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KOREA INSTITUTE FOR INTERNATIONAL ECONOMIC POLICY

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Executive Summary

According to a formal model for choice of locations for Korea's FDI stock, market size and growth in real GDP significantly cause a positive effect on location of FDI, while the real GDP per capita and distance variables turn out to cause negative effects on FDI. In particular, the negative effect of real capita GDP on FDI implies that Korean overseas production has little relation to high-income consumers and products. We can find changes in patterns of choice of location after the Asian financial crisis; in the early 1990s, the motivation behind FDI was to seek low cost labor in declining industries, but by the late 1990s, the main factor driving FDI was the globalization of businesses in the large conglomerate sector. In addition, the insignificance of human capital abundance, technology level and tax rates means that institutional and policy-related variables such as transparency and pro-FDI policy might be more important than those variables.

The estimated coefficients on FDI in the equations for trade and exports are positive and statistically significant in most years, indicating that Korea's FDI tends to promote its exports and overall trade. The observed strong relationship between Korea's FDI and trade is consistent with the earlier empirical results of Kim (1994) and Kim and Kang (1997). Empirical results also show that the effects of Korea's FDI on trade become smaller after the Asian financial crisis, and that market size proxied by nominal GDP becomes more important than in the earlier period. The positive values of the AFTA (ASEAN) dummy can be interpreted as strong complementary interdependence between Korea and the ASEAN countries.

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Chang-Soo Lee

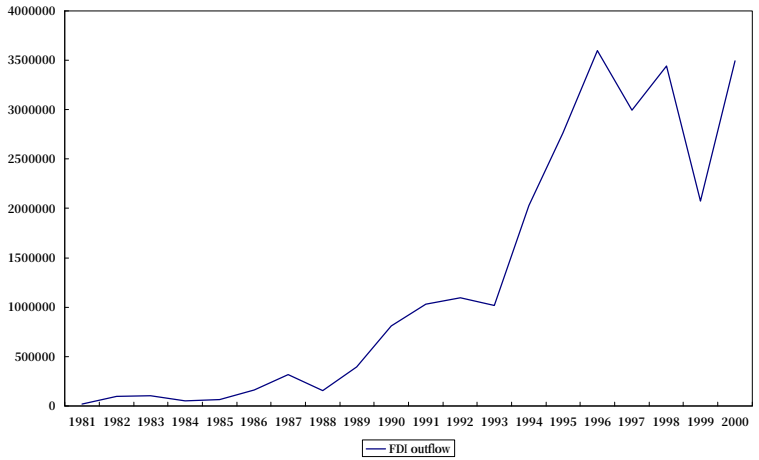
I. Introduction

Korea and other newly industrialized economies (NIEs) emerged as major FDI exporting countries in East Asia in the 1980s. After a sharp appreciation of the Japanese yen in the 1985-88 period, the Korean won subsequently appreciated. This alignment of the currencies encouraged outflows of FDI from Korea to other developing East Asian countries, particularly in export-oriented manufacturing industries. The globalization of business activities, particularly in large conglomerates, was a major factor behind the surge of Korea's FDI in the mid-1990s. Figure 1.1 confirms this fact, showing abnormally higher FDI outflows in 1995-1997 than 1990-1994 and the period after the Asian financial crisis.

Considering the long-term trend in FDI, we concentrate on two periods in this study—the early 1990s and late 1990s. We can find changes in the volume and the regional and sectoral composition of Korea's FDI in the latter half of the 1990s compared to the early 1990s (see Appendix).

The purpose of this paper is to supply an empirical framework and baseline answers for two basic questions on Korea's FDI outflows at the cross-country level: (1) Which factors of host countries

Figure 1.1. FDI outflows in Korea



attract Korea's FDI? (2) Does the FDI-trade nexus between Korea and its partner countries show complementarity or substitution?

This paper is the first study in an FDI research series, which is composed of five independent studies. The second paper presents country and industry-specific research on Korea's (Japan's) FDI into China and the United States (Korea and China): FDI into a developing country and that into a developed country. At the industry level, the study explores different determinant factors of the recipient countries that attract Korea's (Japan's) FDI, and empirically verifies the somewhat different linkages between FDI and trade in developed and developing countries. The third research project is a case study that explores linkages between FDI and trade at the firm level, using survey data of affiliates of Japanese and Korean companies in host countries (China and Korea). This data clarifies the demand structure of the affiliates' production (sales for host, source, or the third country market) and procurement patterns of intermediate goods (import

from parent companies, purchase from host country, etc.). The fourth part of the series deals with the issue of FDI barriers and ways of removing them in China, Korea and Japan to strengthen the economic cooperation between the three countries. The final study examines the effects of Japan's (Korea's) FDI on the industrial structure and competitiveness of the host countries of Korea and China (China).

Robert Lipsey and his colleagues have studied FDI, often focusing on the relationship between investment and trade. His long-time research has given us a rich body of empirical literature that relates the behavior of multinational firms to industry and country characteristics (see footnote 2 in page 16). These works provide the basis for the empirical framework set out in Section III and IV. As stated above, the purpose of this paper is to provide an empirical framework and baseline answers for two basic questions: the choice of locations for Korean FDI outflows and the effect of the outflows on Korea's trade at the country level.[1)]

Relating to the first issue, we present a modified gravity equation as an empirical framework for Korea's FDI outflows. Is that model

1) Two basic questions (choice of FDI location and FDI's effect on trade) are new for Korea but not new at all for Japan and the United States because of these countries' predominant roles in the region. The liberalization policies of East Asian countries in the areas of manufacturing trade and inward FDI not only triggered an inflow of export-oriented FDI mainly from Japan and the United States but also promoted an outflow of manufacturing exports. FDI-trade linkages were created in this process of economic integration, contributing to rapid economic growth in the region. Can we arrive at similar conclusions on these two issues in the case of Korea?

useful in understanding the factors of the host countries, such as GDP and distance, that attract Korea's FDI? We expect that the major factors of host countries engendering the overseas FDI to be high economic growth, large market size and low labor cost. One of the major issues is the role of human capital and the technology level and tax rates in a host country. The insignificance of these factors in estimating overseas FDI stock would suggest that institutional and policy-related factors might be more important variables, and that Korea's FDI seeks unskilled or semi-skilled labor rather than skilled labor. The negative sign of the coefficient for per capita GDP in the equation would also imply that Korea's overseas FDI has little relation to high-income consumers and products (this is always positive for developed countries). We also ask whether there is any difference before and after the 1997 financial crisis in East Asia in the behavioral pattern of Korea's FDI or in the determinants of location between developing and developed countries.

With regard to the paper's second issue about the relationship between FDI and trade, the relevant questions are as follows. Does FDI facilitate or restrict international trade (exports, imports)? Does international trade promote or discourage FDI? These questions concern whether FDI and trade are complements or substitutes but we focus on the effect of FDI on trade. This issue has already been seriously examined by Kim (1994) and Kim and Kang (1997). They empirically verified a positive relationship between Korea's (Japan's) FDI and exports at the industry level, employing regression analysis using cross-section data as well as time-series data (see details in page 17). Can we arrive at the same conclusion employing a gravity model expanding the time span to the late 1990s? We also ask whether there

is any change in the relationship between FDI and trade after the 1997 crisis.

The structure of the paper is as follows. Section II begins with a review of past literature on the theory of FDI (multinational firms) and trade, and then goes on to examine the existing empirical literature on the linkages between FDI and trade. Section III estimates the modified gravity equation explaining the choice of locations for Korea's FDI stock. Section IV tests the effects of FDI on trade, exports and imports under the framework of a gravity model. Section V summarizes the results of the previous sections and sets out the limitations of the study.

II. Literature Review

International trade and FDI have become major contributors to deepening interdependence among countries. However, economic theory does not provide clear conclusions on the relationship between them. Because of the lack of clear theoretical prescriptions on the determinants of FDI locations and the effects of FDI on trade, empirical analyses have been performed to identify the key mechanisms at work. Here we introduce a kind of gravity approach to be evolved over time to explain the choice of FDI location of a particular investing country and the FDI's effect on trade.

The crucial issue is whether trade and FDI are substitutes, as Heckscher-Ohlin trade theory asserts and much of the literature on multinational firms suggests, or whether they are complements, which empirical work supports. If trade and FDI are complements, then overseas production will stimulate exports to those countries. Otherwise, affiliates' production in host countries will lead to a decrease in exports to that country.

Substitutes or Complements

A standard Heckscher-Ohlin model, emphasizing factor proportion differences, leads to the idea that FDI and trade are perfect substitutes (Mundel, 1957). This implies again that the determinants of overseas FDI can be derived from those of trade. Similarly vertical expansion of multinational firms implies a substitution relationship between FDI and trade as long as the locational choice is motivated

by different factor intensities or factor-price differentials.

The so-called OLI framework based on an eclectic hybrid of ownership, locational and internalization advantages has led to a deep understanding of the formation of multinationals. However, this framework has been sterile in explaining trends in the choice of FDI location of horizontal multinational firms, such as the increasing volume of two-way investment between rich industrial countries. In addition, it has also been unable to generate empirical models that can explain the positive effects of FDI on trade in most cases.

However, there exist theoretical reasons for possible complementarity when standard H-O assumptions are relaxed (Markusen 1983; Wong 1986). Markusen illustrated that FDI and trade can be complements when trade is induced by non-H-O factors, such as technology differences between trading partners. A crucial determinant of this relationship is whether FDI is undertaken in an export industry or import-competing industry in the host country: FDI undertaken in an export industry tends to expand trade, while FDI undertaken in an import-competing industry tends to reduce trade (Kawai and Urata: 252).

Brainard (1997) also showed complementarity between affiliate sales (FDI) and trade flows constructing the model of proximity-concentration tradeoffs. This hypothesis explains the choice of overseas production over exporting as motivated by proximity to customers or specialized suppliers (access to the destination market) at the expense of production scale economies. The decision whether to expand abroad via trade or via FDI hinges on a trade-off between these proximity advantages and scale advantages from concentrating production at a single point. The complementarity between trade and affiliate

sales (direct investment) arises because relative income levels and firm-specific advantages associated with intellectual property increase both multinational sales and trade flows.

Recently, the knowledge-capital model, based on stylized facts empirically constructed by Lipsey and his colleagues,[2] emerges to integrate both horizontal and vertical motives for FDI and predicts how affiliate activity should be related to variables such as country size and relative-endowment differences (Carr, Markusen and Maskus, 1998; Markusen and Maskus, 1999). The basic implication is that host-country market size is more important for production for local sales than for export sales, and that host-country skilled-labor scarcity is more significant for export production than production for local sales. The empirical work by Lipsey and his co-authors lead to a sort of gravity model that can explain choice of FDI location using variables such as nominal GDP (host country market size or demand), per capita GDP (relative endowment differences) and secondary enrollment ratio (the abundance of skilled-labor). Their empirical results also provide logical linkages for the complementary relationship be-

2) Robert Lipsey and his colleagues have contributed to relating the pattern of FDI by multinational firms to host country characteristics and to trade flows. This body of work provides a tremendous volume of empirical evidence on FDI and trade, which needs to be reconciled with formal theory (Lipsey 1999a, 1999b, 1993, 1989; Lipsey, Ramstetter and Blomstrom 2000; Lipsey, Blomstrom and Ramstetter 1995; Lipsey and Weiss 1984, 1981; Blomstrom, Lipsey and Kulchycky 1988; Kravis and Lipsey 1982). Owing to their research, multinational firms can be integrated into both the empirical analysis of FDI and trade, and trade theory (Markusen and Maskus, 1999: 2-5).

tween FDI flow and trade, using country and industry characteristics. Section 3 and 4 of this paper empirically verify the determinants of Korea's FDI and the effects of FDI on trade using this literature.[3)]

FDI's Effect on Trade

Does FDI facilitate or restrict international trade? To what extent does FDI (production and affiliates' sales in a foreign market) replace or increase exports to the same market? While there are theoretical reasons to suggest both substitution and complementary effects, surprisingly, empirical work in this area almost invariable shows a net complementary relationship between exports and foreign production.

First, we review the Korean literature. As stated earlier, Kim (1994) is the first paper that seriously examined the relationship between Korea's FDI and trade at the industry level. His findings are as follows: (1) The larger the amount of overseas FDI of Korean electronics firms, the larger the exports of the firms; (2) When cross-section data is employed, results show that outward FDI has a positive effect on exports in the industry-level analysis; (3) Time-series data shows that outward FDI causes positive effects on exports in most in-

3) Eaton and Tamura (1996) develop a model of choice between exploiting a technology in another country via export and via FDI. The model points to the destination country's size, level of technological sophistication, and distance from the source as factors in the decision. They argue that investment flows and trade can be captured by a modified "gravity model" which relates exports and FDI to destination country characteristics reflecting market size, the cost of direct investment, the level of development, and transport costs.

dustries except food and beverages. Kim and Kang (1997) arrive at similar conclusions using the Korean and Japanese cross-section data: (1) Outward FDI does not substitute exports from the investing country; (2) As a determinant of outward FDI, retaining foreign export markets is more important in Japan than in Korea. The second conclusion implies that outward FDI in Korea is more of a cost-oriented type while Japanese outward FDI is more of a market-oriented type.[4] Kim (1997) uses the same methodology as Kim (1994) and arrives at the same conclusions.

Now turning to overseas empirical literature, Lipsey and Weiss (1981), Blomstrom, Lipsey and Kulchycky (1988), Graham (1996), Kawai and Urata (1998), and Brenton, Di Mauro and Lucke (1999) find that affiliates' sales positively correlated with exports and foreign production. For U.S. manufacturing affiliates' activities in the host countries, Lipsey and Weiss (1981) find only positive coefficients in regression equations for U.S. exports from the same industries to those host countries. These were 10 out of 14 for exports to developed countries and 9 out of 11 for exports to less developed countries. Blomstrom, Lipsey and Kulchycky similarly find evidence of complementarity using industry data on U.S. and Swedish multinationals. Using U.S. data, they find positive coefficients for af-

4) This second implication gives an insight to our model for choice of location in section 3. If Korea's FDI is largely motivated by low labor cost, real GDP per capita in a gravity model of section 3 is negative and significant. If Korea's FDI is largely motivated by local demand, nominal GDP in a gravity model is positive and significant. We develop this point in section 3 by dividing the whole sample into developing and developed countries.

filiates' net sales that were statistically significant in 7 industries: textiles and apparel, printing and publishing, agricultural chemicals, office and computing machinery, electronic components, instruments, and other manufacturing. The industries for which the coefficients of affiliates' net sales were negative were other food products, drugs, primary nonferrous metals, and lumber, wood, furniture, and fixtures. In order to explore the possible impact of FDI on bilateral trade, Brenton, Di Mauro and Lucke include the residual from the FDI regressions in the gravity models for exports and imports and then check the coefficient of the FDI residual, following Graham (1996). The coefficient is significant and positive for 7 out of the 11 source countries. A similar finding applies to imports. The coefficient of the FDI residual is significant and positive for 5 out of the 11 FDI source countries.

Other studies have examined the relationship between affiliates' sales and exports using firm-level data, including Swendenborg (1979), Lipsey and Weiss (1984), and Lipsey, Ramstetter and Blomstrom (2000). Using cross-section data for Swedish multinationals, Swendenbog (1979) finds that multinational sales and exports are complements at the level of the firm. Lipsey and Weiss (1984) find that the higher the level of output by a U.S. firm in a foreign area, the higher in general were that firm's exports to that area. Foreign production is strongly related to the firm's export of intermediate goods for further processing, but also positively related to the export of finished products from the United States. According to Lipsey, Ramstetter and Blomstrom, within individual Japanese manufacturing firms, parent companies' exports from Japan to a foreign region are positively related to production in that region by the affili-

ates of that parent. The relationship is similar for U.S. and Swedish firms in parallel studies. Japanese parent employment also tends to be higher, the more the firm produces abroad. Japanese firms' behavior with respect to home employment is somewhat similar to Swedish firms, but contrasts with U.S. firms, for whom production in developing countries is associated with lower parent employment at home.

Although almost all of these studies find net complementarity, Blonigen (2001) successfully demonstrates a standard theory of the multinational enterprise (MNE), finding net substitution using more disaggregated data than firm-level data. He examines product-level data, which fits the assumption of a single product firm often used in MNE theory, and finds substantial evidence for both a substitution and complementary effect between affiliate production and exports with Japanese automobile parts for the U.S. market. This product-level study corroborates complementarity in the real world, illustrating the positive effects of FDI to the host on exports from sources at above the firm level.

However, these empirical findings have been challenged with the argument that an endogeneity bias is driving the strong complementarity results. Grubert and Mutti (1991) and Graham (1996) try to control for the endogeneity bias when estimating the relationship between affiliates' sales and trade using country-level data. Graham still finds net complementarity, while Grubert and Mutti find an insignificant relationship between affiliates' sales and exports after instrumenting for affiliate sales.

Empirical studies, regardless of whether at the level of country, industry or firm, almost always find net complementarity. The com-

plementarity effect in firm-level analyses arises from the multi-product nature of the MNEs. It means that there may be demand complementarities across a firm's products and/or a vertical production relationship across the firm's products.

Reasons for complementarity

What drives a positive effect of FDI on trade? This section examines the reasons why foreign production may complement exports.[5] As argued by Blonigen (2001), Swenson (1997), Kawai and Urata (1998), Kim (1994), Kim and Kang (1997) and Lipsey and Weiss (1981; 1984), there are two important factors driving complementarities: demand complementarity and complementarity from vertical relationships. Lipsey and Weiss (1981) suggest that their finding of a positive correlation at the industry level shows that manufacturing presence in another country 'tends to promote' the firm's exports to that country. Specifically, a firm's production presence in a foreign market with one product may increase total demand for all of its products through a number of channels including: (1) provision of important sales and after-sale services, (2) commitment-to-market effects on consumers, and (3) more efficient and quicker deliveries and distribution. In this way, foreign production and sales of one good promotes export sales of goods produced by the firm in its home country (Blonigen, 2001).

5) Frankel and Wei (1996) refer to a possibility that FDI can lead to lower exports from the source country to the host, when the aim of the investment is to circumvent trade barriers, so that sales with the host market substitutes for shipments from the source country.

A vertical production relationship is another way that complementarity may occur. Investment by a manufacturer may increase exports of inputs to the host market. Swenson (1997), Frankel and Wei (1996) and Lipsey and Weiss (1981) find that Japanese transplant automakers import a large amount of parts from Japan and are much less willing to substitute U.S. parts for imported inputs. [6] Blonigen (2001) analyzes this vertical relationship in detail using product-level data. Production of Japanese automobiles (the input-using industry) in the United States should increase Japanese exports of automobile parts to the United States (a complementary effect), while the location of Japanese automobile parts production in the United States should decrease Japanese exports of automobile parts (substitution effect).

Kawai and Urata (1998)'s explanation for procurement and import patterns of Japanese multinationals is simply a vertical relationship argument. According to them, approximately 40 percent of the total procurement of intermediate goods came from Japan for all the foreign affiliates in 1992. The degree of reliance on Japan for the supply of intermediate goods is higher in the four machinery sectors such as general machinery, electric machinery, transport machinery, and precision instruments. High export shares to Japan for the machinery sectors are largely attributable to the global strategy of Japanese firms in these sectors. Under the strategy of inter-process specialization, Japanese firms seek to minimize production cost by dividing the entire production process into a number of subprocesses and by locating each subprocess in a country where that particular subprocess

6) Sometimes it is very difficult to disentangle what drives a complementarity into demand complementarities and vertical relationships even in firm-level data.

may be performed most efficiently or inexpensively.

Korea's multinationals follow this Japanese method of production arrangement in Asia. And like Japanese firms such a production arrangement gives rise to a production system under which a vertical division of labor is pursued internationally within a firm, leading to the emergence of inter-process, intra-firm, and intra-industry trade. We also took note of the location shifts and arrangements of the activities of the small- and medium-sized enterprises (SMEs). The SMEs in Korea shift the production of low-technology or labor-intensive products to East Asian developing countries, while more technology-intensive products are assigned to plants in Korea; Low-tech products manufactured in Asia are exported to Korea or North America looking for final demand, while more high-tech products manufactured in Korea are exported to Asia.

Considering the patterns of procurement and sales of foreign affiliates of Japanese firms in this section, we can find a strong, positive relationship between Korea's FDI and trade. Korea's FDI in East Asia tends to stimulate Korea's exports significantly, and this positive effect appears consistently regardless of the destinations of the FDI and exports. This is because some Korean firms apply the strategy of breaking up the production process into several subprocesses and locating labor-intensive subprocesses to labor-abundant countries. Such an arrangement gives rise to a production system in which an international division of labor is pursued within a firm, leading to the emergence of interprocess, intrafirm, and intraindustry trade.

III. Determinants of FDI Outflows

There is a long tradition of empirical research on the determinants of FDI. Lipsey and his co-authors, Eaton and Tamura (1996, 1994) and Frankel and Wei (1996) have provided modified versions of the gravity model. This section conducts empirical analyses to explain the choice of locations for Korea's FDI using the analytical framework of Lipsey (1999a) that finalize the tradition of research by Lipsey and his colleagues.[7]

In the case of U.S. FDI activity, the factors of market size and growth rates, per capita income, distance, and tax rates account for about half the variation among developing host countries.[8] We estimate a gravity equation across 102 countries worldwide that have received FDI from Korea (see Appendix Table 1) and examine whether the major Asian countries such as Japan and China deviate from the levels implied by these regression equations.

Each FDI location is measured by the stock of investment in it us-

7) Frankel and Wei (1996) provide a gravity model for FDI stock and then empirically verify the effect of FDI on trade.

8) According to Lipsey, there are considerable differences in the determinants of U.S. FDI activity between industries in which U.S. affiliates are export-oriented, such as machinery, and industries in which the affiliates' sales are mainly local. In the export-oriented industries, market size and distance from the United States were unimportant, and high per capita real income was the most consistent favorable influence. In the industries oriented to local sales, large market size attracted U.S. firms and long distance from the United States discouraged them.

ing 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 real GDP and real GDP per capita, is from the World Bank's *World Development Indicators 2001*. Distance of the host country from Korea is measured by great circle distance (see Darrel Kindred, 1997) available from http:\\www.indo.com. Although shipping distance is a more accurate concept than great circle distance, we applied the great circle distance method in accordance with Sohn and Yoon (2001). We use tax revenue (% of GDP) and taxes on goods and services (% of ver-added of industry and services) as measures of the rate of taxation on Korea's affiliates in the host country. Secondary and tertiary school enrolment and R&D expenditure (% of GNP) are also used as explanatory variables as indicators for the level of human capital accumulation (abundance of skilled labor) and the level of technology (see Appendix Table 2).

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 developed countries, expansion of local sales is a particularly important motive for Korean firms. However, local sales are not as important for Korea's FDI in Asia as they are for the country's investments in North America and Europe.

However, it is not certain whether the per capita real income of the host country is positively related to Korea's FDI stock. The effect of per capita income, beyond that of market size, presumably reflects the orientation of Korea-based firms toward goods and services typically purchased by higher income consumers, or toward intermediate

products and capital goods used to produce such goods and services (Lipsey). Considering that Korean products are not always for higher income consumers, the sign of per capita income would be uncertain. According to a different interpretation for the coefficient of real per capita income, since low wages are associated with low per capita real income, the negative sign of the coefficient means low-wage-motivated FDI, or FDI related to overseas shifts of labor-intensive production (Kawai and Urata, 1998). It is a well-known fact that the export motive accounted for a relatively large share of the FDI undertaken by Korean firms in Asia. Korean firms shift their production base to East Asia in order to produce labor-intensive products for export. In addition, Korean firms that have shifted their production bases to developing East Asian countries have been able to avoid direct trade conflicts while exporting their products from the host country to the U.S. market.

The average rate of growth in real GDP in the 1990-99 period enters as an explanatory variable with the expectation of a positive effect on the FDI stock, which is in contrast with Lipsey who uses the real GDP growth rate of the preceding period.[9] A large coefficient for this variable implies that robust economic growth in the host country is an important factor behind Korea's FDI outflows. Distance from Korea can have both negative and positive effects on Korea's FDI. A greater distance from Korea makes a foreign operation more difficult and expensive to supervise, and might therefore discourage

9) Lipsey introduces this variable under the assumption that a high rate in the past is a good predictor of high rates in the future. In this regard, employing average growth rates in the whole sample period can be validated from the perspective of rational expectation.

investment. However, a greater distance also makes exporting from Korea more expensive, and might therefore make local production more desirable and encourage investment. But this possibility based on a substitution relationship between trade and FDI is very low, considering the motives of Korea's FDI.[10] Tax rates in host countries should presumably have a negative effect on Korea's investment. Finally human capital abundance measured by secondary gross enrollment has a positive effect on FDI location. According to the knowledge-capital model, vertical multinationals are favored over national firms and horizontal multinationals when the countries have very different relative environments, especially when the country with abundant skilled labor is also small (Markusen and Maskus, 1999).

First, we estimate the modified gravity model with all the explained variables included for the years 1991, 1992, 1993 and 1997, 1998, 1999. But the results showed that the tax rates, human capital abundance (secondary and tertiary school enrollment) and technology level (R&D expenditure share in GNP) are not significant at all. This means that Korea's FDI seeks unskilled or semi-skilled labor rather than skilled labor, *ceteris paribus*, and that institutional and policy-related variables such as transparency and pro-FDI policy, or residuals, might be more important than those variables. This result would be one of the contributions of this paper and requires more serious

10) International trade theory and most of models of multinational firms basically imply the negative coefficient for distance variable because most of them look at the relationship between trade and FDI under one product framework. But sometimes this loses its basis because of multi-product reality.

analysis.

We estimate the equation again after deleting the insignificant human capital variable, expecting an improvement in tax-related variables. The results are reported in Table 3.1.

$$\log(ODI_{ij}) = \alpha + \beta_1 \log GDP_j + \beta_2 GRGDP_j + \beta_3 \log(PGDP_j) + \beta_4 \log(DISTANCE_{ij}) + \beta_5 RTXGP_j + \beta_6 ENG2G_j + u_j$$

Table 3.1. Location of FDI (with Tax Rate)

	1991	1992	1993	1997	1998	1999
Intercept	8.18	4.38	2.84	5.97	5.38	5.10
	(1.5)	(0.6)	(0.4)	(1.3)	(1.1)	(1.0)
Nominal GDP (log value)	0.31*	0.59**	0.74**	0.90**	0.95**	0.98**
	(1.7)	(2.4)	(3.3)	(5.5)	(5.8)	(5.6)
Growth in real GDP	17.29	32.08*	38.60**	8.41	0.58	14.14
	(1.1)	(1.8)	(2.4)	(0.8)	(0.1)	(1.5)
Real GDP per capita (log value)	0.15	-0.22	-0.33	-0.60**	-0.71**	-0.96**
	(0.5)	(-0.6)	(-1.0)	(-2.2)	(-2.7)	(-2.8)
Distance from Korea	-0.60	-0.51	-0.68	-0.89**	-0.67	-0.57
	(-1.3)	(-0.9)	(-1.4)	(-2.0)	(-1.6)	(-1.1)
Tax rate	-0.05	-0.29	0.03	0.02	-0.03	0.01
	(-1.1)	(-0.6)	(0.6)	(0.4)	(-0.7)	(0.2)
Adjusted R^2 (Prob.F)	0.22**	0.23**	0.34**	0.41**	0.47**	0.48**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

The sign and size of coefficients on the explanatory variables are largely consistent with our expectations except for larger than ex-

pected coefficients for growth rate in real GDP. This problem is investigated thoroughly in Table 3.2. Market size (nominal GDP) and growth in real GDP significantly cause a positive effect on the location of FDI. In particular, the coefficient of real GDP growth shows a large value. Real GDP per capita and the distance variable turn out to cause negative effects on FDI, but they are significant only in the late 1990s. The negative effect of real capita GDP on FDI implies that Korean overseas production is not for high-income consumers and/or Korea's FDI is motivated by the low wages of host economies.

Table 3.2. Location of FDI (without Tax Rate)

	1991	1992	1993	1997	1998	1999
Intercept	4.68	2.89	2.65	6.05*	7.23*	5.66
	(1.0)	(0.6)	(0.6)	(1.7)	(2.0)	(1.6)
Nominal GDP (log value)	0.47**	0.57**	0.61**	0.79**	0.84**	0.88**
	(3.4)	(3.7)	(4.3)	(6.4)	(6.8)	(7.3)
Growth in real GDP	21.08*	30.61**	34.42**	9.01	9.25	8.54
	(1.9)	(2.1)	(2.6)	(1.3)	(1.3)	(1.3)
Real GDP per capita (log value)	-0.08	-0.18	-0.12	-0.27*	-0.41*	-0.40**
	(-0.4)	(-0.8)	(-0.6)	(-1.7)	(-2.6)	(-2.5)
Distance from Korea	-0.45	-0.40	-0.52	-0.94**	-1.01**	-0.91**
	(-1.2)	(-1.0)	(-1.3)	(-2.9)	(-3.1)	(-2.8)
Adjusted R^2 (Prob.F)	0.25**	0.25**	0.35**	0.44**	0.45**	0.46
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

Deleting the insignificant human capital variables does not improve the insignificance of the tax variables, invalidating this model

again. However, this is not surprising, despite the strong impact found in other studies of location. Lipsey (1999a) also does not provide a significant and positive coefficient of tax variables. Since, even in the U.S. case, institutional and policy-related variables play a great role in the choice of location. This is the case for Korea's FDI, too.

Finally, we estimate the model again after deleting variables for tax rate in the independent variables. This improves the model, increasing the t-values of distance variables, nominal GDP and real GDP growth. The results are reported in Table 3.2. In general, both large market size and high growth in real GDP are shown to have attracted Korea's FDI stock.

In particular, growth in real GDP in the study period almost always appears with a significant and positive sign. However, the coefficient for this variable is inexplicably large. This arises mainly from the multicollinearity problem. Deleting the real GDP growth in the model increases the coefficients for nominal GDP and real GDP per capita to 0.58, 0.70, 0.77 and 0.39, 0.43, 0.45 for 1991, 1992 and 1993, respectively, but does not change the same coefficients in the late 1990s. Another reason for the large coefficient for the GDP growth would be inconsistency in units with all the other variables shown as log values. Then why do the coefficients in the early 1990s change even after the problem is redressed? This is related with the R-square, which is adjusted lower in the early 1990s than in the late 1990s. We conclude that the Lipsey model, in addition to omitting institutional and policy variables, has limitations in explaining Korea's FDI location in the early 1990s. However, the model is more reliable in checking the determinants of FDI in Korea's FDI outflows in the same framework.

Coefficients for distance from Korea are negative. As has been the case in many studies, there is evidence that low wages, which would be associated with low per capita real income, were the main magnets for inward FDI in the late 1990s, even though this coefficient is insignificant in the early 1990s.

The regression in the late 1990s shows other differences from the early 1990s. The coefficients of nominal GDP and distance become bigger in absolute terms while the coefficients of real GDP growth become smaller. These changes, combined with the earlier discussion of growth rate in GDP and multicollinearity, mean that determinants of choice of locations in the early 1990s are somewhat different from those in the late 1990s, and the Lipsey model is less successful in explaining FDI patterns in Korea in the earlier period than in the late period. This might arise from the changes in the motives of Korea's FDI outflows: low labor costs in declining industries in the early 1990s and globalization of businesses in the large conglomerate sector in the late 1990s.

We divide the whole sample into two groups, developing and developed economies, and run regressions separately to check the differences in choice of locations for FDI between developing and developed economies. We hypothesize that market size is a more important motive for developed countries whereas low labor costs are more important for developing countries. The results are summarized in Table 3.3 and Table 3.4 respectively.

We find three main differences in the results. The sign of the coefficient on real GDP per capita is positive for developing countries, but negative for developed economies. These results validate that Kawai and Urata's interpretation is less persuasive than Lipsey's. It is

Table 3.3. Location of FDI: Developing Country

	1991	1992	1993	1997	1998	1999
Intercept	9.83 (1.2)	5.18 (0.8)	8.04 (1.1)	12.77** (2.9)	13.86** (3.3)	11.01** (2.5)
Nominal GDP (log value)	0.25 (1.3)	0.35** (2.0)	0.37** (2.0)	0.47** (3.4)	0.53** (4.0)	0.64** (4.8)
Growth in real GDP	21.26 (1.5)	32.41* (1.7)	34.75* (1.8)	8.37 (1.2)	8.32 (1.3)	7.65 (1.2)
Real GDP per capita (log value)	0.54 (1.1)	0.64 (1.4)	0.31 (0.7)	0.71** (2.5)	0.62** (2.2)	0.49* (1.8)
Distance from Korea	-1.08 (-1.6)	-0.88 (-1.4)	-1.00 (-1.5)	-1.82** (-4.5)	-1.93** (-5.0)	-1.71** (-4.2)
Adjusted R^2 (Prob.F)	0.20** (0.04)	0.28** (0.00)	0.28** (0.00)	0.50** (0.00)	0.55** (0.00)	0.53** (0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

Table 3.4. Location of FDI: Developed Country

	1991	1992	1993	1997	1998	1999
Intercept	-8.58 (-0.9)	6.46 (0.6)	2.17 (0.3)	-3.32 (-0.4)	-5.35 (-0.7)	-6.1 (-0.7)
Nominal GDP (log value)	0.94** (3.9)	1.14** (3.7)	1.14** (4.7)	1.37** (6.8)	1.41** (6.7)	1.42** (6.5)
Growth in real GDP	51.34** (2.2)	32.97 (1.4)	34.63* (1.8)	28.78* (1.7)	34.92* (1.9)	36.08* (1.9)
Real GDP per capita (log value)	0.13 (0.2)	-1.27* (-1.7)	-0.96 (-1.6)	-0.76 (-1.5)	-0.72 (-1.4)	-0.71 (-1.3)
Distance from Korea	-0.32 (-0.6)	-0.87 (-1.3)	-0.70 (-1.4)	-0.69 (-1.5)	-0.60 (-1.3)	-0.53 (-1.0)
Adjusted R^2 (Prob.F)	0.42** (0.01)	0.31** (0.01)	0.44** (0.00)	0.61** (0.00)	0.60** (0.00)	0.59** (0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

absurd to argue that Korea's overseas FDI to developed economies is motivated by the low wages of those countries. A more convincing argument is that Korea's overseas production in developed countries is not related to high-income products or related intermediate goods, while it is for developing countries. The second difference in the estimation results of the two groups is that the distance variable is negative and significant for developing countries while it is insignificant for the developed economies. Finally market size variables such as nominal GDP and real GDP growth explain the wider variations of FDI location in the developed group compared to the developing group. The last two differences are consistent with the earlier observation that FDI into developed (developing) countries is more related to local sales (export sales) than in the case of FDI into developing (developed) countries.

To examine whether Korea's FDI with each partner country is large or not, an econometric test is undertaken based on earlier estimations of Table 3.2. Thus, the rationale for over-investment or under-investment critically depends on the correctness of the estimation. Under the assumption of correctness, the differences between actual FDI stock and 'normal' FDI stock of the major partner countries implies FDI barriers/impeding factors (institutional and policy-related detriments) that are not considered in the Lipsey model. Table 3.5 shows the results. A negative value of the difference implies that Korea's FDI in that country is less than normal patterns, whereas a positive value means overinvestment in that country. The negative differences in China, Japan and Taiwan imply underinvestment in those countries, while the ASEAN countries and the United States show overinvestment.

The low numbers for Korea's FDI in Japan, China, Taiwan and India probably reflect long periods of hostile policies towards FDI and subsequently, institutional restrictions such as intranparency imposed by the host country government. The high positive residuals for Singapore, Hong Kong, Malaysia, Thailand, Indonesia and the U.S. may reflect active pro-investment government policies and incentives.[11]

11) Another possibility is that they reflect economies of agglomeration. A large presence of Korean affiliates in a country paves the way for other affiliates to enter by facilitating the accumulation of knowledge and lowering costs of entry for followers.

Table 3.5. The Difference between Actual and Normal FDI Stock

	DIFFER91	DIFFER92	DIFFER93	DIFFER97	DIFFER98	DIFFER99
Australia	1.90	2.13	2.32	1.59	1.83	1.62
Canada	3.12	3.28	3.17	1.69	1.62	1.29
Chile	0.06	0.20	0.48	0.31	0.40	0.59
China	-0.43	-0.02	0.39	0.29	-0.42	-0.25
Germany	0.07	0.62	1.15	0.91	0.92	0.53
Hong Kong	1.61	2.25	2.24	1.38	1.43	1.70
India	-2.31	-2.24	-2.37	-0.20	-0.65	-0.44
Indonesia	3.28	3.21	3.01	2.34	2.48	2.08
Japan	-0.21	0.06	-0.24	-1.66	-1.70	-2.06
Malaysia	2.61	2.69	2.66	1.99	1.91	1.68
Mexico	-0.49	-0.65	-0.50	0.66	0.50	0.39
Philippines	1.79	1.67	1.56	1.00	0.75	0.63
Singapore	1.05	1.90	1.90	1.56	1.77	2.13
S. Africa	NA	-1.79	-1.10	-0.79	-0.91	0.14
Taiwan	-1.24	-0.82	-1.05	-2.08	-2.27	-2.42
Thailand	1.40	1.46	1.54	0.75	1.25	1.22
Turkey	0.30	0.25	-0.13	-0.13	-0.47	-0.67
U.K.	1.11	1.55	1.62	1.25	1.10	1.25
U.S.A.	3.06	3.10	2.90	2.53	2.33	2.00
Vietnam	NA	0.36	1.04	1.95	1.51	1.56

Notes: 1) Diff = log (actual FDI stock) - log (fitted FDI stock)

2) Unit of the FDI outflows: millions of US dollars.

IV. FDI's Effect on Trade

Owing to the empirical research of Lipsey and his co-authors and theoretical work of Markusen and his colleagues, multinational firms can be integrated into both the empirical analysis of FDI and trade, and trade theory. In line with this research, empirical work has been performed. In order to explore the possible impact of FDI on bilateral trade, Brenton, Di Mauro and Lucke (1999), Kawai and Urata (1998), Graham (1996), Eaton and Tamura (1994) and Drysdale and Garnaut (1982) estimated FDI flow and trade equations using the gravity model and examined the relationship between the two.

Brenton, Di Mauro and Lucke (1999), and Graham (1996) include the residual from the FDI gravity regressions in the gravity models for exports and imports. They assume that if FDI substitutes for trade, then trade should be lower than normal whenever FDI is higher than normal. Hence, under the hypothesis of substitutability, the coefficient of the FDI residual in the gravity model for trade should be negative.[12]

Kawai and Urata examined the FDI-trade interactions more directly, by estimating the gravity models for trade with FDI flows of the previous year as an explanatory variable. The gravity model for trade to test the impact of FDI on trade is as follows.[13]

12) We test the linkages between FDI and trade using this methodology. The results, summarized in Appendix Table 3, 4, 5, and 6, are similar to the results of this section despite showing a weaker nexus than the study of this section. However, the results in the Appendix might be better than the ones in this section in terms of endogeniety bias.

$$\log(TRADE_{ij}) = \alpha + \beta_1(\log GNP_i * \log GNP_j) + \beta_2(\log CGNP_i * \log CGNP_j) + \beta_3 \log(DISTANCE_{ij}) + \beta_4 FDIFLOW_{ij}(-1) + u_{ij},$$

where $TRADE$ is exports, or imports, or exports plus imports, and GNP_i and GNP_j are the economic sizes of Korea and the trading partner, respectively.

The gravity equation used here is the same as the traditional one except for the FDI term.[14] The likely endogeneity of FDI, the possibility of determining FDI by the same factors that determine bilateral trade, might be a serious problem when FDI is included as a variable to explain bilateral trade in the gravity equation. We address this problem, in a preliminary way, by putting only the lagged flow variable on the right-hand side of the equation. The idea is that this variable is predetermined, though in a cross-section study this approach is not a complete solution.

13) This gravity model differentiated with the standard one in that adjacent and language variables as well as regional bloc dummies are excluded whereas FDI is included in the explanatory variable list.

14) Deardorff (1998) and Anderson and Wincoop (2001) provide the rich theoretical foundation for the gravity model. The gravity model establishes a "norm" of bilateral trade volume based on economic, geographic and cultural factors. The dependent variable is the bilateral volume of total trade, exports, and imports (in logarithmic form). The two most important factors in explaining bilateral trade flows are the geographical distance between the two countries, and their economic size. These factors are the essence of the gravity model and are the source of the name, by analogy to the formula for gravitational attraction between two heavenly bodies.

We use the log of distance between the two major cities (usually the capitals) of the respective countries, even though a more thorough measure of distance would account for land and sea routes. Entering GNPs in product form is empirically well-established in bilateral trade regressions. Intuitively, one is likely to choose to trade more with a larger country than a smaller one. There are also reasons to believe that GNP per capita has a positive effect, for a given size. As countries become more developed, they tend to specialize more and trade more. An important part of this process is that higher-income countries tend to have lower trade barriers. This is consistent with Linder's (1961) hypothesis, according to which consumers with similar per capita incomes have similar consumption bundles. Using per capita income as a proxy for the distribution of types of consumers, the empirical results confirm that bilateral trade flows are higher as the per capita incomes of the trading partners are more similar.

The estimated equations to test the effect of FDI on trade, exports and imports are summarized in Table 4.1, Table 4.2 and Table 4.3, respectively.

The estimated coefficients on $FDIFLOW_{ij}(-1)$ in the equations for trade (exports plus imports) and exports are positive in every sample year and statistically significant except in 1999, indicating that Korea's FDI tends to promote its exports and overall trade. In the case of imports, the estimated coefficients on $FDIFLOW_{ij}(-1)$ are positive in every sample year but statistically significant in 1991, 1992 and 1993 at the significance level of 5 percent. This indicates that Korea's FDI tends to promote its imports in the early 1990s but this tendency weakens after the Asian financial crisis in 1997.

Table 4.1. FDI's Effect on Trade: FDI to Trade

	1991	1992	1993	1997	1998	1999
Intercept	0.77	1.03	4.11*	2.8	0.51	0.83
	(0.3)	(0.4)	(1.9)	(1.1)	(0.3)	(-0.4)
Nominal GNP (log value)	0.45**	0.41**	0.25**	0.27**	0.54**	0.70**
	(5.0)	(4.4)	(2.1)	(2.3)	(6.9)	(7.1)
Real GNP per capita (log value)	0.34**	0.25**	0.22**	0.29**	0.20**	0.14
	(3.3)	(2.5)	(2.3)	(2.5)	(2.6)	(1.3)
Distance from Korea	-0.77**	-0.70**	-0.62**	-0.54**	-0.73**	-0.79**
	(-4.2)	(-3.6)	(-3.6)	(-2.5)	(-4.5)	(-3.9)
FDI outflow (t-1)	0.19**	0.27**	0.26**	0.22**	0.12**	0.06
	(3.1)	(4.9)	(3.4)	(2.9)	(2.2)	(0.8)
Adjusted R^2 (Prob.F)	0.83**	0.79**	0.73**	0.65**	0.80**	0.79**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

Table 4.2. FDI's Effect on Trade: FDI to Exports

	1991	1992	1993	1997	1998	1999
Intercept	0.32	0.43	4.30*	4.75**	-3.37*	-1.49
	(0.1)	(0.2)	(1.9)	(2.4)	(-1.7)	(-0.7)
Nominal GNP (log value)	0.40**	0.41**	0.27**	0.18*	0.69**	0.78**
	(4.4)	(4.1)	(2.1)	(1.8)	(7.9)	(7.5)
Real GNP per capita (log value)	0.32**	0.16	0.08	0.25**	0.09	0.05
	(3.1)	(1.5)	(0.8)	(2.6)	(1.0)	(0.4)
Distance from Korea	-0.69**	-0.61**	-0.63**	-0.65**	-0.58**	-0.81**
	(-3.7)	(-2.9)	(-3.5)	(-3.7)	(-3.2)	(-3.9)
FDI outflow (t-1)	0.22**	0.26**	0.26**	0.27**	0.16**	0.03
	(3.5)	(4.5)	(3.2)	(4.4)	(2.6)	(0.4)
Adjusted R^2 (Prob.F)	0.81**	0.73**	0.69**	0.69**	0.79**	0.78**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

Table 4.3. FDI's Effect on Trade: FDI to Imports

	1991	1992	1993	1997	1998	1999
Intercept	-3.31	-2.53	1.11	-3.51	-2.53	-4.58
	(-0.9)	(0.76)	(0.34)	(-1.0)	(-0.8)	(-1.5)
Nominal GNP (log value)	0.59**	0.51**	0.33*	0.48**	0.52**	0.77**
	(3.9)	(3.8)	(1.85)	(2.8)	(3.7)	(5.5)
Real GNP per capita (log value)	0.44**	0.39**	0.35**	0.26	0.4**	0.30**
	(2.5)	(2.7)	(2.5)	(1.6)	(2.9)	(1.9)
Distance from Korea	-0.78**	-0.75**	-0.69**	-0.28	-0.69**	-0.77**
	(-0.3)	(-2.7)	(-2.6)	(-0.9)	(-2.4)	(-2.7)
FDI outflow (t-1)	0.17	0.26**	0.23**	0.16	0.13	0.04
	(1.6)	(3.3)	(2.0)	(1.5)	(1.3)	(0.4)
Adjusted R^2 (Prob.F)	0.70**	0.71**	0.61**	0.54**	0.61**	0.71**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

The magnitudes of the coefficients for FDI outflows in Table 4.2 were 0.22 and 0.26 in 1991 and 1992, and 0.16 and 0.03 in 1998 and 1999, respectively: the coefficients become smaller in 1998 and 1999 than in 1991 and 1992.[15] The coefficients for nominal GNP in the gravity equation for FDI to exports are 0.4-0.5 in 1991 and 1992 and 0.7-0.8 in 1998 and 1999. We interpret these results such that effect of Korea's FDI on trade become smaller after the Asian financial crisis, and that market size proxied by nominal GDP becomes more important than the earlier period.

15) The estimation results in 1997 and 1993 are ruled out because of relatively bad goodness of fit.

There is a possibility that the strong nexus between FDI and trade is exaggerated because of missing variables in the gravity equation: dummies for regional blocs. Once the gravity model has established the norm, a dummy variable can then be added to represent when both countries in a given pair belong to the same regional grouping. The coefficient on this "bloc variable" tells us the extent to which trade within the group has been promoted, whether by explicit preferential trading policies or by less formal socio-political forces. We introduce six regional bloc dummies—EU, APEC, MERCOSUR, NAFTA (Canada-U.S FTA), MERCOSUR and AFTA (ASEAN)—in the previous equations and estimate the revised gravity equation.

The revised gravity model for trade is as follows.

$$\log(TRADE_{ij}) = \alpha + \beta_1(\log GNP_i + \log GNP_j) + \beta_2 \log(CGNP_i + \log CGNP_j) + \beta_3 \log(DISTANCE_{ij}) + \beta_4 FDIFLOW_{ij}(-1) + \gamma_1 EU + \gamma_2 APEC + \gamma_3 MERCOSUR + \gamma_4 NAFTA + \gamma_5 AFTA + u_{ij}$$

The coefficients on *APEC, MERCOSUR* and *NAFTA* are insignificant in most cases while the coefficients on the *EU* and *AFTA* are negative and significant and positive and significant, respectively. On the other hand, inclusion of regional bloc dummies makes the effect of the distance variable on trade weaker than in the original gravity equations. Thus, we estimate the gravity equations again after deleting three insignificant regional bloc dummies—*APEC, MERCOSUR* and *NAFTA*. The results are reported in tables 4.4, 4.5 and 4.6.

The *EU* dummy has negative and significant coefficients in most cases, indicating that this special regional factor negatively affects Korea's bilateral trade: the formation of a continental trading bloc in

Table 4.4. The Gravity Model with EU and AFTA Variables: FDI to Trade

	1991	1992	1993	1997	1998	1999
Intercept	-1.96 (-0.9)	-1.66 (-0.7)	1.60 (0.6)	-1.50 (-0.7)	-2.14 (-1.2)	-4.21* (-1.9)
Nominal GNP (log value)	0.53** (6.3)	0.47** (5.3)	0.37** (2.7)	0.40** (4.0)	0.62** (8.4)	0.75** (8.1)
Real GNP per capita (log value)	0.42** (4.2)	0.29** (3.1)	0.22** (2.3)	0.39** (4.1)	0.26** (3.4)	0.28** (2.5)
Distance from Korea	-0.63** (-3.8)	-0.54** (-2.9)	-0.55** (-3.2)	-0.32* (-1.8)	-0.57** (-3.8)	-0.58** (-3.0)
FDI outflow (t-1)	0.14** (2.3)	0.24** (4.8)	0.22** (2.6)	0.15** (2.3)	0.07 (1.4)	0.03 (0.5)
EU bloc	-0.85** (-2.7)	-0.74** (-2.4)	-0.50 (-1.4)	-1.18** (-3.7)	-0.87** (-3.0)	-1.06** (-2.7)
AFTA bloc	0.73** (2.0)	0.61* (1.7)	0.41 (1.1)	0.59* (1.8)	0.81** (2.4)	0.87** (2.3)
Adjusted R^2 (Prob.F)	0.86** (0.00)	0.82** (0.00)	0.74** (0.00)	0.78** (0.00)	0.83** (0.00)	0.83** (0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

Table 4.5. The Gravity Model with EU and AFTA Variables: FDI to Exports

	1991	1992	1993	1997	1998	1999
Intercept	-2.25 (-1.1)	-2.04 (-0.8)	1.74 (0.6)	1.71 (0.9)	-4.77** (-2.2)	-5.17** (-2.2)
Nominal GNP (log value)	0.47** (5.5)	0.47** (4.8)	0.40** (2.7)	0.29** (3.2)	0.73** (8.2)	0.83** (8.5)
Real GNP per capita (log value)	0.39** (3.9)	0.19* (1.8)	0.08 (0.8)	0.33** (3.8)	0.16* (1.7)	0.17 (1.4)
Distance from Korea	-0.56** (-3.3)	-0.46** (-2.2)	-0.56** (-3.0)	-0.50** (-3.3)	-0.54** (-2.8)	-0.57** (-2.8)
FDI outflow (t-1)	0.17** (2.7)	0.24** (4.1)	0.22** (2.5)	0.19** (3.5)	0.13** (2.0)	-0.01 (-0.1)
EU bloc	-0.77 (-2.4)	-0.62* (-1.8)	-0.50 (-1.3)	-0.92** (-3.2)	-0.83** (-2.3)	-0.84** (-2.1)
AFTA bloc	0.74** (2.4)	0.68* (1.6)	0.44 (1.1)	0.64** (2.2)	0.14 (0.4)	1.12** (2.8)
Adjusted R^2 (Prob.F)	0.84** (0.00)	0.76** (0.00)	0.70** (0.00)	0.78** (0.00)	0.80** (0.00)	0.81** (0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

Table 4.6. The Gravity Model with EU and AFTA Variables: FDI to Imports

	1991	1992	1993	1997	1998	1999
Intercept	-6.66* (-0.8)	-5.74* (-1.7)	-1.60 (-0.4)	-7.43** (-2.0)	-6.26** (-1.9)	-8.25** (-2.5)
Nominal GNP (log value)	0.70** (4.6)	0.59** (4.5)	0.48** (2.3)	0.59** (3.6)	0.62** (4.5)	0.81** (6.0)
Real GNP per capita (log value)	0.51** (2.9)	0.42** (3.0)	0.34** (2.3)	0.36** (2.2)	0.47** (3.2)	0.46** (2.9)
Distance from Korea	-0.61** (-2.0)	-0.54** (-2.0)	-0.62** (-2.3)	-0.07 (-0.2)	-0.46 (-1.6)	-0.55* (-1.9)
FDI outflow (t-1)	0.08 (0.8)	0.22** (2.9)	0.16 (1.2)	0.08 (0.8)	0.06 (0.6)	0.02 (0.2)
EU bloc	-0.87 (-1.5)	-0.78* (-1.7)	-0.34 (-0.6)	-1.07* (-1.9)	-1.00* (-1.9)	-1.26** (-2.2)
AFTA bloc	1.18* (1.8)	0.94* (1.7)	0.72 (1.2)	0.81 (1.4)	1.34** (2.1)	0.89 (1.6)
Adjusted R^2 (Prob.F)	0.73** (0.00)	0.74** (0.00)	0.61** (0.00)	0.60** (0.00)	0.65** (0.00)	0.74** (0.00)

Notes: 1) Figures in parentheses are t-statistics.
2) ** and * denote significance at the 95% and 90% levels respectively.

Europe decreases Korea's trade with countries on European continent. The *AFTA* dummy has positive and significant coefficients in most cases, indicating that this regional bloc positively affects Korea's bilateral trade. The positive values of the dummy can be interpreted as follows: formation of *AFTA*, in spite of a regional trading bloc, functions as a building block for Korea because of complementary interdependence between Korea and ASEAN countries.

The inclusion of two bloc dummies makes FDI's effect on trade slightly and consistently smaller than before. However, the estimated coefficients on $FDIFLOW_{ij}$(-1) in the equations for trade and exports

are still positive in every sample year and statistically significant except in 1999, indicating that Korea's FDI tends to promote its exports and overall trade. In the case of imports, the estimated coefficients on $FDIFLOW_{ij}(-1)$ are positive in every sample year but not statistically significant in most years. This insignificance in import equations causes a further decrease in the coefficients of FDI in trade (exports plus imports) equations in the late 1990s. Thus, we can infer that the Asian financial crisis changes the strong relationship between trade and FDI by changing the relationship between FDI and imports.

The observed strong relationship between Korea's FDI and trade is consistent with the earlier findings of Kim (1994) and Kim and Kang (1997).

V. Summary and Concluding Remarks

Owing to the empirical research of Robert Lipsey and his co-authors and theoretical work of Markusen and his colleagues, multinational firms can be integrated into both the empirical analysis of FDI and trade, and trade theory. Based on these developments, we examine choice of FDI's location and test the effect of FDI on trade.

We analyze a formal gravity equation for choice of locations for Korea's FDI stock. According to the results, market size and growth in real GDP significantly cause a positive effect on location of FDI, while the real GDP per capita and distance variables turn out to cause negative effects on FDI. In particular, the negative effect of real capita GDP on FDI implies that Korean overseas production has little relation to high-income consumers and products. We can find changes in patterns of choice of location after the Asian financial crisis; in the early 1990s, the motivation behind FDI was to seek low cost labor in declining industries, but by the late 1990s, the main factor driving FDI was the globalization of businesses in the large conglomerate sector. Dividing the whole sample into a developing group and developed group leads to two implications. The first is that Korea's overseas production in developed countries is not related to high-income products, while it is for developing countries. The second is that FDI into developed (developing) countries is more related to local sales (export sales) than the case of FDI into developing (developed) countries. In addition, the insignificance of human capital abundance, technology level and tax rates means that Korea's FDI seeks unskilled labor rather than skilled labor, and that institutional

and policy-related variables such as transparency and pro-FDI policy might be more important than those variables. These results are one of the contributions of this paper and require more serious analysis.

Past research on the linkages between FDI and trade, regardless of whether the studies were conducted at the country, industry or firm level, almost all find net complementarity. The complementarity effect at the firm-level analysis arises from the multi-product nature of MNEs. This means that there may be demand complementarities and/or a vertical production relationship across a firm's products. First, a firm's production presence in a foreign market with one product may increase total demand for all of its products. Second, overseas production of the input-using industry increases exports of parts and intermediate goods from the source country.

Are the conclusions of Kim (1994) and Kim and Kang (1997) still valid after extending the data set to the late 1990s and employing a sort of gravity model?

Section 4 tests the effects of FDI on trade under the framework of a gravity equation. The estimated coefficients on FDI in the equations for trade and exports are positive and statistically significant in most years, indicating that Korea's FDI tends to promote its exports and overall trade. In the case of imports, the estimated coefficients are not statistically significant in most years. Thus, we can infer that the Asian financial crisis changed the strong relationship between trade and FDI by changing the relationship between FDI and imports. Empirical results also show that the effects of Korea's FDI on trade become smaller after the Asian financial crisis, and that market size proxied by nominal GDP becomes more important than in the earlier period. The positive values of the *AFTA* dummy can be interpreted

as strong complementary interdependence between Korea and the ASEAN countries. Finally, the observed strong relationship between Korea's FDI and trade is consistent with the earlier findings of Kim (1994) and Kim and Kang (1997).

However, this paper has the weakness of being a cross-country analysis. According to Lipsey (1999a), many influences on FDI location are specific to particular industries. Mineral resources are required for mining industries, labor costs are more important in labor-intensive industries than capital-intensive ones, human capital abundance may be more important for high-tech than for low-tech industries, and distance to markets is more important for the tradable goods industry than nontradables. This paper cannot induce these industry-characteristic implications because it uses cross-country data. However, an industry-level approach is necessary for a full explanation of Korea's FDI location. This is the next step in our FDI research series.

Appendix: FDI Outflows in 1991-1993 and 1997-1999

Korea's FDI in the early 1990s was directed largely to East Asia and North America, mainly in services and manufacturing. These two regions together observed 79 percent of Korea's FDI outflows. This share lowered to 70 percent in the 1997-99 period due to a decrease in North America's share from 35 to 27 percent. Sectoral composition of FDI also changed. The share of manufacturing decreased from 54.9 percent in the 1991-93 period to 47.3 percent in the 1997-99 period in accordance with structural changes in the Korean economy. Industrial composition in the manufacturing sector also changed. The FDI share of electrical and electronic products in the whole manufacturing sector increased from 18.4 percent in 1991-93 to 33.2 percent in 1997-99 reflecting the changing competitiveness of the Korean manufacturing sector, while the FDI share of machinery and transportation vehicles increased from 6.3 and 6.2 percent to 15.9 and 19.7 percent, respectively. In contrast, the share of textiles and clothing rapidly decreased from 21.4% to 8.7% in the same periods (See Table a1).

Table a1. FDI Outflows (Thousand dollars, %)

Panel A. Region

	91-93		97-99	
Asia	1,393,693	44.3	3,962,950	43.1
Middle East	32,974	1.0	75,136	0.8
North America	1,086,974	34.6	2,446,629	26.6
Latin America	96,298	3.1	657,943	7.2
Europe	396,593	12.6	1,593,552	17.3
Africa	72,252	2.3	203,744	2.2
Oceania	65,858	2.1	258,419	2.8
Total	3,144,642	100.0	9,198,373	100.0

Panel B. Sector

	91-93		97-99	
Agriculture and fishing	36,488	1.2	37,116	0.4
Mining	188,918	6.0	403,440	4.4
Manufacturing	1,726,334	54.9	4,348,151	47.3
Construction	29,086	0.9	207,049	2.3
Trade and retail	890,507	28.3	2,834,035	30.8
Transport and warehousing	24,447	0.8	84,129	0.9
Telecommunications	4,781	0.2	431,717	4.7
Financing and insurance	30	0.0	1,606	0.0
Hotels and restaurants	171,210	5.4	241,070	2.6
Real estate and services	72,841	2.3	609,640	6.6
Total	3,144,642	100.0	9,198,373	100.0

Panel C. Industry

	91-93		97-99	
Food and beverage	64,863	3.8	98,534	2.3
Textiles and apparel	369,059	21.4	376,476	8.7
Leather and footwear	63,896	3.7	58,545	1.3
Wood and furniture	78,140	4.5	30,008	0.7
Paper and printing	53,038	3.1	98,821	2.3
Petroleum and chemicals	136,913	7.9	375,131	8.6
Non-metallic minerals	97,540	5.7	-19,944	-0.5
Basic metals	173,845	10.1	265,151	6.1
Fabricated metals	52,746	3.1	-7,643	-0.2
Machinery and equipment	108,048	6.3	690,611	15.9
Electronics and telecommunication equipment	317,858	18.4	1,442,574	33.2
Transportation vehicles	106,356	6.2	857,057	19.7
Other manufacturing	104,032	6.0	82,830	1.9
Manufacturing	1,726,334	100.0	4,348,151	100.0

Appendix Table

Table A1. Country Codes

1	ALG	Algeria	35	GIN	Guinea	69	PER	Peru
2	AGO	Angola	36	GUY	Guyana	70	PHL	Philippines
3	ARG	Argentina	37	HND	Honduras	71	POL	Poland
4	AUS	Australia	38	HKG	Hong Kong, China	72	PRT	Portugal
5	AUT	Austria	39	ISL	Iceland	73	ROM	Romania
6	BHS	Bahamas, The	40	IND	India	74	RUS	Russian Federation
7	BHR	Bahrain	41	IDN	Indonesia	75	SAU	Saudi Arabia
8	BGD	Bangladesh	42	IRN	Iran, Islamic Rep.	76	SEN	Senegal
9	BEL	Belgium	43	IRL	Ireland	77	SGP	Singapore
10	BOL	Bolivia	44	ISR	Israel	78	SLK	Slovak Republic
11	BRA	Brazil	45	ITA	Italy	79	SLN	Slovenia
12	BRN	Brunei	46	JPN	Japan	80	SOL	Solomon Islands
13	BGL	Bulgaria	47	JOR	Jordan	81	ZAF	South Africa
14	CAM	Cambodia	48	KZK	Kazakhstan	82	ESP	Spain
15	CMR	Cameroon	49	KEN	Kenya	83	LKA	Sri Lanka
16	CAN	Canada	50	KOR	Korea, Rep.	84	SWZ	Swaziland
17	CHL	Chile	51	KWT	Kuwait	85	SWE	Sweden
18	CHN	China, Mainland	52	LAO	Lao PDR	86	CHE	Switzerland
19	COL	Colombia	53	LIT	Lithuania	87	SYR	Syrian Arab Republic
20	CRI	Costa Rica	54	LUX	Luxembourg	88	OAN	Taiwan, Province of china
21	CIV	Cote d'Ivoire	55	MAC	Macao, China	89	TAJ	Tajikistan
22	CSK	Czech Republic	56	MYS	Malaysia	90	TZA	Tanzania
23	DNK	Denmark	57	MLI	Mali	91	THA	Thailand
24	DOM	Dominican Republic	58	MUS	Mauritius	92	TUR	Turkey
25	ECU	Ecuador	59	MEX	Mexico	93	UKR	Ukraine
26	EGY	Egypt, Arab Rep.	60	MNG	Mongolia	94	ARE	United Arab Emirates
27	ETH	Ethiopia	61	MAR	Morocco	95	GBR	United Kingdom
28	FJI	Fiji	62	NLD	Netherlands	96	USA	United States
29	FIN	Finland	63	NZL	New Zealand	97	URY	Uruguay
30	FRA	France	64	NGA	Nigeria	98	UZB	Uzbekistan
31	DEU	Germany	65	NOR	Norway	99	VUT	Vanuatu
32	GHA	Ghana	66	PAK	Pakistan	100	VEN	Venezuela, RB
33	GRC	Greece	67	PAN	Panama	101	VTN	Vietnam
34	GTM	Guatemala	68	PNG	Papua New Guinea	102	YEM	Yemen, Rep.

Table A2. Data Description (Variable names)

Variable	Explanation
(1) Original Variables	
ODI	ODI stock (Outstanding invested, Thousands of U.S. Dollars, The Export-Import Bank)
KFL	ODI outflow (Net invested, Thousands of US Dollars, The Export-Import Bank)
DISTANCE	
KOREX	Korean exports to a country (Millions of US Dollars, DOTS)
KORIM	Korean imports from a country (Millions of US Dollars, DOTS)
GDPV	GDP at market prices (current US$, thousands)
CGDP	GDP per capita (constant 1995 US$)
CGNP	GNP per capita (constant 1995 US$)
CGNIV	GNI per capita, Atlas method (current US$)
GNIV	GNI (current US$, thousand)
POP	Total Population (thousand persons)
RTRGP	Trade (% of GDP)
RXGDP	Exports of goods and services (% of GDP)
RMGDP	Imports of goods and services (% of GDP)
FDINGP	Foreign direct investment, net inflows (% of GDP)
FDININ	Foreign direct investment, net inflows (% of gross capital formation)
RXDUTY	Export duties (% of exports)
RMDUTY	Import duties (% of imports)
RTXGP	Tax revenue (% of GDP)
RTXGS	Taxes on goods and services (% value added of industry and services)
ENR3G	School enrollment, tertiary (% gross)
ENR2G	School enrollment, secondary (% gross)
RDGNI	Research and development expenditure (% of GNI)

Table A2. Continued

Variable	Explanation
(2) Log values	
KTRADE	KOREX + KORIM
LKTRAD	log (KTRADE)
LKOREX	log (KOREX)
LKORIM	log (KORIM)
LODI	log (ODI)
LGNIV	log (GNIV)
LGDPV	log (GDPV)
LCGDP	log (CGDP)
LCGNP	log (CGNP)
LCGNIV	log (CGNIV)
LPOP	log (POP)
(3) Regional bloc dummies	APEC, MERCOSUR, NAFTA, AFTA

Table A3. Linkages between FDI and Trade: FDI to Trade

	1991	1992	1993	1997	1998	1999
Intercept	0.33	-1.75	2.82	-1.28	-2.00	-4.86**
	(0.1)	(-0.8)	(1.1)	(-0.6)	(-1.07)	(-2.2)
Nominal GNP (log value)	0.66**	0.68**	0.50**	0.55**	0.65**	0.82**
	(7.5)	(9.0)	(4.7)	(6.2)	(10.0)	(11.5)
Real GNP per capita (log value)	0.22**	0.17*	0.13	0.30**	0.34**	0.23**
	(2.3)	(1.8)	(1.4)	(3.0)	(3.7)	(2.1)
Distance from Korea	-0.89**	-0.61**	-0.70**	-0.43**	-0.64**	-0.57**
	(-4.8)	(-3.4)	(-3.8)	(-2.5)	(-3.9)	(-2.8)
FDI Residual (log value)	0.18**	0.11*	0.09	0.18	0.08	0.08
	(3.3)	(1.8)	(1.2)	(1.8)	(1.3)	(1.4)
EU bloc	-0.43	-0.88**	-0.34	-1.26**	-1.14**	-1.17**
	(-1.4)	(-2.45)	(-1.0)	(-4.0)	(-3.5)	(-3.2)
AFTA bloc	1.20**	1.02**	0.71**	0.60	1.17**	1.00**
	(3.4)	(2.8)	(2.0)	(1.6)	(3.3)	(2.5)
Adjusted R^2 (Prob.F)	0.84**	0.84**	0.63**	0.76**	0.84**	0.84**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

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

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

3) Equation estimated is as follows.

$$\log(TRADE_{ij}) = \alpha + \beta_1(\log GNP_i + \log GNP_j) + \beta_2 \log(PGNP_i + \log PGNP_j) + \beta_3 \log(DISTANCE_{ij}) + \gamma_1 APEC_i + \gamma_2 EAEC_i + \beta_4 FDI\ Residual + v_{ij}$$

Table A4. Linkages between FDI and Trade: FDI to Export

	1991	1992	1993	1997	1998	1999
Intercept	-0.40	-1.71	3.18	1.50	-3.79*	-6.22**
	(-0.2)	(-0.8)	(1.2)	(0.8)	(-1.8)	(-2.6)
Nominal GNP (log value)	0.63**	0.67**	0.55**	0.48**	0.75**	0.89**
	(6.7)	(9.1)	(5.0)	(5.8)	(10.3)	(11.8)
Real GNP per capita (log value)	0.15	0.15*	-0.03	0.24**	0.20	0.15
	(1.4)	(1.7)	(-0.3)	(2.7)	(1.9)	(1.4)
Distance from Korea	-0.75**	-0.66**	-0.75**	-0.60**	-0.57**	-0.57**
	(-3.8)	(-3.8)	(-4.0)	(-3.9)	(-2.9)	(-2.6)
FDI Residual (log value)	0.17**	0.15**	0.16**	0.23**	0.05	0.07
	(2.9)	(2.5)	(2.2)	(3.1)	(0.8)	(1.2)
EU bloc	-0.35	-0.77**	-0.18*	-1.20**	-1.19**	-1.02**
	(-1.0)	(-2.2)	(-0.5)	(-4.2)	(-3.1)	(-2.6)
AFTA bloc	1.26**	1.10**	0.79**	0.71**	0.76**	-1.18**
	(3.3)	(3.0)	(2.2)	(2.2)	(1.9)	(2.9)
Adjusted R^2 (Prob.F)	0.79**	0.85**	0.66**	0.75**	0.80**	0.83**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

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

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

3) Equation estimated is as follows.

$$\log(EXPORT_{ij}) = \alpha + \beta_1(\log GNP_i + \log GNP_j) + \beta_2 \log(PGNP_i + \log PGNP_j) + \beta_3 \log(DISTANCE_{ij}) + \gamma_1 APEC_i + \gamma_2 EAEC_i + \beta_4 FDI\,Residual + v_{ij}$$

Table A5. Linkages between FDI and Trade: FDI to Import

	1991	1992	1993	1997	1998	1999
Intercept	-3.88	-4.97	-0.68	-6.97**	-6.68**	-8.99**
	(-1.1)	(-1.5)	(-0.18)	(-2.0)	(-2.4)	(-2.6)
Nominal GNP (log value)	0.77**	0.79**	0.54**	0.65**	0.65**	0.84**
	(5.5)	(7.0)	(3.48)	(5.5)	(6.7)	(7.7)
Real GNP per capita (log value)	0.36**	0.18	0.30**	0.30**	0.60**	0.42**
	(2.4)	(1.4)	(2.29)	(1.9)	(4.3)	(2.5)
Distance from Korea	-0.92**	-0.60**	-0.66**	-0.11	-0.52**	-0.49
	(-3.1)	(-2.2)	(-2.5)	(-0.4)	(-2.1)	(-1.5)
FDI Residual (log value)	0.13	0.10	-0.01	0.08	0.03	0.09
	(1.5)	(1.1)	(-0.1)	(0.6)	(0.3)	(1.0)
EU bloc	-0.49	-0.93*	-0.34	-1.00**	-1.20**	-1.48**
	(-1.0)	(-1.7)	(-0.7)	(-2.0)	(-2.4)	(-2.6)
AFTA bloc	1.49**	1.15**	0.85	0.71	1.57**	1.07*
	(2.6)	(2.1)	(1.6)	(1.1)	(3.0)	(1.8)
Adjusted R^2 (Prob.F)	0.75**	0.75**	0.48	0.58**	0.76**	0.71**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

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

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

3) Equation estimated is as follows.

$$\log(IMPORT_{ij}) = \alpha + \beta_1(\log GNP_i + \log GNP_j) + \beta_2 \log(PGNP_i + \log PGNP_j) + \beta_3 \log(DISTANCE_{ij}) + \gamma_1 APEC_i + \gamma_2 EAEC_i + \beta_4 FDI\,Residual + v_{ij}$$

Table A6. Linkages between FDI and Trade: Trade to FDI

	1991	1992	1993	1997	1998	1999
Intercept	3.57	5.89	-2.14	-2.93	-3.94	-0.03
	(0.6)	(1.1)	(-0.3)	(-0.7)	(-0.9)	(-0.0)
Nominal GNP (log value)	0.70**	0.62**	1.16**	0.97**	0.98**	0.71**
	(2.9)	(3.3)	(4.4)	(5.1)	(6.5)	(4.2)
Real GNP per capita (log value)	-0.36	-0.32	-0.56**	-0.40**	-0.43**	0.04
	(-1.4)	(-1.4)	(-2.4)	(-2.1)	(-2.0)	(0.1)
Distance from Korea	-0.65	-0.79	-0.76*	-0.32	-0.15	-0.58
	(-1.3)	(-1.8)	(-1.7)	(-1.0	(-0.40)	(-1.2)
Trade Residual (log value)	1.29**	0.71*	0.57	0.63	0.39	0.45
	(3.3)	(1.8)	(1.2)	(1.8)	(1.3)	(1.4)
EU bloc	0.24	0.79	0.73	-0.78	0.47	-1.45*
	(0.29)	(0.9)	(0.9)	(-1.3)	(0.65)	(-1.6)
AFTA bloc	2.33*	1.77*	1.64*	1.68**	1.63**	1.79**
	(2.4)	(1.9)	(1.8)	(2.4)	(2.1)	(2.0)
Adjusted R^2 (Prob.F)	0.37**	0.37**	0.48**	0.49**	0.51**	0.38**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

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

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

3) Equation estimated is as follows.

$$\log(FDIFLOW_{ij}) = \alpha + \beta_1(\log GNP_i + \log GNP_j) + \beta_2 \log(PGNP_i + \log PGNP_j) + \beta_3 \log(DISTANCE_{ij}) + \gamma_1 APEC_i + \gamma_2 EAEC_i + \beta_4 TRADE\ Residual + v_{ij}$$

References

Anderson, James E. (1979), "A Theoretical Foundation for the Gravity Equation," *American Economic Review* 69: 106-116.

_____ and Wincoop, Eric van (2001), "Gravity with Gravitas: A Solution to the Border Puzzle," NBER Working Paper No. 8079.

Blonigen, Bruce A. (2001), "In Search of Substitution Between Foreign production and Exports," *Journal of International Economics* 53: 81-104.

Blomstrom, Magnus, Robert E. Lipsey and Kssenia Kulchcky (1989), "US and Swedish Direct Investment and Exports," in Baldwin, Robert E. (ed.), *Trade Policy Issues and Empirical Analysis,* Chicago and London: University of Chicago Press.

Brainard, S. L. (1997), "An Empirical Assessment of the Proximity-Concentration Trade-Off between Multinational Sales and Trade," *American Economic Review* 87 (4): 520-544.

Brenton, Paul, Francesca Di Mauro and Matthias Lucke (1999), "Economic Integration and FDI: An Empirical Analysis of Foreign Investment in the EU and in Central and Eastern Europe," *Empirica* 26 (2): 95-121.

Carr, David, James R. Markusen and Keith Maskus (1998), "Estimating the Knowledge-Capital Model of the Multinational Enterprise." NBER working paper 6773.

Deardorff, Alan V. (1998), "The Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?" in Jeffrey A. Frankel, ed., *The Regionalization of the World Economy,* Chicago: University of Chicago.

Eaton, Jonathan, and Akiko Tamura (1994), "Bilateralism and Regionalism in Japanese and U.S. Trade and Direct Foreign Investment Patterns," *Journal of the Japanese and International Economics* 8: 478-510.

_____ (1996), "Japanese and U.S. Exports and Investment as Conduits of Growth," NBER Working Paper No. 5457.

Frankel, Jeffrey A. (1997), *Regional Trading Blocs in the World Economic System*, Washington D.C.: Institute for International Economics.

_____ and Andrew K. Rose (2000), "Estimating the Effect of Currency Unions on Trade and Output," NBER Working Paper 7857.

_____ and Shang-Jin Wei (1996), "ASEAN in a Regional Perspective," UC Berkeley Working Paper C96-074, November 1996.

_____, Ernesto Stein and Shang-Jin Wei (1997), "Continental Trading Blocs: Are They Natural or Supernatural?" in Jeffrey A. Frankel ed., *The Regionalization of the World Economy*, University of Chicago: 91-113.

Graham, E.M., (2000), "The Relationship between Trade and Foreign Direct Investment in the Manufacturing Sector: Empirical Results for the United States and Japan," in D. Encarnation (ed.), *Does Ownership Matter?: Japanese Multinationals in East Asia*, Oxford University Press.

_____ (1996), "On the Relationship among Foreign Direct Investment and International Trade in the Manufacturing Sector: Empirical Results for the United States and Japan," WTO Staff Working Paper RD-96-008.

Grubert, H. and J. Mutti (1991), "Taxes, Tariffs, and Transfer Pricing in Multinational Corporate Decision Making," *Review of Economics and Statistics* 73: 285-93.

Hortsmann, Ignatius J. and James R. Markusen (1987), "Strategic Investments and the Development of Multinationals," International Economic Review 28: 109-21.

Kawai, Masahiro and Shujiro Urata (1998), "Are Trade and Investment Substitutes or Complements? An Empirical Analysis of Japanese manufacturing Industries," in Lee, Hiro, Roland and W. David, *Economic Development and Cooperation in the Pacific Basin: Trade, Investment, and Environmental Issues*, Cambridge; New York and Melbourne: Cambridge University Press, 1998.

Kim, June-Dong (1994), "Exports and FDI in the Period of Globalization," Policy References 94-16, Korea Institute for International Economic

Policy (Korean).

_____ and In-Soo Kang (1997), "Outward FDI and Exports: The Case of South Korea and Japan," *Journal of Asian Economics* 8: 39-50.

Kim, Seungjin (1997), *Determinants and Effects of Korea's FDI Outflows*, Korea Development Institute (Korean).

Kravis, Irving B. and Robert E. Lipsey (1982), "The Location of Overseas production and Production for Export by U.S. Multinational Firms," *Journal of International Economics* 12: 201-23.

Lee, Seong-Bong (2000), "Korea's Overseas Direct Investment: Evaluation of Performances and Future Challenges," KIEP Working Papers 00-10, Korea Institute for International Economic Policy.

Lipsey, Robert E. (1999a), "The Location and Characteristics of U.S. Affiliates in Asia," NBER Working Paper No. 6876.

_____ (1999b), "Affiliates of U.S. and Japanese Multinationals in East Asian Production and Trade," NBER Working Paper No. 7292.

_____ (1993), "Foreign Direct Investment in the United States: Changes over Three decades," in Froot, Kenneth A. (ed.), *Foreign Direct Investment*, Chicago and London: University of Chicago Press.

_____ (1989), "The Internationalization of Production," NBER Working Paper No. 2923.

Lipsey, Robert E., Eric D. Ramstetter and Magnus Blomstrom (2000), "Outward FDI and Parent Exports and Employment: Japan, The United States, and Sweden," NBER Working Paper No. 7623.

Lipsey, Robert E. and N. Y. Weiss (1984), "Foreign Production and Exports of Individual Firms," *Review of Economics and Statistics* 66: 304-07.

_____ (1981), "Foreign Production and Exports in Manufacturing Industries," *Review of Economics and Statistics* 63: 488-94.

Markusen, James R. (1983), "Factor Movements and Commodity Trade as complements," *Journal of International Economics* 13: 341-56.

Markusen, James R. and Keith E. Maskus (1999), "Multinational Firms:

Reconciling Theory and Evidence," NBER Working paper No. 7163.

Markusen, James R. and Anthony J. Venables (1998), "Multinational Firms and the New Trade Theory," *Journal of International Economics* 46: 183-203.

McCallum, John (1995), "Natural Borders Matter: Canada-U.S. Regional Trade Patterns," *American Economic Review* 85: 615-23.

Mundel, R.A. (1957), "International Trade and Factor Mobility," *American Economic Review* 47: 321-56

Sohn, Chan-Hyun and Jinna Yoon (2001), "Does the Gravity Model Fit Korea's Trade Patterns?: Implications for Korea's FTA Policy and North-South Korean Trade," KIEP Working Paper 01-01. KIEP.

Swedenborg, B. (1979), "The Multinational Operations of Swedish Firms," The Institute for Economic and Social Research, Stockholm.

Swenson, D. L. (1997), "Explaining Domestic Content: Evidence from Japanese and US Automobile Production in the United States," in R.C. Feenstra (ed.), *Effects of US Trade Protection and Protection Policies*, University of Chicago Press, Chicago.

Urata, Shujiro (1998), "Japanese Foreign Direct Investment in Asia," in Kumer Nageshi (ed.), *Globalization, Foreign Direct Investment and Technology Transfers: Impacts on and Prospects for Developing Country.*

Wang, Yoon-Jong (ed.,) (1997), Current Issues and Performance of Korea's Overseas FDI: In-depth Report, KIEP (Korean).

Wong, Kar-Yui (1986), "Are International Trade and Factor Mobility Substitutes?" *Journal of International Economics* 20: 25-44.

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