting China's foreign trade. Thus, it is clear that openness has a positive effect on FDI inflows.

Second, the coefficients for two variables for degree of internal reforms (COLL and STATE) have right signs with a statistical significance at the 99 percent level. China has endeavored to construct a more transparent legal framework and business environment, particularly in the legal system concerning FDI. China has

〈Table 5〉 Main Determinants of FDI: Final Identification

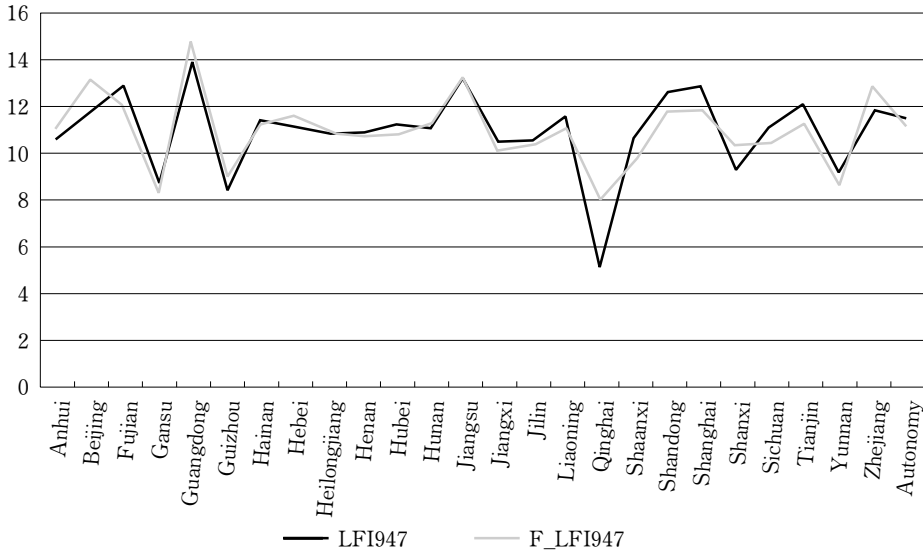
	1994~1997		1998~2000	
	World	Korea	World	Korea
Intercept	5.67* (2.4)	14.31* (2.8)	7.70** (4.1)	16.49+ (1.9)
Open door policies (Openness, %)	0.11** (3.3)		0.45** (3.2)	
Internal reforms (Coll)	4.08** (3.2)	6.07** (3.4)	5.71** (3.2)	13.07* (2.4)
Internal reforms (State)	-6.16** (-3.82)	-14.24** (-6.5)	-6.39** (-4.0)	-17.32** (-4.2)
Infrastructure (Road)		-1.91* (-2.8)		-1.40 (-1.4)
Infrastructure (Rail)	0.68* (2.2)	1.80* (2.8)	0.41+ (1.7)	0.52 (0.7)
Human capital abundance (H1)	0.10** (3.9)		0.10** (4.3)	
Human capital abundance (H2)		0.19** (5.0)		0.25** (1.9)
Investment policy (SEZ)		0.19** (4.6)		0.17* (2.6)
Ethnic dummy		3.51** (3.8)		5.71** (4.1)
Adjusted R^2 (Prob. F)	0.25** (0.0)	0.26** (0.0)	0.25** (0.0)	0.25** (0.0)

Notes: 1) Figures in parentheses are t -statistics.

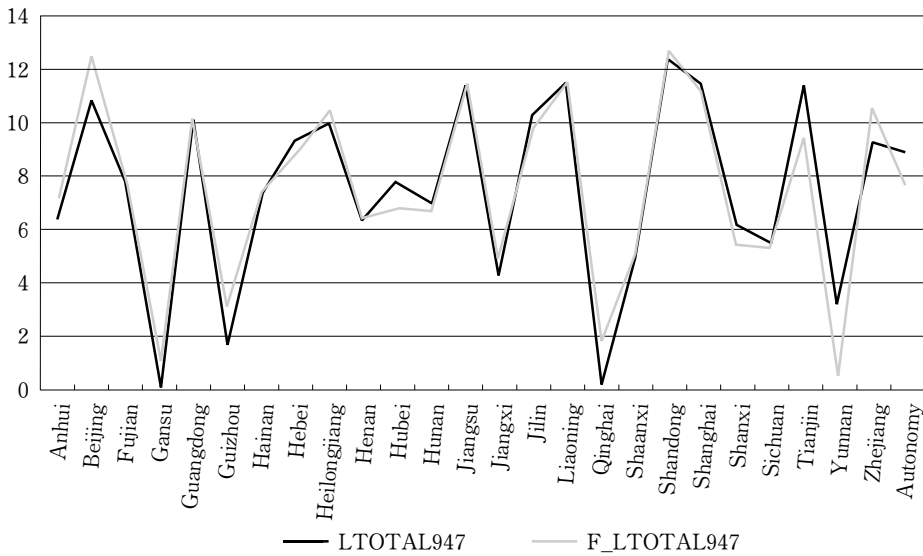
2) **, *, and + denote significance at the 99%, 95%, and 90% levels, respectively.

also launched a program to restructure and reduce the state-owned sector by introducing advanced managerial skills and enhancing internal efficiency and international competitiveness. Thus, it is quite reasonable to assume that internal reform policies are the main determinants of FDI attraction.

Third, labor abundance proxied by H1 (the number of people who have completed a primary and secondary education over the total population) also causes a positive effect on FDI location with a statistical significance at the 99 percent level. Fourth, the coefficient for infrastructure measured by railway extension is positive and statistically significant at the 95 percent level. It is quite valuable considering the earlier result showing a negative effect on FDI location. How-



<Figure 4> Actual and Fitted Value of Foreign Investment: World (log value)



<Figure 5> Actual and Fitted Value of Foreign Investment: Korea (log value)

ever, an FDI promotion policy measured by SEZ is not statistically significant at the estimation and is deleted from the final version. But this does not mean that investment promotion policies with unique packages of tax incentives are not important determinants of FDI. SEZ is simply deleted because of a multicollinearity

problem: SEZ is closely related to the openness variable with a correlation coefficient of 0.71.

Now we look at the Korean case. The estimation results of Korea's FDI into Chinese provinces are also quite consistent with the predictions of earlier studies except for two critical differences. First, the effect of openness to international trade and access to international markets on FDI (OPEN) is not specified as a determinant of Korea's FDI into Chinese provinces as in the case of the original Demurger-equation estimation. At that time we presented the argument that some cases of Korea's FDI into China are not motivated by local considerations including reform policies but by domestic conditions such as a less favorable business environment due to various factors including wage increases.

Second, the effect of infrastructure measured in terms of railways and roads on provincial FDI distribution is uncertain: the coefficient for ROAD is negative with a statistical significance at the 95 percent level, whereas that of RAIL is positive and statistically significant at the 95 percent level. This result is also quite similar to that of the earlier part of this section estimating Demurger's foreign investment equation. The implication is that Korea's investment in China is less motivated by the development level of China in terms of infrastructure than by the domestic push factors of Korea.

However, the estimation results reported in the earlier table are quite consistent with standard predictions as in the case of worldwide investment into Chinese provinces. First, the coefficients for the two variables for degree of internal reforms (COLL and STATE) have right signs with a statistical significance at the 99 percent level, suggesting that internal reforms are important determinants of Korea's FDI flows into China. Second, human capital abundance proxied by H2 (the number of people who have completed a secondary and tertiary education over the total population) also causes a strong positive effect on FDI location with a statistical significance at the 99 percent level.

Third, the FDI promotion policy with various tax incentive policies proxied by SEZ has a strong positive value with a statistical significance at the 99 percent level, implying that SEZ is an important determinant of FDI location. Remember that this variable is not a significant determinant of location in the worldwide

FDI case. Finally we also test the hypothesis that Korea's FDI is influenced by its special ethnic ties in the three Northeastern provinces (Jilin, Liaoning and Heilongjiang) where many Chinese Koreans live. The estimation shows that this is the case: the coefficient for the ethnic dummy variable is positive with a statistical significance at the 99 percent level.

V. Summary and Conclusion

This paper studied the determinants of geographical distribution of Korean FDI over 25 Chinese provinces. Major factors of the distribution are identified and the reasons for their importance are explored further to strengthen the validity of the estimation results.

Section III showed that a gravity equation can successfully explain the distribution of Korea's FDI across 25 Chinese provinces: Chinese provinces with a larger market size, higher GDP per capita and closer distance from Seoul attracted more Korean FDI than other provinces. Moreover, human capital abundance, internal reforms and tax and investment policies were significant determinants in attracting Korean FDI, although the market-related effect was not so large. In particular, the distance variable was very significant in the gravity estimation. Why is distance so important in explaining the choice of location? We believe that this also arises from the close linkage between FDI activities and processing trade, with the distance variable in the gravity equation representing trade cost as well as FDI costs.

Section IV estimated a variety of Demurger equations to arrive at the following points. The results of the world foreign investment into Chinese provinces are quite consistent with theoretical predictions. The effect of openness to international trade and access to international markets on FDI distribution measured by openness was strongly positive with a strong statistical significance. The coefficients for degree of internal reforms (COLL and STATE), labor abundance proxied by H1, and infrastructure measured by railway extension also showed right signs with a statistical significance. In the case of Korea, the effect of

openness (OPEN) and infrastructure (RAIL and ROAD) is not identified or not confirmed as a determinant of Korean FDI in Chinese provinces as in the case of world FDI. However, the coefficients for the two variables for degree of internal reforms (COLL and STATE), human capital abundance (H2), FDI promotion policy (SEZ) and ethnic ties with the three Northeastern provinces were statistically significant as in the case of world FDI.

Considering the estimation results regarding the geographical distribution of FDI, two more important conclusions emerged:

First, market-size related variables do not have a large effect on FDI location. Normally the gravity equation uses three explanatory variables—GDP, per capita GDP and growth rate—to absorb the market's strong influences on the determination of location; but only one variable, nominal GDP, was enough to catch the small effect of Korea's FDI. We were also able to derive a similar argument for the estimation of Demurger's equation because the share of FDI into China motivated by local sales is smaller in the case of Korean investors than in other cases. In other words, some cases of Korea's FDI into China are not motivated by local considerations such as reform policies but by the character of processing trade of Korean FDI and/or by Korea's worsening business environment.

Second, internal reforms, abundance of skilled labor, investment promoting policies, and ethnic ties were major determinants of location of Korea's FDI. This is because the activities of Korea's affiliates in China are partly characterized by the international segmentation of production which is closely linked to processing trade, and because those numerated determinants are crucial in this regard.

Another important empirical finding would be the verification of simultaneity between GDP per capita and other independent variables such as internal reforms, human capital abundance and investment promoting policies. We have to be very careful in considering both of them as explanatory variables in the estimation. However, this paper has limitations because it uses the partial equilibrium approach rather than a general equilibrium approach, which can provide a fuller picture of the theoretical relationship between foreign investment and Chinese economic growth.

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Appendix

〈Table 1〉 Variable List

Variable	Explanation
Province	Anhui(1) Beijing(2) Fujian(3) Gansu(4) Guangdong(5) Guizhou(6) Hainan(7) Hebei(8) Heilongjiang(9) Henan(10) Hubei(11) Hunan(12) Jiangsu(13) Jiangxi(14) Jilin(15) Liaoning(16) Qinghai(17) Shaanxi(18) Shandong(19) Shanghai(20) Shanxi(21) Sichuan(22) Tianjin(23) Yunnan(24) Zhejiang(25) Autonomy(26)
Distance	Seoul to provincial capital, km
Total	Korea's FDI into the province: Total Industry
Manuf	Korea's FDI into the province: Manufacture
Texti	Korea's FDI into the province: Textile, Clothing and Leather
Chemi	Korea's FDI into the province: Petroleum and Chemical products
ElecC	Korea's FDI into the province: Electronics Communication
SFI	Foreign investment share in GDP, %
SKFI	Korea's FDI share in GDP, %
GDP	Provincial GDP, Current price, 100 million yuan
GGDP	Growth rate in GDP
CGDPV	per capita provincial GDP, yuan
H1	Population with junior secondary school attainment, per 100 thousand persons
H2	Population share with secondary and tertiary school attainment, %
STATE	The share of state sector in industrial output, %
COLL	The share of collective sector in industrial output, %
RAIL	Railways, Extension length, km
ROAD	Road, Area of paved roads, 10 thousand sq.m
SEZ1	Number of special economic zones in a province (Source: China)
SEZ2	Number of special economic zones in a province (Source: KOTRA, Korea)
OPEN	Openness, the share of trade in provincial GDP
ETHNIC	Ethnic dummies with value of 1 for three Northeastern provinces
WAGE	Manufacturing wage, Yuan