Financial Opening and Investment Efficiency in Korea

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Abstract

Does financial opening make firm-level and industry-level investment more efficient? We examine the argument that more foreign capital inflows ease financing constraints of firms' investment by increasing the efficiency in the financial market, using the microeconomic data of the Korean economy. Our results demonstrate that there is no evidence that financial opening and foreign capital inflows lowered financing constraints in the 1990s in Korea. We find that non-chaebol firms were more financially constrained than chaebol firms and this disparity grew more serious during financial restructuring after the crisis. But higher foreign ownership or more foreign capital inflows did not lower financing constraints of independent firms, though it made chaebol firms' investment more responsive to profitability and sales. Industry-level regressions demonstrate that financial opening and more capital inflows have not brought about more efficient capital allocation across industries.

Keywords : Financial Opening, Investment, Financing Constraint, Economic Efficiency JEL Classification : E22, G31, F36

Ⅰ. Introduction

Does financial opening encourage economic efficiency and growth? There are numerous studies on capital account liberalization and its economic effects but the policy remains as one of the most controversial issues in current debates. Mainstream economists believe that financial opening spurs economic growth by increasing efficiency, while skeptics refute this notion. In fact, most cross-country empirical studies on the relationship between the opening of the capital market and economic growth find mixed results, and there are limitations to these studies (Eichengreen, 2001; Kose et al., 2006).

As a result, more microeconomic empirical studies to examine the firm-level and industry-level capital allocation in answering the efficiency effect of financial opening have emerged in the recent past. There are many studies that analyze the impact of financial liberalization on the investment behavior of firms. (Gelos and Werner, 1999; Gallego and Loayza, 2001). Most studies report that investment by small or independent firms tends to be more financially constrained, showing higher cash flow sensitivity. But they also report that financial liber-

alization or capital account liberalization could ease this financing constraint of investment as the financial market develops and grows more efficient （Love, 2003 ; Harrison et al., 2004）.

In this paper, we ask whether financial opening has really lessened financing constraints and made investment more efficient in Korea in the 1990s. Beginning in the 1990's, Korea opened its financial market and liberalized foreign borrowing extensively. However, capital account liberalization was mismanaged without good regulation mechanism, thereby worsening vulnerability, and hence the economy suffered from a financial crisis in 1997. The Korean experience provides an interesting case for studying the microeconomic effects of financial opening and the crisis on investment of firms.

We attempt to examine the impact of financial opening and foreign capital inflows on investment efficiency in various ways. First, the standard investment specification including the cash stock variable is tested in an attempt to investigate whether financial opening and foreign capital flows lowered financing constraints. We also test how the 1997 crisis and the subsequent corporate and financial restructuring affected financing constraints. We complement the firm-level results using the industry-level investment regressions to test for efficiency of capital allocation across industries.

In section II, we briefly review current empirical studies about financial liberalization, opening and investment efficiency from the perspective of financing constraints theory. In section III, we explain our specifications of the investment model and data. In section IV, we present and discuss empirical results from firm-level and industry-level regressions. In general, we do not find the evidence that financial opening and more foreign capital inflows lowered financing constraints, while we find that foreign ownership made the investment of chaebols more responsive to the profitability or sales variable.

II. Literature Review : Microeconomic Benefits of Financial Liberalization and Opening

Many economists argue that financial opening spurs economic growth by encouraging investment and economic efficiency in capital allocation. However, there is no strong empirical evidence for the benefit of capital account openness. Macroeconomic empirical studies, using cross-country and panel specifications, have reported only mixed results （Kose et al., 2006）. It is now well known that these have limitations such as endogeneity, missing variables and heterogeneity across countries. Because of this, economists have started to investigate the microeconomic effects of financial opening or capital account liberalization, studying the benefit of financial opening to firm-level investment.

Most studies in this line examine whether the cash flow sensitivity of firms' investment becomes lower along with financial opening. It is argued that firms' investment is financially constrained when the capital market is not perfect due to market failures because of information asymmetry. Following Fazzari, Hubbard and Peterson （1988） a substantial body of empirical literature report that the cash flow or internal funds of firms is significant to investment due to this financing constraints. Economists have examined many countries in the context of

this theory and found that firms are faced with financing constraints, more serious for small or independent firms. A large number of studies, including Hoshi, Kashyap and Scharfstein （1991） for Japan Gilchrist and Himmelberg （1998）. Mairesse et al. （1999） for the U. S., and Bond et al. （1997） for European countries, present similar results. Studies of developing and transition countries are also developing.

More recently economists make use of this empirical examination to test the argument that financial liberalization and opening ease financing constraints and thus make investment more efficient by way of increasing efficiency in the financial market. Several studies have shed light on the benefit of financial liberalization in developing countries, including Harris et al. （1994） for Indonesia, Jaramillo et al. （1996） for Ecuador, Gelos and Werner （1999） for Mexico, Gallego and Loayza （2001） for Chile. Most conclude that liberalization eases financing constraints of small firms as financial liberalization makes the financial market more efficient.[1] Another line of study compares firms in different countries using a cross-country firm-level panel data. Laeven （2001） reports that financial liberalization reduces financing constraints, especially for small firms which suffer from more severe constraints. Love （2003） also shows that financial development lowers financing constraints for smaller firms, consistent with other studies. An alternative study by Galindo, Schiantarelli and Weiss （2001） reports that financial liberalization has increased the share of investment going to firms with a higher marginal return to capital.[2]

Other studies attempt to directly test the effect of foreign investment on financing constraints. Harrison et al.（2004） investigate whether greater foreign capital inflows are associated with a reduction in financing constraints and find that that foreign direct investment （FDI） eases constraints. However, Harrison and McMillan （2003） examine the case of Ivory Coast and report that FDI exacerbates financing constraints of domestic firms because borrowing by foreign firms aggravates the constraints of domestic firms. Another study by Lins et al. （2001） shows that non-U. S. firms are faced with less financing constraints after issuing equity on the U. S. stock exchange. This line of empirical study should be developed more, using better measures for financial opening and foreign investment.

There are also industry-level studies that examine the efficiency of capital allocation across industries. For Korea, Borensztein and Lee （1999） study whether bank lending went to sectors where profitability or productivity was higher. They report that there was a negative relationship, and thus capital allocation had been inefficient in Korea for long. It is interesting that they find that there was no improvement after the late 1980s when the government introduced financial liberalization. However, Cho （1988） reports some evidence for the efficiency effect of financial liberalization using an industry-level empirical examination. Wurgler （2000） shows that there is more investment in industries in which the growth of value added is faster, in countries with a more developed financial system.

Ⅲ．Test Strategies and Data

1．Empirical investment models and test strategy

In this section, we discuss investment specifications and present our test strategy. We first use the standard mainstream investment model with financing constraints based on Euler equation. The investment model is derived from the first order conditions of a managers' maximization problem of firm value, using dynamic optimization. It uses the marginal profitability of capital as the fundamental variable or investment opportunity, and a cash variable to capture features of financing constraints, and usually adds a lagged investment variable to control for costly adjustment. A higher sensitivity of investment to the cash variable suggests financing constraints and inefficiency in the financial market, since investment should be responsive to only fundamentals in a perfect market.

The limitations of this model should be noted. Operating income plus depreciation, the cash flow variable commonly used, is correlated with current profitability in reality, which might be associated with future profitability. Then cash flow sensitivity could partly reflects fundamentals (Gilchirst, and Himmelberg, 1998). In addition, cash flow sensitivity may not be a good measure for financing constraints owing to the difficulty of its interpretation (Kaplan and Zingales, 1997; 2000; Cleary, 1999)[3]. Lastly, using either Tobin's q or the sales variable as investment opportunity requires a restrictive assumption[4]. Despite these problems, since it is the standard model most commonly used in the mainstream literature, we use this model to investigate financing constraints and the effect of financial opening on them.

Our specification is similar to the model used by Laeven (2001) with the cash variable and the sales capital ratio. The sample includes all Korean listed firms from 1991 to 2000. To overcome the problem associated with the traditional cash flow variable, we use a cash stock variable defined as cash and liquid assets including deposits and marketable securities over total tangible assets (Love, 2003). Following other studies, we divide our sample into large firms in corporate groups called chaebols in Korea and independent firms called non-chaebols when examining the difference in financing constraints.

Our benchmark specification is as follows.

$$(I_{it}/K_{it})=b_1+b_2(I_{it-1}/K_{it-1})+b_3SaK_{it}+b_3\ CF_{it}+e_{it},$$

Where, I：investment

K：tangible fixed assets

SaK：sales to capital, proxy for the marginal profitability of capital

CF：cash stock-to-capital ratio

Our first test is whether firms' investment was sensitive to cash stock, and whether this financing constraint was more serious for non-chaebol firms. Next, we investigate what happened after the crisis in terms of the investment-cash flow sensitivity, introducing the interaction term between cash stock and post-crisis dummy variables as follows. Our hypothesis is

that non-chaebol firms suffered more from constraints during the credit crunch following the crisis and financial restructuring than chaebol firms.

$$(I_{it}/K_{it}) = b_1 + b_2(I_{it-1}/K_{it-1}) + b_3 SaK_{it} + b_3\ CF_{it} + b_3\ CF_{it}CRI_t + e_{it},$$

Where, CRI : post-crisis dummy variable

Finally, we introduce financial openness variables such as foreign capital inflows and foreign share ownership of individual firms. We are interested in whether financial opening or more foreign capital inflows increased efficiency in the financial market and thus eased financing constraints for investment, especially for non-chaebols. To test this, the interaction term of financial opening and the cash stock variable is added to the model as follows.

$$(I_{it}/K_{it}) = b_1 + b_2(I_{it-1}/K_{it-1}) + b_3 SaK_{it} + b_4 CF_{it} + b_5\ CF_{it}FO_t + b_6 FO_t + e_{it},$$

Where, FO : financial opening index using various measures

In addition to the firm-level study, we employ industry-level investment regressions that could show a broader picture of capital allocation in the economy. Using industry-level data and a simple specification similar to other study (Borensztein and Lee, 1999), we test whether financial opening made investment increase in industries with higher profitability. Because of data availability we do not use the cash flow variable but use profitability as investment opportunity, and we use sales growth and the debt ratio as control variables. Several measures for financial opening and foreign capital inflows are added and interacted with profitability to explore the effect of financial opening on capital allocation across industries. The examination of the capital allocation across industries in relation to financial opening acts as a complement to our results from the firm-level study.

$$FAGR_t = b_1 + b_2 * PR_{t-1} + b_3 * SAGR_t + b_4 * Debt_{t-1} + b_6 * PR_{t-1} * FO_t + e_{it},$$

FAGR : proxy for investment, growth rate of fixed asset across industries

SAGR : growth rate of sales

Debt : debt/capital

PR : operating profit/total assets

Since the system of industry classification changed after 1990 significantly, we limit our sample to data from 1990. We use several proxies for financial opening including year dummies and foreign capital inflows. In both the firm-level and industry-level studies, the results using the pooled OLS and fixed effects model are reported. They differ in the assumption of unobserved firm-specific effects, but considering their existence in firms' investment, the result of the fixed effects model could be more preferable.

2 . Data
1) Measures for financial opening

Concerning the index of financial opening, most studies have settled on a dummy variable to indicate before/after financial liberalization. Since there were important deregulation measures and a significant increase in foreign borrowing after 1994 in Korea, we use year dummy

variables which take a value of 1 if the year was on or after 1994 (Cho, 1999). But this simple dummy approach cannot capture the degree of financial openness and the effect of foreign capital inflows. Recently some researchers have used foreign capital inflow variables as a proxy for opening (Harrison et al., 2004; Harrison and McMillan, 2003). We also use several capital inflow variables, including the share of foreign direct investment, portfolio investment and bank loans to GDP. However, these variables are still macroeconomic and across industries at best, and hence they are limited in capturing the microeconomic effects of capital account liberalization fully. In particular, they cannot show cross-sectional differences in the firm-level regressions. We overcome this by employing the data of foreigners' share ownership of individual firms. The increase of foreign ownership may help to ease financing constraints of small firms, by enhancing the firms' reputation and increasing its opportunities to gain external loans.[5] As the Korean government increased the ceiling of foreign ownership gradually after the initial deregulation in 1992 and totally liberalized it in 1998, foreign ownership gradually increased after 1992 and rose quickly following the crisis.

2) Firm-level data

We use firm-level panel data from financial statements of Korean firms that include information of tangible assets, investment, profitability and sales, constructed by the National Credit Information Evaluation (NCIE) in Korea. The dataset includes all listed firms, covering more than 700 firms in the stock market from 1991 to 2000. We concentrate on nonfinancial firms after controlling for outliers.[6] In addition to this, we use firm-level foreign ownership data that show the share of weekly foreign ownership of individual firms over the same period, provided by Dae-Woo security company. Since foreigners' share ownership is very volatile, we calculate annual averages of foreign ownership using this high-frequency weekly data. We provide the list of variables and explanations in Appendix I.

3) Industry-level data

Data of the manufacturing industry from the Bank of Korea (BOK) based on the firm-level survey of financial statements for more than 6000 firms are used as the industry-level panel data. The BOK calculates the data by total 21 sub-industries, using this original survey. Because of data availability, we use operating profit divided by assets, the growth rate of sales, and the debt to capital ratio as independent variables. To examine the effects of FDI across industries, we also derive the data for FDI inflows in each industry using a fraction of FDI across industries out of total FDI inflows into the economy from the Ministry of Commerce, Industry and Energy of Korea. There is a slight discrepancy in the classifications of industries for financial statements and FDI data. The classification of FDI across industries covers only 13 industries in the manufacturing sector, while industry-level financial statements data include 21 industries. Thus, we match the FDI data across industries with the original industry-level data based on financial statements from the BOK in the relevant industries.[7]

IV. Empirical Results

1. Financing constraints and the effect of the crisis

We first examine whether firms were financially constrained and, if so, how financing constraints differed between firms in the 1990s, using the standard investment specification. Table 1 demonstrates that firms' investment was clearly constrained by finance in the regression for total firms.[8] Since we use the cash stock variable, the cash flow sensitivity is less affected by profit and reflects the feature of financing constraints more evidently. When we divide the sample, cash flow sensitivity is much higher for independent firms, while it is insignificant for chaebol firms. The result is the same regardless of the time period before and after the crisis. Hence, we conclude that independent firms were financially constrained while chaebols were not, which is consistent with the theory and other studies (Shin and Park, 1999). Because only independent firms were faced with financing constraints, if there was any benefit from financial opening it would be a reduction of financing constraints of these firms.

In fact, mainstream economists have argued that chaebols' investment was inefficient and excessive, which caused the financial crisis in Korea (Krueger and Yoo, 2001; Joh, 2003). But the coefficient of the sales variable, a proxy for investment opportunity, is significant and higher for the chaebol firms' sample. This appears to refute the argument that chaebol firms were significantly inefficient. However, when we add a dummy variable for chaebol firms in the regression of all firms sample, its coefficient is statistically significant, mainly driven by the result of the pre-crisis period. This suggests that chaebol firms had a tendency to invest more before the crisis even after controlling for relevant variables that explain investment (Shin and Park, 1999).[9] Thus, we have a partial evidence for more aggressive investment behavior of chaebol firms, though it is still not easy to argue that this was seriously inefficient. This could be explained by the fact that the chaebol had a group structure and a better tie with financial institutions that were helpful to investment.

Before investigating the effect of financial opening, let us first analyze the impact of the financial crisis, using the dummy variable for the post-crisis period after 1997 and the interaction term of this and the cash stock variable. As expected, the interaction term is significantly positive for independent firms, while not for chaebols, as seen in Table 2. This suggests that post-crisis economic restructuring brought about a more serious credit crunch and financing constraints to independent firms because chaebols had better access to the capital market (Ferri and Kang, 1999). In fact, 90% corporate bonds were issued by the 30 largest chaebols in 1998 and 1999 and CP (commercial paper) markets were dominated by them (Crotty and Lee, 2001).[10]

2. Financial opening, foreign capital inflows and financing constraints

Most studies examine the efficiency effect of financial liberalization or opening on financial market by testing the change in financing constraints after liberalization. We introduce an

Table 1　Firm-level investment and financing constraint : all firms（from 1991 to 2000）

1 ）All listed firms

Dependent variable : I/K

Independent Variables	Pooled OLS with industry, year dummies	LSDV with fixed effects
Intercept	0.327 *** (11.32)	−0.016　 (−0.10)
I/K	0.073 *** (6.35)	0.018　 (1.47)
Sales/K	0.027 *** (12.23)	0.088 *** (21.68)
Cash/K	0.049 *** (3.64)	0.102 *** (5.30)
Adjusted R-square	0.069	0.277
No. of observation	6,354	6,266

Note :
1 ）t-value in parenthesis.
2 ）*** : significant at 1% level, ** : at 5% level, * : at 10% level.
3 ）Dummy variables not reported.
4 ）Cash/K : cash stock/tangible capital stock.
5 ）Same in following tables.

2 ）Chaebol vs. Non-chaebol firms

Independent Variables	Chaebols		Non-chaebols	
	Pooled OLS with industry, year dummies	LSDV with fixed effects	Pooled OLS with industry, year dummies	LSDV with fixed effects
Intercept	0.250 *** (4.32)	−0.002　 (−0.02)	0.315 *** (9.30)	−0.005　 (−0.03)
I/K	0.063 ** (1.83)	0.027　 (0.76)	0.071 *** (5.81)	0.015　 (1.17)
Sales/K	0.046 *** (5.65)	0.108 *** (8.67)	0.027 *** (11.29)	0.086 *** (19.88)
Cash/K	0.046　 (0.85)	0.091　 (1.30)	0.055 *** (3.94)	0.109 *** (5.43)
Adjusted R-square	0.103	0.294	0.071	0.280
No. of observation	759	753	5,595	5,513

Table 2　Firm-level investment and financing constraint with crisis dummy（from 1991 to 2000）

Independent Variables	Chaebols		Non-chaebols	
	Pooled OLS with industry, year dummies	LSDV with fixed effects	Pooled OLS with industry, year dummies	LSDV with fixed effects
Intercept	0.230 *** (3.70)	−0.021　 (−0.19)	0.315 *** (9.30)	−0.021　 (−0.13)
I/K	0.061 * (1.78)	0.026　 (0.71)	0.070 *** (5.73)	0.015　 (1.11)
Sales/K	0.046 *** (5.71)	0.110 *** (8.74)	0.027 *** (11.42)	0.086 *** (19.94)
Cash/K	0.012　 (0.18)	0.034　 (0.39)	0.025　 (1.46)	0.087 *** (3.68)
Cash/K *Cri	0.073　 (0.86)	0.101　 (1.11)	0.081 *** (3 .22)	0.049 * (1.77)
Adjusted R-square	0.102	0.309	0.073	0.346
No. of observation	759	753	5,595	5,513

Note :
1 ）Cri : Post-crisis dummy, 1 when year is 1998, 1999, and 2000 and 0 otherwise.
2 ）Year dummy included.

Table 3 Firm-level investment and financing constraint after financial opening : year dummies for financial opening (from 1991 to 2000)

Independent Variables	Chaebols		Non-chaebols	
	Pooled OLS with industry, year dummies	LSDV with fixed effects	Pooled OLS with industry, year dummies	LSDV with fixed effects
Intercept	0.230 *** (3.70)	−0.020 (−0.18)	0.292 *** (8.46)	−0.021 (−0.14)
I/K	0.062 * (1.83)	0.026 (0.73)	0.070 *** (5.72)	0.014 (1.09)
Sales/K	0.048 *** (5.86)	0.111 *** (8.81)	0.027 *** (11.42)	0.086 *** (19.95)
Cash/K	−0.136 (−1.37)	−0.089 (−0.75)	0.025 (0.93)	0.075 ** (2.28)
Cash/K*FO	0.214 * (2.02)	0.162 (1.50)	0.000 (0.01)	0.019 (0.56)
Cash/K*Cri	0.002 (0.03)	0.057 (0.60)	0.081 *** (2.94)	0.044 (1.47)
Adjusted R-square	0.106	0.298	0.073	0.280
No. of observation	759	753	5,595	5,513

Note :
1) FO : financial opening dummy, 1 for years from 1994 to 1997, elsewhere 0.
2) Dummy for each year included, thus 2-way fixed effects don't show the independent FO and Cri.

interaction variable of financial opening and the cash variable into the investment model in an effort to verify the gain of financial opening in lowering the cash flow sensitivity of investment. Three proxy variables for financial opening are used, including a year dummy to indicate deregulation of foreign borrowing, capital inflows such as FDI, and finally the share of foreign ownership of individual companies. We also control for the effect of the crisis, including the interaction term of the post-crisis dummy and the cash variable.

Table 3 reports the result with the opening dummy. In the Korean case of the 1990s, we do not find any evidence that financial opening helped to ease financing constraints of independent firms. Next, we test the effect of capital inflows, including foreign direct investment, foreign portfolio investment, foreign loans and total foreign capital inflows, on financing constraints. There is no strong evidence that more FDI lowered financing constraints for independent firms, and the result remains the same with all other foreign capital flows though we report the case of FDI only in Table 4. Opposite to Harrison et al. (2004), our results about Korea do not support the hypothesis that FDI eases financing constraints. However, when we limit our sample to the pre-crisis period, the interaction term of the cash variable and FDI is significantly negative for independent firms. This suggests that our weak result is because of the rapid increase of FDI inflows after the crisis that was not so helpful in lowering financing constraints, though it was different in the pre-crisis period. As to other capital flows, we find no evidence for benefits of lowering the cash flow sensitivity regardless of the period[11]. Our finding implicates that foreign capital inflows did not ease financing constraints in the 1990s, except FDI before the crisis.

However, foreign capital flows or opening dummies are macroeconomic variables with only one observation for each year, and hence it is naturally desirable to use more microeconomic measures. We employ the foreigners' share ownership data of individual firms to investigate the differential effect of foreign capital across individual firms.

Table 4 Firm-level investment and financing constraint after financial opening : foreign direct investment inflows （from 1991 to 2000）

Independent Variables	Chaebols		Non-chaebols	
	Pooled OLS with industry, year dummies	LSDV with fixed effects	Pooled OLS with industry, year dummies	LSDV with fixed effects
Intercept	0.288***(4.74)	−0.022 (−0.20)	0.239***(7.01)	−0.042 (−0.27)
I/K	0.062* (1.82)	0.035 (0.96)	0.075***(6.13)	0.022* (1.66)
Sales/K	0.047***(5.79)	0.114***(8.98)	0.028***(11.56)	0.087***(20.20)
Cash/K	0.095 (0.88)	0.231* (2.13)	0.017 (0.59)	0.076** (2.21)
CashK*FDI	−0.162 (−0.70)	−0.221 (−0.95)	0.010 (0.17)	−0.024 (−0.38)
FDI	0.018 (0.17)	0.075 (0.72)	−0.040 (−0.92)	−0.045 (−1.04)
Cash/K*Cri	0.308 (0.81)	0.417 (1.11)	0.060 (0.57)	0.092 (0.86)
Crisis Dummy	−0.042 (−0.24)	−0.102 (−0.59)	0.102 (1.36)	0.108 (1.47)
Adjusted R-square	0.075	0.269	0.068	0.272
No. of observation	759	753	5,595	5,513

Note :
1) FDI : inward foreign direct investment/GDP.
2) Each year dummy excluded, and one-way fixed effect model used.

Table 5 Firm-level investment and financing constraint after financial opening : the share of foreign ownership for financial opening （from 1991 to 2000）

Independent Variables	Chaebols		Non-chaebols	
	Pooled OLS with industry, year dummies	LSDV with fixed effects	Pooled OLS with industry, year dummies	LSDV with fixed effects
Intercept	0.254***(3.83)	0.028 (0.25)	0.291***(8.34)	−0.017 (−0.11)
I/K	0.065* (1.89)	0.031 (0.84)	0.070***(5.73)	0.015 (1.10)
Sales/K	0.048***(5.84)	0.112***(8.93)	0.027***(11.43)	0.086***(19.98)
Cash/K	−0.027 (−0.39)	0.013 (0.14)	0.023 (1.32)	0.086***(3.54)
Cash/K* Foreign ownership	0.012** (1.98)	0.008 (1.18)	0.001 (0.30)	0.000 (0.27)
Foreign ownership	−0.004 (−1.48)	−0.007** (−2.29)	0.000 (0.08)	−0.002 (−1.47)
Cash/K*Cri	0.030 (0.34)	0.065 (0.69)	0.080***(3.15)	0.049* (1.75)
Adjusted R-square	0.105	0.302	0.073	0.281
No. of observation	759	753	5,595	5,513

Note :
1) Foreign ownership : annual average of weekly foreign ownership data for individual firms.
2) Each year dummy included.

The result in Table 5 is consistent with our former results. We do not have any finding that the cash flow sensitivity of firms with higher foreigners' share ownership declined, particularly for independent firms. This suggests that higher foreign ownership did not help financially constrained firms get access to external finance by encouraging efficiency in the financial market. The result does not change whether we control for the crisis effect or not, and whether we examine the pre-crisis period or the whole period.[12]

This counterintuitive finding could be understood when we take the specific institutional

Table 6　The effect of foreign ownership on responsiveness of investment to profitability and sales, for chaebol firms (1991-2000)

Independent Variables	Pooled OLS	LSDV with fixed effects	Pooled OLS	LSDV with fixed effects
Intercept	0.308***(5.24)	0.091 (0.86)	0.315***(5.30)	0.100 (0.34)
Profitability	0.130 (1.22)	−0.028 (−0.23)	0.214** (2.22)	0.052 (0,47)
Profitability*Foreign ownership	0.022** (2.52)	0.028***(2.63)		
Sales/K	0.050***(4.09)	0.111***(6.31)	0.042***(3.44)	0.104***(3.17)
Sales/K*Foreign ownership			0.003** (2.36)	0.004***(3.17)
Debt/K	−0.029** (−2.00)	−0.002 (−0.10)	−0.028** (−1.96)	−0.003 (−0.14)
Foreign Ownership	−0.005** (−2.01)	−0.011***(−3.37)	−0.006** (−2.05)	−0.014***(−3.83)
Adjusted R-square	0.115	0.308	0.114	0.310
No. of observation	759	753	759	753

Note :
1) OLS with industry, year dummies.
2) For fixed effect model, year dummies included and 2-way fixed effects model used.

context of the Korean economy into account. In Korea, the financial market had been dominated by powerful corporate groups having strong connections with financial institutions. Most nonbank financial institutions (NBFIs) were owned by large chaebols and they channeled foreign borrowing to mainly chaebol firms (Lee et al., 2002). In this situation, financial opening and foreign capital inflows are not likely to have eased financing constraints of independent firms, and hence independent firms did not benefit from the increase in foreign capital inflows and higher foreigners' share ownership.

Financial opening or foreign capital inflows may influence the sensitivity of investment to the sales variable because it may chaebol firms' investment behaviors. We test the impact of financial opening on the responsiveness of investment of chaebols to the sales and profitability variable. Interaction terms with year dummies for financial opening and foreign ownership are significantly positive for chaebols, though we report the case of foreign share ownership only. That with the FDI variable is significant but the result is driven by the post-crisis period. This suggests that at least chaebol firms' investment changed more responsive to investment opportunity along with higher foreign capital inflows, which may be another evidence for financial opening to increase efficiency in part. It should be noted that the coefficient of foreign ownership by itself is significantly negative. One explanation is that chaebol firms reduced investment to protect the control of management when foreign ownership increased, since the owner family usually had a very small share of ownership. This is evidently seen after the crisis with the change of the financial system toward more market-based one and increasing foreign influence.

After the crisis, serious concerns have been raised by the fall in overall investment. Domestic investment was about 35% of GDP by 1997, but it dropped to about 27% after the crisis, falling to a much lower rate than the saving rate. One may argue that more foreign capital

inflows, especially FDI, are helpful to the encouragement of investment and thus the economic recovery. However, the independent term of foreign investment and the interaction term with the sales variable in all firms' investment regressions are not significant, though not reported. This is consistent with a finding that the increase of foreign investment did not promote the recovery after the crisis in East Asia （Mody and Negishi, 2001）.

In sum, we do not find the strong evidence that financial opening or more foreign capital inflows enhanced the efficiency of the financial market and eased financing constraints of investment. But higher foreign ownership appears to have checked chaebols' aggressive investment to some extent and made it more responsive to sales, while it independently had a negative impact on the level of chaebol firms' investment.

3. Industry level regressions

This section presents the result of industry-level regressions to complement our findings using firm-level data. We use several variables across industries from the BOK depending on the availability of data. Since data for capital stock and sales to fixed assets across industries are not available, we use fixed assets growth instead of investment over fixed assets. We include operating profit over total assets as a proxy for profitability, and control for the sales growth variable. To examine the effect of financial opening, we interact financial opening and profitability in a manner similar to that in the previous section, assuming that investment should be more responsive to profitability if capital allocation across industries is more efficient （Lee and Borensztein, 1999; Wurgler, 2000）.

Table 7 shows that profitability and sales growth explain industry-level investment in Korea very well. The coefficient of the debt ratio is not negative, which may reflect the feature of the high-debt model in Korea. Concerning the benefit of financial opening, there is no evidence that financial opening in the 1990s made investment more responsive to profitability. We use various measures of the ratio of foreign capital flows to GDP including FDI, foreign portfolio investment, and foreign loans to GDP as well as financial opening dummy variables, but there is no significant result. In addition to overall FDI into the whole economy, we use FDI in each industry to capture cross-industry effects more exactly. In all regressions, no interaction term regardless of measures is significantly positive. It is surprising that the effect of foreign direct investment on the sensitivity of investment to profitability is significantly negative when we use overall FDI to GDP ratio. When we introduce the interaction term of foreign capital flows and sales growth, again we do not have any significant result.

All in all, our industry-level result supports a skeptical view about the positive effect of foreign capital inflows on efficiency in capital allocation across industries. Though the sample period is different, another study using industry-level data also finds that financial liberalization after the late 1980s did not improve capital allocation in Korea （Borensztein and Lee, 1999）. Our results confirm that there is hardly any benefit of financial opening with respect to industry-level capital allocation in Korea in the 1990s.

Table 7　Industry-level investment and the effect of foreign capital flows in the 90s.

1) All industries (from 1991 to 2000)

Independent Variables	Pooled OLS with year dummies	LSDV with fixed effects
Intercept	−5.525* (−1.82)	−7.491 (−1.65)
Profitability	0.953*** (3.67)	1.073*** (3.60)
Sales growth	0.331*** (5.10)	0.245*** (3.05)
Debt ratio	0.001 (0.50)	0.003 (0.90)
Adjusted R-square	0.308	0.395
No. of observation	210	210

2) Role of foreign direct investment inflows across industries (from 1991 to 2000)

Independent Variables	FDI inflows across industries		Overall FDI inflows	
	Pooled OLS with industry, year dummies	LSDV with fixed effects	Pooled OLS with industry, year dummies	LSDV with fixed effects
Intercept	−5.564* (−1.75)	−6.978 (−1.47)	−1.363 (−0.30)	−5.231 (−1.12)
Profitability	0.841** (2.59)	0.918** (2.52)	1.816*** (3.52)	1.970*** (3.53)
Sales growth	0.322*** (4.52)	0.254*** (3.05)	0.174*** (2.78)	0.240*** (3.00)
Debt ratio	0.002 (0.53)	0.003 (0.85)	0.003 (1.16)	0.003 (0.84)
Profit*FDI	0.973 (0.46)	1.757 (0.76)	−0.689** (−2.32)	−0.593* (−1.90)
FDI inflows	1.675 (0.11)	−7.07 (−0.40)	2.361 (1.06)	——
Adjusted R-square	0.304	0.397	0.150	0.407
No. of observation	210	210	210	210

1) Year dummy not reported.
2) Two-way fixed effects model used.

Ⅴ. Conclusions

In spite of the argument that financial opening should spur economic growth by encouraging investment and efficiency of capital allocation, empirical results using the traditional cross-country macroeconomic data are only mixed. Recently, economists have started to conduct more microeconomic studies using firm-level or industry-level data. Estimating the investment model with financing constraints, most studies find that financial opening and more foreign capital inflows help to ease financing constraints. They report that independent or smaller firms usually suffer from financing constraints due to the imperfect financial market and liberalization is likely to reduce constraints by increasing efficiency in the financial market.

The paper examines the microeconomic effect of financial opening and foreign capital inflows on financing constraints of Korean firms in the 1990s. Using firm-level and industry-level data, we test whether financial opening or more capital inflows encouraged efficiency and lowered financing constraints, and whether investment became more responsive to pro-

fitability. We introduce various measures for financial opening including foreigners' ownership of individual firms so as to explore the effect on individual firms.

In general, we do not find strong evidence to support the mainstream argument that opening the financial market makes investment more efficient. Our results demonstrate that independent firms had faced more financing constraints in comparison with chaebols, and financing constraints for independent firms became more serious after the crisis. There is no evidence that financial opening and greater foreign capital inflows helped to ease financing constraints of these firms. The mainstream support for financial opening has no empirical grounding in Korea, perhaps due to the specific institutional structure of the Korean economy. Industry-level regressions complement these findings by demonstrating that greater foreign capital inflows did not enhance investment efficiency across industries. However, chaebol firms' investment appears to have become more responsive to profitability or sales along with more financial opening and higher foreigners' ownership although foreign ownership made a negative impact on their investment independently.

Note :

1) Other studies on developing countries include Bahlous and Nabli （2001） for Tunisia, Gangopadhyay et al. （2002） for India, Perroti and Gelfer （2001） for Russia, Lizal and Sveznar （2002） for Czech, and Burdina et al. （2002） for Bulgaria. Most of these explore the effect of financial liberalization on financing constraints.

2) Their efficiency index to show relative marginal return is the total return actually achieved divided by a benchmark return, an estimate of a return if investment had been allocated to firms in proportion to their share of capital in the economy. They use sales-based and profit-based measures. This is similar to the index of efficiency in Wurgler （2000）.

3) There is a debate regarding how the cash flow sensitivity reflects financing constraints. Kaplan and Zingales （1997） and Cleary （1999） do not find that firms with more constraints actually have higher cash flow sensitivity. For further discussion, see Fazzari et al. （2000） and Kaplan and Zingales （2000）.

4) The sales to capital ratio could be a measure for fundamentals of firms based on the assumption of the Cobb-Douglas production function. The Euler approach, using the sales variable for fundamentals, looks somewhat similar to the accelerator model although it does not use sales growth. Another measure for fundamentals using profitability is possible based on the assumption of no fixed costs.

5) We may use foreign loans of individual firms as a variable for financial openness. However, foreign borrowing was channeled to firms mostly through financial institutions and it is too little for individual firms in comparison with foreign ownership.

6) Appendix II presents the deletion criteria, similar to that of Laeven （2001） and Love （2003）.

7) For example, FDI data have an observation for the electronics industry overall, though there are financial statements data across sub-industries of that industry. In this case, we use the same data of FDI for the computer and office goods （30）, the other electrical machine （31） and the electronic parts （32） industry.

8) Love （2003） uses a more complicated setup using the future I/K variable compared to Laeven （2001）. Though not reported, our result is consistent when we test this specification.

9) Interestingly, when we examine the post-crisis period alone, the chaebol dummy becomes insignificant, perhaps due to the fact that the impact of corporate restructuring of chaebol firms after the crisis depressed their investment.

10) For the extensive analysis of the effect of financial restructuring and its results, see Crotty and Lee (2001).

11) The result does not change with or without the interaction term with the crisis dummy.

12) We also test a specification without the foreign share independently. The interaction term changes more significant but it is still not statistically significant. Note that several studies do not include the independent term of the condition variable.

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〈Appendix I : variables and data〉

Ⅰ. Financial opening variables

1）Financial opening index : year dummy

: after examining development of capital account liberalization policy, especially foreign borrowing, we put 0 before 1994, and 1 after 1994.

2）Foreign capital inflows index

: FDI / GDP, foreign portfolio inflows / GDP and foreign lending / GDP, from Bank of Korea（BOK）website, Balance of Payment accounts

3）Foreign ownership data for individual firms

: Foreigners' share for individual listed firms. From Daewoo security company. Annual average of weekly data used.

Ⅱ. Firm-level financial statements data

: covering all listed nonfinancial firms, more than 700 firms from 1990 to 2000（after treating missing values and deleting some outliers, the number of observation is reduced）. All data of financial statements of firms from National Information & Credit Evaluation, Inc.（NICE）of Korea.

1）Capital stock（K）

: Total tangible fixed assets

2）Investment

: Gross investment$=K_t-K_{t-1}+$depreciation

3）Sales

: Total sales at the beginning of period t.

4）Cash stock

: Measure for liquidity, calculated by cash, deposit$+$marketable securities, at the end of period t-1.

5）Debt ratio

: Total debt / total tangible fixed assets, at the end of period t-1.

6）Profitability

: Operating profit / total tangible fixed assets, at the end of period t-1.

We match these firm-level financial statements data and foreigners' ownership data from different sources.

Ⅲ. Industry-level data

: All data from financial statements analysis from the Bank of Korea website, originally based on the survey of more than 60000 firms.

1）Industry classification

: 21 manufacturing industries（industry code）used including, food（15）. textile（17）. clothes（18）. leather（19）. wood（20）. paper and pulp（21）. printing（22）. cokes and petrochemical（23）. chemical products（24）. plastic products（25）. non-metal（26）. first steel（27）. metalrugy（28）. machine（29）. computer and office goods（30）. other electrical machine（31）. electronic parts（32）. medical and optical device（33）.auto and trailer（34）. other transportation equipments（35）. furniture（36）.

2）Fixed assets growth rate

: Growth rate of fixed assets of each industry

3 ） Profitability
    : Operating profit / total assets
4 ） Debt ratio
    : Debt / equity capital
5 ） Sales growth
    : Growth rate of sales

〈**Appendix II : deletion criteria**〉

We delete all observation with missing data for relevant variables and also followings :

Observations with I/K less than 0,

Observations with I/K higher than 2.5,

Observations with Sales/K higher than 15,

Observations with Cash/K higher than 2.5,

Observations with Cash/K less than 0,

Observations with Operating profit less than 0.