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**The Role of Foreign Direct
Investment in Korea's
Economic Development:
Productivity Effects and Implications
for the Currency Crisis**

June-Dong Kim · Sang-In Hwang



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Abstract

This paper seeks to investigate the role of foreign direct investment (FDI) in Korea focusing on productivity spillover effects in manufacturing and implications for the current currency crisis. Estimation results of a random-effects model with instruments using the annual data of six subsectors in manufacturing industries reveal that foreign direct investment had a positive but statistically insignificant effect on the productivity of Korean manufacturing during 1974–1996. The paper also examines whether or not FDI has the role of preventing the bail-out loans in a currency crisis. The probit estimation results using cross section data of 90 developing countries show that the incidence of bail-out loans from the IMF during 1994–1997 is negatively associated with FDI stock relative to total debt. The probit analysis using pooled data of 84 countries in 22 years of 1973–1994 also reveals that FDI inflow relative to total debt is negatively associated with both currency crashes and the IMF rescue loans.

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I. Introduction

Since the 1960s, Korea has accomplished remarkable economic growth, allowing it to overcome the devastation caused by the Korean War. However, the currency crisis of 1997 brought Korea into the most severe hardship since the Korean War. To overcome the current financial crisis, Korea needs to inject stable foreign capital through foreign direct investment (FDI). However, there still exist negative sentiments against foreign investment fearing foreign control over domestic economy. In fact, the Korean government as well as general public were in favor of indigenous industrialization rather than FDI-based development.

It is now needed to investigate the role of FDI in economic development when the Korean economy suffers a currency crisis. Specifically, with public sentiments against the harsh conditions of the IMF financial arrangements, it is interesting to see whether or not FDI is in fact to help avoid the IMF bail-out loans. The multinational firms may help the crisis-ridden country to circumvent the IMF financial arrangements by providing local subsidiaries and business partners a normal access to raw materials or trade financing.

For a longer-term issue, we need to examine whether FDI enhances efficiency and thus contribute to a sustainable growth. Despite the low realization of FDI, case study evidences show that foreign firms helped develop such strategic industries as semiconductors and raise productivity through transferring technology and management know-how.

This paper seeks to investigate these two issues regarding the role of FDI in Korea's economic development. First, we seek to examine whether the quantitative data supports the anecdotal evidences of the

productivity spillover effects of foreign direct investment in Korean manufacturing. Furthermore, we investigate the role of FDI in a currency crisis by looking at the relationship between the relative importance of FDI and the incidence of the IMF bail-out loans in developing countries.

This paper is organized as follows: Section II reviews the evolution of the Korean government's foreign direct investment policy. Section III presents the trends and patterns of FDI inflow into Korea. Section IV presents an estimation of the effects of FDI on the productivity of Korean manufacturing industries. Section V investigates whether FDI can play a role in preventing the IMF rescue loans using the data of 90 developing countries. Concluding remarks are provided in Section VI.

II . Historical Overview of Foreign Direct Investment Policy in Korea

In order to investigate the role of foreign direct investment in Korea's economic development, it is helpful to review the government's policy on FDI. Korea is well known around the world as an "outward-oriented" country. Yet, as demonstrated below, the main orientation of Korea's investment policies has failed to embrace an open-market strategy throughout its development stages.

Institutionalization (1960~1983)

Following the import-substitution drive of the 1950s, Korea shifted its development strategy toward a more outward-oriented system which emphasized export promotion. The new export-led growth strategy went hand-in-hand with policies aimed at introducing FDI. In 1960, the Korean government enacted the Foreign Capital Inducement Act (FCIA) and related decrees.

The government wanted to use FDI for easing balance-of-payment difficulties, supplying needed technology and expertise. FDI was welcomed into the light manufacturing export sector, especially in the two Free Export Zones at Masan and Iri. However, foreign investment was still discouraged in those sectors still protected by import-substitution measures. This is because the Korean government feared that the economy would become dominated by foreign firms. Moreover, the Korean government wanted to channel the limited amount of capital resources to industries vital to long-term economic growth. With this strategy in mind, the Korean government preferred

foreign borrowings which bring foreign resources under its control.

Liberalization of foreign direct investment (1984~1997)

A major change occurred in the early 1980s as the Korean economy began to experience serious difficulties due to the negative effects of the Heavy and Chemical Industry Promotion Plan of the 1970s. A new industrial strategy was thus adopted in the early 1980s in an attempt to upgrade Korea's industrial structure into one embracing more technology- and skill-intensive sectors. A key component of this technological upgrade was to liberalize FDI.

In 1984, the Korean government replaced the positive list system with a negative list system in which all industries not listed were open for FDI approval.

In December 1989, various performance requirements imposed on foreign invested enterprises (FIEs), such as export, local content, and technology transfer requirements, were abolished.

From 1994, the Korean government liberalized restricted business categories according to a Five-Year Foreign Investment Liberalization Plan, which has been updated every year thereafter. Multilateral trade negotiations such as GATT and the government's aim to induce more competition in the domestic market fostered a gradual opening of the service sector.

In December 1996, when Korea joined the OECD, the Korean government furthered liberalization by amending the Foreign Capital Inducement Act into the Act on Foreign Direct Investment and Foreign Capital Inducement. Its main purpose was to realign Korea's foreign direct investment system in line with international norms and standards. For example, the concept of FDI was expanded to

encompass the long-term (five years or more) loans. Also, starting from February 1997, foreign investors were allowed to acquire outstanding shares of Korean companies through friendly mergers and acquisitions (M&As). Such friendly M&As required the consent of the board of directors of the targeted company.

Even though the Korean government made some real efforts to liberalize foreign direct investment, its overall position towards FDI was a passive one. The government allowed foreign direct investment into liberalized business categories and activities but refused to remove various impediments and to promote foreign direct investment to the extent carried out in the South-East Asian countries.

Promotion after currency crisis (1998 afterwards)

At the end of 1997, Korea was throttled by a currency crisis when the won depreciated over 100% against the U.S. dollar. Loss of foreign reserves and reluctance of foreign lenders to roll over loans brought Korea to the brink of default in late December of 1997. To overcome the crisis in the most rapid and painless way possible, the Korean government is targeting a more active promotion of foreign direct investment.

In June 1998, the Korean government allowed hostile cross border M&As without any reservation. In November 1998, the Korean government will enact the Foreign Investment Promotion Act. This new legislation will focus on creating an investor-oriented policy environment by streamlining foreign investment procedures, strengthening investment incentives and establishing an institutional framework for investor-relationship management, including providing all investor needs through one-stop service.

III. Trends of Foreign Direct Investment in Korea

Foreign direct investment into Korea showed no significant change during the initial period of implementation from the 1960s until the mid-1980s (Table 3-1). During this period FDI played a very minor role in Korea's industrialization.¹⁾

In the mid-1980s, however, foreign direct investment into Korea increased from an annual average of US\$ 500 million to over US\$ 1 billion. After peaking in 1988, however, inward FDI declined. This decline is attributed to the following factors:

- Increased labor disputes and the ensuing wage hikes in the late 1980s made Korea less attractive as a source of low-cost labor;
- Rises in real estate prices, and difficulties of FIEs in corporate finance worsened the business environment for foreign investors;
- Overall, Korea's foreign investment climate became relatively less attractive than those of the South-East Asian countries after the second half of the 1980s.

Foreign investment inflow improved again in 1994, totaling US\$ 1.3 billion and equaling the previous peak level. Foreign investment increased further to US\$ 3.2 billion in 1996 and US\$ 6.9 billion in

1) Koo (1985) also points out that the effects of foreign firms in improving sectoral efficiency in Korea during 1960s and 1970s appear to have been insignificant.

Table 3-1. FDI inflow into Korea, by Sector and Home Country, 1962~1997

(Unit: US\$ million, %)

	'62~'86*	'87~'90*	'91~'93*	'94~'95*	'96	'97	Cumulated '62~'97
Total	145.3	1060	1111.6	1629.0	3202.6	6971.0	24640.1
Manufacturing	92.8 (63.9)	707.4 (66.7)	748.0 (67.3)	642.6 (39.4)	1930.2 (60.3)	2347.9 (33.7)	12957.9 (52.6)
Food	5.9 (4.0)	36.7 (3.5)	59.5 (5.4)	16.3 (1.0)	252.9 (7.9)	850.6 (12.2)	1607.9 (6.5)
Chemicals	18.2 (12.5)	195.4 (18.4)	207.3 (18.7)	140.7 (8.6)	388.5 (12.1)	234.6 (3.4)	2763.1 (11.2)
Textiles and Clothing	8.4 (5.8)	14.7 (1.4)	13.8 (1.2)	32.2 (2.0)	21.0 (0.7)	85.2 (1.2)	482.2 (2.0)
Electric & Electronics	21.0 (14.4)	169.9 (16.0)	78.6 (7.1)	145.5 (8.9)	435.6 (13.6)	291.0 (4.2)	2457.3 (10.0)
Transport Equipment	13.5 (9.3)	95.1 (9.0)	44.6 (4.0)	69.2 (4.3)	271.4 (8.5)	394.5 (5.7)	1656.3 (6.7)
Service	51.4 (35.4)	350.3 (33.0)	362.4 (32.6)	986.0 (60.5)	1254.3 (39.2)	4567.8 (65.5)	11566.5 (46.9)
Hotel	36.5 (25.1)	198.9 (18.8)	55.2 (5.0)	254.6 (15.6)	228.4 (7.1)	2595.6 (37.2)	5206.1 (21.1)
Wholesale & Retail	0.7 (0.5)	10.0 (0.9)	36.0 (3.2)	80.0 (4.9)	296.9 (9.3)	891.8 (12.8)	1477.7 (6.0)
Trading	0.2 (0.1)	24.5 (2.3)	80.1 (7.2)	104.1 (6.4)	126.2 (3.9)	233.2 (3.3)	910.4 (3.7)
Financing & Insurance	7.0 (4.8)	110.2 (10.4)	87.4 (7.8)	368.1 (22.6)	265.7 (8.3)	279.8 (4.0)	2159.1 (8.8)
By Home Country							
Japan	76.1 (52.3)	474.0 (44.7)	222.4 (20.0)	423.4 (26.0)	254.6 (7.9)	265.7 (3.8)	5832.6 (23.7)
Malaysia	0.00 (0.0)	0.1 (0.0)	0.0 (0.0)	111.4 (6.8)	672.5 (21.0)	722.1 (10.4)	1617.9 (6.6)
U. S. A.	42.9 (29.5)	292.6 (27.6)	338.7 (30.5)	477.9 (29.3)	876.1 (27.4)	3189.6 (45.8)	8280.7 (33.6)
Europe	13.9 (9.5)	220.8 (20.8)	471.3 (42.4)	440.9 (27.1)	1058.3 (33.0)	2409.4 (34.6)	6993.4 (28.4)
Netherlands	2.1 (1.5)	37.6 (3.6)	258.1 (23.2)	118.6 (7.3)	204.8 (6.4)	830.8 (11.9)	2251.1 (9.1)
Germany	2.5 (1.8)	58.2 (5.5)	74.8 (6.7)	52.4 (3.2)	94.9 (3.0)	398.1 (5.7)	1118.8 (4.5)
Ireland	0 (0.0)	0.0 (0.0)	0.3 (0.0)	118.6 (7.3)	410.0 (12.8)	357.4 (5.1)	1005.8 (4.1)

Note: based on notifications. * denotes annual average. Percentage shares in total investment are in parentheses.

Source: Ministry of Finance and Economy

1997.²⁾ This climb is in part due to the Korean government's liberalization of foreign investment, including the expansion of business categories eligible for foreign investment. However, a significant portion of the increased FDI in 1997 is foreign borrowings in nature in that local companies utilized friendly M&As and long-term loans to circumvent the regulations on foreign borrowings.

For the sectoral distribution of FDI inflow into Korea, the manufacturing sector was the largest recipient during the early liberalization period, comprising 63.9% of total inward FDI during 1962–1986. This trend continued until 1993, when the share of the manufacturing sector exceeded 65% of total FDI inflow. As the service sector has been gaining importance in the overall Korean economy, FDI into the service sector increased significantly, comprising the largest portion of total FDI (60.5%) in 1994–95. This trend continued in 1997, when FDI into the service sector represented 65.5% of total FDI.

In the manufacturing sector, the composition of inward FDI changed towards more investment into the heavy and chemical industries. Since the mid-1980s, FDI into labor-intensive and low-technology industries, such as textiles and clothing, has been significantly reduced due to the rise in labor costs. Instead, the electric and electronics sector as well as transport equipment and chemicals are receiving increased amounts of foreign investment. In 1997, however, foreign food

2) Even though foreign direct investment into Korea increased recently, its level relative to the size of the economy is lower than that of the South-East Asian countries. The inward FDI stock in Korea as a percentage of GDP in 1995 was 2.3 percent, far below than the world average of 10.1 percent and the Southeast Asian countries' average of 15.1 percent. (World Investment Report 1997, Annex Table B.6)

companies increased their investment into Korea by acquiring domestic food companies and their distribution networks.

The composition in the service sector has also changed. Even though the hotel business is recorded as the largest subsector in terms of cumulated FDI, FDI into wholesale & retail as well as financing & insurance increased throughout the 1990s.

Table 3-1 further shows that FDI into Korea was largely from Japan and the US in the past. Recently, investments from European countries, including the Netherlands, have increased as such countries became aware of the growing Korean market. In 1996, investments from Malaysia and Ireland significantly increased, providing more than 33% of all FDI that year. These investments are presumed to be capital flows from the other regions which seek to exploit tax benefits of offshore banking in these countries.

Now, in 1998, after the outbreak of the currency crisis, a number of domestic firms are being sold in order to alleviate debt burdens. Up to now, only a few deals were made, as shown in Table 3-2. Since the M&A market has not been well developed in Korea, there is a wide gap between the price domestic firms are offering and the price at which foreigners are willing to pay. Delay of the sale of such assets is also attributed to the high debt ratios and lack of transparency of domestic firms as well as a lack of improvement in labor market conditions.

Table 3-2. Recent Sales of Korean Firms to Foreigners (1998.1~1998.4)

Korean Firm	Foreign Buyer	Contents
Hanwha	FAG OEM & Handel (Germany)	sold bearing unit at 320 billion won (213 million dollars)*
Hanwha	BASF (Germany)	sold 50% stake of Hanwha BASF Urethane at 120 billion won (80 million dollars)*
Hyosung	BASF (Germany)	sold 50% stake of Hyosung BASF at 64 billion won (43 million dollars)*
Hyundai Electronics	Adaptech (USA)	sold Symbios Logic (a US subsidiary) at 875 million dollars
Daesang	BASF (Germany)	sold Lycine unit at 600 million dollars
Halla	Bowater (USA)	sold Halla Pulp and Paper at 210 million dollars
Sambo Computer	Seiko Epson (Japan)	sold printer unit at 20 million dollars
Daewoo	Al Walid (Saudi Arabia)	sold CB of 100 million dollars

Note: * denotes that exchange rate of 1,500 won per dollar is applied.

IV. Effect of Foreign Direct Investment in Korea on Productivity

Despite the small amount of FDI in Korea relative to the size of its economy, it was foreign firms which brought the key technology and constructed the basis for such industries as electronics and pharmaceuticals. For example, subsidiaries of foreign semiconductor firms contributed to the domestic firms growing into major players in the world market by spinning out skilled workers and managers as well as via technical guidance to subcontractors. Also, multinational pharmaceutical firms helped the domestic pharmaceutical industry develop new drugs through boosting local research capabilities.³⁾

More specifically, anecdotal evidences show that foreign invested firms may raise productivity by⁴⁾:

- spinning out skilled workers;
- providing technical guidance to subcontractors;
- bringing in new capital goods and technology;
- introducing advanced management know-how;
- conducting in-house R&D;
- enhancing competition.

3) A more detailed description on the impact of foreign invested firms on the development of the Korean semiconductor and pharmaceutical industries is given in Kim (1997).

4) Blomstrom and Kokko (1996) presents an overview of empirical studies on productivity spillovers by classifying them into backward and forward linkages, training of local employees, and demonstration and competition effects.

The purpose of this section is to examine whether or not the quantitative data supports the qualitative case study evidence for productivity spillovers in Korea. Previous empirical studies on this issue present mixed evidence on the productivity spillovers by foreign investment. Studies using sector-level data tend to show positive evidence for the productivity spillovers of foreign presence (ownership) or the level of FDI (Caves, 1974; Globerman, 1979; Blomstrom and Persson, 1983; Choi and Hyun, 1991; Hong 1997; Chan, 1998).⁵⁾ However, studies using firm-level data find that foreign direct investment has a statistically insignificant impact on total factor productivity (TFP) growth (Haddad and Harrison, 1993; Aitken and Harrison, 1994; Djankov and Hoekman, 1998).⁶⁾

One reason for these different results is that most studies using sector-level data did not cure the identification problem: if foreign investment tends to locate in the more productive sectors, estimates of the impact of the FDI on productivity of domestic industries are biased upwards (Aitken and Harrison, 1994; Harrison, 1996).

Given the absence of the appropriate firm-level data in Korea, we resort to the industry aggregate data in six manufacturing subsectors; food, textile & clothing, chemicals & petroleum, metals, machinery,

5) Using a cross-country data of 69 developing countries, Borensztein, de Gregorio and Lee (1998) also finds that FDI contributes more to growth than domestic investment when a sufficient absorptive capability of the advanced technologies, measured by human capital, is available in the host economy.

6) One exception is Chung, Mitchell and Yeung (1994) which finds that, using firm-level panel data of U.S. automobile component manufacturers, productivity gains among the host country suppliers largely stem from the increase in competition created by FDI rather than from the direct technology transfer.

and electric & electronics. This paper differs from the previous studies using sector-level data by taking the endogeneity problem into consideration, estimating a random-effects model with instruments.

Empirical Framework

Constrained by the insufficient number of observations, we take the growth accounting approach for calculating TFP in each subsectors. Although the growth accounting approach is subject to criticism, it can avoid such econometric problems as limited degrees of freedom that are expected to occur if the production function approach is utilized (Collins and Bosworth 1996, pp. 139).⁷⁾

The conventional growth accounting framework shows that the growth rate of value added in sector (i) can be decomposed into the contribution of increase in factor inputs plus a residual. That is, assuming the underlying relationship between output (Q), the inputs capital (K), labor (L), and technology or total factor productivity (A) as follows:

$$Q_i = F(K_i, L_i, A_i) \quad i = 1 \dots n \quad (1)$$

Equation (1) yields an index of growth in total factor productivity, denoted by a_i , which can be defined as the growth rate of output, q_i , less the share-weighted growth of the factor inputs, k_i and l_i ⁸⁾:

- 7) Hong and Kim (1996) shows that the estimates of TFP growth by the growth accounting approach are similar to the estimates by the translog production function approach in Korean manufacturing industries during 1967–93.
- 8) Any deviations from constant returns to scale and unmeasured human capital are allocated to this residual of total factor productivity (Lee, 1995;

$$a_i = q_i - a_k k_i - a_L l_i \quad (2)$$

We use the Tornqvist approximations of Divisia index for factor shares, which is the arithmetic average of the current and previous period's factor shares.⁹⁾

For the impact of FDI on productivity, we use the following specification:

$$a_{it} = \beta_0 + \beta_1 fdi_{i,t-1} + \beta_2 roy_{i,t-1} + \varepsilon_{it} \quad (3)$$

where *fdi* represents growth rate of FDI stock and *roy* stands for growth rate of royalty stock, which is used as a proxy for imported technology from foreign countries. Unlike FDI stock, royalties paid for imported technology may have offsetting effects on productivity. In other words, it may raise productivity through technology transfer or lower productivity by reducing the incentive to conduct R&D. We assume that it takes one year for foreign invested firms to start operating after investment and also that technology imports affect productivity with a one year lag. Hence, the explanatory variables, *fdi* and *roy*, are lagged one year to adjust for a time delay.¹⁰⁾

Data

Annual data on real output (value-added) and employment in

Collins and Bosworth, 1996).

9) Lee and Zang (1997) also uses the Divisia–Tornqvist index for calculating regional productivity in Korea.

10) Taking lags for the independent variables may also reduce the possible endogeneity.

manufacturing industries' were taken from the *Report on Mining and Manufacturing Survey*, published by the National Statistical Office, which contains very detailed micro-level industry data. The number of employees was multiplied by average man-hours to yield data on labor input. For the real net capital input, we used the industry-specific real net capital stock data calculated by Pyo (1997) who employs the polynomial benchmark estimation method. We adjusted this net capital stock by operation ratio indexes in the *Korea Statistical Yearbook* published by the National Statistical Office.¹¹⁾

For the real value of FDI and royalty stock, we used the data of Choi and Hyun (1991) for 1974–1989, with the exception that we adjusted for 1990 constant gross fixed capital formation prices. For 1990–1996, we updated this FDI and royalty stock, adding the new inflow of FDI and royalties to the depreciation-adjusted stock.¹²⁾

Estimation Results

Because of the possible endogeneity between productivity effects and the independent variables, estimating equation (3) by ordinary least squares (OLS) may give biased and inconsistent estimates. To deal with the possible endogeneity that FDI flows into the manufacturing subsectors with high productivity, we estimate a random-effects model. The random-effects model has an advantage over the fixed-effects estimation in that it avoids the imposition of constant productivity growth over time. To correct for the remaining endogeneity–

11) Basu (1995) finds that cyclical factor utilization is very important for explaining procyclical productivity.

12) The assumed depreciation rates taken from Choi and Hyun (1991) are 12 percent for FDI and 15 percent for royalties.

ty problem, we also estimate the random-effects model using instruments.¹³⁾

Table 4-1 reports the results of OLS and random-effects estimation with and without instruments. For both OLS and random-effects model, the coefficient on the growth rate of FDI stock is positive, but statistically insignificant.¹⁴⁾ Unlike the case study evidences, the industry aggregate data does not show that FDI has a positive effect on productivity. This might be due to aggregation of data at the sector level in that the experiences of individual firms are not sufficient to have an impact at the aggregate level. We expect a different result from a firm-level analysis which we leave as a future research.

Growth rate of royalty stock has a negative but statistically insignificant effect for both OLS and the random-effects model with and without instruments. One of the possible explanations for the insignificant effect of royalties on productivity is that the negative effect of the importation of technology by reducing incentives to conduct in-house R&D may offset its positive effect on productivity through technology transfer.

13) Specifically, fitted values of the independent variables using instruments are inserted in the estimation of a random-effects model.

14) The coefficient and t-ratio become smaller when the random-effects model is estimated using instruments.

Table 4-1. Regression estimates of the productivity effects of foreign direct investment into Korean manufacturing (1974-1996)

$$a_{it} = \beta_0 + \beta_1 fdi_{i,t-1} + \beta_2 roy_{i,t-1} + \varepsilon_{it}$$

	OLS	Random Effects	Random Effects (Instruments) ¹⁾
Constant	0.049 (3.413)	0.049 (3.520)	0.064 (3.312)
$fdi_{i,t-1}$	0.037 (1.145)	0.037 (1.149)	0.032 (0.214)
$roy_{i,t-1}$	-0.054 (-0.948)	-0.052 (-0.926)	-0.132 (-1.116)
No. of observations	138	138	138
Adj. R ²	-0.001	-0.001	-0.002

Notes: Figures in parentheses are t-statistics.

1) $fdi_{i,t-2}$, $fdi_{i,t-3}$, $roy_{i,t-2}$, and $roy_{i,t-3}$ are used as instruments.

V. The Role of Foreign Direct Investment in a Currency Crisis: Is FDI a Safety Net for the Crisis?

In 1997, Thailand, Indonesia, Malaysia, and Korea were hit by a currency crisis. There is a wide range of literature on the nature of the Asian crisis (Krugman, 1998a; Sachs, 1997a; Fisher, 1998; Frankel, 1998).¹⁵⁾ According to such literature, the causes of the Asian crisis can be broadly summarized into two general factors: one is the moral hazard of domestic financial intermediaries, and the other is the bank-run by foreign investors. From the midst of the crisis, we explain the causes as a combination of these two arguments--both underlying structural problems and an abrupt loss of investor confidence.

In fact, the moral hazard of financial intermediaries whose liabilities were perceived as having an implicit government guarantee created bubbles of asset prices.¹⁶⁾ Asian-style corporate governance which emphasizes growth rather than profitability as well as the closed and underdeveloped domestic banking system which lacks the appropriate risk management also contributed to these bubbles by allowing over-investment.

15) The Asian currency crises were born in an environment marked by the globalization of financial and capital markets and the movement of massive capital across national borders. Thus they have distinct characteristics from the other currency crises in the past. See NBER (1998) for details.

16) The implicit government guarantee can be attributed to directed lending or connected lending which is a typical characteristic of the "crony capitalism".

The bursting of the bubbles touched off a downward spiral in which falling asset prices exposed the insolvency of intermediaries, forcing them to cease operations, leading to further asset deflation (Krugman, 1998a). The bank-run or financial panic aggravated this vicious cycle as foreign investors liquidated their investments early, thus making the crisis more severe than ever.

The question that must follow the discussion on the causes of the crisis is "What measures can be taken to prevent another crisis in the future?" In regard to this subject, the importance of FDI is gaining empirical support. Frankel and Rose (1996) and Park and Lee (1998) show that a low level of net foreign direct investment, that is, FDI inflow subtracted from FDI outflow, correlates closely with the incidences of currency crisis.

One argument in favor of FDI is that of stability. In the event of a crash, investors can suddenly dump securities and banks can refuse to roll over loans, but multinational corporations cannot quickly pack up their factories and go home (Frankel and Rose, 1996, p. 355). In addition, the mere potential of FDI may act as a stabilizer against the risk of financial panic since the presence of potential foreign buyers would provide sufficient liquidity to make a liquidity crisis impossible (Krugman, 1998b).

Related to this argument, one can argue that even in a currency crisis, countries (such as Malaysia) where multinational firms have a dominant presence in the domestic economy may endure or overcome the crisis without being forced to resort to the IMF bail-out loans.¹⁷⁾

17) The IMF bail-out loans usually accompany painful macroeconomic adjustment. Sachs (1997b) criticized the IMF programs on the Asian Crisis, pointing out that demanding too much austerity in the form of budget cuts and tight credit to countries with high savings and budget surpluses

Thanks to their parent firms, subsidiaries of multinational firms in crisis-ridden countries do not suffer lowered credit ratings or such difficulties in importing raw materials or in trade financing as do other domestic firms.

The following section examines this last hypothesis that FDI is associated with the IMF rescue loans by using cross-sectional data from 1994 to 1997 and pooled data from 1973 to 1994 for developing countries. Santaella (1995) provides a complementary work that analyzes the macroeconomic conditions surrounding the IMF financial arrangements in developing countries, but it does not study the relationship between the IMF arrangements and FDI. For an empirical analysis, we adopt the probit estimation of Frankel and Rose (1996) which is a non-structural exploration of the data.

1. Cross-sectional analysis of currency crashes and the IMF rescue loans from 1994 to 1997

We first use cross-sectional data of 90 developing countries to investigate whether or not the countries experiencing currency crashes or the IMF rescue loans during the period of 1994–1997 have a lower level of FDI than the other countries.¹⁸⁾

may transform a currency crisis into a rip-roaring economic downturn. Feldstein (1998) also argued that the IMF should have focused on providing technical advice and the limited financial assistance as a supportive organization rather than as the agent of painful contractions in its dealing with the Asian Crisis.

- 18) The 90 developing countries are Algeria, Argentina, Bangladesh, Barbados, Belize, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros,

Variables and Data

As the dependent variable, we construct a binary variable, *b9497*, which takes a dichotomous value of one if the country received bail-out loans from the IMF during 1994–1997 and zero otherwise. The IMF Stand-By and Extended Fund Facility (EFF) arrangements were used for the proxy of the rescue loans. The Stand-By arrangements can be considered as emergency loans for balance-of-payments support and the EFF is to allow member countries to adopt measures in a medium-term horizon for solving their balance-of-payments adjustment problems.

To compare the relationship between FDI and the IMF rescue loans with the previous works on the currency crisis, we also use a variable for currency crash, *e9497*, which is constructed as in Frankel and Rose (1996). The binary variable, *e9497*, is one if the country experienced a nominal currency depreciation of at least 25% and an increase in the rate of depreciation of at least 10% during the period of 1994–1997 and zero otherwise.¹⁹⁾

Congo, Costa Rica, Cote D'Ivoire, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Ethiopia, Fiji, Gabon, Gambia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Jamaica, Jordan, Kenya, Republic of Korea, Lesotho, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Mauritania, Mauritius, Mexico, Morocco, Nepal, Nicaragua, Niger, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Portugal, Romania, Rwanda, Saint Vincent, Senegal, Seychelles, Sierra Leone, Solomon Islands, Sri Lanka, Sudan, Swaziland, Syrian Arab Republic, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Uganda, Uruguay, Vanuatu, Venezuela, and Zimbabwe.

19) In calculating the depreciation of currency, we use the end of year exchange rates. The estimation results are not seriously affected by using

As the independent variables, we use seven of the variables used in Frankel and Rose (1996), for which we use the 1993 data due to availability.²⁰⁾ As internal domestic macroeconomic variables, we use the growth rate of domestic credit (Domestic Credit) which is a measure of monetary policy and the growth rate of real GDP per capita (Growth Rate). As measures of vulnerability to external shocks, we use the ratio of foreign exchange reserves to monthly import values (Reserves/Imports), the current account as a percentage of GDP (Current Account), and the ratio of total debt to GNP (Debt). For the composition of capital inflows and foreign debt, the ratio of short-term debt to total debt (Short Term Debt), the ratio of net FDI inflow to total debt (FDI Flow/Debt), and the ratio of inward FDI stock to total debt (FDI Stock/Debt) are used.

The variables of interest are FDI Flow/Debt and FDI Stock/Debt, denoting FDI inflow and inward FDI stock, respectively. FDI inflow represents the stability of the foreign capital inflow. It also incorporates the foreign investors' view on the policy regimes or investment environment of the host country. Thus it is appropriate to test the first argument on the role of FDI in a currency crisis, that is, its role as a stabilizer. Meanwhile, inward FDI stock represents the presence of multinational firms in the host country. Hence it is more suited for testing the other hypothesis which is on the role of FDI in circumventing the need for the IMF rescue loans in a crisis-ridden country.

the annual average of exchange rates, although the explanatory power in terms of log likelihood gets marginally smaller.

20) The definitions and data sources for the variables used are presented in the Appendix Table A-1.

Table 5-1. Probit Estimation of Currency Crashes and the IMF Rescue Loans in 1994-97 (Cross-Sectional Data of 90 Developing Countries)

Dependent Independent	Currency Crash (e9497)		IMF Rescue Loan (b9497)	
Short Term Debt	0.0039 (0.38)	0.0060 (0.60)	0.0125 (1.13)	0.0197 (1.61)
Debt	-0.1214 (-0.64)	-0.1085 (-0.66)	-0.9743 (-2.31)	-0.8793 (-2.56)
Growth Rate	-0.0882 (-2.08)	-0.0757 (-2.23)	0.0038 (0.09)	-0.0140 (-0.41)
Reserves/Imports	0.0122 (0.21)	-0.0090 (-0.17)	-0.0081 (-0.14)	-0.0410 (-0.59)
Domestic Credit	-0.0005 (-0.55)	-0.0005 (-0.55)	-0.0010 (-0.76)	-0.0015 (-0.30)
Current Account	-0.0076 (-0.47)	-0.0107 (-0.66)	-0.0011 (-0.06)	-0.0024 (-0.13)
FDI Flow/Debt	0.0186 (0.64)	-	-0.1074 (-2.53)	-
FDI Stock/Debt	-	-0.0017 (-0.51)	-	-0.0209 (-2.69)
No. of Obs.	84	90	84	90
Obs. With Dep=1	34	40	29	32
Obs. With Dep=0	50	50	55	58
Log Likelihood	-53.57	-57.83	-46.34	-49.03

Note: t-values are in parentheses. For independent variables, 1993 data are used.

Coefficients on the constant are not reported.

Probit Estimation Results

Table 5-1 presents the probit estimation results of the cross-section

analysis for the period of 1994–1997. For the currency crash case, only the coefficient on the growth rate of GDP per capita is significant. Its negative sign shows that countries with higher growth rates tend to have lower incidences of currency crashes. Unlike the previous studies, neither FDI flow nor stock is associated with a currency crash.

For the IMF rescue loans, the coefficients on FDI flow and FDI stock, -0.1074 and -0.0227 respectively, are both significantly negative. This implies that countries with which the IMF made the Stand-By and EEF arrangements during 1994–1997 tend to have lower FDI inflow and stock in 1993 than other countries. The coefficients on the other variables except for the ratio of total debt to GNP (Debt) are not significant.

2. Analysis of currency crashes and the IMF rescue loans in 1973–94 using pooled data

The cross-section analysis in section 5.1 has one drawback in that the number of total observations is small relative to the number of independent variables. In addition, the data in 1993 may not be able to sufficiently explain the incidence of currency crashes and the IMF rescue loans in the four-year period ahead. To overcome this problem, we conduct the same analysis using pooled data in 1973–1994 for the 84 developing countries.²¹⁾

21) Due to lack of data on the IMF financial arrangements, 17 countries are deleted from the list of the 90 countries in section 5.1. They are Belize, Comoros, Djibouti, Equatorial Guinea, Grenada, Guinea-Bissau, Hungary, Maldives, Oman, Papua New Guinea, Portugal, Saint Vincent, Sao Tome, Seychelles, Solomon Islands, Vanuatu, and Zimbabwe. Instead, 11 countries which is Burundi, Lebanon, Liberia, Myanmar, Somalia,

Variables and Data

The data descriptions are the same as in the cross-section analysis of section 5.1, except that for the dependent variable, ER, representing the event of currency crashes, we adopt the three-year 'windowing' of Frankel and Rose (1996).²²⁾ That is, we exclude crashes which occurred within three years of each other to avoid counting the same crash twice. Similarly, for the other dependent variable, IMF, denoting the incidence of the IMF Stand-By and EFF arrangements, we exclude arrangements which were made in consecutive years to avoid double-counting.²³⁾ Among the independent variables, the ratio of inward FDI stock to total debt is deleted due to the absence of relevant data in the full sample period.

Probit Estimation Results

Table 5-2 reports the probit estimation results using the pooled data of 84 countries during the 22 years from 1973 to 1994.²⁴⁾ In the second row, 'Lagged', (t) denotes that the independent variables are those in the current year. In the (t-1) column, we tabulate the results in which all regressors are lagged one year to adjust for time lag in

Tanzania, Western Samoa, Yemen, Yugoslavia, Zaire, and Zambia are added.

- 22) Here, annual average of the nominal exchange rates is used in calculating the depreciation rate.
- 23) For the case of the arrangements made in more than 3 consecutive years, we count the first two years to take into account the delay or adjustment period in improving the economic conditions.
- 24) For the currency crash (ER), we reproduced the estimation results by Park and Lee (1998).

the relationship between currency crashes or the IMF rescue loans and macroeconomic conditions.

The estimated coefficient on our variable of interest, FDI Flow/Debt, is significantly negative in all cases, implying that FDI inflow relative to total debt is negatively associated with currency crashes and the IMF rescue arrangements in both the current and lead periods.

For currency crashes, the coefficients on the other variables are similar to the results of Frankel and Rose (1996). Lower growth rates, higher growth of domestic credit, and higher portions of short-term debt all seem to raise the odds of a currency crash in the following year.

We saw roughly similar results for the IMF rescue arrangements, except that the growth rate of domestic credit is not significantly associated with the IMF arrangements and that the coefficient on foreign reserves (Reserves/Imports) is now significant. This is because the growth rate of domestic credit raises the inflation rate and hence has a direct effect on exchange rates or currency crashes. Meanwhile, the low level of foreign reserves relative to monthly imports indicates the country's inability to deal with the balance-of-payments problem without asking for rescue loans from the IMF. Otherwise, the results imply that the macroeconomic conditions behind currency crashes and the IMF rescue loans are similar. In particular, FDI inflow seems to lower the odds of both currency crashes and the IMF rescue loans.

Using the estimated coefficients in (t-1) columns of Table 5-2 and values of independent variables for 1996 (1993 for Mexico), we calculate in Table 5-3 the predicted probabilities of currency crisis and the IMF arrangements in some crisis-ridden countries for 1997 (1994 for Mexico). According to the prediction, the probabilities of currency crisis and the IMF arrangements in Korea are the highest among the five

Table 5-2. Probit Estimation of Currency Crashes and the IMF Rescue Loans in 1973-94 (Pooled Data of 84 Developing Countries)

Dependent Independent	Currency Crash (ER)		IMF Rescue Loan (IMF)	
	t	t-1	t	t-1
Lagged				
Short Term Debt	0.0030 (0.61)	0.0101 (2.22)	-0.0022 (-0.44)	0.0069 (1.43)
Debt	0.5076 (3.96)	0.0594 (0.46)	0.3363 (3.24)	0.0981 (0.92)
Growth Rate	-0.0525 (-4.96)	-0.0363 (-3.78)	-0.0196 (-2.00)	-0.0327 (-3.41)
Reserves/Imports	-0.0087 (-0.40)	-0.0377 (-1.73)	-0.0525 (-2.13)	-0.0786 (-3.03)
Government Budget	0.0122 (1.13)	-0.0164 (-1.74)	-0.0004 (-0.04)	-0.0277 (-3.00)
Domestic Credit	0.0024 (4.99)	0.0005 (3.09)	0.0001 (0.17)	-0.0003 (-0.75)
Current Account	0.0241 (3.07)	0.0119 (1.69)	0.0179 (2.35)	0.0018 (0.26)
FDI Flow/Debt	-0.0345 (-3.43)	-0.0329 (-3.41)	-0.0378 (-3.51)	-0.0268 (-2.58)
No. of Obs.	1080	1111	964	996
Obs. With Dep=1	116	128	130	138
Obs. With Dep=0	964	983	834	858
Log Likelihood	-306.27	-361.87	-354.56	-364.94

Note: t-values are in parentheses. Coefficients on the constant are not reported.

crisis-ridden Asian countries. Furthermore, they are higher than the case of Mexico for 1994. The Appendix Table A-5 which present the values of the pre-crash macroeconomic variables reveals that the

predicted high probabilities of currency crisis and the IMF arrangements for Korea can be attributed to the relatively high portion of short-term debt and the low ratio of FDI flow to total debt.

Meanwhile, the predicted probabilities for Indonesia are the lowest among these crisis-ridden countries, including Mexico. Considering the fact that Indonesia turned out to suffer the crisis not less severely than other countries, it may be due to the lack of consideration of some political factors in the above probit model.

Table 5-3. Probabilities of Currency Crashes and the IMF Arrangements in Selected Countries for 1997

	KOR	IND	THI	MAL	PHI	MEX
Currency Crashes (ER)	0.195	0.065	0.093	0.064	0.100	0.119
IMF Arrangements (IMF)	0.168	0.050	0.071	0.065	0.097	0.119

Note: 1) Based on the estimated coefficients in (t-1) columns of Table 5-2 which is applied to the values of independent variables in Appendix Table A-5.

2) For Mexico, probabilities are for the year of 1994.

VI. Concluding Remarks

Throughout Korea's economic development, FDI has played a negligible role. Even in 1996, FDI accounted for less than 1% of total domestic fixed capital formation in Korea, far less than that of the South-East Asian countries. Despite its quantitative insignificance, case study evidences show that FDI has had a significant impact on the quality of the Korean economic development by spinning out skilled workers and managers or via technical guidance of subcontracts.

However, industry aggregate data of six subsectors in Korean manufacturing during 1974–1996 fails to support these case study evidences. Estimation of a random-effects model using instruments show that productivity spillover effects of FDI are positive but statistically insignificant. We leave the analysis using firm-level data as a future research.

Concerning the role of foreign direct investment in a currency crisis, the presence of multinational firms may help a crash-ridden country to overcome its crisis without being forced to resort to the bail-out loans from the IMF. Probit estimation results using cross-sectional data reveal that inward FDI, in both flow and stock, in 1993 is negatively associated with the incidence of the IMF Stand-By and EFF arrangements during 1994–1997. Probit analysis using pooled data of 84 developing countries during the 22 years from 1973 to 1994 also shows that FDI inflow tends to lower the odds of incidence of currency crashes and the IMF rescue loans. This implies that the Korean government needs to actively promote FDI in order to overcome the current crisis and prevent another one from occurring in the future.

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Appendix Tables

Appendix Table A-1a. Summary Statistics of the variables in Table 4-1

Variable	Mean	Standard Deviation
a_{it}	0.042	0.116
fdi_{it-1}	0.069	0.310
roy_{it-1}	0.188	0.178

Appendix Table A-1b. Correlation Matrix of the variables in Table 4-1

a_{it}	1.00	–	–
fdi_{it-1}	0.09	1.00	–
roy_{it-1}	–0.07	0.16	1.00

Appendix Table A-2. Definitions and Data Sources for Variables in Section V

Variable	Definition	Source
IMF (b9497)	one if a country received the IMF Stand-By or EFF arrangements (in 1994–1997), zero otherwise	Santaella (1995) and IMF Annual Report (various years)
ER (e9497)	one if a country suffers a depreciation by more than 25% in a year and an increase in the rate of depreciation of at least 10% (during 1994–1997), zero otherwise	International Financial Statistics Yearbook (various years)
Short Term Debt	ratio of short-term debt to total debt (%)	1995 World Bank's World Data CD-Rom
Debt	ratio of total debt to GNP	Same as above
Growth Rate	growth rate of GDP per capita (%)	Same as above
Reserves/Imports	ratio of foreign reserves to monthly imports (months)	Same as above
Government Budget	ratio of government budget surplus to GDP (%)	Same as above
Domestic Credit	growth rate of domestic credit (%)	Same as above
Current Account	ratio of current account surplus to GDP (%)	Same as above
FDI Flow/Debt	ratio of net foreign direct investment inflow to total debt (%)	Same as above
FDI Stock/Debt	ratio of foreign direct investment stock to total debt (%)	World Investment Report 1995, UNCTAD

Appendix Table A-3a. Summary Statistics of the variables in Table 5-1

Variable	Mean	Standard Deviation
b9497	0.35	0.48
e9497	0.41	0.49
Short Term Debt	15.07	14.25
Debt	0.80	0.92
Growth Rate	1.10	4.14
Reserves/Imports	3.57	2.75
Domestic Credit	51.15	292.08
Current Account	-9.40	10.49
FDI Flow/Debt	4.05	5.63
FDI Stock/Debt	17.08	18.82

Appendix Table A-3b. Correlation Matrix of the variables in Table 5-1

b9497	1.00	-	-	-	-	-	-	-	-	-
e9497	0.26	1.00	-	-	-	-	-	-	-	-
Short Term Debt	0.06	-0.00	1.00	-	-	-	-	-	-	-
Debt	-0.17	0.00	-0.02	1.00	-	-	-	-	-	-
Growth Rate	-0.09	-0.23	0.15	-0.19	1.00	-	-	-	-	-
Reserves/Imports	0.05	0.00	-0.01	-0.28	0.04	1.00	-	-	-	-
Domestic Credit	-0.07	-0.08	0.05	-0.08	0.08	0.19	1.00	-	-	-
Current Account	0.08	-0.10	0.09	-0.50	0.23	0.32	0.12	1.00	-	-
FDI Flow/Debt	-0.21	-0.02	0.22	0.23	0.43	0.02	-0.06	0.03	1.00	-
FDI Stock/Debt	-0.21	-0.06	0.30	-0.05	0.15	-0.11	-0.06	-0.10	0.64	1.00

Appendix Table A-4a. Summary Statistics of the variables in Table 5-2 (t)

Variable	Mean	Standard Deviation
ER	0.12	0.32
IMF	0.13	0.34
Short Term Debt	14.60	11.94
Debt	0.54	0.42
Growth Rate	1.61	5.75
Reserves/Imports	3.41	3.11
Government Budget	-4.32	5.83
Domestic Credit	47.93	228.25
Current Account	-6.79	8.53
FDI Flow/Debt	4.03	9.44

Appendix Table A-4b. Correlation Matrix of the variables in Table 5-2 (t)

ER	1.00	-	-	-	-	-	-	-	-	-
IMF	0.20	1.00	-	-	-	-	-	-	-	-
Short Term Debt	0.04	-0.01	1.00	-	-	-	-	-	-	-
Debt	0.14	0.18	-0.06	1.00	-	-	-	-	-	-
Growth Rate	-0.21	-0.12	0.02	-0.21	1.00	-	-	-	-	-
Reserves/Imports	-0.03	-0.10	0.18	-0.29	0.17	1.00	-	-	-	-
Government Budget	-0.03	-0.05	0.04	-0.26	0.14	0.37	1.00	-	-	-
Domestic Credit	0.22	-0.01	0.04	-0.02	-0.08	0.02	-0.02	1.00	-	-
Current Account	0.06	-0.00	0.19	-0.29	0.09	0.38	0.30	0.03	1.00	-
FDI Flow/Debt	-0.11	-0.13	-0.06	-0.26	0.19	0.27	0.21	-0.00	0.08	1.00

Appendix Table A-5. Values of macro variables for calculating the probabilities in Table 5-3

	Unit	KOR	IND	THI	MAL	PHI	MEX
Short Term Debt	%	58.9	24.8	40.8	41	26.6	23.1
Debt/GNP	-	0.26	0.534	0.504	0.392	0.649	0.332
Growth Rate	%	5.9	6.1	5.2	5.3	5	-2.1
Reserves/Imports	months	2.65	6.73	6.27	4.09	3.52	4.1
Government Budget	%	-1.1	0	1.5	-0.5	-0.1	-1.7
FDI Flow/Debt	%	-1.36	3.24	1.26	11.13	1.99	4.15
Domestic Credit	%	19.3	22.7	14.03	12	40.2	11.48
Current Account	%	-4.7	-4	-8.5	-7.4	-4.4	-6.42

Note: Values for FDI Flow/Debt are in 1995. Values for Mexico are in 1993.

All other Values are in 1996.

Source: Compiled by Park and Lee (1998) from various primary sources.

국문요약

본 논문은 한국의 경제발전에서 차지하는 외국인직접투자의 역할을 생산성 효과와 외환위기에 대한 시사점이라는 두가지 측면에서 분석하고 있다. 제조업 부분에 대해 대체변수를 이용한 Random-Effects 모형을 추정하였을 때, 1974~96년 동안 제조업 분야에 있어서 외국인직접투자가 생산성에 미친 효과는 통계적으로 유의성이 없는 결과를 보였다. 또한 본 논문은 외환위기하에서의 외국인직접투자의 역할을 외국인직접투자가 IMF 구제금융 지원을 방지하여 줄 수 있는지에 초점을 두어 살펴보았다. 90개 개도국 자료를 사용하여 Probit 모형을 추정한 결과, 1994~1997년간 IMF로부터의 구제금융 지원여부는 FDI 스톡이 총외채에서 차지하는 비율과 음(-)의 관계를 보였다. 또한 1973~1994년 동안 84개국의 자료를 사용하여 Probit 모형을 추정하였을 경우에는, 총외채중 FDI 유입액이 차지하는 비중이 클수록 외환위기 및 IMF 구제금융 확률이 작다는 결과를 나타내었다.

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